FINAL
ENGINEERING EVALUATION/ COST ANALYSIS
Index Shooting Range, Mt. Baker-Snoqualmie National Forest

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ACRONYMS AND ABBREVIATIONS

bcy	Bank cubic yard
bgs	Below ground surface
lcy	Loose cubic yard
mg/kg	Milligram per kilogram
amsl	Above mean sea level
APA	Abbreviated Preliminary Assessment
ARAR	Applicable or Relevant and Appropriate Requirements
BA	Biological Assessment
BMP	Best management practice
CAD	Conveyor assisted delivery
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CFR	Code of Federal Regulations
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
F	degrees Fahrenheit
FP S&Gs	Forest Plan Standards and Guidelines
GS	Geological Survey
LRMP	Land and Resource Management Plan
MDC	Maximum detected concentration
MDL	Method detection limit
MRL	Method Reporting Limit
MTCA	Model Toxics Control Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NWFP	Pacific Northwest Forest Plan
O&M	Operations and maintenance
PAH	polycyclic aromatic hydrocarbons
RAO	Removal action objective
RCRA	Resource Conservation and Recovery Act
RSL	Regional Soil Screening Levels
SHPO	State Historic Preservation Officer
SPLP	Synthetic precipitation leaching procedure
TCLP	Toxicity characteristic leaching procedure
TEE	Terrestrial Ecologic Evaluation
URS	URS Corporation
USDI	United States Department of the Interior
WAC	Washington Administrative Code
WDOE	Washington Department of Ecology
WPSAP	Work Plan and Sampling and Analysis Plan
WRCC	Western Regional Climate Center

EXECUTIVE SUMMARY

URS Corporation (URS) prepared this Engineering Evaluation/Cost Analysis (EE/CA) for a proposed Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) removal action at the Index Shooting Range in western Washington. This former shooting range is located within the Mt. Baker-Snoqualmie National Forest, in Snohomish County, approximately ½-mile to the west of the town of Index (Figure 1) in the foothills of the Cascade Mountains.

The Index Shooting Range was in use from 1947 through 2009 and consisted of a clubhouse and two trap houses that contained target launching equipment. A series of shooting stations were also located on the south side of the range and shot was fired to the north of the clearing into a forested area.

Results from groundwater monitoring events conducted in 2006 by others and 2011 by URS do not exceed Model Toxics Control Act (MTCA) criteria. Much of the soil in the forested area to the north of the clearing contains high concentrations of lead that exceed MTCA Method A cleanup criteria.

Four alternatives were evaluated for the Index Shooting Range:

- Alternative 1 – No Action
- Alternative 2 – Excavation and On-Site Treatment
- Alternative 3 – Excavation and Off-Site Disposal
- Alternative 4 – On-Site Capping

A removal action is necessary to eliminate direct exposure to lead-impacted soils. Therefore, the removal actions evaluated in this EE/CA focus on eliminating direct contact with high lead concentrations in soils and attaining ARARs to the extent practical.

Alternative 4 is recommended to address risk associated with exposure to lead in Site soil. The area of lead-impacted soils exceeding the MTCA Method A criteria of 250 mg/kg, approximately 2.46 acres, would be capped in place by a two-foot cap consisting of 1.5 feet of clean backfill material and 0.5 feet of compost. An approved seed mix would then be spread over the compost. Annual monitoring of the capped area would be conducted for a minimum of five years to ensure these areas become revegetated and remain stable, and to identify and eliminate infestations of non-native or invasive plant species.

The total estimated cost for the recommended alternative is **$842,000.**

1.0 INTRODUCTION

URS Corporation (URS) was contracted by the United States Department of Agriculture Forest Service (Forest Service) to perform an Engineering Evaluation/Cost Analysis (EE/CA) for an anticipated non-time critical removal action at the Index Shooting Range (the Site) on the Mt. Baker-Snoqualmie National Forest in western Washington.

- This EE/CA is being performed by the Forest Service under its cleanup authorities (42 USC 9604(a), 7 Code of Federal Regulations (CFR) 2.60(a)(39) and Federal Executive Order 12580). The purpose of this EE/CA is to select an alternative to minimize or eliminate any release or threat of release of a hazardous substance into the environment or impact on public health and welfare as outlined in 40 CFR 300.415(b)(2)(i-viii).
- This EE/CA was prepared utilizing the U.S. Environmental Protection Agency (EPA) "*Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*" and in accordance with the provisions of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR 300.415(b)(4)(i).
- The purpose of a removal action is to "abate, prevent, minimize, stabilize, mitigate or eliminate the release or the threat of a release" (40 CFR 300.415). The EE/CA for a removal action is intended to:
    - Satisfy environmental review requirements for removal actions;
    - Satisfy administrative record requirements for documentation of removal action selection; and
    - Provide a framework for evaluating and selecting alternative technologies.
- To meet those purposes, this EE/CA identifies objectives for the removal action and evaluates the effectiveness, implementability, and cost of four alternatives that may satisfy these objectives.
- The primary sources of data used to evaluate Site conditions and to develop removal action alternatives are the Index Sportsmen's Club – Final Field Investigation Report (EA, 2004), Summary of Field Activities and Results of Groundwater Sampling, Final (EA, 2006), the Abbreviated Preliminary Assessment (APA) (USFS, 2011), and a data gap investigation conducted by URS as part of this EE/CA.

2.0 SITE CHARACTERIZATION

Site characterization data is presented in the Index Sportsmen's Club – Final Field Investigation Report (EA, 2004), Summary of Field Activities and Results of Groundwater Sampling, Final (EA, 2006), and the Abbreviated Preliminary Assessment (APA) (USFS, 2011) reports. A vicinity map is provided in Figure 1, and a map showing primary Site features is provided in Figure 2.

2.1 Site Description

- The Site is a former shooting range located within the Mt. Baker-Snoqualmie National Forest, in Snohomish County, Washington. It is located approximately ½-mile west of the town of Index, WA, in the NE ¼ of Section 19, Township 27 North, Range 10 East.
- The Site is found on the United States Department of the Interior (USDI) Geological Survey (GS) 7 ½ Minute Quadrangle Map – Index, Washington (GS, 1989).
- The site is approximately 7.5 acres, approximately 5 acres of forest and 2.5 acres of clearing.
- The site is bordered to the north by a Burlington Northern Sante Fe Railroad Right of Way.
- The North Fork of the Skykomish River runs from east to west approximately 250 feet south of

the site.

- All site features related to the former shooting range, including two trap houses, 10 shooting station pads and a club house have been demolished and removed from the site.

2.2 Topography and Climate

- The area surrounding the site is characterized by hilly to mountainous topography and narrow stream valleys. The stream valleys are generally oriented in an east-west direction.
- The site is located at an approximate elevation of 500 feet above mean sea level (amsl).
- A summary of the climate indicators is provided below and is based on data from the Western Regional Climate Center's Desert Research Institute (WRCC DRI, 2011) for Index, Washington.
    - The mean annual precipitation is 89.19 inches.
    - The mean maximum temperature for the nearby town of Baring is 57.9 degrees Fahrenheit (F), with an average maximum temperature of 75.2 F in July.
    - The mean minimum temperature for the nearby town on Baring is 40.5 F with the average minimum of 31.1 F occurring in January.

2.3 Surrounding Land Use and Populations

Land uses in areas surrounding the Site include recreational use (e.g., rock climbing, rafting, camping, hiking, hunting), and logging. The town of Index had 169 inhabitants in 2009 (U.S. Census Bureau, 2009). The Site is currently inactive and vehicular access is restricted off of public roads by a locked gate. Potential future land use may include recreational uses such as camping.

2.4 Sensitive Environments

Sensitive environments as defined in Washington Administrative Code [WAC] 173-340-200 include wetlands, critical habitat for endangered or threatened species, national or state national wildlife refuge, wild or scenic river, rookery, riparian area, big game winter range, and critical habitat, breeding, or feeding area for fish or shellfish.

According to a report generated on the Washington Department of Fish and Wildlife interactive PHS website:

- There is a Golden Eagle Breeding Area within ¼ mile of the site. The Golden Eagle (*Aquila chrysaetos*) is considered a candidate state species.
- The Site is located within a management buffer for the Northern Spotted Owl (*Strix occidentalis*).

A previous Biological Assessment (BA) (Forest Service, 2009) stated that there are five wildlife species listed as endangered or threatened under the ESA (including the Northern Spotted Owl, Marbled Murrelet, Grizzly Bear, Gray Wolf, and Canada Lynx) in addition to many Region 6 Sensitive Species that occur or may occur at the Site

According to the Mt. Baker-Snoqualmie National Forest GIS Data Dictionary the land allocation designation at the Site is 'Scenic Foreground (allowed partial yield timber harvest)'.

2.5 Data Gap Investigation

URS conducted a data gap investigation at the Site on August 10th and 11th, 2011. Analytical results of the investigation are included as Appendix A. As described in the EE/CA Data Gap Work Plan and Sampling and Analysis Plan (WPSAP) (URS, 2011) the objectives of the data gap investigation were to:

- Collect additional soil samples to delineate the northern extent of lead impacts from the former shooting range activities.

- Evaluate soil samples to determine the need for treatment to meet Subtitle D landfill levels.
- Collect additional groundwater samples to assess polycyclic aromatic hydrocarbons (PAH) impacts to groundwater from the clay pigeon projectile targets.

The results of the data gap investigation are present in the following subsection.

2.5.1 Groundwater Sample Collection

- One additional round of groundwater sampling was completed on August 11, 2011 in general accordance to the WPSAP.
- All groundwater samples were submitted to Apex Laboratories of Tigard, Oregon for PAH analyses. Groundwater sample results are summarized in Table 1.
- No PAHs were detected above the method detection limit (MDL) in the samples collected during the August 11, 2011 sampling event.

2.5.2 Soil Sample Collection

- Soil samples were collected from 10 sample locations on August 11, 2011 (Figure 2) in general accordance with the WPSAP.
- Evidence of past shooting range activities such as shot remnants were not observed during the data gap sampling event. Due to a lack of shot observed during sample collection, the samples were not sieved during collection.
- At most sample locations, soil samples were collected at two depths generally from 3”-6” and 18”-24”.
- Soil samples were submitted to Apex Laboratories of Tigard, Oregon for total lead and toxicity characteristic leaching potential (TCLP) analyses. Soil sample results from the data gap sampling and previous sampling activities are summarized in Table 2.
- The highest lead concentrations detected in the data gap samples were all collected from shallow intervals. Of those samples the detected concentrations that exceeded the Model Toxics Control Act (MTCA) Method A criteria of 250 mg/kg were from locations SS-03 (1580 mg/kg), SS-04 (720 mg/kg), SS-05 (513 mg/kg), and the SS-05 field duplicate (409 mg/kg).

2.6 Source, Nature, and Extent of Contamination

The source, nature and extent of contamination at the Site are summarized in the following subsections by media type. Refer to the Index Sportsmen’s Club – Final Field Investigation Report (EA, 2004), Summary of Field Activities and Results of Groundwater Sampling, Final (EA, 2006), and the APA (USFS, 2011) for more detailed information on the historical sampling events.

2.6.1 Groundwater

- Groundwater is present at the site at elevations generally ranging from 3 to 15 feet below top of casing.
- There are no drinking water wells located on or near the site. The water supply for the town of Index is located upslope of the shooting range.
- Groundwater sampling events conducted in 2006 indicated a potential for migration of lead and PAHs at the site, however, concentrations of these analytes were below MTCA Method A cleanup levels (EA, 2006).
- Additional groundwater sampling conducted as part of the 2011 data gap investigation did not detect PAHs above the method detection limits (MDLs).

- With the possible exception of future workers excavating the area, no human or ecological exposures to groundwater are anticipated.
- The groundwater pathway is not addressed further in this EE/CA.

2.6.2 Air

- Air quality at the Site has not been characterized and no air samples were collected during the previous investigations. The most likely, although remote, source of air contamination at the Site is windblown dust particulates from the surface soils.
- The air pathway is a potentially complete because metal-impacted soil is concentrated at the surface where human and ecological receptors could be exposed to particulate matter by inhalation. Furthermore, surface soils are covered by a layer of forest duff.
- Due to the remote source of air quality impacts due to the contaminated soils to air, the air pathway is not addressed further in this EE/CA.

2.6.3 Soil

Background Soil

- Background soil samples were collected during the 2004 Field Investigation (Figure 2) at two locations designated BK-SSS-01 and BK-SSS-02. At one location, BK-SSS-02, soil was collected at depth. The results indicated the following:
  - Arsenic and lead were detected above Method Reporting Limits (MRLs) (Table 2) at both background soil sample locations and depths.
  - Only arsenic results from both background surface (0-3 inches) samples exceeded screening criteria.
  - The Site-specific background concentrations are used in the EE/CA to assist with the selection of cleanup criteria for the Site.

Shooting Range Soil

- The majority of the cleared portion of the site, approximately 2.5 acres, did not contain lead concentrations above the MTCA Method A criteria.
- Shallow soils to the north of the clearing generally have higher lead concentrations. Concentrations exceeding the MTCA Method A criteria of 250 mg/kg are shown on Figure 3.
- The total estimated area of soils exceeding the MTCA Method A criteria is approximately 2.5 acres including the northern portion of the clearing and the forested area to north.
- Soil samples exceeding criteria were collected from shallow sample intervals (i.e., less than 1 foot below ground surface (bgs)).
- The total estimated volume of lead impacted soil exceeding MTCA Method A criteria is 3,970 bank cubic yards (bcy) or 5,160 cubic yards (cy).

TCLP Results

Soil samples were analyzed for TCLP lead to determine the need for treatment to meet Subtitle D landfill levels.

- TCLP soil results are summarized on Table 2.
- TCLP results for shallow interval samples collected from locations SS-01, SS-03, and SS-04 exceeded the Toxicity characteristic criteria of 5 mg/l.

3.0 SITE CLEANUP CRITERIA

There are two general types of cleanup criteria:

(1) Applicable or Relevant and Appropriate Requirements (ARAR), and

(2) Risk-based cleanup criteria developed from human health and ecological risk equations using acceptable risk levels and Site-specific factors.

ARARs are "applicable" or "relevant and appropriate" federal and state environmental requirements. Applicable requirements include cleanup standards and other substantive requirements, criteria, or limitations promulgated under federal or state laws that apply to hazardous substances and removal actions at the Site. Relevant and appropriate requirements are not applicable to the Site but may be suitable for use because they address issues or problems sufficiently similar to those at present at the Site. In addition to ARARs, federal and state environmental and public health guidance and proposed standards that are not legally binding but may prove useful are "to be considered" standards.

The results of the 2011 data gap and previous sampling events indicate that there are potentially significant risks at the Site from the exposure of ecological and human receptors to Site soil. The following discussion of ARARs and proposed cleanup criteria, therefore, focuses on soil as the only media of concern at the Site. ARARs and proposed cleanup criteria for soil are discussed below.

3.1 Applicable or Relevant and Appropriate Requirements

ARARs are used to:

(1) Evaluate the extent of Site cleanup needed;

(2) Scope and develop removal action alternatives; and

(3) Guide the implementation and operation of the preferred alternative.

The NCP (40CFR 300.415(j)) establishes that a removal action shall "to the extent practical, considering the exigencies of the situation, attain ARARs under federal environmental or state environmental facility siting laws."

To determine whether compliance with ARARs is practicable, two factors are specified in 40 CFR 415(j):

- Urgency, and
- Scope of the removal action.
    - The scope of the removal action is often directed at minimizing and mitigating potential hazard rather than totally eliminating the hazard; even though a particular standard may be an ARAR for a particular medium, it may be outside the scope of the immediate problem the removal action is addressing.

A comprehensive list of potential ARARs generated and evaluated for the Site is presented in Appendix B. This list was developed based on ARARs identified during EE/CAs recently completed by the Forest Service at other sites in the State of Washington. The ARARs were used to determine the design specifications and performance standards for the project. They are grouped as federal or state of Washington ARARs, and are identified by a statutory or regulatory citation, followed by a brief explanation of the ARAR, and whether the ARAR is applicable or relevant and appropriate).

- Administrative requirements are not ARARs and thus do not apply to actions conducted entirely on-Site. Administrative requirements are those that involve consultation, issuance of permits, documentation, reporting, and record-keeping.
- The CERCLA program has its own set of administrative procedures, which assure proper implementation of CERCLA. The preamble to the final NCP states that the application of

additional or conflicting administrative requirements could result in delay or confusion.

- Provisions of statutes or regulations that contain general goals that merely express legislative intent about desired outcomes or conditions, but are non-binding, are not ARARs. In accordance with Section 121(e) of CERCLA, no permits are required for the removal action.

Potential key chemical-, action-, and location-specific ARARs for a removal action at the Index Shooting Range Site include, respectively:

- **Chemical-specific Soil Standards:**
  - Washington MTCA Industrial Soil Cleanup Levels – Human Receptors (WAC Chapter 173-340, Tables 740-1 and 745-1).
  - Washington MTCA Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals (WAC Chapter 173-340, Table 749-3).
  - EPA Industrial Soil Regional Screening Levels (RSLs) (EPA, 2009).
  - EPA Ecological Soil Screening Levels (EPA, 2008).
- **Solid/Dangerous Waste (Solids) Disposal Requirements:**
  - Washington MTCA Terrestrial Ecologic Evaluation (TEE) Criteria (WAC Chapter 173-340).
  - Washington State Hazardous Waste Management Act and Dangerous Waste Regulations (WAC Chapter 173-303).
  - Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Subtitle C (40 CFR Part 261 to 279).
- **Forest Plan Standard and Guidelines (FP S&Gs):**
  - Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan (LRMP) (Forest Service, 1990), as amended by the Pacific Northwest Forest Plan (NWFP) (1994).
  - Other Standards and Guidelines may also be potentially applicable, for example, measures identified for the protection of threatened, endangered or sensitive species.

Many potential key location-specific and some action-specific ARARs will be considered during the design phase of the removal, after the removal decision identifies the selected alternative and removal activities.

3.1.1 Soil Standards

The soil ARARs are based on Washington state and federal standards for the protection of human health and the environment and are summarized in Table 3. Lead concentrations in Site soils exceeded the soil quality ARARs:

- Lead in background soil exceeded human health and/or ecological ARARs.
- The maximum detected concentration (MDC) of lead in soils at the Site exceeded human health and/or ecological ARARs.

3.1.2 Solid/Dangerous Waste (Solids) Disposal Requirements

These ARARs set minimum functional performance standards for proper handling and disposal of solid waste; describe responsibilities of various entities; and stipulate requirements for solid waste handling facility location, design, construction, operation, and closure. All substantive requirements for closure and post-closure of limited purpose landfills (WAC 173-350-400) are potential ARARs (WAC 173-340-71 0[7] [c]). The soils at the Site are considered landfills that contain solid waste and are releasing hazardous substances above both state and federal cleanup standards.

3.1.3 Forest Plan Standard and Guidelines (FP S&Gs)

Portions of the Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan (LRMP) (Forest Service, 1990), as amended by NWFP (Forest Service, 1990), are potentially applicable or relevant and appropriate for assessing Site removal alternatives. The LRMP and NWFP include standards and guidelines that are potentially relevant and appropriate to actions at the Site.

3.2 Proposed Cleanup Criteria

The proposed soil cleanup criteria are shown on Table 3. Calculations of risk-based concentrations were not expected to provide significant advantages over the level set in the conservative MTCA Method A ARAR and were, therefore, not calculated for the soil. Concentrations detected in background soils exceed one or more of the proposed criteria. The MTCA Method A Unrestricted Land Use criteria is proposed for the soil removal action at the Index Shooting Range. Unrestricted Land Use criteria would be appropriate for current and future (i.e., recreational uses such as camping) uses of the site.

4.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

The primary goal of a removal action is to protect human health and the environment by preventing or minimizing the potential release of a hazardous substance and reducing the potential for direct contact and transport of contaminants to the environment. Based on the risks identified at the former Index Shooting Range in addition to consideration of the current site conditions, the following non-time critical removal action objectives (RAO) were developed for the Site:

- Reduce human and wildlife exposure to **lead** in the site soils above the MTCA Method A criteria.
- Attain ARARs to the extent practical.

The following sections discuss the justification for a removal action at the Site and the scope of the removal action.

4.1 Removal Action Justification

40 CFR 300.415(b), lists several factors to be considered in determining whether a removal action is appropriate. The factors relevant at this Site, and the conditions establishing the presence of those factors, are summarized below:

- **High levels of hazardous substances, pollutants, or contaminants in soils, at or near the surface that may migrate:**
  - The total volume of lead-impacted soils at the site is approximately 3,970 bcy.
  - Lead impacted soils are at the surface (i.e., less than 1 foot bgs). Although the surface is vegetated, there is a potential for mobilization of these soils during significant rain fall events.
- **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants:**
  - Lead is present in site soils at concentrations that exceed a human health screening criterion.
  - Lead is present in site soils at concentrations that exceed an ecological screening criterion.
- **Actual or potential contamination of drinking water supplies or sensitive ecosystems:**
  - Lead-impacted soils are present at the site.
  - The site is considered, by the state of Washington, a sensitive ecosystem as it is within ¼ mile of a Golden Eagle Breeding Area (a state candidate species) as well as being located within a management buffer for the Northern Spotted Owl.

- Five wildlife species listed as endangered or threatened under the ESA (including the Northern Spotted Owl, Marbled Murrelet, Grizzly Bear, Gray Wolf, and Canada Lynx) in addition to many Region 6 Sensitive Species that occur or may occur at the Site.

4.2 Scope of Removal Action

The scope of removal actions evaluated in this EE/CA focuses on minimizing human and ecological receptor exposures to high concentrations of lead in the soils at the Site.

- The primary sources of high lead concentrations consist of soils impacted by past shooting range activities. Therefore, the scope of this removal action focuses on addressing the lead-impacted soil.
- Three removal action alternatives are considered that should significantly reduce the potential for direct contact with lead-contaminated soil.
  - Excavation of the soil, on-Site treatment via soil washing.
  - Excavation and off-Site disposal of the soils at a RCRA Subtitle D landfill. Approximately 2000 tons of soil would require on-site stabilization prior to disposal.
  - Capping of lead-contaminated soil with clean backfill soil and compost.

Confirmation sampling will be required to evaluate the removal action effectiveness and compliance with the ARARs.

- For alternatives requiring excavtion, the number and type of samples, analytical methods, and MDLs will need to be determined. Contingency measures should be identified in the event the analytical results indicate the Site cleanup criteria are not being met in the underlying soils exposed by excavation.

Post-removal action operation and maintenance (O&M) activities will be required to monitor the removal action effectiveness and compliance with the ARARs.

- Visual, post-construction monitoring of the removal area will be necessary to document that revegetation is occurring to ensure that the restoration cover materials remain stable and erosion does not occur.
- Visual, post-construction monitoring of the removal areas and any other areas disturbed by the removal action will be necessary to ensure infestations of noxious or invasive weeds are identified and eradicated.

5.0 IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section describes the selection of a removal action using a three–step process:

1) Identify potential removal action options and alternatives applicable to the Site and screen to eliminate ineffective or unfeasible alternatives;
2) Analyze selected removal action alternatives based on effectiveness, implementability, and cost; and
3) Identify existing data gaps that are relevant to the selected alternatives.

5.1 Identification and Screening of Removal Action Options and Alternatives

Removal action technologies applicable to the Site were identified based on previous experience at similar sites. The technologies, described in Table 4, were screened to eliminate inappropriate, ineffective, infeasible or cost prohibitive methods. In addition, technologies with unproven or uncertain performance were eliminated if they had relatively high implementation costs and/or would likely require

implementation with other costly mitigation components. Technologies with uncertain or unproven performance were retained if they represented potentially cost effective mitigation and the performance can be investigated through pilot or bench scale testing. For this EE/CA, a potentially cost effective technology is one that could provide protection comparable to other standard methods utilized in soil treatment, at a cost similar to or less than the costs of those methods. All components not screened out were retained as potential technologies that could be implemented at the Site.

The technologies were assessed relative to others in the same sub-category based on effectiveness, implementability, and cost. This allowed each technology to be assigned a relative ranking of high, medium, or low for each evaluation criterion. Table 4 summarizes the results of the removal action technology screening process, including the technologies retained for incorporation into removal action alternatives.

Based on results of the removal action technology screening process, four removal action alternatives were selected for detailed analysis. The alternatives include:

- **ALTERNATIVE 1 – NO ACTION**
- **ALTERNATIVE 2 – ON-SITE TREATMENT**
- **ALTERNATIVE 3 – EXCAVATION AND OFF-SITE DISPOSAL**
- **ALTERNATIVE 4 – ON-SITE CAPPING**

Each alternative is discussed below.

5.2 Removal Action Elements Common to all Action Alternatives

Certain work elements would be employed and implemented regardless of the action alternative selected. These elements include:

- Clearing/grubbing of existing vegetation in the area of lead impacted soils. Whether the impacted soil is treated on-Site, capped on-Site, or excavated and disposed of off-Site, some vegetation removal will be required. The vegetation will be stockpiled on-Site and returned to the excavation areas during Site restoration.
- Best management practices (BMP) may be implemented, as needed, during the on-Site work to contain run-off, minimize erosion, and minimize the potential for spread of noxious weeds.
    - The removal action will likely occur during the dry season. This makes it unlikely that BMPs will be necessary for run-off or erosion control. Potential erosion control BMPs may include silt fencing, straw bales, temporary surface water diversions, and dust suppression.
    - BMPs for minimizing the spread of noxious weeds may include wheel washing of trucks driving to/from the Site.
- Restoration and revegetation of the removal area and any other areas disturbed by the removal action.
- O&M monitoring of the restored areas disturbed by the removal action.

