City of Wenatchee

January 4, 2021

Phase 2 Interim Remedial Action Preliminary Design Report

Saddle Rock Park
Wenatchee, Washington

for
City of Wenatchee

January 4, 2021

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

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Preliminary Design Report

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Wenatchee, Washington

File No. 4296-008-02

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Prepared for:

City of Wenatchee
1350 McKittrick Street
Wenatchee, Washington 98807

Attention: Charlotte Mitchell

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Nick E. Rohrbach
Senior Environmental Scientist

Jedidiah R. Sugalski, PE
Environmental Engineer

Dustin G. Wasley, PE
Principal

NER:JRS:DGW:tjh

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1.0 INTRODUCTION

The City of Wenatchee (City) has retained GeoEngineers, Inc. (GeoEngineers) to develop the Phase 2 design for an Interim Remedial Action (IRA) at the Saddle Rock Park (Site) located in Wenatchee, Washington (Drawing 1 and Vicinity Map, Figure 1). Phase 1 IRA design and construction oversight was conducted by GeoEngineers under a previous 2019 City contract (GeoEngineers 2019a). The Site was documented to have several mining claims, where waste rock was generated during previous mining explorations. Since 2011, the Washington State Department of Ecology (Ecology) and others have performed multiple investigations and developed a Remedial Investigation (RI) and Feasibility Study (FS) for the site.

The work proposed in this Phase 2 Preliminary IRA Design Report (Report) utilizes the information from previous investigations, reports and the Phase 1 IRA work to develop plans and specifications to remove waste rock pile SR05 (Drawing 3). Arsenic concentrations at SR05 are greater than the Site-specific background concentration of 95 milligrams per kilogram (mg/kg). In order the access SR05, an existing trail (a former dirt road, referenced as the primary haul road) will be utilized and improved. It is expected that traditional design and construction means and methods will be employed for this Phase 2 work.

The Phase 1 IRA generally consisted of removal of the lower four waste rock piles (SR01, SR02, SR03 and SR08). The remaining upper waste rock piles (SR04, SR05 and SR06) were reserved for a second phase because the bulk of waste rock material with arsenic concentrations greater than background were located at SR01, SR02, SR03 and SR08. In addition, these four piles were located nearer to the Site entrance where potential public exposure was the greatest. A detailed evaluation of the remaining waste rock piles and access was conducted after the Phase 1 IRA to determine appropriate next steps and to estimate project funding needed to conduct the remaining second phase.

Further data review of the previously identified waste rock pile SR06, indicated that non-native materials in this location were a result of excavation into the hillside to accommodate road construction (the current primary haul road). As a result, this location was no longer under consideration for remedial action at the Site (GeoEngineers 2019b). A statistical review (by GeoEngineers and Ecology) of the arsenic concentrations at SR04 indicated arsenic concentrations were not greater than the Site-specific background concentration. Therefore, Ecology concluded that cleanup of SR04 was not required (Ecology 2020). In addition, SR04 is located in a remote area and is heavily vegetated so exposure risk is less than at the other waste rock piles.

As part of the Phase 2 IRA, additional data collection was conducted to identify bare soil areas within the park with naturally occurring arsenic concentrations exceeding the Site-specific background concentration. The additional data collection was focused where human receptors are likely to encounter the high arsenic concentrations during recreational activities (along hiking trails). Activities related to identifying the high arsenic concentrations in Site bare soil and proposed measures to mitigate exposure to the high arsenic concentrations within the park area are described in Technical Memorandum (TM), "Arsenic Concentrations in Bare Soil Delineation, Saddle Rock Park" and the report "Mitigation Measures Assessment, Saddle Rock Park," provided in Appendices A and B respectively.

2.0 SITE DESCRIPTION AND BACKGROUND

The Saddle Rock Regional Park is a local landmark in the Wenatchee Valley and has been a popular destination for hikers, bicyclists and horseback riders for decades. In 2011, the City completed the purchase of the property with the assistance and support of the Chelan-Douglas Land Trust (CDLT), Washington State Recreation Conservation Office and local citizens. The City dedicated the property as the Saddle Rock Regional Park on July 16, 2011.

The 325-acre property was previously owned by the Washington Department of Natural Resources (DNR) for over 100 years. Based on DNR records, it received small mining lease payments from 1891 to 1989. In connection with due diligence by others, a Phase I Environmental Assessment (ESA) indicated possible mining waste rock sites created during DNR ownership and total arsenic concentrations exceeding Model Toxics Control Act (MTCA) standards. Decades of public use has also led to severe erosion problems, and habitat deterioration.