Certain work elements would be employed and implemented for both Alternatives 2 and 3. These elements include:

- Excavation of the lead impacted soils. This activity is an element of both the on-Site and off-Site alternatives.
- Decommissioning of two monitoring wells within the removal area.
- Confirmation sampling of the base of excavation. Use of an XRF would be effective to identify

remaining contaminated areas as well as clean areas.

5.3 Description of Alternatives

The four alternatives are described below.

5.3.1 Alternative 1 – No Action

This alternative consists of no further action and leaving the Site as is:

- The lead impacted soil would remain in the current location.

5.3.2 Alternative 2 – On-Site Treatment

This alternative involves the excavation of lead impacted soils, treatment via soil washing and placement back in the excavated area. The basic elements of this alternative are depicted on Figures 4 and 5. This alternative includes the following elements:

- Mobilization of equipment to the Site, which may include the following:
  - Small and/or large track-mounted excavators.
  - Haul trucks.
  - Front-end loader.
  - Small dozer.
  - Water truck.
  - On-site soil washing plant (required components would be determined following feasibility study)
  - Chain saw and hand tools.
  - Pressure washer.
  - Sanitary and decontamination facilities.
- Clear and grub excavation area, remove trees and stumps.
- Decommission monitoring wells MW-1 and MW-2.
- Excavation of impacted soils.
  - Transport to and stockpile at soil washing pad.
- Confirmation sampling.
  - Following excavation of the removal area, soil samples will be collected from the excavation footprint and analyzed at an approved laboratory for total lead.
  - Analytical results will be compared to the proposed cleanup criteria.
  - The analytical results will provide the basis for determining whether additional excavation is required to meet the cleanup criteria.
  - As described in Section 5.5, it is assumed that exceedances of the screening criteria will necessitate overexcavation, resulting in a 20 percent increase in excavated impacted soil volume.
- Onsite soil washing.
  - Soils would be washed on-site through wet screening and possibly extraction process pending feasibility testing required to assess applicability of technology to site soil conditions.

    - Prior to replacement of washed soils back in excavation area, confirmation sampling would be required to assure achievement of site cleanup criteria.
- Return treated soil to excavated area, use small dozer to grade returned soils, it is assumed that 80 percent of treated soils will be returned to the excavation area.
- Restoration and revegetation.
    - Purchase about 1,000 loose cubic yards (lcy) of EKO Compost and transport to the Site.
    - Cover the excavation area with EKO compost, to a minimum thickness of 3".
    - Seed the surface of the EKO compost in the excavation area with a Forest Service approved seed mix.

5.3.3 Alternative 3 – Excavation and Off-Site Disposal

This alternative involves the excavation of the lead-impacted soils and disposal of the material at an off-Site RCRA Subtitle D landfill. The basic elements of this alternative are depicted on Figures 6 and 7. This alternative includes the following elements:

- Mobilization of equipment to the Site, which may include the following:
    - Small and large track-mounted excavators.
    - Front-end loader.
    - Small dozer.
    - Highway legal ton dump trucks.
    - Water truck.
    - Chain saw and hand tools.
    - Pressure washer.
    - Sanitary and decontamination facilities.
- Clear and grub excavation area, remove trees and stumps.
- Decommission monitoring wells MW-1 and MW-2.
- Excavation of the lead impacted soils that exceed the MTCA cleanup criteria of 250 mg/kg.
    - Clear vegetation from the excavation area. Set aside for later use during Site restoration.
    - Treat portion of hazardous soils (i.e., those exceeding TCLP characteristic of 5 mg/L) with EnviroBlend® at a 2% wt/wt dosage.
        - Material will be spread over delineated area and mixed in using disc furrow attachment or other mechanical means.
        - Confirmation sampling of reduction in TCLP concentrations will be required to ensure treatment has reduced TCLP lead concentrations to below 5 mg/L.
- Excavate the lead impacted soils down 1 foot.
- Confirmation sampling of the excavation footprint.
    - Following excavation of the lead impacted soils, soil samples will be collected from the excavation footprints and analyzed at an approved laboratory for total lead.
    - Analytical results will be compared to the proposed cleanup criteria.

- The analytical results will provide the basis for determining whether additional excavation is required to meet the cleanup criteria.
- As described in Section 5.5, it is assumed that exceedances of the screening criteria will necessitate overexcavation, resulting in a 20 percent increase in excavated soil volume. Including the 20 percent over excavation the total removal volume increases to approximately 4,763 bcy or 6,192 cy.

- Transportation and off-Site disposal of non-hazardous lead impacted soil.
  - Load the lead impacted soil into haul trucks (truck and pup).
  - All truck loads shall be covered to contain the soil in the trucks during transportation.
  - Transport the material to a Subtitle D landfill.
- Restoration and revegetation of the excavation area.
  - Importation and placement of 2,580 lcy clean backfill from nearby source.
  - Importation and placement of 2,580 lcy EKO compost to a minimum thickness of 6”.
  - Seed the surface of the EKO compost in the excavation area with a Forest Service approved seed mix.

5.3.4 Alternative 4 – On-Site Capping

This alternative involves the capping of lead-impacted soils above the MTCA Method A criteria with clean backfill and compost. The basic elements of this alternative are depicted on Figures 8 and 9. This alternative includes the following elements:

- Mobilization of equipment to the Site, which may include the following:
  - Front-end loader.
  - Tractor with brush mower.
  - Small dozer.
  - Water truck.
  - Chain saw and hand tools.
  - Pressure washer.
  - Sanitary and decontamination facilities.
- Clear and grub cap area, leave trees and stumps and mowed brush in place.
- Construct soil cap.
  - Importation and placement of 7,740 cy clean backfill from nearby source to an average minimum thickness of 18”.
    - Soil placement should consider minimizing impacts to established trees that remain on-Site. A well of at least 6” should remain uncovered surrounding each tree is recommended.
  - Importation and placement of 2,580 cy EKO compost to a minimum thickness of 6”.
  - Soil and compost placement efficiency may be aided with the use of conveyor assisted delivery (CAD) trucks.
- Seed the surface of the EKO compost in the removal area with a Forest Service approved seed

mix.

5.4 Analysis of Selected Removal Action Alternatives

The removal action alternatives were evaluated based on the following criteria:

- Effectiveness
- Implementability
- Relative cost

Effectiveness is defined as the ability of an alternative (relative to other options in the same technology sub-category) to:

- Protect public health and the community, protect workers during implementation, and protect the environment – addresses whether or not the remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls; and
- Comply with ARARs – addresses whether or not a remedy will meet all ARARs or other federal and state environmental statutes and/or provide grounds for invoking a waiver.

Implementability encompasses the technical and administrative feasibility of implementing a removal action and the availability of resources needed to implement the removal action. It also takes into account legal considerations. Factors of particular consideration include removal action and operational feasibility; availability of equipment, personnel, and treatment capacity; community acceptance; and the ability to obtain necessary permits for off-Site actions.

- Technical feasibility – refers to construction and operational considerations, the demonstrated performance and useful life, adaptability to Site-specific environmental conditions, whether it contributes to remedial performance, and whether it can be implemented within 1 year[1].
- Administrative feasibility – refers to the permits required (if any), easements or right-of-ways required, impacts on adjoining properties and the ability to implement institutional controls.
- Availability – includes the availability of equipment, personnel and services, outside laboratory testing services (if needed), and off-Site disposal capacity (if needed).

The relative cost of each alternative was evaluated based on professional experience, engineering judgment, and standard cost estimating tools. Primary cost considerations include:

- Capital costs.
- Engineering and design costs.
- O&M costs.

The estimated costs for each task are provided in Appendix C and summarized in Table 6. Costs are based on experience at similar sites, on published data and reports, and on inquiries to possible vendors. Many removal action unit costs were obtained from R.S. Means (2011), and include overhead and profit. Estimated costs relied on several assumptions regarding Site conditions and are based on conceptual design only. The estimated costs are intended for alternative comparison only and are not suitable for construction bidding purposes.

Assumptions made in preparing the cost estimate include:

[1] The ability to be implemented in 1 year is a specific criterion to be used in the alternative comparative analysis as outlined in EPA's "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA" (1993).

- The action alternatives can be completed in one field season using standard removal action equipment.
- Sufficient fill sources are available nearby.
- A botanical survey of potential fill source locations and would be required to identify non-native or invasive species that may be present.
- 33% of the soil to be removed is assumed to require on-site stabilization to be disposed of as non-hazardous based on existing TCLP data.
- Additional data will be required for characterization and profiling wastes for landfill disposal.
- A temporary staging area can be established on-Site.
- Minor improvements to the on-Site access road will be necessary for the purpose of loading or offloading equipment and materials.
- Improvements to off-site roads will not be necessary.
- Wetlands have not been delineated at the site. Any associated restrictions and restoration requirements and costs would impact both alternatives equally as both alternatives disturb the same area and are not included in the cost estimates.
- Post-removal action O&M monitoring of the Site will be required to monitor the removal action effectiveness and compliance with the ARARs.
    - Monitoring of the cover will be necessary to document that the cover remains stable and re-exposure of lead impacted soils by erosion does not occur. URS assumes monitoring will occur once a year during the winter or spring for five years.
    - Non-native or invasive species monitoring and management at the Site is included as part of post-removal action O&M activities. URS assumes monitoring will occur once a year during the late spring for five years.
- The estimated fees for removal action oversight were based on the anticipated duration of the removal action.
- The total estimated removal action costs include a 20 percent contingency.
- Present value corrections were not calculated because of the short duration of the removal action and monitoring. Ongoing monitoring costs are lump sum.

5.5 Identification of Data Gaps

The following data gaps were identified during preparation of this EE/CA:

1. Uncertainty in waste characterization analytical.
    - Although some samples were analyzed for TCLP and SPLP there remains some uncertainty in the waste characterization data.
    - TCLP data is typically used to characterize wastes; it is at the discretion of the disposal facility to accept the wastes based on SPLP data. Therefore, the possibility of collecting additional waste characterization data exists.
2. Some uncertainty remains in the vertical extent of contamination.
    - Based on site data it is generally assumed that the excavation of 1foot would be sufficient for removal of all soils above the cleanup criteria. However, there is limited data pertaining to the leaching potential of those samples exhibiting the highest lead concentrations at the site (TA-

SSS-14 and TA-SSS-15).

3. The site is designated as Scenic Foreground with allowed partial yield timber harvest; for alternatives in which tree removal is required viability of harvesting data is unknown.
4. A BA for the site has identified wetlands at the site; however, no delineation activities have been performed.
5. Sensitive environments and/or species may be present at the site.
6. The volume of shot present at the site is unknown, physical removal of shot has the potential to reduce the volume requiring treatment and/or disposal.

The costs associated with the data gaps are included in the cost estimate.

- Data gap #1:
  - For Alternative 3, the cost to excavate and dispose of impacted soils assumes approximately 33% of the material will exceed TCLP criteria, requiring handling as a hazardous waste. The actual amount of material requiring handling as hazardous waste may differ, it is recommended additional waste characterization sampling be completed during removal.
- Data gap #2:
  - For Alternative 2, the cost to treat soils on-site assumes a 20 percent contingency for over-excavation of impacted soils.
  - For Alternative 3, the cost to excavate and treat soils on-site assumes a 20 percent contingency for over-excavation of impacted soils.
- Data gap #3:
  - For Alternatives 2 and 3, the viability of the trees removed to be harvested as timber is unknown. If selected, an assessment is recommended to determine viability prior to removal.
- Data gap #4:
  - For Alternatives 2, 3, and 4, the presence of wetlands has been identified onsite. However, delineation has not been performed and needs to be completed prior to initiation of any removal action design.
- Data gap #5:
  - For Alternatives 2, 3, and 4, the presence of Sensitive or Survey/Manage species in the removal area is unknown. A botanical and mollusk survey should be prepared prior to removal activities.
- Data gap #6:
  - For Alternatives 2 and 3, the feasibility of screening out shot for recycling is unknown. Considering that the soils are predominantly silt overlain by a duff layer and the relatively low volume of small shot at the site it is highly unlikely that screening would be feasible. Ultimately a feasibility study would be required to determine if this is an option.

Broad assumptions regarding material quantities and Site conditions were used to address the data gaps in the development of conceptual designs presented in this EE/CA. However, additional data that is critical to the removal action should be collected before preparing the final design. Including, but not limited to, feasibility testing for physical screening of site soils for shot recovery, assessment of timber for harvesting, delineation of wetlands onsite, and surveys for presence of sensitive or survey/manage mollusk and botanical species.

6.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The removal action alternatives were compared based on the following criteria:

- Effectiveness
  - Protective of human health and the environment.
  - Complies with ARARs, especially key ARARs identified for the Site.
  - Achieves RAOs.
- Implementability
  - Technical Feasibility
  - Administrative Feasibility
  - Availability of Resources
- Cost

The comparative analysis of removal action alternatives is described in Table 5 and summarized below by criteria. A comparative cost summary of the alternatives is shown in Table 6. State and community acceptance will be determined during the public comment period.

6.1 Effectiveness

- Alternative 1 – No Action is the least effective.
  - The lead would continue to pose a risk to both human and ecological receptors indefinitely.
- Alternative 2 – Excavation and on-site treatment is considered effective as it would remove the lead from site soils.
  - Chemical-specific ARARs may be attained as the total lead concentration in the soil would decrease. Achievement of the ARARs would be evaluated through further feasibility testing of the technology as applicable to site conditions.
  - Compliance with most solids disposal ARARs – Action specific ARARs would generally be obtained. Contaminated wastes would be treated to remove lead on-site, some wastes though at a greatly reduced volume would require off-site hauling and disposal.
  - Compliance with FP S&G ARARs – Alternative 2 may not comply with all FP S&G ARARs such as:
    - Scenic View shed
    - Water Resources and Riparian Areas standards and
    - Aquatic conservation strategy objectives
    - The alternative may be effective and provide long-term permanence (Table 5).
  - Potential to reduce toxicity, volume, and exposure through treatment. This potential would be evaluated in a feasibility study.
  - Reduces risk to the community by reducing volume of waste requiring long-distance transport of soil.
  - Moderate to high potential risk to human health and the environment during treatment due to significant handling required.

- Alternative 3 – Excavation and off-Site disposal provides the most protection by removing the lead impacted soil from the Site and disposing of it in a controlled facility.
    - The soil RAOs would be achieved under this alternative by excavating the lead impacted soils and disposing of them off-Site at a RCRA Subtitle D landfill.
    - Chemical-specific ARARs for soil would be attained:
    - Excavation of lead-impacted soils would reduce site lead concentrations in soil to below the MTCA criteria of 250 mg/kg.
    - Compliance with Solids Disposal ARARs – Key action-specific ARARs would be attained. Contaminated wastes would be isolated from the environment in an off-Site permitted waste facility.
    - Compliance with FP S&G ARARs – Alternative 3 may not comply with all FP S&G ARARs such as:
        - Scenic View shed
        - Water Resources and Riparian Areas standards and
        - Aquatic conservation strategy objectives
    - The alternative is highly effective and provides long-term permanence (Table 5).
    - Minimal potential risk to human health and the environment during off-Site transportation of soil.
    - Moderate toxicity reduction potential resulting from stabilization treatment prior to disposal and a high reduction in exposure through containment at a RCRA Subtitle D landfill.
- Alternative 4 – On-Site capping soils provides moderate protection by minimizing direct contact with lead-impacted soils.
    - The soil RAOs would be achieved under this alternative through reduction of of human an wildlife exposure to lead in soils above the MTCA Method A criteria.
    - Chemical-specific ARARs would not be attained as the lead-impacted soils exceeding MTCA Method A criteria of 250 mg/kg would remain on-Site.
    - Compliance with FP S&G ARARs – Alternative 4 may not comply with all FP S&G ARARs such as:
        - Scenic View shed
        - Water Resources and Riparian Areas standards and
        - Aquatic conservation strategy objectives
    - The alternative is highly effective and may provide long-term permanence (Table 5).
    - Least risk to human health and the environment of all alternatives as there is no disturbance of lead-impacted soils during and after construction of cap.
    - There is no reduction in toxicity, mobility or volume of lead-impacted soils, however, a cap would reduce risks associated with exposure.

6.2 Implementability

- Alternative 1 – No Action is most technically feasible and easiest to implement.
- Alternative 2 – Excavation, on-Site treatment via soil washing has the potential to be moderately

implementable.

- The availability of soil washing technology is low to moderate, substantial mobilization fees may be required pending treatment train design based on feasibility testing.
- The alternative is low to moderately implementable using a mix standard construction equipment and methods and soil washing equipment.
- Further treatability testing including examination of soil characteristics such as grain size, clay content and cation exchange capacity is required to determine feasibility of this technology for use at the site.
- Potential to reduce volume of soils requiring disposal.
- Washing operation may generate aqueous wastes, potentially hazardous.

- Alternative 3 – Excavation and off-Site disposal would be moderately to highly implementable.
  - The availability of service and materials is high.
  - The alternative is implementable using standard construction equipment and methods.
  - The alternative would require a relatively long distance for transport of the soil to the off-Site disposal facility.
- Alternative 4 – On-Site capping would be highly implementable.
  - The availability of service and materials is high.
  - The alternative is implementable using standard construction equipment and methods.
  - The alternative does not require disturbance, handling, or disposal of lead-contaminated soils.

6.3 Cost

- Alternative 1 – No Action is the least expensive alternative.
- Alternative 2 – Excavation and on-site treatment is the most expensive alternative ($2,827,000).
- Alternative 3 – Excavation and off-Site disposal is the second most expensive alternative ($1,701,000).
- Alternative 4 – On-Site Capping is the least expensive alternative ($842,000).

7.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Based on the elements of the alternatives described in Section 5.3, and the comparative analysis of the alternatives in Section 6.0 and Table 10, the recommended alternative is Alternative 4. Alternatives 2 and 3 require significantly more disturbance to the site as well as a substantial amount of contaminated material handling.

Alternative 4 is recommended to address risk associated with exposure to lead in Site soil. The area of lead-impacted soils exceeding the MTCA Method A criteria of 250 mg/kg, approximately 2.46 acres would be capped in place by a two foot cap consisting of 1.5 feet of clean backfill material and 0.5 feet of compost. An approved seed mix would then be spread over the compost. Annual monitoring of the restored excavation capped area would be conducted for a minimum of five years to ensure these areas become revegetated and remain stable, and to identify and eliminate infestations of non-native or invasive plant species. The removal action would achieve RAOs of reduced human and wildlife exposure to lead in the site soils above the MTCA Method A criteria and attain ARARs to the extent practical by eliminating direct contact with lead-contaminated soils at the Site.

The recommended alternative will satisfy the eight factors in 40 CFR 300.415(b) as described below.

Factor	Site Condition	Satisfied?
(1) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.	The potential for human and ecological exposure to contaminated soil will be significantly reduced following excavation and disposal of off-site.	Yes
(2) Actual or potential contamination of drinking water supplies or sensitive ecosystems.	There are no drinking wells on or near the Site. The TCLP and SPLP results suggest that groundwater and surface water are unlikely to be impaired by leachate from lead contaminated soil. However, the site may be located withina sensitive ecosystem a factor the removal action would need to address.	Yes
(3) Hazardous substances, pollutants, or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.	There are no hazardous substances, pollutants, or contaminants in drums, barrels, tanks, or other bulk storage containers. The removal action does not need to address this factor.	Not Applicable
(4) High levels of hazardous substances, pollutants, or contaminants in soils largely at, or near, the surface that may migrate.	There does not appear to be a potential for migration of hazardous substances from the Site. However, the removal action will further minimize this potential.	Yes
(5) Weather conditions that may cause hazardous substances, pollutants, or contaminants to migrate or be released.	There does not appear to be a potential for weather conditions to cause hazardous substances, pollutants, or contaminants to migrate or be released. However, the removal action will further minimize this potential.	Yes
(6) Threat of fire or explosion.	No flammable materials on-Site.	Not Applicable
(7) The availability of other appropriate federal or state response mechanisms to respond to the release.	The Site is on Forest Service land and is being addressed by the Forest Service.	Yes
(8) Other situations or factors that may pose threats.	Physical hazards will be mitigated.	Yes

The total estimated removal action cost is **$842,000.**

The proposed removal action designs presented in this EE/CA are conceptual only and not intended for removal action. All material quantities are estimates only and should be verified for final design.

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TABLES

Table 1. Groundwater Data Summary
Index Shooting Range

Sample ID	Sample Date	**Total Metals** (ug/L)			**PAHs** (ug/L)															
		Antimony	**Arsenic**	**Lead**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b)fluoranthene**	**Benzo(k)fluoranthene**	**Benzo(g,h,i)perylene**	**Chrysene**	**Dibenz(a,h)anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Phenanthrene**	**Pyrene**
MW-1	2/9/2006	4.71	1 U	3.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-1	4/17/2006	3 U	1 U	2.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-1	8/11/2011	--	--	--	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0388 UJ	0.0194 UJ	0.0194 UJ
MW-2	2/9/2006	3 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-2	4/17/2006	3 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-2	8/11/2011	--	--	--	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0381 UJ	0.0190 UJ	0.0190 UJ
MW-2Dup	8/11/2011	--	--	--	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0189 UJ	0.0377 UJ	0.0189 UJ	0.0189 UJ
MW-3	2/9/2006	3 U	2.11	1 U	--	--	--	**0.0462**	**0.052**	**0.0746**	**0.0371**	--	**0.0653**	--	**0.169**	--	**0.0261**	--	--	**0.115**
MW-3	4/17/2006	3 U	1.46	1 U	--	--	--	**0.0606**	**0.0619**	**0.084**	**0.0701**	--	**0.0745**	--	**0.195**	--	**0.0552**	--	--	**0.179**
MW-3	8/11/2011	--	--	--	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0190 UJ	0.0381 UJ	0.0190 UJ	0.0190 UJ
MW-4	2/9/2006	3 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-4	4/17/2006	3 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-4	8/11/2011	--	--	--	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0194 UJ	0.0388 UJ	0.0194 UJ	0.0194 UJ
MW-4Dup	2/9/2006	3 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-4Dup	4/17/2006	3 U	1 U	1 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A[1]		--	5	15	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Notes:

Bold = The analyte was detected above the reported method detection limit (MDL).

U = The analyte was analyzed for but not detected at or above the reported method detection limit (MDL).

UJ = The analyte was not detected above the reported sample detection limit. However, the reported detection limit is approximate and may or may not present the actual limit of detection necessary to accurately and precisely measure the analyte in the sample.

-- = not analyzed.

PAHs = Polycyclic aromatic hydrocarbons

ug/L = micrograms per litre

[1] = Ecology, 2007. Model Toxics Control Act Chapter 70.105D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Departmen of Ecology, Toxics Cleanup Program. Revised November 2007. Publication No. 94-06.

Shaded values exceed criteria.

Table 2. Soil Data Summary
Index Shooting Range

Sample ID	Sample Depth (inches)	Sample Date	Total Metals (mg/kg)		SPLP (mg/L)		TCLP (mg/L)	Total Phosphorus (mg/kg)	Soluble Phosphorus (mg/kg)	Total Organic Carbon (%)	Cation Exchange Capacity (meq/100g)
			Arsenic	Lead	Arsenic	Lead	Lead				
BK-SSS-01	3 - 6	11/12/2003	**24.9**	**12.1**	--	--	--	--	--	--	--
BK-SSS-02	3 - 6	11/12/2003	**44.8**	**61.1**	**0.00471**	**0.00407**	--	--	--	--	--
BK-SUS-02	24-27	11/12/2003	**14.6**	**7.98**	--	--	--	--	--	--	--
TA-SSS-03	3 - 6	11/12/2003	**53.6**	**18.8**	--	--	--	**691**	**2.10**	**1.38**	**6.1**
TA-SSS-04	8 - 10	11/12/2003	**13.3**	**19.7**	--	--	--	**449**	**2.22**	**0.94**	**2.1**
TA-SSS-05	6 - 8	11/12/2003	**57.6**	**37.1**	**0.00681**	**0.00336**	--	--	--	--	--
TA-SSS-06	5 - 8	11/12/2003	**40.3**	**17.2**	--	--	--	--	--	--	--
TA-SSS-06Dup	5 - 8	11/12/2003	**37.4**	**16.1**	--	--	--	--	--	--	--
TA-SSS-07	3 - 6	11/12/2003	**26.5**	**8.24**	--	--	--	--	--	--	--
TA-SSS-08	3 - 6	11/12/2003	**56.8**	**93.5**	**0.00779**	**0.00346**	--	**354**	**3.30**	**1.46**	**5.8**
TA-SSS-09	2 - 4	11/12/2003	**30.9**	**18.0**	--	--	--	**493**	**2.43**	**0.74**	**2.0**
TA-SSS-10	3 - 6	11/12/2003	**77.9**	**53.1**	0.00100 U	**0.0127**	--	--	--	--	--
TA-SSS-12	2 - 4	2/12/2004	**22.4**	**2440**	--	--	--	--	--	--	--
TA-SSS-13	2 - 4	2/12/2004	**60.2**	**7140**	**0.0778**	**1.15**	--	**507**	--	--	--
TA-SSS-14	2 - 4	2/12/2004	**319**	**58100**	--	--	--	--	--	--	--
TA-SSS-15	2 - 4	2/12/2004	**111**	**10200**	--	--	--	--	--	--	--
TA-SSS-16	2 - 4	2/12/2004	**33.2**	**1130**	--	--	--	--	--	--	--
TA-SUS-04	24 - 27	11/12/2003	**18.1**	**6.29**	--	--	--	--	--	--	--
TA-SUS-06	24 - 27	11/12/2003	**20.8**	**6.23**	--	--	--	--	--	--	--
TA-SUS-07	24 - 27	11/12/2003	**33.4**	**7.61**	--	--	--	--	--	--	--
TA-SUS-08	24 - 27	11/12/2003	**65.7**	**14.9**	--	--	--	--	--	--	--
TA-SUS-13	16 - 22	2/12/2004	**13.4**	**44.3**	--	--	--	--	--	--	--
TA-SUS-13Dup	16 - 22	2/12/2004	**11.5**	**62.1**	--	--	--	--	--	--	--
SS-01	6 -8	8/11/2011	--	**193**	--	--	**11.0**	--	--	--	--
SS-01	12 - 18	8/11/2011	--	**55.7**	--	--	**0.944**	--	--	--	--
SS-02	3 -6	8/11/2011	--	**140**	--	--	**0.104**	--	--	--	--
SS-02	18 - 24	8/11/2011	--	**84.9**	--	--	**0.0870**	--	--	--	--
SS-03	3 -6	8/11/2011	--	**1580**	--	--	**8.93**	--	--	--	--
SS-03	18 - 24	8/11/2011	--	**78.3**	--	--	**0.0955**	--	--	--	--
SS-04	3 -6	8/11/2011	--	**720**	--	--	**6.47**	--	--	--	--
SS-05	3 -6	8/11/2011	--	**513**	--	--	**0.963**	--	--	--	--
SS-05	18 - 24	8/11/2011	--	**13**	--	--	**0.450 J**	--	--	--	--
SS-05Dup	3 -6	8/11/2011	--	**409**	--	--	**1.01**	--	--	--	--
SS-05Dup	18 - 24	8/11/2011	--	**17.4**	--	--	**1.59 J**	--	--	--	--
SS-06	3 -6	8/11/2011	--	**22.9**	--	--	**0.0110 J**	--	--	--	--
SS-06	18 - 24	8/11/2011	--	**7.6**	--	--	0.00500 U	--	--	--	--
SS-07	3 -6	8/11/2011	--	**69**	--	--	**0.00550 J**	--	--	--	--
SS-07	24	8/11/2011	--	**14**	--	--	0.00500 U	--	--	--	--
SS-08	3 -6	8/11/2011	--	**8.63**	--	--	0.00500 U	--	--	--	--
SS-09	3 -6	8/11/2011	--	**14.2**	--	--	**0.00650 J**	--	--	--	--
SS-09	8 - 12	8/11/2011	--	**14.5**	--	--	**0.00650 J**	--	--	--	--
SS-10	3 -6	8/11/2011	--	**8.14**	--	--	0.00500 U	--	--	--	--
MDC			319	58100	0.0778	1.15	11.0	691	3.30	1.46	6.1
MTCA Method A[1]			20	250	--	--	--	--	--	--	--

Notes:

Bold = The analyte was detected above the reported method detection limit (MDL).

U = The analyte was analyzed for but not detected at or above the reported method detection limit (MDL).

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

-- = not analyzed.

mg/kg = milligrams per kilogram

mg/L = milligrams per litre

[1] = Ecology, 2007. Model Toxics Control Act Chapter 70.105D RCW and Cleanup Regulation Chapter 173-340 WAC. Washington State Departmen of Ecology, Toxics Cleanup Program. Revised November 2007. Publication No. 94-06.

MDC = Maximum Detected Concentration

TCLP = toxicity characteristic leaching procedure

SPLP = synthetic precipitation leaching procedure

Shaded values exceed criteria.

Table 3. Soil Quality ARARs and Proposed Cleanup Criteria (mg/kg)
Index Shooting Range EE/CA

Analyte	Background Concentration (range)	Washington State (Puget Sound) Background Soil Concentrations	Maximum Detected Site Concentration	State of Washington			Federal		Proposed Soil Cleanup Criteria
				WAC 173-340-740	WAC 173-340-	WAC 170-340-7493			
				MTCA Method A Industrial Soil (Table 745-1)	MTCA Method A Unrestricted Land Use (Table 740-1)	MTCA Ecological Indicator Soil Concentrations (Table 749-3)[a]	EPA Industrial Soil RSLs	EPA Ecological SSLs[b]	
Lead	12.1-61.1	24	58100	1000	**250**	50s	800	11a	**250**

Notes:

Shaded values exceed one or more criteria

Shaded values exceeded by Site or Background concentrations.

Bold value selected as Proposed Soil Cleanup Level.

mg/kg = milligrams per kilogram.

-- = Not available.

[a] Lowest value selected from plant(p), soil biota(s), and wildlife(w) receptors.

[b] Lowest value selected from plant(p), soil invertebrate(s), avian(a), and mammalian(m) receptors.

ARAR = Applicable or relevant and appropriate requirement

EPA = U.S. Environmental Protection Agency

MTCA = Model Toxics Control Act

NS = No standard

RSL = Regional Screening Level

WAC = Washington Administrative Code

Table 4. Removal Action Technology Screening Matrix
Index Shooting Range EE/CA

Technology Class	Process Option	Description	Effective-ness	Implemen-tability	Cost	O&M	Land Impact	Pros	Cons	Retained?
No Action										
No action	No action	Leave feature(s) as is	Low	High	Low	None	None	Cheap, easy	No risk reduction	Yes
Institutional Controls										
Access Restriction	Fencing	Security fence around site	Low	High	Low	Medium–subject to vandalism	Minimal	Simple	Only a mild impediment to access	No
	Warning signs	Signs posted at physical hazards to warn of potential risks	Low	High	Low	Medium–subject to vandalism	Minimal	Simple, more effective than barbed-wire	Does not provide a physical barrier to site access or contaminated soil	No
Engineering Controls										
Solids Containment	Geosynthetic cover	Engineered multilayer cover with a synthetic liner (GCL or HDPE)	High	Medium	High	Low–inspect for erosion	High	Prevents physical contact with lead impacted soil	Must be installed/tested correctly; prevention of leaching/infiltration not necessary at Site	No
	Soil cover	Soil cover constructed from soils obtained from local sources	Medium	High	Low	Low–inspect for erosion	Moderate	Prevents physical contact with lead impacted soil; natural looking; suitable growing medium for vegetation	May not prevent physical contact with soil for burrowing organisms. Lead contaminated soil remains onsite.	Yes
Land Disposal										
Off-site disposal	Landfill	Excavate soil and dispose in landfill	High	High	High	Low–material hauled off site; inspect reclaimed areas	None	Eliminates direct exposure by removing waste from Site	Risk of highway spills	Yes
Treatment										
Solidification/ stabilization	Stabilization	Inject soil with cement or other material to physically stabilize	Medium to High	High	Medium	Low–inspect for erosion/settling	High	Does not require waste excavation	More expensive than other on-site technologies. Does not remove lead contamination from site	No
Soil Stabilization	Stabilization	Mix soil with amendment	Medium to High	High	Medium	Low-inspect for erosion/settling	High	Simple application, can be used prior to disposal to meet TCLP criteria	Does not reduce total lead concentrations at site	Yes
Washing	Washing	Excavate, screen soil and wash with aqueous solution	Medium	Low	High	Low–inspect for erosion/settling	High	Reduces lead concentrations at the site	Requires water source, significant handling, and chemical disposal	Yes

Table 5. Comparative Analysis of Removal Action Alternatives
Index Shooting Range

Assessment Criteria	Alternative 1 - No Action	Alternative 2 - Consolidation and On-Site Capping	Alternative 3 - Excavation and Off-Site Disposal	Alternative 4 - On-Site Capping
Compliance with Removal Action Goals and Objectives				
Attributes:	Does not comply	Waste capped with soil that meets cleanup criteria	Lead impacted material removed from site	Lead impacted material removed from site
Advantages:	None	Reduces exposure of ecological receptors to waste rock	Eliminates potential exposure at site	Reduces potential exposure at site
Overall Protectiveness of Public Health, Safety and Welfare				
Attributes:	No protection	Lead impacted soils exceeding cleanup criteria would be treated on site, pending stude of technology feasibility	All soil exceeding cleanup levels removed from site	All soil exceeding cleanup levels capped with clean fill and compost
Advantages:	None	Reduced soil volume to be hauled and disposed off-site	Eliminates exposure potential to lead at the site	Reduces exposure potential to lead at the site
Environmental Protectiveness				
Attributes:	No protection	Soil exceeding cleanup criteria treated on-site, pending study of technology feasibility	All soil exceeding cleanup levels removed from site	All soil exceeding cleanup levels are capped with clean fill and compost
Advantages:	None	Moderate to high level of ecological protection due to reduction of lead bioavailability	High level of protection Eliminates potential for future exposure	Moderate level of ecological protection due to reduced potential for exposure
Compliance with Key ARARs				
Attributes:	Does not comply	Moderate compliance with Soil Quality ARARs (pending feasibility study) High compliance with Solids Disposal ARARs Moderate compliance with FP S&G ARARs	Moderate compliance with Soil Quality ARARs High compliance with Solids Disposal ARARs Moderate compliance with FP S&G ARARs	Moderate compliance with Soil Quality ARARs High compliance with Solids Disposal ARARs Moderate compliance with FP S&G ARARs
Advantages:	None	Potentially reduces lead concentrations and complies with most ARARs	Eliminates potential for future non-compliances from waste material	Eliminates potential for future non-compliances from waste material
Long-term Effectiveness and Permanence				
Attributes:	No action	Effectiveness dependant on site conditions	Contaminant source removed from site	Contaminant source remains, however, cap would prevent exposures
Advantages:	None	Potentially effective and may provide long-term permanence	Most effective and permanent long term	Potentially effective and may provide long-term permanence
Reduction of Toxicity, Mobility, and Volume				
Attributes:	No action	Potential reduction in volume, toxicity and mobility	No reduction in toxicity or mobility, but waste is removed from site	No reduction in toxicity or mobility, but waste is capped
Advantages:	None	Risks associated with lead impacted soil may be significantly reduced	Complete reduction of volume lead impacted soils	Risks associated with lead impacted soil may be significantly reduced

Table 5. Comparative Analysis of Removal Action Alternatives
Index Shooting Range

Assessment Criteria	Alternative 1 - No Action	Alternative 2 - Consolidation and On-Site Capping	Alternative 3 - Excavation and Off-Site Disposal	Alternative 4 - On-Site Capping
Short-Term Effectiveness				
Attributes:	No action	Soil treated within one field season; short-term effectiveness is immediate	Soil removed from the site within one field season	Impacted soil area capped within one field season
Advantages:	None	More difficult to stage and implement Minimal risk to community and moderate risk to workers Does not require off-site transport of waste	More easily constructed Minimal risk to community and workers	Most easily constructed Lowest risk to community and workers
Implementability				
Attributes:	Not applicable	Washing may be accomplished using standard construction equipment and methods, additional equipment may be required pending results of feasibility study. With average soil washing throughput of 2-4 tons/hr, implementation of soil washing will take substantially longer to achieve.	Soil removal, transport, and site reclamation accomplished using standard construction equipment and methods	Cap construction accomplished using standard construction equipment and methods
Advantages:	None	Somwhat difficult to implement; technically and administratively feasible.	Easier to implement; technically and administratively feasible.	Easiest to implement; technically and administratively feasible.
Estimated Total Present Worth Cost				
Attributes	$0	$2,812,000	$1,686,000	$827,000
Advantages (cost savings over most expensive option):	$2,812,000	$0	$1,126,000	$1,985,000

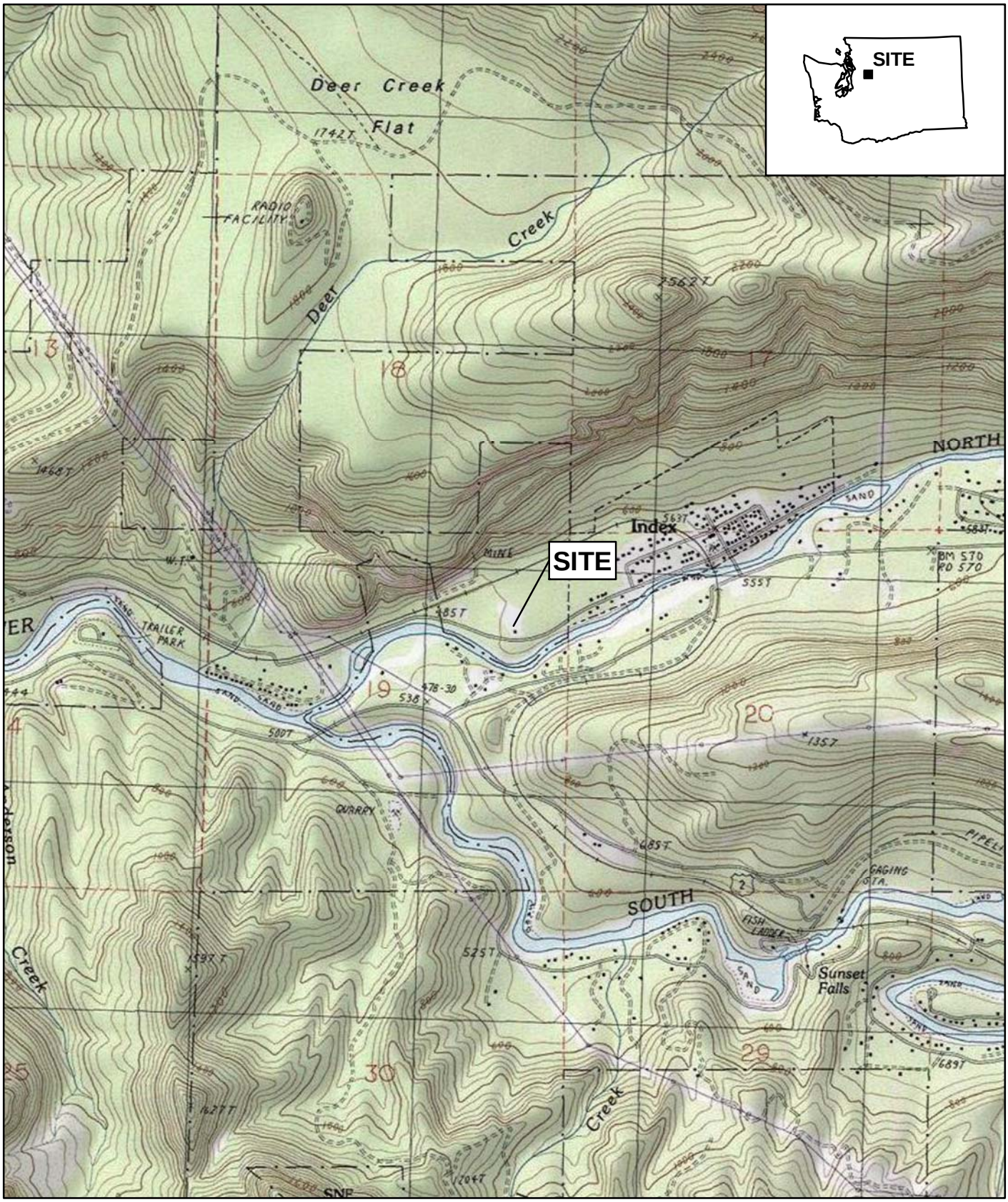
Table 6. Estimated Removal Action Cost Summary
Index Shooting Range EE/CA

Task	Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Recommended Alternative Cost
Wetland Delineation	Survey and deilineate wetlands in work area	0	$15,000	$15,000	$15,000	$15,000
Removal Action Construction	Feasibility Study	$0	$25,000	$0	$0	$0
	Mobilization/Demobilization		$198,229	$124,418	$59,655	$59,655
	Erosion Control and Decon. Station		$4,553	$4,553	$4,553	$4,553
	Clearing, Grubbing, and Site Improvements		$83,702	$67,125	$18,208	$18,208
	Monitoring Well Decommssioning		$1,422	$1,422	$0	$0
	Excavate, Overexcavate[1] Soil		$129,310	$129,310	$0	$0
	Load, Transport, and Dispose Soil		$135,432	$677,160	$0	$0
	On-site Treatment		$1,504,800	$17,866	$0	$0
	Procure, Transport, and Place Clean Backfilled Soil		$0	$129,000	$356,040	$356,040
	Purchase, Import, and Place Compost		$80,301	$199,978	$199,978	$199,978
	Seed Application and Restoration		$6,269	$6,269	$6,269	$6,269
	O&M (Monitoring)		$11,500	$11,500	$11,500	$11,500
	Removal Action Construction Subtotal		**$2,181,000**	**$1,369,000**	**$656,000**	**$656,000**
	20% Contingency		$436,000	$274,000	$131,000	$131,000
	Removal Action Construction Total		**$2,617,000**	**$1,643,000**	**$787,000**	**$787,000**
Oversight/Reporting	Work Plan, CQAP, HASP	$0	$25,000	$15,000	$15,000	$15,000
	Removal Action Oversight		$160,000	$18,000	$15,000	$15,000
	Removal Action Report		$10,000	$10,000	$10,000	$10,000
	Oversight/Reporting Total		**$195,000**	**$43,000**	**$40,000**	$40,000
TOTAL COST		**$0**	**$2,827,000**	**$1,701,000**	**$842,000**	**$842,000**

Notes:

(1) For Alternatives 2 and 3, the cost to excavate aassumes a 20 percent increase in excavated soil volume associated with overexcavation of underlying soils.

FIGURES



Source: Index, Washington 7.5 Minute USGS Topographic Map, 1989.

0 2,000 4,000 Feet

SITE VICINITY MAP

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USFS
INDEX SHOOTING RANGE
INDEX, WASHINGTON

FIGURE 1

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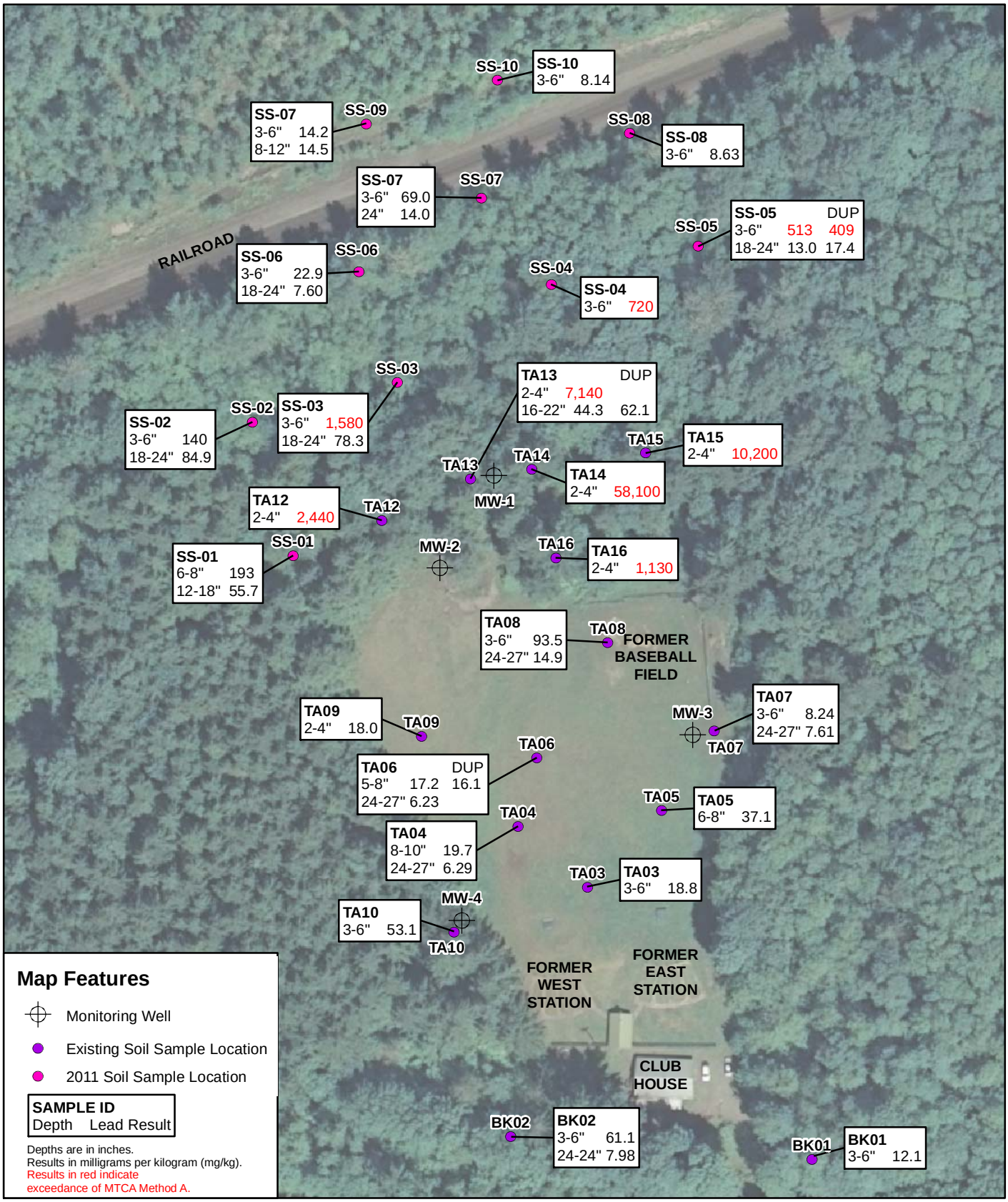

Source: USGS 2007.

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SOIL SAMPLE LOCATIONS

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INDEX SHOOTING RANGE
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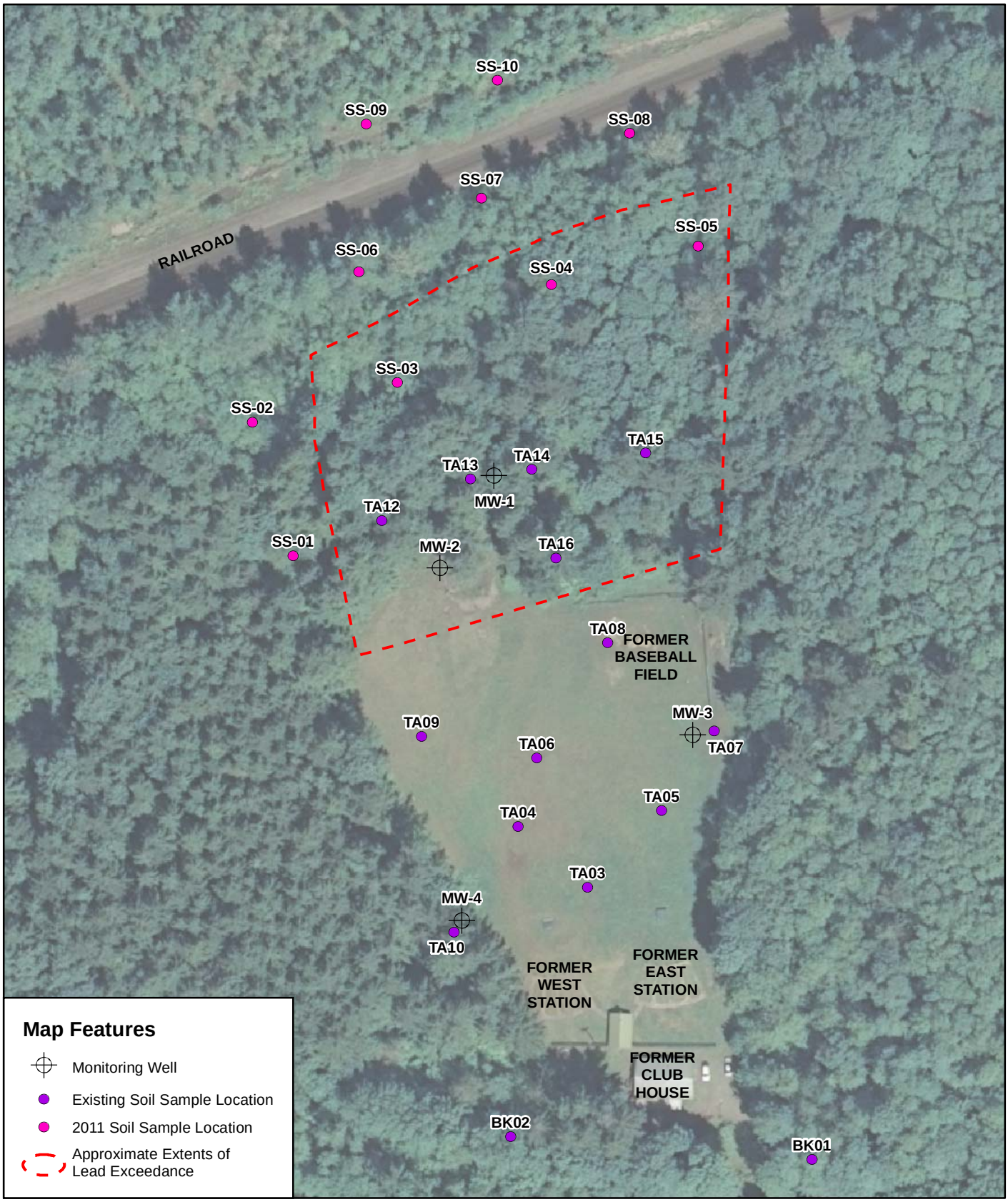
FIGURE 2

O:\25697469 USDA FS Index Data Gap EECA\5000 Technical\Figures\Fig 2 Soil Sample Location.mxd



Source: USGS 2007.