Ecology conducted an initial investigation of the Site in the Spring of 2011. Waste rock samples from six sites along with soil samples from surrounding areas were collected to compare the concentration of metals in waste rock to background concentrations. Analysis identified elevated total arsenic concentrations in the indigenous materials and two additional areas were identified for further testing. Laboratory analysis of the materials confirmed total arsenic concentrations exceeding the MTCA standards.

In 2012, the City received an integrated planning grant from Ecology through which a RI, cultural resources and FS reports were prepared. The RI and FS reports identified and estimated 6,045 cubic yards of waste rock that were impacted above MTCA standards. The constituents of concern included arsenic, mercury, selenium, silver and barium. Total arsenic was detected above the screening level of 14.4 milligrams per kilogram (mg/kg) in all waste rock samples, whereas the other constituents of concern were not always present at concentrations above their respective screening criteria.

Four waste rock areas (SR-01, SR-02, SR-03 and SR-08) were assessed and removed during Phase 1 of the IRA. Phase 1 IRA construction activities began in September 2019 and concluded in November 2019. Construction activities included excavating waste rock with arsenic concentrations greater than the Site-specific cleanup level of 95 mg/kg from the waste rock pile areas. In addition, soil samples were collected and analyzed for barium, iron, lead, manganese, mercury, selenium and silver to confirm that these other constituents of concern (COC) were less than the current MTCA unrestricted land use cleanup criteria. After excavation, the disturbed areas were graded to match existing topography to facilitate and control stormwater drainage, and most disturbed areas were hydroseeded. A hand-held x-ray fluorescence (XRF) instrument collected soil confirmation sample analytical results of the final excavation limits, which were used to document removal of waste rock material.

Approximately 7,889 cubic yards (cy) (approximately 11,802 tons) of waste rock was excavated from the Site and transported for off Site disposal at Waste Management's (WM) Greater Wenatchee permitted Subtitle D landfill.

This Report presents the preliminary design for Phase 2 activities to address the remaining waste rock pile at the Site (SR05) and mitigation measures to prevent human exposure to bare soils that have elevated arsenic concentrations.

3.0 PHASE 2 IRA SCOPE OF WORK

An Agreed Order (AO) between the City and Ecology was revised after Phase 1 activities were completed and a revised scope of work (SOW) has been established in accordance with the following sections.

3.1. Task 1a—Further Delineation of Arsenic in Bare Soils within the Phase 2 Area

Under Task 1a, GeoEngineers assessed arsenic in bare soils influenced by human activities (not including SR-05 waste rock) within the Phase 1 and Phase 2 areas, as discussed in Ecology's Technical Memorandum dated October 1, 2019 (Ecology 2019) and in Ecology's email dated March 12, 2020. Geotechnical explorations were also conducted in select areas along the primary haul road alignment, to collect subsurface soil data for engineering analysis.

GeoEngineers performed an XRF survey to define the extent of arsenic in bare soil throughout the Site above the established background concentration of 95 mg/kg. "Bare soils" were defined as areas with no vegetative cover, not including outcrops and scree slopes, where the lack of vegetative cover appears to be likely attributable to human activities. XRF arsenic characterization was completed in general accordance with methods described in the amended Sampling and Analysis Plan (SAP) submitted to the City on February 20, 2019 and amended under Task 3. Surficial soil measurements of total arsenic were obtained, since no excavation of soils in these areas is anticipated.

The results of the XRF arsenic characterization was submitted to the City and Ecology within a technical memorandum, which included tabulated and mapped arsenic results (Appendix A). The memorandum was used during Task 1b to assess options to mitigate potential exposure of hikers to elevated concentrations of arsenic in soil in these areas.

3.2. Task 1b—Assessment and Identification of Appropriate Mitigation Measures for Contaminated Soil Influenced by Human Activities

GeoEngineers assessed potential mitigation measures to address bare soil areas in Phase 1 and 2 areas (impacted by human activities) with elevated arsenic concentrations as delineated under Task 1a. Our assessment included protectiveness, permanence, estimated cost, management of short-term risks, technical and administrative implementability and considerations of public concerns. The assessment also considered and discussed long-term operations and maintenance requirements.

Potential mitigation measures in this assessment included, but was not be limited to:

- Public education and signs.
- Potential trail realignments and/or trail closures.
- Revegetation or covering of bare soils.
- Appropriate features for trail closures.
- Installation of benches at selected locations to encourage hikers to sit/rest in areas with lower arsenic concentrations in soil.
- Potential feature(s) at the trailhead to support removal of dirt and dust from shoes, boots and paws before hikers leave the site.

The assessment was submitted to the City and Ecology in a summary report discussing screening of potentially applicable mitigation measures, further development of applicable mitigation measures and recommendations regarding what mitigation measures should be implemented at the Site. The final assessment is included in Appendix B.