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EXTENT OF LEAD EXCEEDANCE

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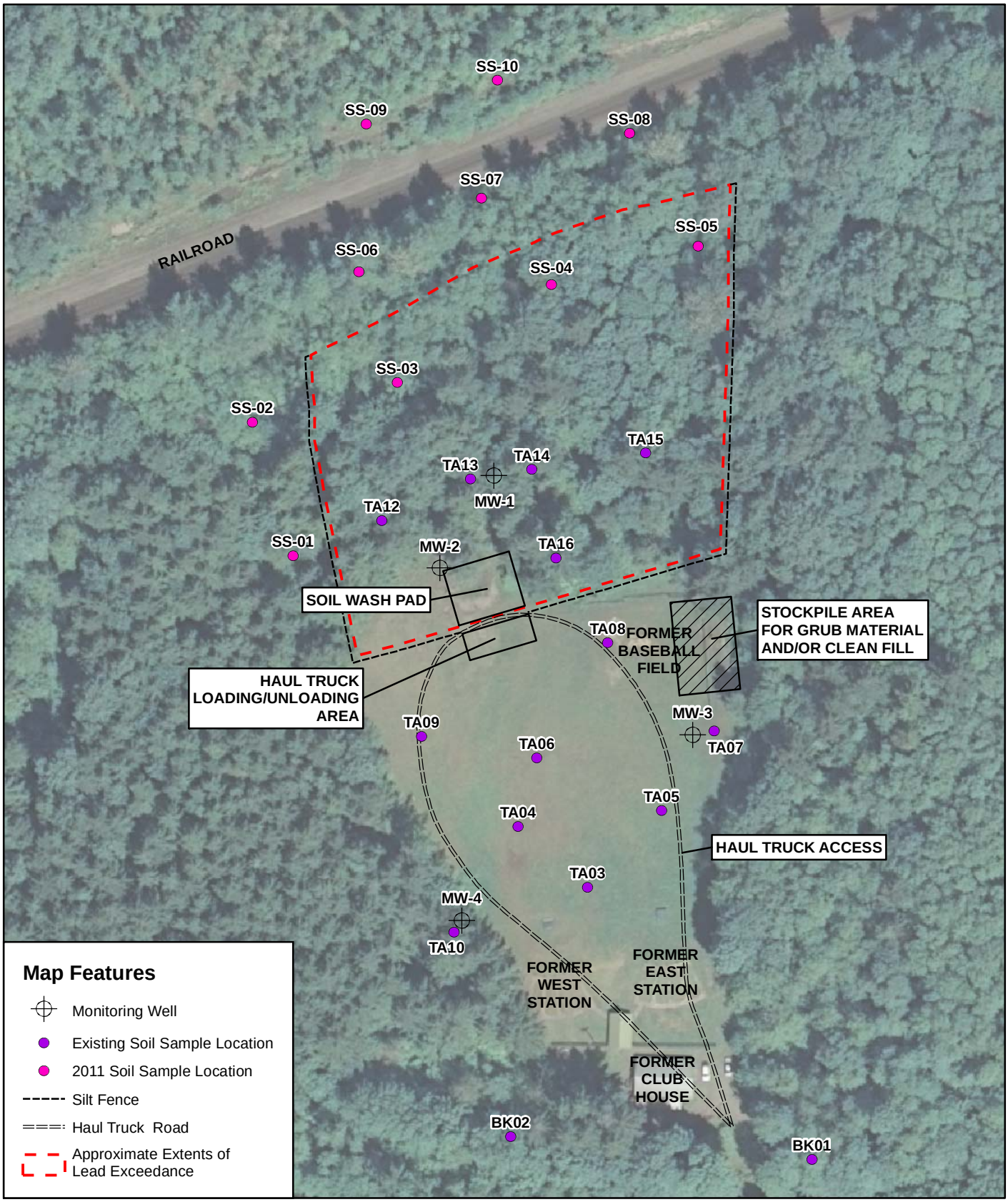
INDEX SHOOTING RANGE
INDEX, WASHINGTON

FIGURE 3

O:\25697469 USDA FS Index Data Gap EECA\5000 Technical\Figures\Fig 3 Extent of Lead Exceedances.mxd



Source: USGS 2007.

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CONCEPTUAL STAGING FOR ALTERNATIVE 2

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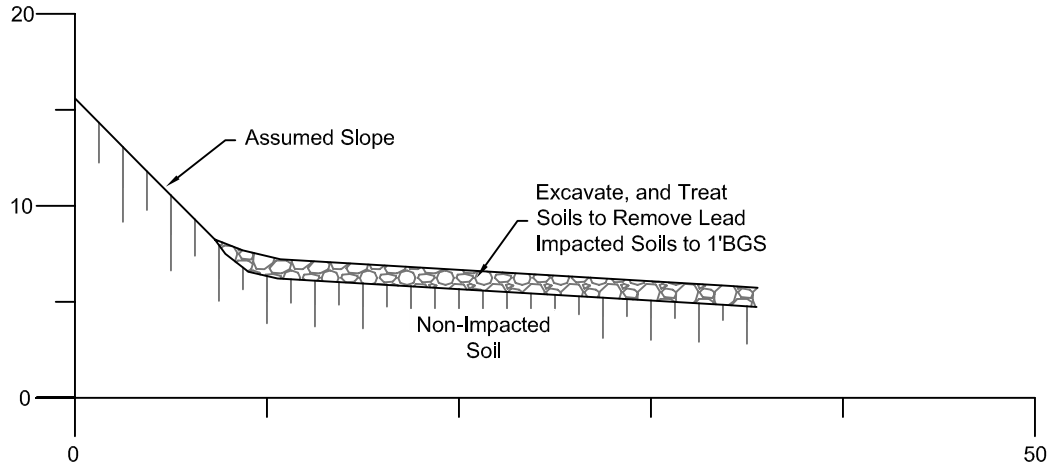
FIGURE 4

O:\25697503 GP Toledo Storage Bldg Geotech\5000 Technical\CADD\Fig 4 Conceptual Staging for Alt 2.mxd



CONCEPTUAL ALTERNATIVE 2 CROSS SECTION FOR EXCAVATION

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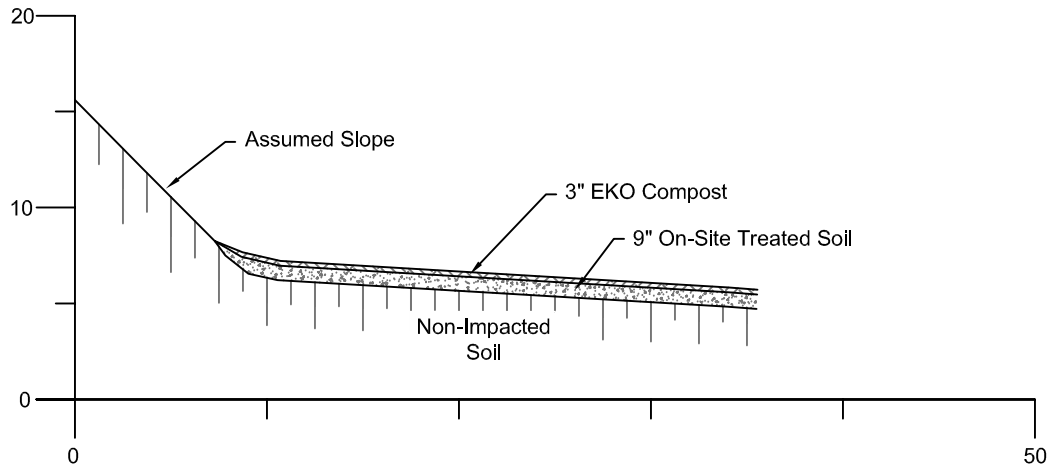

CONCEPTUAL ALTERNATIVE 2 CROSS SECTION FOR RESTORATION

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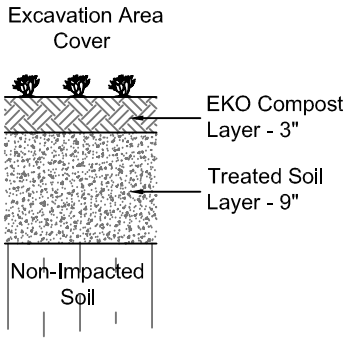

CONCEPTUAL COVER DETAIL

Not to Scale

CONCEPTUAL DESIGN FOR EXCAVATION AND ON-SITE TREATMENT

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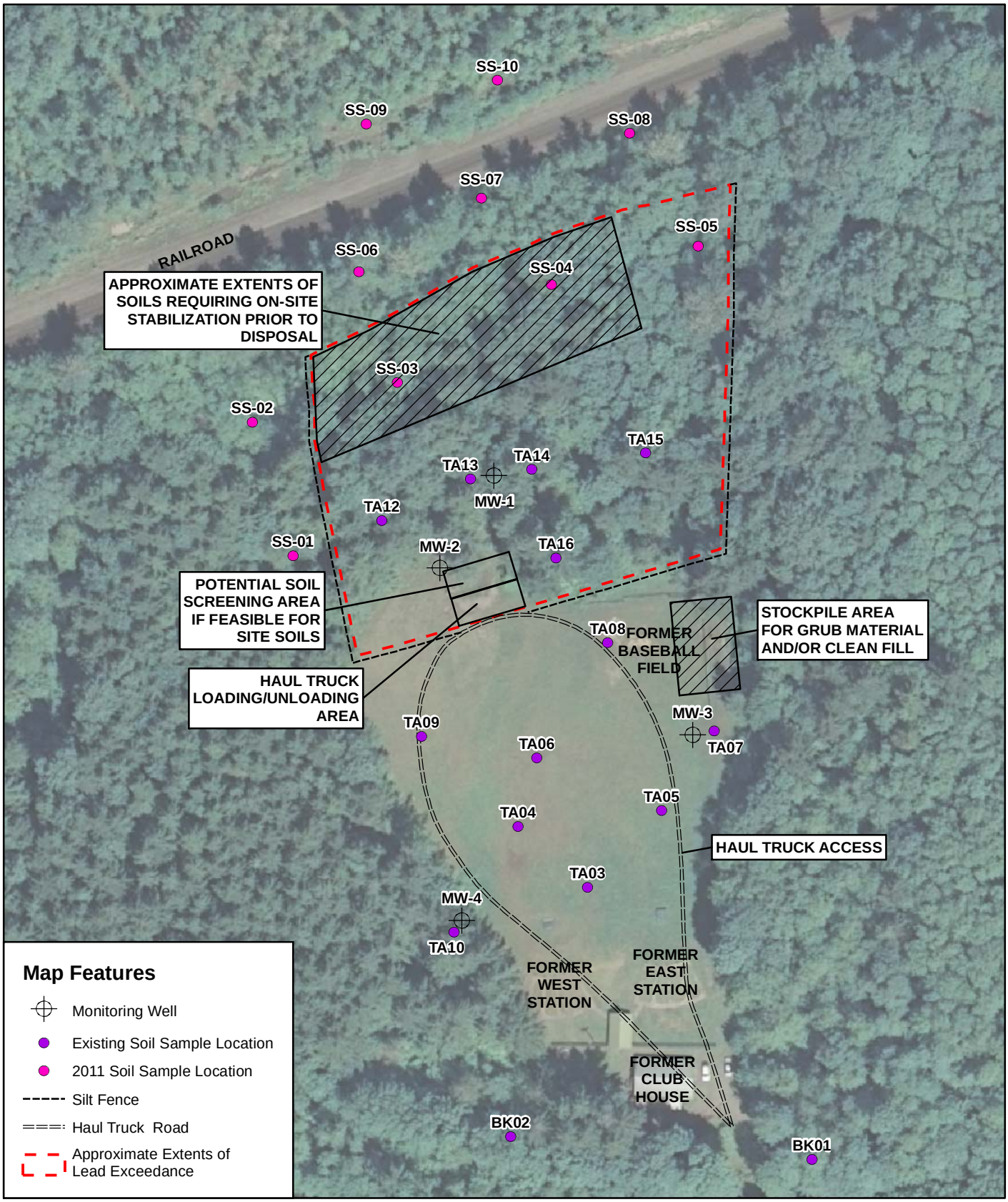
INDEX, WASHINGTON

FIGURE 5

O:\25697469 USDA FS Index Data Gap EECA\5000 Technical\Figures\Fig 5 Conceptual Design for Excavation and On-Site Treatment.dwg Oct 10, 2011 - 2:40pm



Source: USGS 2007.

0 120 240 Feet

CONCEPTUAL STAGING FOR EXCAVATION

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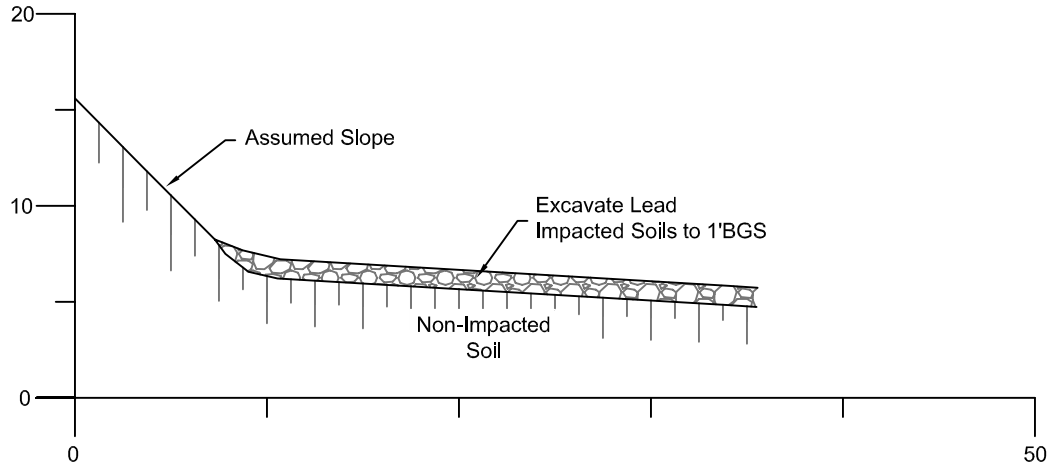
FIGURE 6

O:\25697469 USDA FS Index Data Gap EECA\5000 Technical\Figures\Fig 6 Conceptual Staging for Excavation.mxd



CONCEPTUAL ALTERNATIVE 3 CROSS SECTION FOR EXCAVATION

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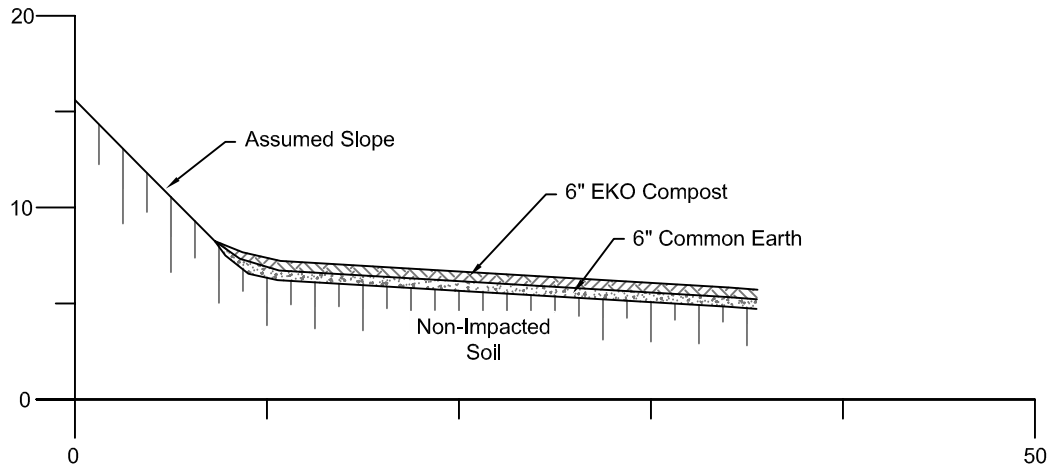

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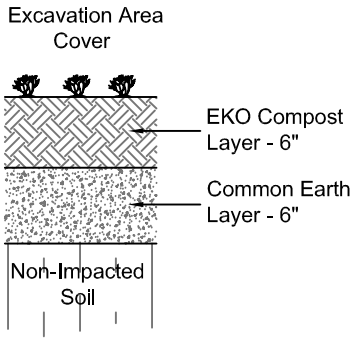

CONCEPTUAL COVER DETAIL

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CONCEPTUAL DESIGN FOR EXCAVATION AND OFF-SITE DISPOSAL

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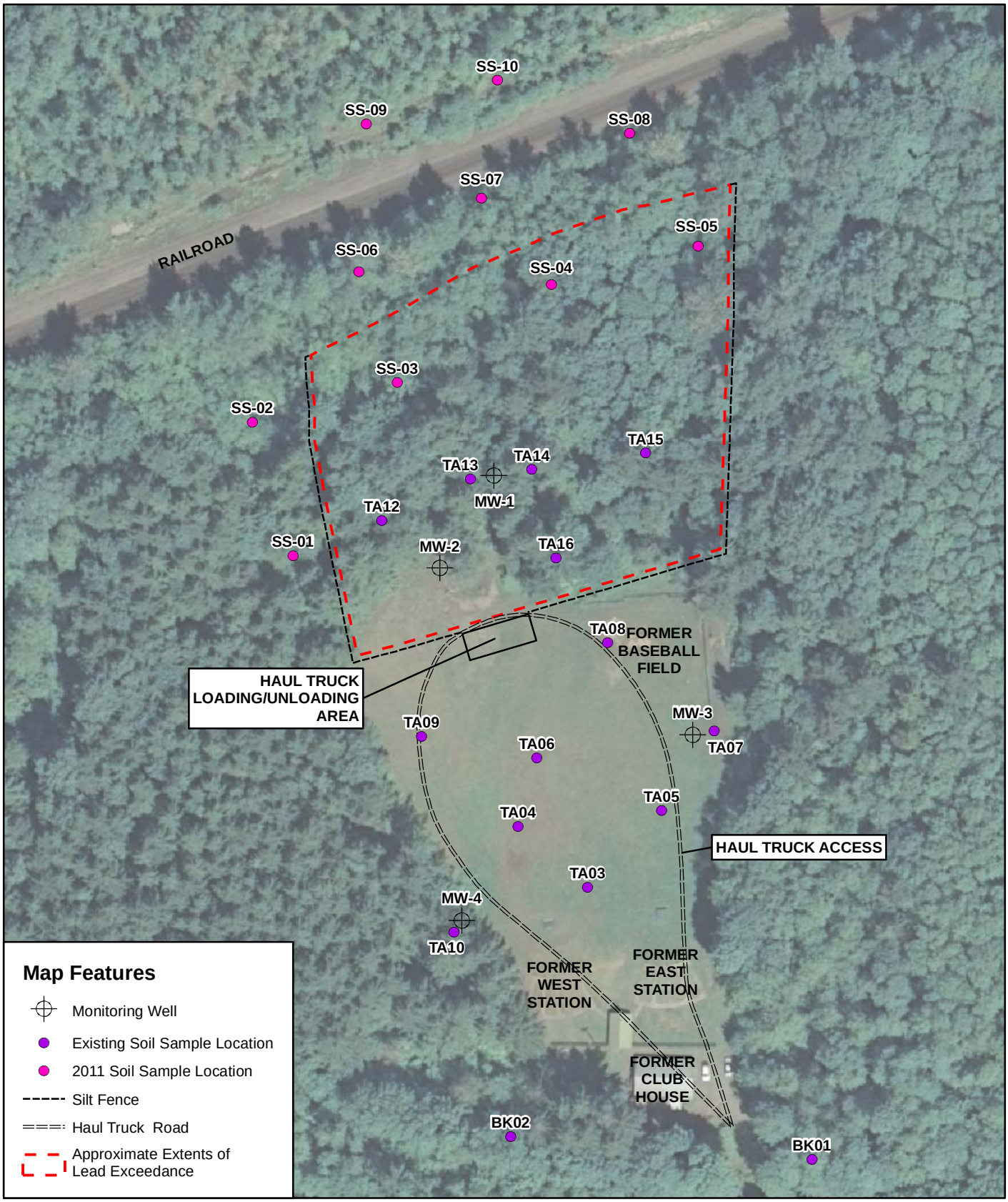
INDEX, WASHINGTON

FIGURE 7

O:\25697469 USDA FS Index Data Gap EECA\5000 Technical\Figures\Fig 7 Conceptual Design for Excavation and Off-Site Disposal.dwg Oct 07, 2011 - 10:57am



Source: USGS 2007.

0 120 240 Feet

CONCEPTUAL STAGING FOR ALTERNATIVE 4

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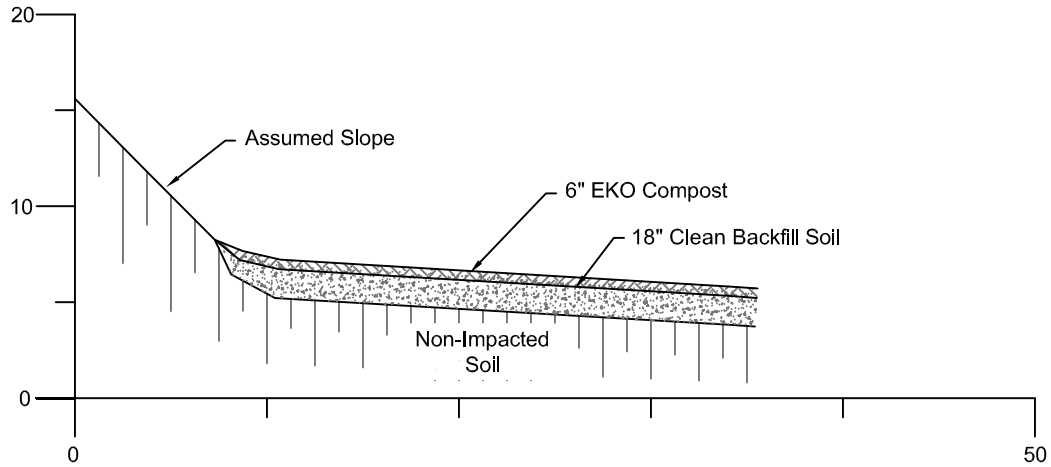
INDEX SHOOTING RANGE
INDEX, WASHINGTON

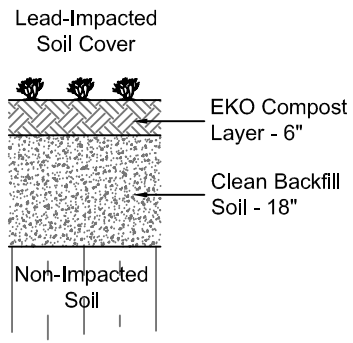
FIGURE 8

O:\25697469 USDA FS Index Data Gap EECA\5000 Technical\Figures\Fig 8 Conceptual Staging for Alt 4.mxd



CONCEPTUAL ALTERNATIVE 4 CROSS SECTION FOR RESTORATION

Not to Scale



CONCEPTUAL COVER DETAIL

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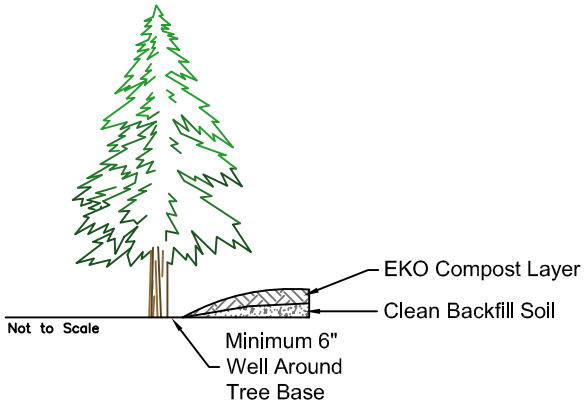

CONCEPTUAL DESIGN FOR EXCAVATION AND ON-SITE TREATMENT

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FIGURE 9

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APPENDIX A

2011 Data Gap Investigation Analytical Data

Apex Labs

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Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

Wednesday, September 7, 2011

Mike Powell
URS - Portland
111 SW Columbia STE 1500
Portland, OR 97201-5850

RE: Index Shooting Range / 25697649.00001

Enclosed are the results of analyses for work order A11H168, which was received by the laboratory on 8/12/2011 at 1:20:00PM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: dthomas@apex-labs.com, or by phone at 503-718-2323.

Apex Laboratories

Darwin Thomas, Business Development Director

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Apex Labs

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1	A11H168-01	Water	08/11/11 11:00	08/12/11 13:20
MW-2	A11H168-02	Water	08/11/11 09:30	08/12/11 13:20
MW-3	A11H168-03	Water	08/11/11 14:00	08/12/11 13:20
MW-4	A11H168-04	Water	08/11/11 12:20	08/12/11 13:20
MW-5	A11H168-05	Water	08/11/11 09:40	08/12/11 13:20
IDW	A11H168-06	Water	08/11/11 16:45	08/12/11 13:20
SS-01-06-8	A11H168-07	Soil	08/11/11 18:20	08/12/11 13:20
SS-01-12-18	A11H168-08	Soil	08/11/11 18:35	08/12/11 13:20
SS-02-3-6	A11H168-09	Soil	08/11/11 18:10	08/12/11 13:20
SS-02-18-24	A11H168-10	Soil	08/11/11 18:10	08/12/11 13:20
SS-03-3-6	A11H168-11	Soil	08/11/11 18:00	08/12/11 13:20
SS-03-18-24	A11H168-12	Soil	08/11/11 18:05	08/12/11 13:20
SS-04-3-6	A11H168-13	Soil	08/11/11 17:45	08/12/11 13:20
SS-05-3-6	A11H168-14	Soil	08/11/11 17:10	08/12/11 13:20
SS-05-18-24	A11H168-15	Soil	08/11/11 17:30	08/12/11 13:20
SS-06-3-6	A11H168-16	Soil	08/11/11 15:55	08/12/11 13:20
SS-06-18-24	A11H168-17	Soil	08/11/11 16:05	08/12/11 13:20
SS-07-3-6	A11H168-18	Soil	08/11/11 15:34	08/12/11 13:20
SS-07-24	A11H168-19	Soil	08/11/11 15:43	08/12/11 13:20
SS-08-3-6	A11H168-20	Soil	08/11/11 15:10	08/12/11 13:20
SS-09-3-6	A11H168-21	Soil	08/11/11 16:20	08/12/11 13:20
SS-09-8-12	A11H168-22	Soil	08/11/11 16:25	08/12/11 13:20
SS-10-3-6	A11H168-23	Soil	08/11/11 16:40	08/12/11 13:20
SS-11-3-6	A11H168-24	Soil	08/11/11 17:22	08/12/11 13:20
SS-11-18-24	A11H168-25	Soil	08/11/11 17:38	08/12/11 13:20

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-1 (A11H168-01)			**Matrix: Water**		**Batch: 1108349**			A-01
Acenaphthene	ND	0.0194	0.0388	ug/L	1	08/19/11 17:01	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0194	0.0388	"	"	"	"	Q-30
Anthracene	ND	0.0194	0.0388	"	"	"	"	Q-30
Benz(a)anthracene	ND	0.0194	0.0388	"	"	"	"	
Benzo(a)pyrene	ND	0.0194	0.0388	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0194	0.0388	"	"	"	"	
Chrysene	ND	0.0194	0.0388	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0194	0.0388	"	"	"	"	
Fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Fluorene	ND	0.0194	0.0388	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0194	0.0388	"	"	"	"	
Naphthalene	ND	0.0388	0.0777	"	"	"	"	Q-30
Phenanthrene	ND	0.0194	0.0388	"	"	"	"	
Pyrene	ND	0.0194	0.0388	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 34 %*	*Limits: 35-120 %*	"	"	"	*NR*
2-Fluorobiphenyl (Surr)			*27 %*	*Limits: 45-120 %*	"	"	"	*S-03*
p-Terphenyl-d14 (Surr)			*68 %*	*Limits: 30-120 %*	"	"	"	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-1 (A11H168-01RE1)			**Matrix: Water**		**Batch: 1108444**			A-02, H-02
Acenaphthene	ND	0.0194	0.0388	ug/L	1	08/24/11 13:37	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0194	0.0388	"	"	"	"	
Anthracene	ND	0.0194	0.0388	"	"	"	"	
Benz(a)anthracene	ND	0.0194	0.0388	"	"	"	"	
Benzo(a)pyrene	ND	0.0194	0.0388	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0194	0.0388	"	"	"	"	
Chrysene	ND	0.0194	0.0388	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0194	0.0388	"	"	"	"	
Fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Fluorene	ND	0.0194	0.0388	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0194	0.0388	"	"	"	"	
Naphthalene	ND	0.0388	0.0777	"	"	"	"	
Phenanthrene	ND	0.0194	0.0388	"	"	"	"	
Pyrene	ND	0.0194	0.0388	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 39 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*36 %*	*Limits: 45-120 %*	"	"	"	*S-06*
p-Terphenyl-d14 (Surr)			*85 %*	*Limits: 30-120 %*	"	"	"	

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ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-2 (A11H168-02)			**Matrix: Water**	**Batch: 1108349**				A-01
Acenaphthene	ND	0.0190	0.0381	ug/L	1	08/19/11 17:29	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0190	0.0381	"	"	"	"	Q-30
Anthracene	ND	0.0190	0.0381	"	"	"	"	Q-30
Benz(a)anthracene	ND	0.0190	0.0381	"	"	"	"	
Benzo(a)pyrene	ND	0.0190	0.0381	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0190	0.0381	"	"	"	"	
Chrysene	ND	0.0190	0.0381	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0190	0.0381	"	"	"	"	
Fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Fluorene	ND	0.0190	0.0381	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0190	0.0381	"	"	"	"	
Naphthalene	ND	0.0381	0.0762	"	"	"	"	Q-30
Phenanthrene	ND	0.0190	0.0381	"	"	"	"	
Pyrene	ND	0.0190	0.0381	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 44 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*35 %*	*Limits: 45-120 %*	"	"	"	*S-06*
p-Terphenyl-d14 (Surr)			*81 %*	*Limits: 30-120 %*	"	"	"	

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ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-2 (A11H168-02RE1)			**Matrix: Water**		**Batch: 1108444**			A-02, H-02
Acenaphthene	ND	0.0190	0.0381	ug/L	1	08/24/11 14:04	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0190	0.0381	"	"	"	"	
Anthracene	ND	0.0190	0.0381	"	"	"	"	
Benz(a)anthracene	ND	0.0190	0.0381	"	"	"	"	
Benzo(a)pyrene	ND	0.0190	0.0381	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0190	0.0381	"	"	"	"	
Chrysene	ND	0.0190	0.0381	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0190	0.0381	"	"	"	"	
Fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Fluorene	ND	0.0190	0.0381	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0190	0.0381	"	"	"	"	
Naphthalene	ND	0.0381	0.0762	"	"	"	"	
Phenanthrene	ND	0.0190	0.0381	"	"	"	"	
Pyrene	ND	0.0190	0.0381	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 57 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*52 %*	*Limits: 45-120 %*	"	"	"	
p-Terphenyl-d14 (Surr)			*87 %*	*Limits: 30-120 %*	"	"	"	

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ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-3 (A11H168-03)			**Matrix: Water**	**Batch: 1108349**				A-01
Acenaphthene	ND	0.0190	0.0381	ug/L	1	08/19/11 17:56	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0190	0.0381	"	"	"	"	Q-30
Anthracene	ND	0.0190	0.0381	"	"	"	"	Q-30
Benz(a)anthracene	ND	0.0190	0.0381	"	"	"	"	
Benzo(a)pyrene	ND	0.0190	0.0381	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0190	0.0381	"	"	"	"	
Chrysene	ND	0.0190	0.0381	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0190	0.0381	"	"	"	"	
Fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Fluorene	ND	0.0190	0.0381	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0190	0.0381	"	"	"	"	
Naphthalene	ND	0.0381	0.0762	"	"	"	"	Q-30
Phenanthrene	ND	0.0190	0.0381	"	"	"	"	
Pyrene	ND	0.0190	0.0381	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 42 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*35 %*	*Limits: 45-120 %*	"	"	"	*S-06*
p-Terphenyl-d14 (Surr)			*81 %*	*Limits: 30-120 %*	"	"	"	

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Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-3 (A11H168-03RE1)			**Matrix: Water**		**Batch: 1108444**			A-02, H-02
Acenaphthene	ND	0.0187	0.0374	ug/L	1	08/24/11 14:31	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0187	0.0374	"	"	"	"	
Anthracene	ND	0.0187	0.0374	"	"	"	"	
Benz(a)anthracene	ND	0.0187	0.0374	"	"	"	"	
Benzo(a)pyrene	ND	0.0187	0.0374	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0187	0.0374	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0187	0.0374	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0187	0.0374	"	"	"	"	
Chrysene	ND	0.0187	0.0374	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0187	0.0374	"	"	"	"	
Fluoranthene	ND	0.0187	0.0374	"	"	"	"	
Fluorene	ND	0.0187	0.0374	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0187	0.0374	"	"	"	"	
Naphthalene	ND	0.0374	0.0748	"	"	"	"	
Phenanthrene	ND	0.0187	0.0374	"	"	"	"	
Pyrene	ND	0.0187	0.0374	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 74 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*65 %*	*Limits: 45-120 %*	"	"	"	
p-Terphenyl-d14 (Surr)			*92 %*	*Limits: 30-120 %*	"	"	"	

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ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-4 (A11H168-04)			**Matrix: Water**		**Batch: 1108349**			A-01
Acenaphthene	ND	0.0194	0.0388	ug/L	1	08/19/11 18:24	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0194	0.0388	"	"	"	"	Q-30
Anthracene	ND	0.0194	0.0388	"	"	"	"	Q-30
Benz(a)anthracene	ND	0.0194	0.0388	"	"	"	"	
Benzo(a)pyrene	ND	0.0194	0.0388	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0194	0.0388	"	"	"	"	
Chrysene	ND	0.0194	0.0388	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0194	0.0388	"	"	"	"	
Fluoranthene	ND	0.0194	0.0388	"	"	"	"	
Fluorene	ND	0.0194	0.0388	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0194	0.0388	"	"	"	"	
Naphthalene	ND	0.0388	0.0777	"	"	"	"	Q-30
Phenanthrene	ND	0.0194	0.0388	"	"	"	"	
Pyrene	ND	0.0194	0.0388	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 45 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*33 %*	*Limits: 45-120 %*	"	"	"	*S-06*
p-Terphenyl-d14 (Surr)			*85 %*	*Limits: 30-120 %*	"	"	"	

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ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-4 (A11H168-04RE1)			**Matrix: Water**		**Batch: 1108444**			A-02, H-02
Acenaphthene	ND	0.0187	0.0374	ug/L	1	08/24/11 14:58	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0187	0.0374	"	"	"	"	
Anthracene	ND	0.0187	0.0374	"	"	"	"	
Benz(a)anthracene	ND	0.0187	0.0374	"	"	"	"	
Benzo(a)pyrene	ND	0.0187	0.0374	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0187	0.0374	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0187	0.0374	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0187	0.0374	"	"	"	"	
Chrysene	ND	0.0187	0.0374	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0187	0.0374	"	"	"	"	
Fluoranthene	ND	0.0187	0.0374	"	"	"	"	
Fluorene	ND	0.0187	0.0374	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0187	0.0374	"	"	"	"	
Naphthalene	ND	0.0374	0.0748	"	"	"	"	
Phenanthrene	ND	0.0187	0.0374	"	"	"	"	
Pyrene	ND	0.0187	0.0374	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 54 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*46 %*	*Limits: 45-120 %*	"	"	"	
p-Terphenyl-d14 (Surr)			*93 %*	*Limits: 30-120 %*	"	"	"	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-5 (A11H168-05)			**Matrix: Water**		**Batch: 1108349**			A-01
Acenaphthene	ND	0.0189	0.0377	ug/L	1	08/19/11 19:46	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0189	0.0377	"	"	"	"	Q-30
Anthracene	ND	0.0189	0.0377	"	"	"	"	Q-30
Benz(a)anthracene	ND	0.0189	0.0377	"	"	"	"	
Benzo(a)pyrene	ND	0.0189	0.0377	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0189	0.0377	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0189	0.0377	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0189	0.0377	"	"	"	"	
Chrysene	ND	0.0189	0.0377	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0189	0.0377	"	"	"	"	
Fluoranthene	ND	0.0189	0.0377	"	"	"	"	
Fluorene	ND	0.0189	0.0377	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0189	0.0377	"	"	"	"	
Naphthalene	ND	0.0377	0.0755	"	"	"	"	Q-30
Phenanthrene	ND	0.0189	0.0377	"	"	"	"	
Pyrene	ND	0.0189	0.0377	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 44 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*34 %*	*Limits: 45-120 %*	"	"	"	*S-06*
p-Terphenyl-d14 (Surr)			*79 %*	*Limits: 30-120 %*	"	"	"	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
MW-5 (A11H168-05RE1)			**Matrix: Water**		**Batch: 1108444**			A-02, H-02
Acenaphthene	ND	0.0190	0.0381	ug/L	1	08/24/11 15:25	EPA 8270D (SIM)	
Acenaphthylene	ND	0.0190	0.0381	"	"	"	"	
Anthracene	ND	0.0190	0.0381	"	"	"	"	
Benz(a)anthracene	ND	0.0190	0.0381	"	"	"	"	
Benzo(a)pyrene	ND	0.0190	0.0381	"	"	"	"	
Benzo(b)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(k)fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Benzo(g,h,i)perylene	ND	0.0190	0.0381	"	"	"	"	
Chrysene	ND	0.0190	0.0381	"	"	"	"	
Dibenz(a,h)anthracene	ND	0.0190	0.0381	"	"	"	"	
Fluoranthene	ND	0.0190	0.0381	"	"	"	"	
Fluorene	ND	0.0190	0.0381	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	0.0190	0.0381	"	"	"	"	
Naphthalene	ND	0.0381	0.0762	"	"	"	"	
Phenanthrene	ND	0.0190	0.0381	"	"	"	"	
Pyrene	ND	0.0190	0.0381	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 71 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*64 %*	*Limits: 45-120 %*	"	"	"	
p-Terphenyl-d14 (Surr)			*87 %*	*Limits: 30-120 %*	"	"	"	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
IDW (A11H168-06)			**Matrix: Water**		**Batch: 1108274**			
Arsenic	**2.23**	0.500	2.00	ug/L	1	08/16/11 11:28	EPA 6020	
Barium	**32.8**	0.100	1.00	"	"	"	"	
Cadmium	ND	0.100	1.00	"	"	"	"	
Chromium	**1.59**	0.200	2.00	"	"	"	"	J
Lead	**3.06**	0.200	1.00	"	"	"	"	
Mercury	ND	0.0200	0.0800	"	"	"	"	
Selenium	ND	0.500	2.00	"	"	"	"	
Silver	**0.244**	0.100	1.00	"	"	"	"	J
SS-01-06-8 (A11H168-07)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**193**	0.120	1.20	mg/kg dry	10	08/15/11 15:10	EPA 6020	
SS-01-12-18 (A11H168-08)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**55.7**	0.124	1.24	mg/kg dry	10	08/18/11 15:23	EPA 6020	
SS-02-3-6 (A11H168-09)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**140**	0.129	1.29	mg/kg dry	10	08/15/11 15:14	EPA 6020	
SS-02-18-24 (A11H168-10)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**84.9**	0.124	1.24	mg/kg dry	10	08/18/11 15:26	EPA 6020	
SS-03-3-6 (A11H168-11)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**1580**	0.152	1.52	mg/kg dry	10	08/15/11 15:26	EPA 6020	
SS-03-18-24 (A11H168-12)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**78.3**	0.112	1.12	mg/kg dry	10	08/18/11 15:38	EPA 6020	
SS-04-3-6 (A11H168-13)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**720**	0.139	1.39	mg/kg dry	10	08/15/11 15:29	EPA 6020	
SS-05-3-6 (A11H168-14)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**513**	0.176	1.76	mg/kg dry	10	08/15/11 15:41	EPA 6020	
SS-05-18-24 (A11H168-15)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**13.0**	0.138	1.38	mg/kg dry	10	08/18/11 15:41	EPA 6020	
SS-06-3-6 (A11H168-16)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**22.9**	0.137	1.37	mg/kg dry	10	08/15/11 15:47	EPA 6020	
SS-06-18-24 (A11H168-17)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**7.60**	0.129	1.29	mg/kg dry	10	08/18/11 15:49	EPA 6020	
SS-07-3-6 (A11H168-18)			**Matrix: Soil**		**Batch: 1108260**			

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
SS-07-3-6 (A11H168-18)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**69.0**	0.133	1.33	mg/kg dry	10	08/15/11 15:50	EPA 6020	
SS-07-24 (A11H168-19)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**14.0**	0.144	1.44	mg/kg dry	10	08/18/11 15:52	EPA 6020	
SS-08-3-6 (A11H168-20)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**8.63**	0.120	1.20	mg/kg dry	10	08/15/11 15:53	EPA 6020	
SS-09-3-6 (A11H168-21)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**14.2**	0.115	1.15	mg/kg dry	10	08/15/11 15:56	EPA 6020	
SS-09-8-12 (A11H168-22)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**14.5**	0.122	1.22	mg/kg dry	10	08/18/11 15:55	EPA 6020	
SS-10-3-6 (A11H168-23)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**8.14**	0.121	1.21	mg/kg dry	10	08/15/11 15:59	EPA 6020	
SS-11-3-6 (A11H168-24)			**Matrix: Soil**		**Batch: 1108260**			
Lead	**409**	0.166	1.66	mg/kg dry	10	08/15/11 16:02	EPA 6020	
SS-11-18-24 (A11H168-25)			**Matrix: Soil**		**Batch: 1108348**			
Lead	**17.4**	0.138	1.38	mg/kg dry	10	08/18/11 15:58	EPA 6020	

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Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
SS-01-06-8 (A11H168-07)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**11.0**	0.00500	0.0500	mg/L	5	08/19/11 12:08	EPA 1311/6020	
SS-01-12-18 (A11H168-08)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.944**	0.00500	0.0500	mg/L	5	08/19/11 12:14	EPA 1311/6020	
SS-02-3-6 (A11H168-09)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.104**	0.00500	0.0500	mg/L	5	08/19/11 12:17	EPA 1311/6020	
SS-02-18-24 (A11H168-10)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.0870**	0.00500	0.0500	mg/L	5	08/19/11 12:20	EPA 1311/6020	
SS-03-3-6 (A11H168-11)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**8.93**	0.00500	0.0500	mg/L	5	08/19/11 12:23	EPA 1311/6020	
SS-03-18-24 (A11H168-12)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.0955**	0.00500	0.0500	mg/L	5	08/19/11 12:26	EPA 1311/6020	
SS-04-3-6 (A11H168-13)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**6.47**	0.00500	0.0500	mg/L	5	08/19/11 12:28	EPA 1311/6020	
SS-05-3-6 (A11H168-14)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.963**	0.00500	0.0500	mg/L	5	08/19/11 12:40	EPA 1311/6020	
SS-05-18-24 (A11H168-15)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.450**	0.00500	0.0500	mg/L	5	08/19/11 12:43	EPA 1311/6020	
SS-06-3-6 (A11H168-16)			**Matrix: Soil**		**Batch: 1108356**			
Lead	**0.0110**	0.00500	0.0500	mg/L	5	08/19/11 12:46	EPA 1311/6020	J
SS-06-18-24 (A11H168-17)			**Matrix: Soil**		**Batch: 1108379**			
Lead	ND	0.00500	0.0500	mg/L	5	08/19/11 19:50	EPA 1311/6020	
SS-07-3-6 (A11H168-18)			**Matrix: Soil**		**Batch: 1108379**			
Lead	**0.00550**	0.00500	0.0500	mg/L	5	08/19/11 19:53	EPA 1311/6020	J
SS-07-24 (A11H168-19)			**Matrix: Soil**		**Batch: 1108379**			
Lead	ND	0.00500	0.0500	mg/L	5	08/19/11 19:56	EPA 1311/6020	
SS-08-3-6 (A11H168-20)			**Matrix: Soil**		**Batch: 1108379**			
Lead	ND	0.00500	0.0500	mg/L	5	08/19/11 19:59	EPA 1311/6020	
SS-09-3-6 (A11H168-21)			**Matrix: Soil**		**Batch: 1108379**			
Lead	**0.00650**	0.00500	0.0500	mg/L	5	08/19/11 20:02	EPA 1311/6020	J
SS-09-8-12 (A11H168-22)			**Matrix: Soil**		**Batch: 1108379**			

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
SS-09-8-12 (A11H168-22)			**Matrix: Soil**		**Batch: 1108379**			
Lead	**0.00650**	0.00500	0.0500	mg/L	5	08/19/11 20:05	EPA 1311/6020	J
SS-10-3-6 (A11H168-23)			**Matrix: Soil**		**Batch: 1108380**			
Lead	ND	0.00500	0.0500	mg/L	5	08/19/11 20:13	EPA 1311/6020	
SS-11-3-6 (A11H168-24)			**Matrix: Soil**		**Batch: 1108380**			
Lead	**1.01**	0.00500	0.0500	mg/L	5	08/19/11 20:28	EPA 1311/6020	
SS-11-18-24 (A11H168-25)			**Matrix: Soil**		**Batch: 1108380**			
Lead	**1.59**	0.00500	0.0500	mg/L	5	08/19/11 20:31	EPA 1311/6020	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
IDW (A11H168-06)			**Matrix: Water**		**Batch: 1108249**			
pH	**6.52**			pH Units	1	08/12/11 14:58	EPA 150.1	
pH Temperature (deg C)	**21.6**			"	"	"	"	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
SS-01-06-8 (A11H168-07)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**89.2**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-01-12-18 (A11H168-08)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**90.3**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-02-3-6 (A11H168-09)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**76.7**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-02-18-24 (A11H168-10)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**82.2**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-03-3-6 (A11H168-11)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**63.4**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-03-18-24 (A11H168-12)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**91.1**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-04-3-6 (A11H168-13)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**85.4**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-05-3-6 (A11H168-14)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**64.9**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-05-18-24 (A11H168-15)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**78.0**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-06-3-6 (A11H168-16)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**84.2**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-06-18-24 (A11H168-17)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**87.7**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-07-3-6 (A11H168-18)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**72.6**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-07-24 (A11H168-19)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**75.2**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-08-3-6 (A11H168-20)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**87.3**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-09-3-6 (A11H168-21)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**88.9**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-09-8-12 (A11H168-22)			**Matrix: Soil**		**Batch: 1108291**			