3.3. Task 2— Phase 2 IRA Preliminary Design and Engineering Cost Estimate

After the City and Ecology's approval of the selected mitigation measures in Task 1b, a draft Phase 2 IRA preliminary design report (this Report) and engineering cost estimate has been prepared for submittal to Ecology. Elements of this preliminary design include primary haul road improvements, preliminary remedial design for the SR05 waste rock pile, and the preliminary design of Ecology-approved mitigation measures for bare soil areas with elevated arsenic concentrations. The geotechnical data collected as part of Task 1a was evaluated also, to complete applicable engineering analysis for recommended cut and fill slope inclinations, slope stability and roadway surfacing requirements.

For the bare soil mitigation measures, the following mitigation measures will be installed:

- Signage;
- Revegetation or covering; and
- Trail closing.

We also prepared an engineering cost estimate for the implementation of the Phase 2 IRA. This cost estimate includes the estimated costs for completion of all components of the Phase 2 IRA including:

- Primary haul road improvements;
- Remedial excavation and reclamation at SR-05; and
- Implementation of the selected mitigation measures.

The purpose of the cost estimate is to document that sufficient funds have been allocated to complete the Phase 2 IRA prior to preparation of the bid package.

3.4. Task 3—Preparation of Phase 2 IRA Design Report and Bid Package

After Ecology and City review of the Task 2 Preliminary Design Report and Engineering Cost Estimate, a decision will be made by Ecology and the City with respect to proceeding with preparing the Task 3 IRA design report and bid package. If it is determined by Ecology and the City that insufficient funds have been allocated to complete the entire scope, then the scope of work within the bid package may be adjusted. Final geotechnical design considerations for construction, from Task 1a and 2, will also be included in this task.

Components of the Phase 2 IRA Design Report will include:

- A design narrative describing the purpose and objectives of the project;
- Description of the planned remedial actions and mitigation measures;
- Design of Phase 2 primary haul road improvements, including stormwater management features;

- Design of the preferred SR-05 remedial action and the selected bare soil mitigation measures;
- Estimated schedule for mobilization, road improvements, pile excavation, waste rock disposal, confirmation sampling, site regrading and revegetation, and implementation of bare soil mitigation measures;
- Construction ready set of design drawings;
- Technical specifications in Washington State Department of Transportation (WSDOT) format;
- Health and Safety Plan;
- Amended SAP for the SR-05 waste rock pile; and
- Documentation of waste acceptance by the preferred landfill.

The design drawings will generally include the following:

- Coversheet and Notes;
- Topographic view of existing conditions in plan view;
- An erosion and sediment control (ESC) plan;
- Proposed primary haul road improvements and staging/loading area;
- Cross sections of the SR-05 pile showing estimated excavation depths;
- Final grading plans after removal of the SR-05 pile; and
- Details as needed.

GeoEngineers will amend the existing SAP for the site dated February 20, 2019, as appropriate, based on information collected by GeoEngineers throughout the Site.

The project specifications will be sufficient for construction and will include measurement and payment sections, product information and execution. Drawings and specifications will be stamped by a State of Washington Professional Engineer. The specifications will generally include the following:

- Measurement and payment;
- Mobilization;
- Site demolition;
- Waste material disposal;
- Earthwork;
- Sediment control; and
- Revegetation.

3.5. Task 4—Phase 2 IRA Implementation

After Ecology approval of the Design Report and Bid Package, the City will select the contractor(s) and implement the Phase 2 IRA. The City-selected contractor(s) and GeoEngineers will perform the work with an utmost focus on health and safety.

3.6. Task 5—Phase 2 IRA Completion Report

After completion of the Phase 2 IRA field activities, GeoEngineers will prepare the Phase 2 IRA Completion Report.

The IRA completion report will include the following components:

- As-built map of the constructed primary haul road improvements and stormwater features.
- Disposal weight tickets and estimated volume changes for the SR05 waste rock area.
- As-built maps for the SR05 waste rock area delineating the waste rock areas on topography before remedial action and applicable overlays for excavation, regrading and revegetation and added stormwater management features.
- Map for the SR05 waste rock area confirmation sampling locations and depths.
- Tabulations of confirmation results for Site COCs (both XRF and laboratory results).
- Data quality review for the XRF confirmation results.
- Laboratory analytical reports including lab QA/QC samples and associated data quality review.
- Receipts for any purchased revegetation materials for the SR05 area.
- Appropriate as-built information for the installed mitigation measures features to address bare soils.
- Operations and Maintenance Plan for the installed mitigation measure features to address bare soil areas.

GeoEngineers will prepare the report in draft form and submit to the City and Ecology for review/comment. GeoEngineers will incorporate the City's and Ecology's comments into the report and prepare a Draft Final report for submittal back to Ecology. The Draft Final Report will undergo public comment review before it is deemed final. Significant public comments could result in revision of the report.