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
SS-09-8-12 (A11H168-22)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**89.3**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	
SS-10-3-6 (A11H168-23)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**88.9**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-11-3-6 (A11H168-24)			**Matrix: Soil**		**Batch: 1108264**			
% Solids	**63.6**	1.00	1.00	% by Weight	1	08/16/11 10:34	Apex SOP	
SS-11-18-24 (A11H168-25)			**Matrix: Soil**		**Batch: 1108291**			
% Solids	**78.3**	1.00	1.00	% by Weight	1	08/17/11 10:24	Apex SOP	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108349 - EPA 3510C (Acid Extraction)							**Water**					
Blank (1108349-BLK2)					Prepared: 08/18/11 10:38 Analyzed: 08/19/11 15:11							
EPA 8270D (SIM)												
Acenaphthene	ND	0.0182	0.0364	ug/L	1	---	---	---	---	---	---	
Acenaphthylene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	Q-30
Anthracene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Benz(a)anthracene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Benzo(a)pyrene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Carbazole	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Chrysene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Dibenzofuran	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	Q-30
Fluoranthene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Fluorene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
1-Methylnaphthalene	ND	0.0364	0.0727	"	"	---	---	---	---	---	---	Q-30
2-Methylnaphthalene	ND	0.0364	0.0727	"	"	---	---	---	---	---	---	Q-30
Naphthalene	ND	0.0364	0.0727	"	"	---	---	---	---	---	---	Q-30
Phenanthrene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Pyrene	ND	0.0182	0.0364	"	"	---	---	---	---	---	---	
Surr: 2-Fluorobiphenyl (Surr)			*Recovery: 33 %*		*Limits: 45-120 %*		*Dilution: 1x*					*S-06*
p-Terphenyl-d14 (Surr)			*82 %*		*30-120 %*		*"*					
LCS (1108349-BS2)					Prepared: 08/18/11 11:01 Analyzed: 08/19/11 15:38							
EPA 8270D (SIM)												
Acenaphthene	3.58	0.0200	0.0400	ug/L	1	8.00	---	45	45-125%	---	---	
Acenaphthylene	3.87	0.0200	0.0400	"	"	"	---	48	50-125%	---	---	Q-30
Anthracene	5.90	0.0200	0.0400	"	"	"	---	74	55-125%	---	---	
Benz(a)anthracene	6.91	0.0200	0.0400	"	"	"	---	86	"	---	---	
Benzo(a)pyrene	7.48	0.0200	0.0400	"	"	"	---	93	"	---	---	
Benzo(b)fluoranthene	7.14	0.0200	0.0400	"	"	"	---	89	45-125%	---	---	
Benzo(g,h,i)perylene	7.26	0.0200	0.0400	"	"	"	---	91	40-125%	---	---	
Carbazole	6.81	0.0200	0.0400	"	"	"	---	85	50-125%	---	---	
Chrysene	7.03	0.0200	0.0400	"	"	"	---	88	55-125%	---	---	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108349 - EPA 3510C (Acid Extraction)							**Water**					
LCS (1108349-BS2)					Prepared: 08/18/11 11:01	Analyzed: 08/19/11 15:38						
Dibenz(a,h)anthracene	7.39	0.0200	0.0400	ug/L	"	"	---	92	40-125%	---	---	
Dibenzofuran	4.14	0.0200	0.0400	"	"	"	---	52	55-125%	---	---	Q-30
Fluoranthene	7.20	0.0200	0.0400	"	"	"	---	90	"	---	---	
Fluorene	4.81	0.0200	0.0400	"	"	"	---	60	50-125%	---	---	
Indeno(1,2,3-cd)pyrene	7.21	0.0200	0.0400	"	"	"	---	90	45-125%	---	---	
1-Methylnaphthalene	2.81	0.0400	0.0800	"	"	"	---	35	"	---	---	Q-30
2-Methylnaphthalene	2.76	0.0400	0.0800	"	"	"	---	34	"	---	---	Q-30
Naphthalene	2.62	0.0400	0.0800	"	"	"	---	33	40-125%	---	---	Q-30
Phenanthrene	5.69	0.0200	0.0400	"	"	"	---	71	50-125%	---	---	
Pyrene	7.37	0.0200	0.0400	"	"	"	---	92	"	---	---	
Surr: 2-Fluorobiphenyl (Surr)			*Recovery: 35 %*	*Limits: 45-120 %*			*Dilution: 1x*					*S-06*
p-Terphenyl-d14 (Surr)			*85 %*	*30-120 %*			*"*					
Matrix Spike (1108349-MS1)					Prepared: 08/18/11 10:38	Analyzed: 08/19/11 18:51						
QC Source Sample: MW-4 (A11H168-04)												
EPA 8270D (SIM)												
Acenaphthene	3.46	0.0192	0.0385	ug/L	1	7.69	ND	45	45-125%	---	---	
Acenaphthylene	3.67	0.0192	0.0385	"	"	"	ND	48	50-125%	---	---	Q-30
Anthracene	5.27	0.0192	0.0385	"	"	"	ND	69	55-125%	---	---	
Benz(a)anthracene	6.66	0.0192	0.0385	"	"	"	ND	87	"	---	---	
Benzo(a)pyrene	7.28	0.0192	0.0385	"	"	"	ND	95	"	---	---	
Benzo(b)fluoranthene	7.14	0.0192	0.0385	"	"	"	ND	93	45-125%	---	---	
Benzo(k)fluoranthene	6.96	0.0192	0.0385	"	"	"	ND	90	"	---	---	
Benzo(g,h,i)perylene	6.96	0.0192	0.0385	"	"	"	ND	90	40-125%	---	---	
Carbazole	6.67	0.0192	0.0385	"	"	"	ND	87	50-125%	---	---	
Chrysene	6.80	0.0192	0.0385	"	"	"	ND	88	55-125%	---	---	
Dibenz(a,h)anthracene	7.17	0.0192	0.0385	"	"	"	ND	93	40-125%	---	---	
Dibenzofuran	3.76	0.0192	0.0385	"	"	"	ND	49	55-125%	---	---	Q-01
Fluoranthene	7.09	0.0192	0.0385	"	"	"	ND	92	"	---	---	
Fluorene	4.12	0.0192	0.0385	"	"	"	ND	53	50-125%	---	---	
Indeno(1,2,3-cd)pyrene	6.92	0.0192	0.0385	"	"	"	ND	90	45-125%	---	---	
1-Methylnaphthalene	3.21	0.0385	0.0769	"	"	"	ND	42	"	---	---	Q-01
2-Methylnaphthalene	3.19	0.0385	0.0769	"	"	"	ND	41	"	---	---	Q-01
Naphthalene	3.09	0.0385	0.0769	"	"	"	ND	40	40-125%	---	---	Q-30
Phenanthrene	5.16	0.0192	0.0385	"	"	"	ND	67	50-125%	---	---	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108349 - EPA 3510C (Acid Extraction)							**Water**					
Matrix Spike (1108349-MS1)					Prepared: 08/18/11 10:38		Analyzed: 08/19/11 18:51					
QC Source Sample: MW-4 (A11H168-04)												
Pyrene	7.09	0.0192	0.0385	ug/L	"	"	ND	92	"	---	---	
Surr: Nitrobenzene-d5 (Surr)			*Recovery: 42 %*		*Limits: 35-120 %*		*Dilution: 1x*					
2-Fluorobiphenyl (Surr)			*36 %*		*45-120 %*		*"*					*S-06*
p-Terphenyl-d14 (Surr)			*81 %*		*30-120 %*		*"*					
Matrix Spike Dup (1108349-MSD1)					Prepared: 08/18/11 10:39		Analyzed: 08/19/11 19:18					
QC Source Sample: MW-4 (A11H168-04)												
EPA 8270D (SIM)												
Acenaphthene	3.52	0.0192	0.0385	ug/L	1	7.69	ND	46	45-125%	2	35%	
Acenaphthylene	3.64	0.0192	0.0385	"	"	"	ND	47	50-125%	0.7	35%	Q-30
Anthracene	4.99	0.0192	0.0385	"	"	"	ND	65	55-125%	5	35%	
Benz(a)anthracene	6.48	0.0192	0.0385	"	"	"	ND	84	"	3	35%	
Benzo(a)pyrene	6.99	0.0192	0.0385	"	"	"	ND	91	"	4	35%	
Benzo(b)fluoranthene	6.74	0.0192	0.0385	"	"	"	ND	88	45-125%	6	35%	
Benzo(k)fluoranthene	6.97	0.0192	0.0385	"	"	"	ND	91	"	0.2	35%	
Benzo(g,h,i)perylene	6.94	0.0192	0.0385	"	"	"	ND	90	40-125%	0.2	35%	
Carbazole	6.35	0.0192	0.0385	"	"	"	ND	83	50-125%	5	30%	
Chrysene	6.67	0.0192	0.0385	"	"	"	ND	87	55-125%	2	35%	
Dibenz(a,h)anthracene	7.01	0.0192	0.0385	"	"	"	ND	91	40-125%	2	35%	
Dibenzofuran	3.80	0.0192	0.0385	"	"	"	ND	49	55-125%	1	30%	Q-01
Fluoranthene	6.71	0.0192	0.0385	"	"	"	ND	87	"	5	35%	
Fluorene	4.26	0.0192	0.0385	"	"	"	ND	55	50-125%	4	35%	
Indeno(1,2,3-cd)pyrene	6.73	0.0192	0.0385	"	"	"	ND	87	45-125%	3	35%	
1-Methylnaphthalene	3.08	0.0385	0.0769	"	"	"	ND	40	"	4	35%	Q-01
2-Methylnaphthalene	3.07	0.0385	0.0769	"	"	"	ND	40	"	4	35%	Q-01
Naphthalene	2.92	0.0385	0.0769	"	"	"	ND	38	40-125%	6	35%	Q-30
Phenanthrene	4.89	0.0192	0.0385	"	"	"	ND	64	50-125%	6	35%	
Pyrene	6.73	0.0192	0.0385	"	"	"	ND	88	"	5	35%	
Surr: Nitrobenzene-d5 (Surr)			*Recovery: 41 %*		*Limits: 35-120 %*		*Dilution: 1x*					
2-Fluorobiphenyl (Surr)			*36 %*		*45-120 %*		*"*					*S-06*
p-Terphenyl-d14 (Surr)			*82 %*		*30-120 %*		*"*					

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108260 - EPA 3051A							**Soil**					
Blank (1108260-BLK1)					Prepared: 08/15/11 10:13		Analyzed: 08/15/11 13:53					
EPA 6020												
Lead	ND	0.100	1.00	mg/kg wet	10	---	---	---	---	---	---	
LCS (1108260-BS1)					Prepared: 08/15/11 10:13		Analyzed: 08/15/11 13:56					
EPA 6020												
Lead	48.4	0.100	1.00	mg/kg wet	10	50.0	---	97	80-120%	---	---	
LCS (1108260-BS2)					Prepared: 08/15/11 14:06		Analyzed: 08/15/11 16:26					
EPA 6020												
Lead	50.4	0.100	1.00	mg/kg wet	10	50.0	---	101	80-120%	---	---	
Matrix Spike (1108260-MS1)					Prepared: 08/15/11 10:13		Analyzed: 08/15/11 15:44					
QC Source Sample: SS-05-3-6 (A11H168-14)												
EPA 6020												
Lead	517	0.182	1.82	mg/kg dry	10	91.1	513	4	75-125%	---	---	Q-03
Matrix Spike (1108260-MS2)					Prepared: 08/15/11 10:13		Analyzed: 08/15/11 14:04					
QC Source Sample: Other (A11H179-02)												
EPA 6020												
Lead	63.5	0.119	1.19	mg/kg dry	10	59.3	7.18	95	75-125%	---	---	
Matrix Spike Dup (1108260-MSD1)					Prepared: 08/15/11 14:06		Analyzed: 08/15/11 16:29					
QC Source Sample: SS-05-3-6 (A11H168-14)												
EPA 6020												
Lead	621	0.161	1.61	mg/kg dry	10	80.6	513	135	75-125%	18	40%	Q-03
Post Spike (1108260-PS1)					Prepared: 08/15/11 10:13		Analyzed: 08/15/11 17:26					
QC Source Sample: SS-05-3-6 (A11H168-14)												
EPA 6020												
Lead	782			ug/L	1	500	291	98	80-120%		---	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108274 - EPA 3015A							**Water**					
Blank (1108274-BLK1)					Prepared: 08/15/11 15:19		Analyzed: 08/16/11 10:47					
EPA 6020												
Arsenic	ND	0.500	2.00	ug/L	1	---	---	---	---	---	---	
Barium	**0.189**	0.100	1.00	"	"	---	---	---	---	---	---	J
Cadmium	ND	0.100	1.00	"	"	---	---	---	---	---	---	
Chromium	**0.300**	0.200	2.00	"	"	---	---	---	---	---	---	J
Lead	ND	0.200	1.00	"	"	---	---	---	---	---	---	
Mercury	ND	0.0200	0.0800	"	"	---	---	---	---	---	---	
Selenium	ND	0.500	2.00	"	"	---	---	---	---	---	---	
Silver	ND	0.100	1.00	"	"	---	---	---	---	---	---	
LCS (1108274-BS1)					Prepared: 08/15/11 15:19		Analyzed: 08/16/11 10:50					
EPA 6020												
Arsenic	56.0	0.500	2.00	ug/L	1	55.5	---	101	85-115%	---	---	
Barium	55.4	0.100	1.00	"	"	"	---	100	80-120%	---	---	
Cadmium	57.4	0.100	1.00	"	"	"	---	103	"	---	---	
Chromium	54.7	0.200	2.00	"	"	"	---	98	"	---	---	
Lead	56.4	0.200	1.00	"	"	"	---	102	"	---	---	
Mercury	1.19	0.0200	0.0800	"	"	1.11	---	107	"	---	---	
Selenium	29.8	0.500	2.00	"	"	27.8	---	107	"	---	---	
Silver	30.1	0.100	1.00	"	"	"	---	109	"	---	---	
Duplicate (1108274-DUP1)					Prepared: 08/15/11 15:19		Analyzed: 08/16/11 11:11					
QC Source Sample: Other (A11H116-01)												
EPA 6020												
Arsenic	**9.52**	0.500	2.00	ug/L	1	---	9.37	---	---	2	20%	
Barium	**237**	0.100	1.00	"	"	---	238	---	---	0.5	20%	
Cadmium	ND	0.100	1.00	"	"	---	ND	---	---	---	20%	
Chromium	**0.544**	0.200	2.00	"	"	---	0.456	---	---	18	20%	J
Lead	ND	0.200	1.00	"	"	---	ND	---	---	---	20%	
Mercury	ND	0.0200	0.0800	"	"	---	ND	---	---	---	20%	
Selenium	**8.81**	0.500	2.00	"	"	---	8.61	---	---	2	20%	
Silver	ND	0.100	1.00	"	"	---	ND	---	---	---	20%	
Matrix Spike (1108274-MS1)					Prepared: 08/15/11 15:19		Analyzed: 08/16/11 11:14					
QC Source Sample: Other (A11H116-01)												
EPA 6020												

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108274 - EPA 3015A							**Water**					
Matrix Spike (1108274-MS1)						Prepared: 08/15/11 15:19	Analyzed: 08/16/11 11:14					
QC Source Sample: Other (A11H116-01)												
Arsenic	65.2	0.500	2.00	ug/L	1	55.5	9.37	101	70-130%	---	---	
Barium	296	0.100	1.00	"	"	"	238	105	75-125%	---	---	
Cadmium	55.9	0.100	1.00	"	"	"	ND	101	"	---	---	
Chromium	54.0	0.200	2.00	"	"	"	0.456	97	"	---	---	
Lead	51.5	0.200	1.00	"	"	"	ND	93	"	---	---	
Mercury	1.06	0.0200	0.0800	"	"	1.11	ND	95	"	---	---	
Selenium	38.1	0.500	2.00	"	"	27.8	8.61	106	"	---	---	
Silver	28.9	0.100	1.00	"	"	"	ND	104	"	---	---	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108348 - EPA 3051A							**Soil**					
Blank (1108348-BLK1)					Prepared: 08/18/11 10:32		Analyzed: 08/18/11 15:17					
EPA 6020												
Lead	ND	0.100	1.00	mg/kg wet	10	---	---	---	---	---	---	
LCS (1108348-BS1)					Prepared: 08/18/11 10:32		Analyzed: 08/18/11 15:20					
EPA 6020												
Lead	47.2	0.100	1.00	mg/kg wet	10	50.0	---	94	80-120%	---	---	
Duplicate (1108348-DUP1)					Prepared: 08/18/11 10:32		Analyzed: 08/18/11 15:44					
QC Source Sample: SS-05-18-24 (A11H168-15)												
EPA 6020												
Lead	**18.8**	0.143	1.43	mg/kg dry	10	---	13.0	---	---	36	40%	
Matrix Spike (1108348-MS1)					Prepared: 08/18/11 10:32		Analyzed: 08/18/11 15:46					
QC Source Sample: SS-05-18-24 (A11H168-15)												
EPA 6020												
Lead	69.0	0.133	1.33	mg/kg dry	10	66.7	13.0	84	75-125%	---	---	
Matrix Spike (1108348-MS2)					Prepared: 08/18/11 10:32		Analyzed: 08/18/11 16:28					
QC Source Sample: Other (A11H227-02)												
EPA 6020												
Lead	78.6	0.131	1.31	mg/kg dry	10	65.5	21.7	87	75-125%	---	---	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108356 - EPA 1311/3015							**Soil**					
Blank (1108356-BLK1)					Prepared: 08/18/11 12:47		Analyzed: 08/19/11 12:02					
EPA 1311/6020												
Lead	ND	0.00500	0.0500	mg/L	5	---	---	---	---	---	---	
LCS (1108356-BS1)					Prepared: 08/18/11 12:47		Analyzed: 08/19/11 12:05					
EPA 1311/6020												
Lead	2.41	0.00500	0.0500	mg/L	5	2.50	---	96	80-120%	---	---	
Matrix Spike (1108356-MS1)					Prepared: 08/18/11 12:47		Analyzed: 08/19/11 12:11					
QC Source Sample: SS-01-06-8 (A11H168-07)												
EPA 1311/6020												
Lead	13.8	0.00500	0.0500	mg/L	5	2.50	11.0	111	50-150%	---	---	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108379 - EPA 1311/3015							**Soil**					
Blank (1108379-BLK1)					Prepared: 08/19/11 12:56		Analyzed: 08/19/11 16:06					
EPA 1311/6020												
Lead	ND	0.00500	0.0500	mg/L	5	---	---	---	---	---	---	
LCS (1108379-BS1)					Prepared: 08/19/11 12:56		Analyzed: 08/19/11 16:09					
EPA 1311/6020												
Lead	2.10	0.00500	0.0500	mg/L	5	2.50	---	84	80-120%	---	---	
Matrix Spike (1108379-MS1)					Prepared: 08/19/11 12:56		Analyzed: 08/19/11 16:15					
QC Source Sample: Other (A11H236-01)												
EPA 1311/6020												
Lead	2.44	0.00500	0.0500	mg/L	5	2.50	0.131	92	50-150%	---	---	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108380 - EPA 1311/3015							**Soil**					
Blank (1108380-BLK1)					Prepared: 08/19/11 13:00		Analyzed: 08/19/11 20:08					
EPA 1311/6020												
Lead	ND	0.00500	0.0500	mg/L	5	---	---	---	---	---	---	
LCS (1108380-BS1)					Prepared: 08/19/11 13:00		Analyzed: 08/19/11 20:11					
EPA 1311/6020												
Lead	2.36	0.00500	0.0500	mg/L	5	2.50	---	94	80-120%	---	---	
Matrix Spike (1108380-MS1)					Prepared: 08/19/11 13:00		Analyzed: 08/19/11 20:16					
QC Source Sample: SS-10-3-6 (A11H168-23)												
EPA 1311/6020												
Lead	2.48	0.00500	0.0500	mg/L	5	2.50	ND	99	50-150%	---	---	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108249 - Method Prep: Aq							**Water**					
Duplicate (1108249-DUP1)					Prepared: 08/12/11 14:50		Analyzed: 08/12/11 14:59					
QC Source Sample: IDW (A11H168-06)												
EPA 150.1												
pH	**6.52**			pH Units	1	---	6.52	---	---	0	10%	
pH Temperature (deg C)	**22.1**			"	"	---	21.6	---	---	2	30%	
Reference (1108249-SRM1)					Prepared: 08/12/11 14:50		Analyzed: 08/12/11 14:54					
EPA 150.1												
pH	5.98			pH Units	1	6.00		100	98.4-101.7%	---	---	
Reference (1108249-SRM2)					Prepared: 08/12/11 14:50		Analyzed: 08/12/11 15:01					
EPA 150.1												
pH	7.95			pH Units	1	8.00		99	98.74-101.26%	---	---	

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111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108264 - Total Solids (Dry Weight)							**Soil**					
Duplicate (1108264-DUP1)					Prepared: 08/15/11 10:37		Analyzed: 08/16/11 10:34					
QC Source Sample: Other (A11H164-06)												
Apex SOP												
% Solids	**87.4**	1.00	1.00	% by Weight	1	---	83.0	---	---	5	20%	
Duplicate (1108264-DUP2)					Prepared: 08/15/11 10:37		Analyzed: 08/16/11 10:34					
QC Source Sample: Other (A11H172-04)												
Apex SOP												
% Solids	**75.7**	1.00	1.00	% by Weight	1	---	74.9	---	---	1	20%	
Duplicate (1108264-DUP3)					Prepared: 08/15/11 10:37		Analyzed: 08/16/11 10:34					
QC Source Sample: Other (A11H178-03)												
Apex SOP												
% Solids	**77.4**	1.00	1.00	% by Weight	1	---	71.2	---	---	8	20%	
Duplicate (1108264-DUP4)					Prepared: 08/15/11 12:25		Analyzed: 08/16/11 10:34					
QC Source Sample: SS-07-3-6 (A11H168-18)												
Apex SOP												
% Solids	**72.1**	1.00	1.00	% by Weight	1	---	72.6	---	---	0.7	20%	
Duplicate (1108264-DUP5)					Prepared: 08/15/11 15:11		Analyzed: 08/16/11 10:34					
QC Source Sample: Other (A11H077-13)												
Apex SOP												
% Solids	**84.1**	1.00	1.00	% by Weight	1	---	85.6	---	---	2	20%	
Batch 1108291 - Total Solids (Dry Weight)							**Soil**					
Duplicate (1108291-DUP1)					Prepared: 08/16/11 10:45		Analyzed: 08/17/11 10:24					
QC Source Sample: SS-06-18-24 (A11H168-17)												
Apex SOP												
% Solids	**89.0**	1.00	1.00	% by Weight	1	---	87.7	---	---	1	20%	
Duplicate (1108291-DUP2)					Prepared: 08/16/11 10:45		Analyzed: 08/17/11 10:24					
QC Source Sample: Other (A11H185-21)												
Apex SOP												

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1108291 - Total Solids (Dry Weight)							**Soil**					
Duplicate (1108291-DUP2)					Prepared: 08/16/11 10:45		Analyzed: 08/17/11 10:24					
QC Source Sample: Other (A11H185-21)												
% Solids	**79.8**	1.00	1.00	% by Weight	1	---	79.5	---	---	0.4	20%	
Duplicate (1108291-DUP3)					Prepared: 08/16/11 14:22		Analyzed: 08/17/11 10:24					
QC Source Sample: Other (A11H164-05)												
Apex SOP												
% Solids	**76.8**	1.00	1.00	% by Weight	1	---	69.1	---	---	11	20%	
Duplicate (1108291-DUP4)					Prepared: 08/16/11 14:22		Analyzed: 08/17/11 10:24					
QC Source Sample: Other (A11H200-01)												
Apex SOP												
% Solids	**96.9**	1.00	1.00	% by Weight	1	---	97.0	---	---	0.1	20%	

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

SAMPLE PREPARATION INFORMATION

Polyaromatic Hydrocarbons (PAHs) by EPA 8270D SIM

Prep: EPA 3510C (Acid Extraction)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1108349							
A11H168-01	Water	EPA 8270D (SIM)	08/11/11 11:00	08/18/11 10:38	1030mL/2mL	1000mL/2mL	0.97
A11H168-02	Water	EPA 8270D (SIM)	08/11/11 09:30	08/18/11 10:38	1050mL/2mL	1000mL/2mL	0.95
A11H168-03	Water	EPA 8270D (SIM)	08/11/11 14:00	08/18/11 10:38	1050mL/2mL	1000mL/2mL	0.95
A11H168-04	Water	EPA 8270D (SIM)	08/11/11 12:20	08/18/11 10:38	1030mL/2mL	1000mL/2mL	0.97
A11H168-05	Water	EPA 8270D (SIM)	08/11/11 09:40	08/18/11 10:38	1060mL/2mL	1000mL/2mL	0.94
Batch: 1108444							
A11H168-01RE1	Water	EPA 8270D (SIM)	08/11/11 11:00	08/24/11 08:44	1030mL/2mL	1000mL/2mL	0.97
A11H168-02RE1	Water	EPA 8270D (SIM)	08/11/11 09:30	08/24/11 08:44	1050mL/2mL	1000mL/2mL	0.95
A11H168-03RE1	Water	EPA 8270D (SIM)	08/11/11 14:00	08/24/11 08:44	1070mL/2mL	1000mL/2mL	0.94
A11H168-04RE1	Water	EPA 8270D (SIM)	08/11/11 12:20	08/24/11 08:44	1070mL/2mL	1000mL/2mL	0.94
A11H168-05RE1	Water	EPA 8270D (SIM)	08/11/11 09:40	08/24/11 08:44	1050mL/2mL	1000mL/2mL	0.95

Total Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1108274							
A11H168-06	Water	EPA 6020	08/11/11 16:45	08/15/11 15:19	45mL/50mL	45mL/50mL	1.00

Prep: EPA 3051A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1108260							
A11H168-07	Soil	EPA 6020	08/11/11 18:20	08/15/11 10:13	0.467g/50mL	0.5g/50mL	1.07
A11H168-09	Soil	EPA 6020	08/11/11 18:10	08/15/11 10:13	0.507g/50mL	0.5g/50mL	0.99
A11H168-11	Soil	EPA 6020	08/11/11 18:00	08/15/11 10:13	0.52g/50mL	0.5g/50mL	0.96
A11H168-13	Soil	EPA 6020	08/11/11 17:45	08/15/11 10:13	0.421g/50mL	0.5g/50mL	1.19
A11H168-14	Soil	EPA 6020	08/11/11 17:10	08/15/11 10:13	0.437g/50mL	0.5g/50mL	1.14
A11H168-16	Soil	EPA 6020	08/11/11 15:55	08/15/11 10:13	0.432g/50mL	0.5g/50mL	1.16
A11H168-18	Soil	EPA 6020	08/11/11 15:34	08/15/11 10:13	0.516g/50mL	0.5g/50mL	0.97
A11H168-20	Soil	EPA 6020	08/11/11 15:10	08/15/11 10:13	0.476g/50mL	0.5g/50mL	1.05
A11H168-21	Soil	EPA 6020	08/11/11 16:20	08/15/11 10:13	0.491g/50mL	0.5g/50mL	1.02
A11H168-23	Soil	EPA 6020	08/11/11 16:40	08/15/11 10:13	0.463g/50mL	0.5g/50mL	1.08
A11H168-24	Soil	EPA 6020	08/11/11 17:22	08/15/11 10:13	0.474g/50mL	0.5g/50mL	1.05
Batch: 1108348							
A11H168-08	Soil	EPA 6020	08/11/11 18:35	08/18/11 10:32	0.446g/50mL	0.5g/50mL	1.12
A11H168-10	Soil	EPA 6020	08/11/11 18:10	08/18/11 10:32	0.489g/50mL	0.5g/50mL	1.02
A11H168-12	Soil	EPA 6020	08/11/11 18:05	08/18/11 10:32	0.488g/50mL	0.5g/50mL	1.02

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

SAMPLE PREPARATION INFORMATION

Total Metals by EPA 6020 (ICPMS)

Prep: EPA 3051A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A11H168-15	Soil	EPA 6020	08/11/11 17:30	08/18/11 10:32	0.463g/50mL	0.5g/50mL	1.08
A11H168-17	Soil	EPA 6020	08/11/11 16:05	08/18/11 10:32	0.441g/50mL	0.5g/50mL	1.13
A11H168-19	Soil	EPA 6020	08/11/11 15:43	08/18/11 10:32	0.463g/50mL	0.5g/50mL	1.08
A11H168-22	Soil	EPA 6020	08/11/11 16:25	08/18/11 10:32	0.459g/50mL	0.5g/50mL	1.09
A11H168-25	Soil	EPA 6020	08/11/11 17:38	08/18/11 10:32	0.462g/50mL	0.5g/50mL	1.08

TCLP Metals by EPA 6020 (ICPMS)

Prep: EPA 1311/3015

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1108356							
A11H168-07	Soil	EPA 1311/6020	08/11/11 18:20	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-08	Soil	EPA 1311/6020	08/11/11 18:35	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-09	Soil	EPA 1311/6020	08/11/11 18:10	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-10	Soil	EPA 1311/6020	08/11/11 18:10	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-11	Soil	EPA 1311/6020	08/11/11 18:00	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-12	Soil	EPA 1311/6020	08/11/11 18:05	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-13	Soil	EPA 1311/6020	08/11/11 17:45	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-14	Soil	EPA 1311/6020	08/11/11 17:10	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-15	Soil	EPA 1311/6020	08/11/11 17:30	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
A11H168-16	Soil	EPA 1311/6020	08/11/11 15:55	08/18/11 12:47	5mL/50mL	5mL/50mL	1.00
Batch: 1108379							
A11H168-17	Soil	EPA 1311/6020	08/11/11 16:05	08/19/11 12:56	5mL/50mL	5mL/50mL	1.00
A11H168-18	Soil	EPA 1311/6020	08/11/11 15:34	08/19/11 12:56	5mL/50mL	5mL/50mL	1.00
A11H168-19	Soil	EPA 1311/6020	08/11/11 15:43	08/19/11 12:56	5mL/50mL	5mL/50mL	1.00
A11H168-20	Soil	EPA 1311/6020	08/11/11 15:10	08/19/11 12:56	5mL/50mL	5mL/50mL	1.00
A11H168-21	Soil	EPA 1311/6020	08/11/11 16:20	08/19/11 12:56	5mL/50mL	5mL/50mL	1.00
A11H168-22	Soil	EPA 1311/6020	08/11/11 16:25	08/19/11 12:56	5mL/50mL	5mL/50mL	1.00
Batch: 1108380							
A11H168-23	Soil	EPA 1311/6020	08/11/11 16:40	08/19/11 13:00	5mL/50mL	5mL/50mL	1.00
A11H168-24	Soil	EPA 1311/6020	08/11/11 17:22	08/19/11 13:00	5mL/50mL	5mL/50mL	1.00
A11H168-25	Soil	EPA 1311/6020	08/11/11 17:38	08/19/11 13:00	5mL/50mL	5mL/50mL	1.00

Conventional Chemistry Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1108249							

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

SAMPLE PREPARATION INFORMATION

Conventional Chemistry Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A11H168-06	Water	EPA 150.1	08/11/11 16:45	08/12/11 14:50	20mL/20mL	20mL/20mL	NA

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URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23

Notes and Definitions

Qualifiers:

A-01	Re-extraction out of hold time, with acceptable surrogate and blank spike recoveries, confirms results from original analysis. Original results are not considered to be biased, reextract results also reported for comparisson.
A-02	Reextraction to confirm NDs with passing surrogates. Both the original and the reextract are reported for comparisson.
H-02	This sample was extracted outside of the EPA recommended holding time.
J	Estimated Result . Result detected below the lowest point of the calibration curve, but above the specified MDL.
NR	Not Reported.
Q-01	Percent recovery and/or RPD is outside acceptance limits.
Q-03	Percent recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
Q-30	Recovery for Lab Control Spike (LCS) is below the lower control limit. Data may be biased low.
S-03	Duplicate extraction and analysis confirms surrogate failure due to a sample matrix effect.
S-06	Surrogate recovery is outside of established control limits.

Notes and Conventions:

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry'designation are not dry weight corrected.
RPD	Relative Percent Difference
MDL	If MDL is not listed, data has been evaluated to the Method Reporting Limit only.
WMSC	Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.
Batch QC	In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.
Blank Policy	Apex assesses blank data for potential high bias down to a level equal to ½ the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses. For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor. Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL.
---	QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.
***	Used to indicate a possible discrepency with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

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URS - Portland 111 SW Columbia STE 1500 Portland, OR 97201-5850	Project: **Index Shooting Range** Project Number: 25697649.00001 Project Manager: Mike Powell	**Reported:** 09/07/11 15:23

APEX LABS — **CHAIN OF CUSTODY**

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Lab #: A11H108 COC 1 of 3

Company: URS Corporation | Project Mgr: Mike Powell | Project Name: Index Shooting Range | Project # 25697649.00001

Address: 111 SW Columbia, Suite 1500 | Phone: 503 222 7200 | Fax: 503 224 2972 | Email: mike.powell@urscorp.com

Sampled by: J. Kim + J. Gracia

Site Location: OR WA Other: _____

	SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Metals (8)	Priority Metals (13)	As, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1200-COLS	1200-Z	pH					
1	MW-1	1	8/11/11	1100	W	2								X														
2	MW-2	2		0930	W	2								X														
3	MW-3	3		1400	W	2								X														
4	MW-4	4		1220	W	2 #24								X														
5	MW-5	5		0940	W	2								X														
6	IDW	6		1645	W	2											X											
7	SS-01-06-8	7		1820	S	1													X	X								
8	SS-04-12-18	8		1835	S	1																						
9	SS-02-3-6	9		1810	S	1													X	X								
10	SS-02-18-24	10	↓	1910	S	1																						

Normal Turn Around Time (TAT) = 7-10 Business Days — YES NO

TAT Requested (circle): 1 Day, 2 Day, 3 Day, 4 DAY, 5 DAY, Other: _____

SPECIAL INSTRUCTIONS: USE ADDITIONAL VOLUME FROM MW-4 FOR MS/MSD

NOTE PH analysis short hold time on IDW

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Date: 8/11/11	Date:	Date:	Date: 8/12/11
Time:	Time:	Time:	Time: 8:12
Printed Name:	Printed Name:	Printed Name:	Printed Name: Robert Stiff
Company:	Company:	Company:	Company: Apex

Apex Laboratories

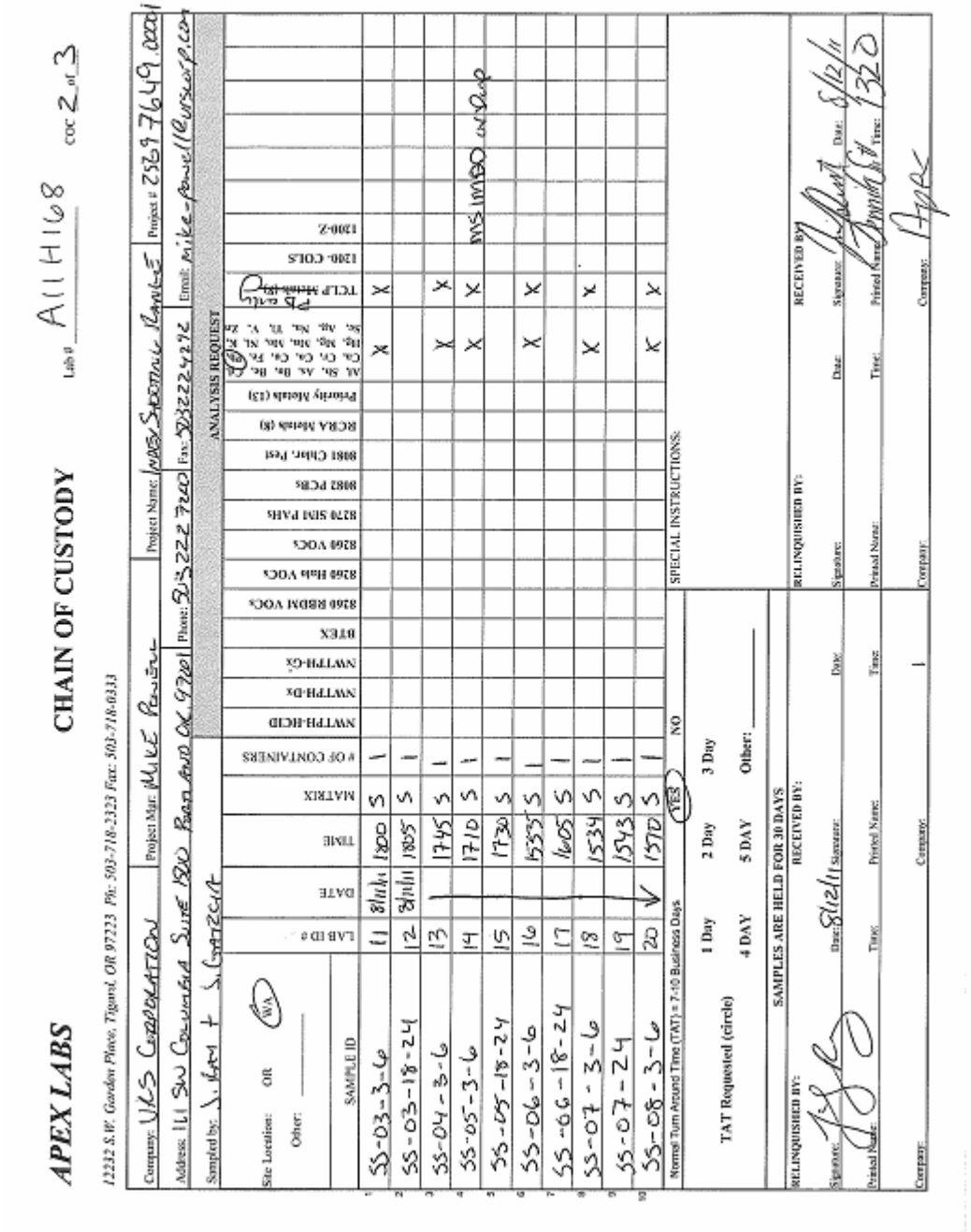
The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Darwin Thomas, Business Development Director

Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

URS - Portland 111 SW Columbia STE 1500 Portland, OR 97201-5850	Project: **Index Shooting Range** Project Number: 25697649.00001 Project Manager: Mike Powell	**Reported:** 09/07/11 15:23



APEX LABS — 12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

CHAIN OF CUSTODY — Lab # A11H168 — COC 2 of 3

Company: URS Corporation — Project Mgr: Mike Powell — Project Name: URS Shooting Range — Project # 25697649.00001

Address: 111 SW Columbia Suite 1500 Portland OR 97201 — Phone: 503 222 7200 — Fax: 503 222 4272 — Email: mike_powell@urscorp.com

Sampled by: J. Hart + J. Cartzear

Site Location: OR WA — Other: _____

ANALYSIS REQUEST

#	SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	BTEX	8260 BRDM VOCs	8260 High VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Metals (8)	Priority Metals (13)	Al, Sb, As, Ba, Be, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1200-COLS	1200-Z
1	SS-03-3-6	11	8/11/11	1800	S	1													X	X		
2	SS-03-18-24	12	8/11/11	1805	S	1																
3	SS-04-3-6	13		1745	S	1													X	X		
4	SS-05-3-6	14		1710	S	1													X	X		
5	SS-05-18-24	15		1730	S	1																
6	SS-06-3-6	16		1535	S	1													X	X		
7	SS-06-18-24	17		1605	S	1																
8	SS-07-3-6	18		1534	S	1													X	X		
9	SS-07-24	19		1543	S	1																
10	SS-08-3-6	20		1510	S	1													X	X		

Normal Turn Around Time (TAT) = 7-10 Business Days — YES — NO

SPECIAL INSTRUCTIONS:

TAT Requested (circle): 1 Day — 2 Day — 3 Day — 4 DAY — 5 DAY — Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: Signature: Date: 8/12/11 Time: Printed Name: Company:

RECEIVED BY: Signature: Date: Time: Printed Name: Company:

RELINQUISHED BY: Signature: Date: Time: Printed Name: Company:

RECEIVED BY: Signature: Date: 8/12/11 Time: 1320 Printed Name: Company: Apex

Apex Laboratories

Darwin Thomas, Business Development Director

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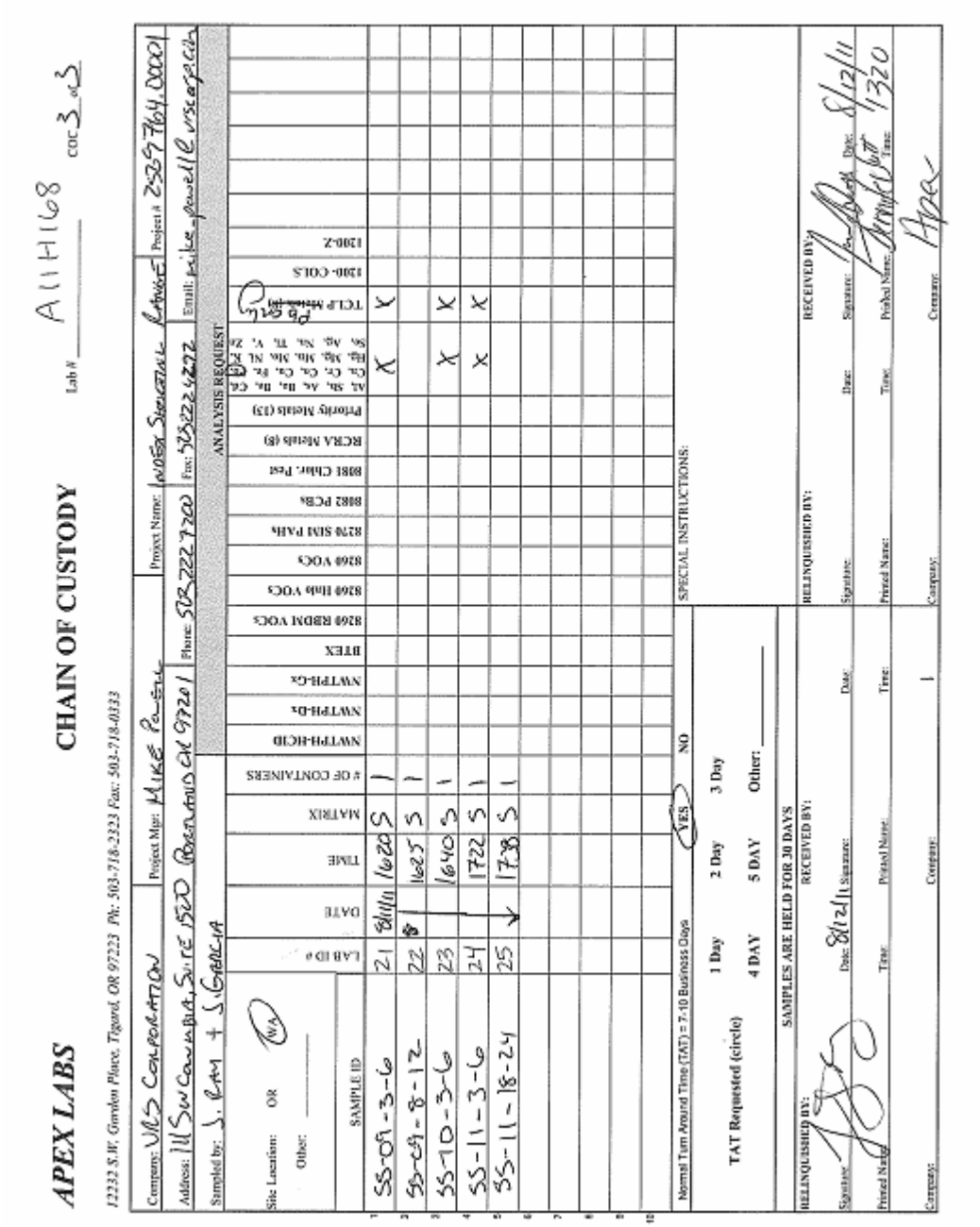
Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

URS - Portland	Project: **Index Shooting Range**	
111 SW Columbia STE 1500	Project Number: 25697649.00001	**Reported:**
Portland, OR 97201-5850	Project Manager: Mike Powell	09/07/11 15:23



APEX LABS

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

CHAIN OF CUSTODY

Lab # A11H168 COC 3 of 3

Company: URS Corporation Project Mgr: Mike Powell Project Name: Index Shooting Range Project # 25697649.00001

Address: 111 SW Columbia, Suite 1500 Portland OR 97201 Phone: 503-222-7200 Fax: 503-222-6272 Email: mike_powell@urscorp.com

Sampled by: J. Ram + S. Garcia

Site Location: OR WA

Other: _____

ANALYSIS REQUEST

	SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	BTEX	8260 RBDM VOCs	8260 Hlth VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Metals (8)	Priority Metals (13)	As, Sb, Ag, Ba, Be, Cd, Cr, Cu, Co, Pb, Ni, Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1200-COLS	1200-Z
1	SS-09-3-6	21	8/11/11	1620	S	1													X	X		
2	SS-09-8-12	22		1625	S	1																
3	SS-10-3-6	23		1640	S	1													X	X		
4	SS-11-3-6	24		1722	S	1													X	X		
5	SS-11-18-24	25		1730	S	1																
6																						
7																						
8																						
9																						
10																						

Normal Turn Around Time (TAT) = 7-10 Business Days YES NO

SPECIAL INSTRUCTIONS:

TAT Requested (circle): 1 Day 2 Day 3 Day 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature]	Date: 8/12/11 Signature:	Signature:	Date: Signature: [signature] Date: 8/12/11
Printed Name:	Time: Printed Name:	Printed Name:	Time: Printed Name: [signature] Time: 1320
Company:	Company: 1	Company:	Company: Apex

Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

URS - Portland 111 SW Columbia STE 1500 Portland, OR 97201-5850	Project: **Index Shooting Range** Project Number: 25697649.00001 Project Manager: Mike Powell	**Reported:** 09/07/11 15:23

APEX LABS COOLER RECEIPT FORM

Client: URS Element WO#: A11 H168

Project/Project #: index shooting Range / 25697649.00001

Delivery info:

Date/Time Received: 8-12-11 @ 1320 By: Jenn

Delivered by: Apex Courier X Client ___ FedEx ___ UPS ___ Senvoy ___ SDS ___ Other ___

Cooler Inspection Inspected by: Kendra 8-12 @ 1700

Chain of Custody:

Included? Yes X No ___ Signed/Dated by Client? Yes X No ___

Signed/Dated by Apex Personnel? Yes X No ___

Coolers: No. of Coolers: 2

	Cooler #1	Cooler #2	Cooler #3	Cooler #4
Temperature (deg. C)	4.9	3.8		
Received on Ice? (Y/N)		→		
Temp. Blanks? (Y/N)		→		
Ice Type: (Gel/Real/Other)		→		
Condition:	good	→		

Cooler out of temp? (Y/N) Possible reason why: ___

Samples Inspection: Inspected by: Kendra 8-12 @ 1710

All Samples Intact? Yes X No ___ Comments: ___

Bottle Labels/COCs agree? Yes ___ No ___ Comments: ___

Containers Appropriate for Analysis? Yes X No ___ Comments: ___

Do VOA Vials have Visible Headspace? Yes X No ___ NA X

Comments ___

Water Samples: pH Checked and Appropriate (except VOAs): Yes X No ___ NA ___

Comments: ___

Additional Information: ___

Labeled by: KH See Client Contact Form: Y

Apex Laboratories

Darwin Thomas, Business Development Director

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Data Review

The data quality review of the four primary groundwater samples, 17 primary soil samples, one field duplicate groundwater samples and two field duplicate soil samples collected on August 11, 2011 at the Index Shooting Range in Index, Washington has been completed. The investigative derived waste (IDW) sample was not included in this data quality review. Samples were submitted to Apex Labs (Apex) of Tigard, Oregon. The groundwater samples submitted were analyzed for polyaromatic hydrocarbons (PAHS; EPA Method 8270D SIM). The soil samples submitted were analyzed for total lead (EPA Method 6020) and toxicity characteristic leaching procedure lead (TCLP; EPA Method 1311/6020).

The review included the analytical data presented in Apex report A11H168. The data were reviewed based on *USEPA Contract Laboratory Program National Functional Guidelines (NFGs) for Organic Data Review*, June 2008, *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Inorganic Data Review*, January 2010, and laboratory quality control criteria. Items reviewed included: chain-of-custody (COC) records, hold times, surrogate recoveries, matrix spike and matrix spike duplicate (MS/MSD) results, laboratory control and laboratory control duplicate (LCS/LCSD) results, laboratory duplicate results, field duplicate results, and method blank results. Qualifiers assigned as a result of the review are discussed below. Data qualifiers assigned to sample results during the data review are presented in Table 1.

The following criteria were evaluated during the review:

- <u>COC Records</u> – Acceptable
- <u>Temperature</u> – Acceptable
- <u>Preservation</u> – Acceptable
- <u>Hold Times</u> – Acceptable with the following exceptions:

  <u>PAH by method 8270D</u> – The initial analysis of groundwater samples MW-1 through MW-5 had QC results below the laboratory criteria (see below). All groundwater samples were re-extracted outside of hold time, with acceptable surrogate and blank spike recoveries, to confirm non detect results from original analysis. The re-extract results reported by Apex have been qualified as 'Do Not Report (DNR)'.
- <u>Method Blanks</u> – Acceptable
- <u>Surrogates</u> – Acceptable with the following exceptions:

  <u>PAH by method 8270D</u> – The surrogate 2-fluorobiphenyl for MW-1 (A11H168-01 and A11H168-01RE1), MW-2 (A11H168-02), MW-3 (A11H168-03), MW-4 (A11H168-04), and MW-5 (A11H168-05) was below the laboratory control limits of 45% at 27%, 36%, 35%, 35%, 33% and 34%, respectively. All initial

PAH results were non-detect; the results were qualified as estimated and flagged 'UJ'. The re-analysis of MW-1 was previously qualified as DNR.

- Laboratory Control Samples (LCS/LCSD) – Acceptable with the following exceptions:

  PAH by method 8270D – The LCS percent recoveries for acenaphthylene (48%), dibenzofuran (52%), 1-methylnapthalene (35%), 2-methylnapthalene (34%), and naphthalene (33%) reported in batch 1108349 were below the laboratory control limits of 50%, 55%, 45%, 45%, and 40%, respectively. All PAH results were previously qualified as estimated and flagged 'UJ' due to surrogate failure. No further qualification is necessary.

- Matrix Spike/Matrix Spike Duplicate (MS/MSD) – Acceptable with the following exceptions:

  PAH by method 8270D – The MS/MSD percent recoveries for acenaphthylene (48/47%), dibenzofuran (49/49%), 1-methylnapthalene (42/40%), 2-methylnapthalene (41/40%), and naphthalene (40/38%) were below the laboratory control limits of 50%, 55%, 45%, 45%, and 40%, respectively. All PAH results were previously qualified as estimated and flagged 'UJ' due to surrogate failure. No further qualification is necessary.

- Field Duplicate – Sample SS-11-3-6 (A11H168-24) and SS-11-18-24 (A11H168-25) was submitted as a field duplicate of samples SS-05-3-6 (A11H168-14) and SS-05-18-24 (A11H168-15), respectively. Sample MW-5 (A11H168-05) was submitted as a field duplicate of sample MW-2 (A11H168-02). Relative percent difference (RPD) calculations were performed on the field duplicate sample pair results when the sample results were greater than five times the method reporting limit. All RPDs for duplicate pairs were within the historical control limit of 50% with the following exceptions:

  TCLP by method 1311/6020 – The RPD for the SS-11-18-24/SS-05-18-24 pair exceeded the control limit of 50% at 112%. The associated sample results were qualified as estimated and flagged 'J'.

- Reporting Limits – Acceptable.

- Laboratory Notes and Qualifiers –

  - As noted above, Apex commented that PAH results for groundwater samples MW-1 through MW-5 were reported with surrogate, LCS and MS/MSD recoveries below the laboratory control limits. The groundwater samples were re-extracted outside of hold time with passing batch QC to verify original results. Both the original and the re-extract samples were reported by Apex for comparison. The original samples are included in Table 2 of the report. The re-extract samples are considered DNR as

discussed previously.

Overall Assessment of Data

The completeness of the analytical reports for this groundwater monitoring event is 100%. The usefulness of the data is based on the USEPA guidance documents referenced in the introduction of this report. Upon consideration of the information presented above, the data are considered usable. The data qualifiers assigned by the laboratory are shown on the laboratory reports.

Data Qualifier Definitions

U The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.

DNR Do Not Report. Another result is available that is more reliable.

References

USEPA 2008a. U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Organic Data Review. June 2008.

USEPA 2004. U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review. January 2010.