The elements presented in this Report cover the Phase 2 IRA preliminary design and construction work activities. Final design and construction of Phase 2 IRA work activities will be provided in a Phase 2 IRA Design Report and Bid Package.

This Report provides guidance for the City and the City's selected contractor(s) for managing contaminated soil that will be encountered during earthwork activities on the project. Soil excavated for this project is subject to special handling and/or disposal requirements as discussed in this Report. The procedures outlined in this document are based on guidance provided by Ecology (Ecology 2012); the MTCA (Chapter 70.105D RCW); Washington Administrative Code (WAC) Chapter 173-340; and our experience on similar projects. We understand that the City's contractor(s) working on this project will be responsible for complying with the final design report and specifications, as well as all applicable local, state and federal regulations during Phase 2 construction activities.

In addition, the City-selected contractor(s) personnel responsible for any earthwork activities shall be 40-hour hazardous waste operations and emergency response (HAZWOPER) trained and certified (in compliance with Occupational Safety and Health Administration [OSHA] standard 29 CFR Part 1910.120) and Chapter 296-843 WAC and meet the regulatory requirements identified in Section 4.4 below.

4.0 PHASE 2 IRA CONSTRUCTION ACTIVITIES

All work shall be conducted in a safe manner, so as to not endanger contractor personnel, public or other key personnel on the Site. The work will consist of, but not be limited to, providing all labor, materials, earthwork and incidentals necessary to improve portions of the primary haul road (the existing main park trail) as needed to access SR05, excavate waste rock from SR05 and transport it off site for permitted off-site disposal. Related mobilization and demobilization, clearing and grubbing, erosion and stormwater control and post-excavation waste rock pile area restoration grading and mitigation measures will also be performed.

Logistical difficulties associated with the performance of this project include steep slopes located throughout the project area, which will require special handling and appropriate construction equipment and vehicles that can operate safely on steep slopes. The steep slopes may cause mobilization difficulties, cause difficulties in moving around the Site due to soil conditions, contribute to further soil erosion and may complicate delivery of the required materials and equipment to complete the project.

Saddle Rock Park will be closed for public use for the construction period of the Phase 2 IRA because work will occur through most of the park. Signs will be posted by the contractor to inform the public of the general hazards (both chemical and physical) associated with the waste rock and construction activities. Signs will be posted by the contractor at the beginning of the road/trail (near the Saddle Rock parking lot entrance and trailhead, as well as the north side of Saddle Rock Park where Jacobsen trail connects) advising the public that the trail is not open for public use and warning of construction equipment usage. Flaggers will not be needed because the public will not be allowed in the construction area of Phase 2. Allowable work hours for the contractor to complete construction activities in a safe manner will be 7 am to 7 pm, Monday through Sunday. If the contractor wishes to deviate from established working hours, the contractor shall submit a written request to the Capital Projects Manager for consideration. The contractor is not allowed to access or utilize the existing Saddle Rock Regional Park trailhead parking lot and vicinity. All Site access shall be routed through the one gated entrance at the dead end of Circle Street.

The contractor shall utilize the existing main trail (primary haul road) to the extent practicable to complete the Phase 2 IRA excavation and transportation of waste rock on- and off-property. As shown on Drawings 5 and 6, the existing primary haul road will be widened in places as needed so equipment can access SR05. At the discretion of the contractor, the existing main trail system will be used and a temporary access road will be constructed from about Station 1755+00 on the primary haul road onward to access SR05. Excavation and grading activities for Phase 2 IRA work will primarily focus on improving the existing primary haul road as needed, constructing the temporary access road to SR05 from the primary haul road, excavation and disposal of waste rock from SR05, resurfacing the primary haul road with gravel and installing new stormwater control features for stormwater runoff along the primary haul road. The contractor shall use care in moving and transporting waste rock material during excavation activities.

The contractor shall use care to minimize existing/native vegetative disturbances outside of the areas to be remediated and along the primary haul road. The staging area (in the general vicinity of the former SR02 waste rock pile area) (Drawing 3) should be made only as large as necessary to fit equipment and materials necessary to complete the project. If the SR02 area is used to unload and reload waste rock, impacted areas within and near SR02 will need to be excavated back to pre-existing topographic conditions, tested by the City's consultant engineer to document that all waste rock has been removed and revegetated.

Excavation and other disturbed areas (including the laydown/staging area developed by the contractor) will be graded to match surrounding existing conditions after waste rock is removed.

Preliminary drawings depicting general construction information are attached (Drawings 1 through 9); the final layout and Phase 2 IRA activities will be included under separate cover. All "field engineering or field adjustment" procedures, plans and designs will be discussed with and approved by the City prior to implementation. Drawings and specifications (in WSDOT format) and the Construction Quality Assurance (CQA) Plan will be submitted under separate cover in the final design report.

4.1. Key Personnel

The field team scheduled to perform work during field operations include:

- Dustin Wasley, PE — Principal-in-Charge
- Nick Rohrbach — Senior Environmental Scientist / Project Manager
- JR Sugalski, PE — Project Engineer / Field Inspector
- Justin Orr (or to-be determined) — Staff Engineer / Field Inspector

All personnel who will be performing invasive activities (i.e., sampling, construction oversight, construction excavation and grading, etc.) during the Phase 2 IRA construction implementation will be trained in accordance with the HAZWOPER standards, as defined by the OSHA standard 29 CFR Part 1910.120 and Chapter 296-843 WAC.

Other personnel who will periodically be on Site are listed below. The City's Capital Project Manager, for Parks, Recreation and Cultural Services, will be kept informed regarding project activities, plans, schedules, budget/invoicing, and other issues through direct communications and meetings by GeoEngineers. Ecology's Project Manager will be kept informed of project progress and information by the City's Capital Project Manager.

- Charlotte Mitchell – City — Capital Project Manager
- Frank Winslow – Ecology — Project Manager
- CDLT representatives — Authorized personnel

4.2. Logistics

Due to the lack of facilities at the Site, a project office building is not currently available for the Phase 2 IRA implementation. Temporary facilities may be brought onto the Site, by the City-selected contractor, and will include a minimum of a contractor personnel/key personnel decontamination area and sanitary facilities (porta potties) in the selected staging area. The staging area used during Phase 1 construction work, generally located near former waste rock pile SR02, may be utilized again during Phase 2 construction work (as long as the area is restored after construction). Care will be taken to avoid any significant impacts to all nearby natural and existing vegetation and to reduce the potential for non-work-related exposure to potentially hazardous materials known to be present at the Site.

All food, equipment and other supplies will be packed in and out. All refuse will be stored in animal-proof containers, and routinely packed out of the Site and properly disposed at an approved solid waste facility.

The staging area will be cleaned up and left in good condition prior to departure each day of construction, and if needed graded and revegetated in accordance with the Phase 2 IRA Design Report and Bid Package. All-terrain vehicles (ATVs) may be used as part of the IRA activities, which will require that a small supply of fuel be kept available at the Site. Small quantities of diesel and gasoline fuel for trucks and equipment may also be stored on Site, with appropriate spill control measures. To control potential spill or release problems, the following fuel handling procedures will be employed:

- Only containers approved for gasoline/diesel will be used.
- A storage area, within the contractor staging area, with secondary containment (with a spill/release volume 110 percent of the stored fuel volume) will be established at the Site.
- Care will be taken to avoid spills during refueling.
- Refueling will be done near the fuel storage area, to the greatest practical degree.
- There will be no open flames or other sources of ignition allowed in the vicinity of the fuel storage area or during refueling operations.

The Phase 2 City-selected contractor(s) shall be prepared to prevent and/control potential fires caused by construction activities on Site. The Site is located in a dry environment and is prone to wildfires due to the lack of moisture and vegetation present. A fire prevention and control plan will be required to be prepared by the City-selected contractor, in accordance with the Phase 2 IRA Design Report and Bid Package.

Additional general requirements for the implementation of the Phase 2 construction are presented in Drawing 2 and are discussed below.

4.3. Cultural and Historical Monitoring

A cultural resource and historical assessment were conducted for the City in 2013 (Reiss-Landreau Research [RLR] 2013). While there were no cultural artifacts discovered specifically within the Phase 1 and 2 waste rock pile areas, an "Inadvertent Discovery Procedure (IDP)" has been defined and will be utilized by the contractor during construction activities. These procedures shall be followed by the contractor at all times and when archaeological significant material is discovered during excavation work. Inadvertent discoveries shall be limited to native American artifacts, including human bones or a buried major deposit that may be present.

A copy of the IDP is provided in Appendix C of this Report. A qualified cultural resource company will be subcontracted by the City during the Phase 2 construction work, in the event a significant find is discovered. Ecology will also be added to the notified parties if the IDP is triggered during construction. The contractor shall be prepared for potential project delays if a significant find is discovered and will make the project Site accessible to all parties involved.