Table 1. Sample Qualification Summary

Client Sample ID	Laboratory Sample ID	Analyte	Qualifier	Rationale
MW-1	A11H168-01RE1	PAHs	DNR	Hold time
	A11H168-01		UJ	Surrogate recovery
MW-2	A11H168-02RE1	PAHs	DNR	Hold time
	A11H168-02		UJ	Surrogate recovery
MW-3	A11H168-03RE1	PAHs	DNR	Hold time
	A11H168-03		UJ	Surrogate recovery
MW-4	A11H168-04RE1	PAHs	DNR	Hold time
	A11H168-04		UJ	Surrogate recovery
MW-5	A11H168-05RE1	PAHs	DNR	Hold time
	A11H168-05		UJ	Surrogate recovery
SS-05-18-24	A11H168-14	TCLP	J	Field duplicate
SS-11-18-24	A11H168-25	TCLP	J	Field duplicate

APPENDIX B

Applicable or Relevant and Appropriate Requirements

Chemical-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL			
Safe Drinking Water Act (SDWA)	40 USC § 300		
National Toxics Rule	40 CFR Part 131	Establishes water quality standards for protection of human health and aquatic organisms for states that fail to fully comply with Clean Water Act (CWA) Section 303(c)(2)(C).	Potentially Applicable—the State of Washington has been delegated this program.Surface water resources on or near
National Primary Drinking Water Regulations	40 CFR Part 141	Establishes health-based standards, maximum contaminant levels (MCL) and maximum contaminant level goals (MCLG), for public water systems.	Not Applicable or Relevant and Appropriate. No drinking water wells on or near the Site.
Clean Water Act (CWA)	33 USC §§ 1314		
National Recommended Water Quality Criteria (NWQC)	33 USC § 1251 et seq., Section 3 04(a), 40 CFR Part 131	Establishes non-enforceable criteria for water quality based on toxicity to aquatic organisms and human health.	Potentially Applicable—the State of Washington has been delegated this program. Recommended but not enforceable criteria. Surface water resources on or near the Site.
Clean Air Act (CAA)	40 USC § 7409		
National Primary and Secondary Ambient Air Quality Standards (NAAQS)	42 USC §§ 7401 et seq.	Establishes air quality levels that protect public health.	Not Applicable—only “major” sources are subject to requirements related to NAAQS, defer to state regulation of fugitive dust emissions.
Resource Conservation and Recovery Act (RCRA)	40 USC § 6901 6992k		
Hazardous Wastes	40 CFR Part 261, Subpart D and C	Defines those solids wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265 and Parts 124, 270, and 271.	Potentially Applicable or Relevant and Appropriate. See action-specific ARARs for further discussion.
STATE OF WASHINGTON			
Hazardous Waste Removal Reduction Act	RCW Chapter 70.95C	Establishes state policies and goals that encourage the reduction of hazardous substance use and the generation of hazardous waste. Requires certain hazardous waste generators and hazardous substance users to prepare plans for voluntarily reducing hazardous substance use and hazardous waste generation.	Potentially Relevant and Appropriate
Persistent Bioaccumulative Toxins Rule	WAC Chapter 173-333	Establishes criteria to identify persistent bioaccumulative toxins and metals of concern that pose human health or environmental threats, defines chemical action plans preparation, and defines the processes ecology will use to coordinate the implementation of this chapter with the department of health and other agencies.	Potentially Relevant and Appropriate

Chemical-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
Surface Water Beneficial Uses	WAC Chapter 173-201A-200 and -600	Requires that surface water bodies be protected for their designated beneficial uses.	Not Applicable or Relevant and Appropriate. No surface water resources on or near the Site.
Dangerous Waste Regulations	WAC Chapter 173-303	(1) Designates solid wastes that are dangerous or extremely hazardous to the public health and environment; (2) provides for surveillance and monitoring of dangerous and extremely hazardous wastes; (3) establishes a system for manifesting, tracking, reporting, monitoring, recordkeeping, sampling, and labeling dangerous and extremely hazardous wastes; (4) establishes siting, design, operation, closure, postclosure, financial, and monitoring requirements for dangerous and extremely hazardous waste transfer, treatment, storage, and disposal facilities; (5) establishes design, operation, and monitoring requirements for managing the state's extremely hazardous waste disposal facility; (6) establishes a program for permitting dangerous and extremely hazardous waste management facilities; and (7) encourages recycling, reuse, reclamation, and recovery to the maximum extent possible.	Potentially Relevant and Appropriate
Drinking Water Standards	Revised Code of Washington (RCW) 70.1 19A, WAC Chapter 246-290	Established health-based MCLs for public water supplies.	Not Applicable or Relevant and Appropriate. No drinking water wells on or near the Site.
Water Quality Standards for Surface Water	RCW 90.48, WAC Chapter 173-201A	Establishes aquatic life criteria for hazardous substances in freshwater.	Not Applicable or Relevant and Appropriate. No surface water resources on or near the Site.
Model Toxics Control Act (MTCA)	RCW 70.1 05D, WAC Chapter 173-340	Specifies that surface water cleanup standards be based on estimates of the highest beneficial use and the reasonable maximum potential exposure under current and future site uses. Establishes administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances have come to be located. It defines the role of the department and encourages public involvement in decision making.	Potentially Relevant and Appropriate
	WAC Chapter 173-340-7490	Specifies procedures for a Terrestrial Ecological Evaluation (TEE) to determine if the existence of hazardous substances at a site could harm terrestrial plants or animals, and to establish cleanup levels to protect biota.	Potentially Relevant and Appropriate
Natural Background Soil Metals Concentrations	WDOE Publication 94-115, October 1994	Defines region–specific natural background concentrations for metals in surficial soils throughout the state.	To Be Considered

Chemical-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
Sediment Management Standards	WAC 173-204	Establishes freshwater surface sediment management standards.	Not Relevant and Appropriate. Sediment management beyond the scope of Removal Action.
Economic Impact Statement For Proposed Sediment Management Standards	WAC 173-204	The WDOE is proposing a management process for implementing sediment quality standards pursuant to requirements of the Model Toxics Control Act, the Water Pollution Control Act, and the Puget Sound Water Quality Authority Act.	Not Relevant and Appropriate. Sediment management beyond the scope of Removal Action.

Location-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL			
RCRA	40 USC § 7601		
Hazardous and Solid Waste Regulations	40 CFR Part 264.18	Location standards and restrictions for hazardous waste treatment, storage, and disposal (TSD) facilities.	Potentially Relevant and Appropriate
	40 CFR §§ 257.3-1 through 257.3-4	Location standards and restrictions for municipal solid waste (MSW) facilities.	Potentially Relevant and Appropriate
Fish and Wildlife Coordination Act	16 USC §§ 661-667	Requires consultation with the USFWS when federal department or agency proposes or authorizes any modification of any stream or other water body to assure adequate protection of fish and wildlife resources.	Potentially Applicable
Fish and Wildlife Conservation Act	16 USC §§ 2901-2911	Promotes conservation of non-game fish and wildlife through assistance to states and use of federal authority.	Potentially Applicable
Protection of Wetlands Executive Order No. 11990	40 CFR Part 6; Appendix A, 40 CFR 6.302(a)	Established to avoid adverse impacts associated with the destruction or loss of wetlands and avoid support of new construction in wetlands if a practicable alternative exists.	Applicable. Wetland resources on Site.
Floodplain Management Executive Order No. 11988	40 CFR Part 6, Appendix A, 40 CFR 6.302(b)	Requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid the adverse impacts associated with direct and indirect development of a floodplain to the extent possible.	Applicable. Floodplain on or near the Site.
Dredge and Fill Regulations	33 USC § 1344, 33 CFR 323.1 et seq.	Prohibits discharge of dredged or fill material into waters of the United States without a permit.	Potnetially Applicable.
Bald Eagle Protection Act	16 USC §§ 668 et seq.	Requires continued consultation with the USFWS during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald or golden eagle.	Potentially Applicable
Endangered Species Act (ESA)	16 USC § § 1531-1544	Outlines procedures for federal agencies to follow if actions may jeopardize listed species. Activities may not jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify a critical habitat.	Potentially Applicable
National Forest Management Act (NFMA), Mt. Baker-Snoqualmie National Forest Land and Resource Management Plan (LRMP, 1988), as amended by the	16 USC § § 1600-1614	NFMA requires land management based on multiple-use, sustained-use yields. The LRMP and NWFP establish guidelines and standards for design, construction, and use of various actions on USFS land.	Applicable or Relevant and Appropriate

Location-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
National Historic Preservation Act (NHPA)	16 USC § 470; 36 CFR Part 800; 40 CFR 6.301(b)	Requires federal agencies to take into account the effect of any federally assisted undertaking or licensing on any property with historic, architectural, archeological, or cultural value that is included in or eligible for inclusion in the National Register of Historic Places.	To Be Considered. Previous surveys have not identified such sites.
Archaeological Resources Protection Act	16 USC § 470	Specifies actions that must be taken to preserve archaeological resources.	Potentially Applicable
Archeological and Historic Preservation Act (AHPA)	16 USC § 469; 40 CFR 6.301(c)	Establishes procedures to provide for preservation of significant scientific, prehistoric, historic, and archeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	To Be Considered. Previous surveys have not identified such sites.
Historic Site, Buildings, Objects, and Antiquities Act	16 USC § 461-467	Requires preservation of historic sites, buildings, and objects of national significance.	To Be Considered. Previous surveys have not identified such sites.
Native American Graves Protection and Reparation Act	25 USC § 3001 et seq.	Establishes protective requirements to be followed when graves or Native American burial sites are encountered.	To Be Considered. Previous consultation with local Tribes have not identified such sites.
The American Indian Religious Freedom Act (AIRFA)	42 USC § 1996	Requires federal agencies to protect the right of Indian tribes to practice their traditional religions.	To Be Considered. Previous consultation with local Tribes have not identified such sites.
Wilderness Act	16 USC § § 1131-1136	Established the National Wilderness Preservation System, which concerns leaving lands unimpaired for future use as a wilderness.	Not Applicable. Site not within wilderness. No wilderness near the Site.

Action-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
FEDERAL			
Clean Water Act	33 USC § 1342		
National Pollutant Discharge Elimination System	40 CFR Part 122.26	In general, Part 122 provides permit requirements for the discharge of pollutants from any point source into waters of the United States. Part 122.26 requires permits for storm-water discharges.	Potentially Applicable. No direct discharge pathways to nearby surface waters have been identified at the site to date.
CWA – Water Pollution Control Act (WPCA), Water Quality Certification	33 USC § 1341, Section 401	Requires certification from the state (WDOE) that discharges into navigable waters comply with applicable water quality standards.	Potentially Applicable. No direct discharge pathways to nearby surface waters have been identified at the site to date.
CWA/WPCA – National Pollution Discharge Elimination System (NPDES)	33 USC § 1342, Section 402	Establishes requirements for point source discharges and stormwater runoff.	Potentially Applicable. No direct discharge pathways to nearby surface waters have been identified at the site to date.
CWA/WPCA – Discharge of Dredge and Fill Materials	33 USC § 1344, Section 404	Regulates the discharge of dredge and fill into waters of the United States, including wetlands.	Potnentially Applicable. Removal Action scope includes potential disturbance of wetland areas.
Clean Air Act	42 USC § 7401 et seq., 40 CFR Part 50	Establishes limits for air emissions.	Potentially Applicable.
Land Disposal Restrictions (LDRs)	40 CFR Part 268	LDRs place specific restrictions (conc. or trmt) on RCRA hazardous wastes prior to their placement in a land disposal unit. Relevant and appropriate LDR requirements will be met if any material accumulations are treated ex situ.	Potentially Applicable.
RCRA Subtitle C – Hazardous Waste Management	42 USC § 6901, 40 CFR Parts 260 to 279	Specifies hazardous waste identification, management, and disposal requirements.	Potentially Applicable, if hazardous waste is disposed of.
Subtitle D – Managing Municipal and Solid Waste	42 USC § 6901, 40 CFR Parts 257 and 258	Establishes guidelines for the management of non-hazardous solid waste.	Applicable, non-hazardous waste is part of Removal Action scope.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal (TSD) Facilities	40 CFR Part 264.13.14	Requirements for proper handling, treatment, storage, and disposal of hazardous wastes.	Potentially Applicable. Hazardous waste disposal may be required.
Disposal of Solid Waste	42 U.S.C. § 6901 et seq; 40 CFR 257	Facility or practices in floodplains will not restrict flow of basic flood, reduce the temporary water storage capacity of the floodplain or otherwise result in a wash out of solid waste.	Applicable. Alternatives include solid waste disposal.

Action-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
Closure Requirements	RCRA/HWMA 40 CFR & 264, Subpart G	Closure of hazardous waste repositories must meet protective standards. Regulations to minimize contaminant migration, provide leachate collection and prevent contaminant exposure will be met.	Potentially Applicable.
Landfill Design and Construction	RCRA/HWMA 40 CFR & 264, Subpart N	Hazardous waste landfills must meet minimum design standards. Protectiveness will be achieved through institutional controls.	Potentially Applicable.
Groundwater Monitoring	RCRA/HWMA 40 CFR & 264, Subpart F 40 CFR & 264, Subpart X	Establishes standards for detection and compliance monitoring. Site wide monitoring will accommodate specific groundwater monitoring requirements.	Not Applicable or Relevant and Appropriate. Monitoring goundwater is not part of the Removal Action scope.
Occupational Exposure to Asbestos	29 CFR Parts 1910 and 1926.	Establishes OSHA requirements for asbestos-related work in the construction and demolition industry. Requirements on exposure limits, work practices and engineering controls to provide worker safety in handling, removal, disposal, or other workplace exposure to asbestos.	Not applicable. Exposure to asbestos is unlikely during the Removal Action.
Superfund Remedial Design and Remedial Action Guidance	EPA OSWER Directive 9355.0-4A, June 1986	Provides guidance for site remediation and the design of remedial action components.	To Be Considered.
Hazardous Materials Transportation Act	49 USC § § 1801-1813 49 CFR Parts 10, 171-177	Regulates transportation of hazardous materials.	Potentially Applicable.
Surface Mining Control and Reclamation Act	30 USC §§ 1201-1328	Performance standards for surface mining activities.	Not Applicable.
Indian Sacred Sites	Executive Order 13007	Requires federal agencies to avoid physical damage to Indian sacred sites and to avoid interfering with access to such sites.	To Be Considered. Previous consultation with local Tribes have not identified such sites.
Protection and Enhancement of the Cultural Environment	Executive Order 11593	Directs federal agencies to nominate historic properties to the NRHP and treat properties that are eligible for the NRHP as though they were listed.	To Be Considered. Previous site evaluations have not identified historic property.
Invasive Species	Executive Order 13112	Requires federal agencies to prevent the introduction of invasive species.	To Be Considered.
Migratory Bird Treaty Act (MBTA)	16 USC § § 703 et seq.	Establishes federal responsibility for the protection of the international migratory bird resource and requires continued consultation with the USFWS during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds.	Potentially Relevant and Appropriate.

Action-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
Responsibilities of Federal Agencies to Protect Migratory Birds	Executive Order 13186	Requires federal agencies to avoid or minimize adverse impacts to migratory bird resources to the extent practical.	To Be Considered.
STATE OF WASHINGTON			
MTCA	RCW 70.1 05D, WAC Chapter 173-340	Establishes procedures and standards for investigating and cleaning up sites with hazardous substances present.	Potentially Applicable.
Sediment Management Standards	WAC 173-204	Establishes freshwater surface sediment management standards.	Not Relevant and Appropriate. Management of sediment is not part of the Removal Action scope.
Regulation and Licensing of Well Contractors and Operators	RCW 18.104, WAC Chapter 173-162	Establishes procedures for well contractors and operators.	Applicable. Removal Action scope includes monitoring well decommssioning.
Minimum Standards for Construction and Maintenance of Water Wells	RCW 18.104, WAC Chapter 173-160	Sets minimum standards for the construction of water and monitoring wells, and well decommissioning.	Applicable. Removal Action scope includes monitoring well decommssioning.
Hazardous Waste Management Act and Dangerous Waste Regulations	RCW 70.105, WAC Chapter 173-303	Establishes regulations for the handling and deposition of dangerous waste, including identification, accumulation, storage, transport, treatment, and disposal.	Potentially Applicable.
Solids Waste Handling Standards	RCW 70.95, WAC Chapter 173-350	Establishes standards for the proper handling and disposal of solid waste, and requirements for the design, construction, operation, and closure of solid waste handling facilities.	Potentially Applicable or Relevant and Appropriate
Hydraulic Code	RCW 77.55, WAC Chapter 220-110	Requires a Hydraulics Project Approval permit for construction activities that use, divert, obstruct, or change the bed or flow of state waters.	Not Relevant and Appropriate. Removal Action scope would not alter flow of state waters.
Shoreline Management Act (SMA)	RCW 90.58	Established to prevent harm to the state's shorelines, including streams with a mean annual flow greater than 20 cubic feet per second.	Not Relevant and Appropriate. Activities affecting the state's shorelines is not part of the Removal Action scope.
Fugitive Dust Emissions	40 CFR Section 50.6	Establishes standards for PM-10	Potentially Applicable.
Water Quality Standards for Surface Waters – Mixing Zones	RCW 90.48, WAC Chapter 173-201A-400	Establishes mixing zone effluent limits for discharges to surface water.	Potentially Applicable. However, no discharge pathway to nearby surface waters have been identified at the site to date.
Water Quality Standards for Surface Waters – Short-term Modifications	RCW 90.48, WAC Chapter 173-201A-410	Allows for short-term modification to water quality criteria for specific water bodies when necessary.	Potentially Applicable or Relevant and Appropriate. However, no discharge pathway to nearby surface waters have been identified at the site to date.

Action-Specific
Applicable or Relevant and Appropriate Requirements
Index Shooting Range, Washington

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/Relevant and Appropriate?
Submission of Plans and Reports for Construction of Wastewater Treatment Facilities	RCW 90.48, WAC Chapter 173-240	Requires submission of wastewater treatment systems designs to the WDOE for review and approval.	Not Relevant and Appropriate. Wastewater treatment is not part of the Removal Action scope.
Aquatic Lands Management	RCW 79.90, WAC Chapter 332-30	Establishes criteria for the management of state-owned aquatic lands to promote uses and protect resources.	Not Relevant and Appropriate. Activities affecting state aquatic lands are not part of the Removal Action scope.
Water Code and Regulation of Public Groundwater – Surface Water and Groundwater Withdrawal	RCW 90-90.03 and 90.44	Specify criteria and procedures for appropriating surface water and groundwater for beneficial uses.	Not Relevant and Appropriate. Surface water and groundwater withdrawals are not part of the Removal Action scope.
Maximum Environmental Noise Levels	RCW-70. 107, WAC Chapter 173-60	Establishes maximum permissible noise levels.	Potentially Applicable
Washington Clean Air Act and Implementing Regulations	WAC Chapter 173-400-040(8)	Requires reasonable precautions be taken to prevent the generation of fugitive dust.	Potentially Applicable
General Regulations for Air Pollution Sources	RCW 70.94, WAC Chapter 173-400	Regulates air pollution from contaminant sources, and establishes rules for the control and prevention of air contaminant emissions.	Potentially Applicable

APPENDIX C
Removal Action Construction Cost Estimate

US Forest Service
Index Shooting Range
Removal Action Construction Cost Estimate

Item	Description	Unit	Unit Rate	Quantity	Cost	Assumptions
Alternative 2 - Excavation with On-site Treatment						
1	Wetland Delineation	LS	$ 15,000.00	1	$ 15,000	Perform wetland survey and delineation within work area
				Subtotal =	**$ 15,000**	
2	Feasibility Study	LS	$ 25,000.00	1	$ 25,000	Testing to include further soil characterization (grain size, clay content, and cation exchange capacity) to evaluate feasibility of technology for site conditions
3	Erosion & Sediment Control	LF	$ 2.32	885	$ 2,053	Silt fence excavation area perimeter, excluding north end as shown on drawings
4	Minor Site Access Improvements	LF	$ 16.08	1,000	$ 16,080	Temporary haul road in clearing, assume 8" gravel depth with woven geotextile fabric
5	Decontamination Station (supply, maintain, dispose)	LS	$ 2,500.00	1	$ 2,500	
6	Clearing and Grubbing	AC	$ 20,750.00	2.46	$ 51,045	Cut & chip heavy trees to 24" diameter, grub stumps and remove
7	Soil Washing Treatment Area Preparation	SY	$ 13.70	1,210	$ 16,577	Prepare pad for soil washing equipment, assumed 1/4 acre
8	Monitoring Well Decommissioning	LF	$ 39.50	36	$ 1,422	Decommission two 18' wells
9	Soil Excavation and load into soil wash	BCY	$ 27.15	4,763	$ 129,310	Includes 20% overexcavation, assumes 300 HP Dozer 150' trip
10	On-site treatment via soil washing	TON	$ 200.00	7,524	$ 1,504,800	Includes wet screening of material, removal of lead shot. Includes 20% overexcavation.
11	Soil Disposal	TON	$ 90.00	1,505	$ 135,432	Assumes non-haz transporation and disposal for 20% of treated soil
12	Compost	CY	$ 77.51	1,036	$ 80,301	Cost from previous Beth Lake and Kelly Camp projects, place on entire excavation footprint delivered & placed to 6" thick, nominal compaction
13	Seed	SF	$ 0.06	107,158	$ 6,269	Entire excavation footprint apply USFS seed mix using push spreader
14	O&M (with monitoring)	LS	$ 11,500.00	1	$ 11,500	2-10 hr visits/year for 5 years, including herbicide, minor weed removal, disposal on site, and small quantity reseeding by hand. Cost from previous Beth Lake and Kelly Camp projects
				Subtotal =	**$ 1,982,289**	
	Mobilization/Demobilization			10%	$ 198,229	Site location, limited lodging, eating and equipment rental options
	Contingency			20%	$ 436,104	
15	Work Plan, CQAP, HASP	LS	$ 25,000.00	1	$ 25,000	Develop soil wash work plan, quality plan and health and safety plan for construction
16	Removal Action Oversight	LS	$ 160,000.00	1	$ 160,000	Assumes oversight based on 2-4 ton/hr throughput on soil washing (1600 hrs)
17	Removal Action Report	LS	$ 10,000.00	1	$ 10,000	Report will document and summarize removal action activities
				Subtotal =	**$ 195,000**	
				Total, Alternative 2 =	**$ 2,826,622**	

US Forest Service
Index Shooting Range
Removal Action Construction Cost Estimate

Item	Description	Unit	Unit Rate	Quantity	Cost	Assumptions
Alternative 3 - Excavation and Offsite Disposal						
1	Wetland Delineation	LS	$ 15,000.00	1	$ 15,000	Perform wetland survey and delineation within work area
				Subtotal =	**$ 15,000**	
2	Erosion & Sediment Control	LF	$ 2.32	885	$ 2,053	Silt fence excavation area perimeter, excluding north end as shown on drawings
3	Minor Site Access Improvements	LF	$ 16.08	1,000	$ 16,080	Temporary haul road in clearing, assume 8" gravel depth with woven geotextile fabric
4	Decontamination Station (supply, maintain, dispose)	LS	$ 2,500.00	1	$ 2,500	
5	Clearing and Grubbing	AC	$ 20,750.00	2.46	$ 51,045	Cut & chip heavy trees to 24" diameter, grub stumps and remove
6	Monitoring Well Decommissioning	LF	$ 39.50	36	$ 1,422	Decommission two 18' wells
7	On-site soil stabilization	TON	$ 8.50	2,090	$ 17,765	Assuming an application rate of 2%wt/wt. dosage, including freight to site
8	Soil Tilling	MSF	$ 2.84	35.72	$ 101	Application and tilling with disc harrow attachment
9	Soil Excavation and load	BCY	$ 27.15	4,763	$ 129,310	Includes 20% overexcavation, assumes 300 HP Dozer 150' trip with trucks loaded using 2 CY front end loader
10	Soil Disposal	TON	$ 90.00	7,524	$ 677,160	Includes 20% overexcavation, assumes non-haz transporation and disposal
11	Backfill	CY	$ 50.00	2,580	$ 129,000	delivered & placed to 6" thick, nominal compaction
12	Compost	CY	$ 77.51	2,580	$ 199,978	Cost from previous Beth Lake and Kelly Camp projects, place on entire excavation footprint delivered & placed to 6" thick, nominal compaction
13	Seed	SF	$ 0.06	107,158	$ 6,269	Entire excavation footprint apply USFS seed mix using push spreader
14	O&M (with monitoring)	LS	$ 11,500.00	1	$ 11,500	2-10 hr visits/year for 5 years, including herbicide, minor weed removal, disposal on site, and small quantity reseeding by hand. Cost from previous Beth Lake and Kelly Camp projects
				Subtotal =	**$ 1,244,184**	
	Mobilization/Demobilization			10%	$ 124,418	Site location, less onsite equipment, limited lodging, eating and equipment rental options
	Contingency			20%	$ 273,720	
15	Work Plan, CQAP, HASP	LS	$ 25,000.00	1	$ 15,000	Develop soil wash work plan, quality plan and health and safety plan for construction
16	Removal Action Oversight	LS	$ 18,000.00	1	$ 18,000	Assumes oversight approximately 230 hours
17	Removal Action Report	LS	$ 10,000.00	1	$ 10,000	Report will document and summarize removal action activities
				Subtotal =	**$ 43,000**	
				Total, Alternative 3 =	**$ 1,700,322**	

US Forest Service
Index Shooting Range
Removal Action Construction Cost Estimate

Item	Description	Unit	Unit Rate	Quantity	Cost	Assumptions
				Alternative 4 - On-site Capping		
1	Wetland Delineation	LS	$ 15,000.00	1	$ 15,000	Perform wetland survey and delineation within work area
				Subtotal =	**$ 15,000**	
2	Erosion & Sediment Control	LF	$ 2.32	885	$ 2,053	Silt fence excavation area perimeter, excluding north end as shown on drawings
3	Minor Site Access Improvements	LF	$ 16.08	1,000	$ 16,080	Temporary haul road in clearing, assume 8" gravel depth with woven geotextile fabric
4	Decontamination Station (supply, maintain, dispose)	LS	$ 2,500.00	1	$ 2,500	
5	Mowing	AC	$ 865.00	2.46	$ 2,128	Brush mowing by tractor with rotary mower (no removal), heavy density
6	Backfill	LCY	$ 46.00	7,740	$ 356,040	Delivered & placed to 18" thick, nominal compaction
7	Compost	CY	$ 77.51	2,580	$ 199,978	Cost from previous Beth Lake and Kelly Camp projects, place on entire excavation footprint delivered & placed to 6" thick, nominal compaction
8	Seed	SF	$ 0.06	107,158	$ 6,269	Entire excavation footprint apply USFS seed mix using push spreader
9	O&M (with monitoring)	LS	$ 11,500.00	1	$ 11,500	2-10 hr visits/year for 5 years, including herbicide, minor weed removal, disposal on site, and small quantity reseeding by hand. Cost from previous Beth Lake and Kelly Camp projects
				Subtotal =	**$ 596,548**	
	Mobilization/Demobilization			10%	$ 59,655	Site location, less onsite equipment, limited lodging, eating and equipment rental options
	Contingency			20%	$ 131,241	
10	Work Plan, CQAP, HASP	LS	$ 15,000.00	1	$ 15,000	Develop soil wash work plan, quality plan and health and safety plan for construction
11	Removal Action Oversight	LS	$ 15,000.00	1	$ 15,000	Assumes oversight of approximately 185 hours
12	Removal Action Report	LS	$ 10,000.00	1	$ 10,000	Report will document and summarize removal action activities
				Subtotal =	**$ 40,000**	
				Total, Alternative 4 =	**$ 842,443**	

	General Assumptions
1	Contractor to comply with all substantive permit requirements, however no permitting costs are anticipated or included.
2	Unit rate for compost assumed from average cost for Kelly Camp project.
3	Mobilization/demobilization percentage to account for remote site location.
4	Assumed no assoicated oversight/reporting necessary for Alternative 1
5	Assumed no monitoring well decommissioning for Alternative 4.
6	No price escalation included.