4.4. Worker Health and Safety Requirements

The following worker health and safety protocols shall be implemented by the City-selected contractor during all excavation/soil disturbing activities:

- Personnel involved in excavation and/or handling of any soil and waste rock during the Phase 2 IRA activities shall conduct their work in accordance with applicable health and safety regulations and the contractor's Site safety and health plan.
- Personnel working on the property shall comply with provisions of WAC 173 340-810 (MTCA Cleanup Regulation, Worker Safety and Health).
- Personnel involved with invasive construction activities (including waste rock excavation and transport) shall be in compliance with HAZWOPER training in accordance with Chapter 296-843 WAC and OSHA standard 29 CFR Part 1910.120.
- For occasional workers, such as professional surveyors, a 24-hour HAZWOPER training course will be completed along with one supervised on-site fieldwork day.

4.5. Mobilization

Mobilization by the City-selected contractor will be performed in accordance with the final drawings and specifications (under separate cover). The final mobilization date will be determined in the future by the City. Select equipment identified below, with the ability to safely navigate steep slopes, is recommended to be used when completing certain work elements. Equipment and vehicles operated by the contractor shall be in accordance with the manufacturer's suggested slope rating(s). The following general equipment is likely to be used during Phase 2 IRA activities, based on experience, technical, safety and cost considerations:

- Several pickup trucks/ATVs;
- Several highway-rated dump trucks;
- Kamatsu CD110R-1 mini tracked spin/dump machines or equivalent (recommended steep slope equipment);
- Wheeled loader;
- One Caterpillar D6 bulldozers or equivalent (recommended steep slope equipment);
- One Caterpillar 330 Excavator or equivalent (recommended steep slope equipment);
- One small backhoe/excavator for haul road and staging area maintenance or difficult excavation areas (recommended steep slope equipment); and
- Water truck, water trailer and/or other mobile water tanks (to actively control fugitive emissions during construction work and on standby for potential fire control).

It will be the contractor's responsibility to verify what kind of equipment can complete the project safely, including the recommended list described above. Equipment will be thoroughly pressure washed and cleaned to remove dirt/weeds/grease/oil prior to arrival on Site and prior to leaving the Site; the equipment will be made available for inspection by key personnel prior to mobilization to the Site. The contractor shall remove all residual contaminated soil (in waste rock pile zones) via physical methods and containing those spoils for transport to the approved permitted off-site landfill. Soil acquired onto equipment elsewhere on the Site will be removed via physical methods and will be left on Site, also prior to leaving the Site. All equipment will be utilized so as to not cause cross contamination or track contamination beyond the limits of SR05. All equipment shall be thoroughly decontaminated by the contractor prior to demobilization.

As described in Section 4.2, the entire project area is within a high wildfire danger environment. The contractor will be required to create and submit a fire plan for Phase 2 IRA activities, which will cover (at a minimum) protocols and procedures for preventing fire creation and fire suppression if a fire was created during construction work. The contractor will be responsible for implementing the plan, during mobilization and all construction activities, in accordance with local, state and federal regulations. Other fire prevention related tools, including fire extinguishers located on every contractor vehicle and equipment, will be required.

4.6. Stormwater Water Control / Erosion Control Measures

Prior to waste rock removal activities, permanent and temporary erosion and sediment control (TESC) devices must be installed by the contractor to control the migration of stormwater and sediment. The contractor shall install erosion and sediment features, as shown on Drawing 3, Erosion and Sediment Control Plan, and Drawing 4, Erosion and Sediment Control Details, to control and contain stormwater runoff from leaving the property. A sediment trap near the site entrance was installed and water bars were also installed on the lower primary haul road as part of Phase 1 activities (Drawing 3), which both shall be maintained during all Phase 2 construction activities. Before conducting excavation of SR05, silt fence shall be installed as shown on Drawing 3. To reduce erosion to the primary haul road after substantial construction work is complete, new additional water bars will be installed by the contractor along the road alignment. Specified water bar spacing in accordance with the *Eastern Washington Stormwater Manual* are provided on Drawing 6. Erosion measures shall be 'field adjusted' by the contractor and approved by the City, if the final drawings are incomplete or indicate an erosion measure that is not functional for the intended purpose.

The contractor shall divert stormwater away from SR05 and trails/haul roads within the active use are during the Phase 2 IRA. Stormwater will be controlled in such a manner that no stormwater discharges will occur off property or into Circle Street drainage structures. Typical erosion and stormwater control details will be shown on the final drawings. The contractor shall install erosion control measures surrounding the staging area, in accordance with the final plans.

A project Storm Water Pollution Prevention Plan (SWPPP) will be generated by the contractor in accordance with City ordinance and the final design plans and specifications, which will include provision for managing stormwater at the Site. All erosion and sediment control design and implementation will be in accordance with Ecology's *Eastern Washington Stormwater Manual*.

4.7. Fugitive Dust Emission Control

Fugitive dust emission control will be implemented during the removal, staging, loading and transport of all waste rock from the Site. If water truck(s) cannot safely mobilize to SR05, alternative mobile water tanks (e.g., portable tanks or water tank trailer) shall be used by the contractor along the primary haul road, the staging area and at SR05. The contractor shall not discharge dust or any other air contaminants into the atmosphere in such quantity as will violate the regulations of any legally constituted authority. At the first sign of fugitive dust emissions, water will be applied using an atomized spray until visually damp. Special consideration will be given not to over water the waste rock. No ponding or runoff from the waste rock will be allowed. Dump trucks leaving the project Site will be covered during transport at all times. Construction procedures employed by the contractor shall reduce the potential for cross contamination of known waste rock soil. The approach is as follows:

- The loading area should be lined with impervious material to capture any spilled material. Any spilled material, or tracked out, will be removed immediately via hand tools or equipment.
- Visible dust should be mitigated by the contractor, using a water truck/water trailer/portable water tank and appropriate hoses/spray nozzles, to control off-site air migration.
- Mitigation and control of potential exposure to fugitive dust during dump truck offloading at the permitted disposal facility will be the sole responsibility of the transport contractor. It will be the transport contractor's responsibility for coordinating with the approved permitted off-site landfill on their fugitive dust control requirements.
- The contractor shall be prepared to elevate personal protective equipment (PPE) requirements (in accordance with their project Health and Safety Plan [HASP]) to Level C, if dust suppression activities are not actively controlled to control air emissions discharges and creating a potential exposure inhalation hazard for on-site personnel. No off-site fugitive dust migration will be allowed.

4.8. Clearing and Grubbing

Clearing and grubbing, performed at the direction of the City and in accordance with the final drawings and specifications, will be kept to a minimum. Grubbed material and slash will be stockpiled on-site for shredding as mulch to be used during Site restoration or for erosion control on exposed slopes. Clearing and grubbing will be limited to the following locations:

- Contractor staging area;
- SR05 and associated temporary access road; and
- Areas requiring widening along the primary haul road.

It is suspected that threatened plant species (*Lomatium nudicaule, Lomatium nudicaule, Bromus tectorum, Balsamorhiza saggitata, Pseudoregneria spicata and Comandra umbellata*) are present at the Site in two locations near SR05. One location is to the west of the SR05 work area and along the primary haul road beyond the limits shown on Drawing 5 are prohibited. There is a second spot that is near or adjacent to the haul area (Drawing 3). This area shall be protected by temporary construction fencing when mobile equipment is present in the area. Care should be taken to not disturb the vegetation during installation of the temporary fencing.

4.9. Haul Roads

It has been determined by GeoEngineers that the existing trail/haul road can be feasibly utilized to complete the Phase 2 IRA activities described in this Report. The primary haul road alignment is provided on Drawings 5 and 6. The contractor will establish a preferred temporary access road from the primary haul road to SR05, by constructing a safe temporary access road. The alignment of the temporary road will be approved by the City before use.

The primary haul road currently varies in width from about 6 to 10 feet wide. The contractor will widen, grade and surface the primary haul road, as needed, in order to access SR05 with excavation equipment and haul truck/equipment(s) to remove the waste rock from SR05. The primary haul road will be surfaced with imported gravel at the discretion of the contractor to accommodate removal of waste rock from SR05. The selection of the equipment needed to remove waste rock at SR05 will also be at the discretion of the

contractor. A geotechnical evaluation was conducted to evaluate cut and fill slopes and recommendations for road surfacing. The geotechnical evaluation is provided in Appendix D.

After the waste rock is removed from SR05, the primary haul road surface will be graded, and new water bars will be installed in accordance with the spacing on Drawing 6. Sections of the primary haul road with slopes of less than about 15 percent will be final surfaced with at least 4 inches of crushed surfacing base coarse (CSBC) as specified in WSDOT specification 9-03.9(3) and 4-04.3. The steeper sections of the road (Station 1712+00 to 1736+00) will be treated with magnesium chloride, calcium chloride or an approved equivalent. The chloride treatment will work to reduce dust generation and erosion for steeper portions of the road. Gravel placed on slopes steeper than 15 percent is likely to erode down the slope.

The primary haul road will be left as a graveled surface to serve as a hiking trail and accommodate maintenance and emergency vehicle access during future park use. The cut slopes of the primary haul road will be hydroseeded. After removal of the waste rock from SR05, the temporary access road to SR05 will be left installed and the road surface graded to blend with the existing surrounding topography and hydroseeded.

Water bars were determined to be an effective stormwater management practice for the primary road on a long-term basis to maintain full dispersion at the Site. A drainage report discussing appropriate stormwater controls for the primary haul road is included in Appendix E.

4.10. Waste Rock Excavation and Disposal

The following sections provide procedures and considerations during the excavation and disposal of waste rock excavated from SR05.

4.10.1. Waste Rock Excavation

Waste rock pile SR05 will be excavated to the approximate limits shown on the final drawings and specifications. Waste rock pile SR04 will not be excavated and will be left as is. The approximate estimated limits of excavation for SR05 are shown on Drawing 7. The final excavation extent and depth will be based on field observations and field screening with an x-ray fluorescence (XRF), operated by the City's consultant engineer field personnel. The target cleanup level for the limits of the excavation will be 95 mg/kg. The estimated current total volume of waste rock to be removed in the Phase 2 IRA is 1,200 cy, based on the waste rock evaluation conducted by GeoEngineers (GeoEngineers 2019b). Once field screening indicates the extents of the waste rock excavation are reached, confirmation soil samples will also be collected in general accordance with the Phase 2 IRA Sampling and Analysis Plan (Appendix F).

The contractor will provide access to SR05 for key personnel and shall sequence excavation and other activities to accommodate sampling and analysis work by the City and its consultant.

In order to control the release of waste rock and sediments from SR05, excavation and transport of the waste rock will proceed in a careful manner working from the top of the slope downwards. Very steep slopes are present, immediately around the lateral limits of SR05. The contractor shall have experience working on steep slopes and submit a steep slope mitigation plan that identifies mitigation measures undertaken to work safely on the steep slopes near SR05 and the primary haul road. Haul dump trucks or haul equipment, utilized both on-site and off-site, will not be overfilled in order to minimize spillage of waste rock. If waste rock spillage occurs, the contractor shall immediately cleanup via hand tools or equipment.

Loading areas and the primary haul roads shall remain free of spilled material to avoid tracking of waste rock and contaminated soil along the haul route(s).

4.10.2. Off-Site Disposal

The following procedures shall be implemented by the contractor when transporting and disposing of waste rock from the project Site to the approved permitted disposal facility:

- The contractor will be responsible for the transportation of excavated waste rock on and off Site, which includes transportation to the City-selected and -approved permitted disposal facility (Waste Management's [WM] Subtitle D landfill located in East Wenatchee, Washington).
- The City has established an account with WM, and a profile has been established for the waste. All invoices will be direct billed to the City.
- Labeling, packaging, transport, disposal and record keeping will occur in general accordance with requirements outlined in WAC 173-303.
- In accordance with WAC 173-350-300, loaded trucks or containers with Subtitle D materials will be covered before leaving the project Site.
- The contractor will coordinate with the disposal facility regarding acceptance of any waste rock being disposed. Mitigation and control of potential exposure to fugitive dust during dump truck offloading at the permitted disposal facility will be the sole responsibility of the transport contractor. It will be the transport contractor's responsibility for coordinating with the landfill on their fugitive dust control requirements.

The City previously obtained approval for waste rock disposal at the permitted disposal facility. A waste profile was established with WM's Subtitle D Greater Wenatchee landfill located in East Wenatchee, Washington during the Phase 1 IRA. The previous waste profile, created during Phase 1 IRA activities, should be utilized as a profile to dispose the waste rock from the Phase 2 IRA project. A copy of disposal records will be provided by the contractor and included in the draft Final Construction Report. It is the contractor's responsibility to coordinate the transportation of contaminated waste rock and obtain and maintain all disposal records from the selected disposal facility for future reference. Disposal records will be provided to the City within 30 days after "Substantial Completion" is obtained by contractor from the City.

4.11. Material and Miscellaneous Debris Removal and Disposal

Non-Native American and non-inadvertent discovery type material(s), man-made wood and metal material and miscellaneous nuisance debris (if encountered) within the Phase 2 work area that pose a potential physical hazard or is considered to be garbage will be removed, after review and approval by the City. Material(s) will be transported and disposed at the landfill described in the above Section 4.10.2.

4.12. Installation of Bare Soil Mitigation Measures

As described in the bare soil investigation memo (Appendix A), three general areas were identified where soil was greater than the Site-specific background concentration of 95 mg/kg. Areas identified included two locations in the Phase 1 area between SR03 and SR08 and a location northwest of SR01. The third area that exceeds the Site-specific background concentration is primarily limited to locations along the

primary haul road that will be used to access SR05. Signage and bench mitigation measures are detailed in the attached Drawings 8 and 9.

To mitigate potential exposure to elevated arsenic concentrations, multiple institutional controls will be implemented, as described in the bare soil mitigation memo (Appendix B). Multiple signs to inform the public of the naturally occurring arsenic in the area will be installed, at the locations shown on Drawing 8. Signs will also be installed to encourage hikers to stay on the main trail system. In addition to signs, benches will be installed at the locations shown on Drawing 8 to encourage people to sit on the benches and not on bare soil in the area. The benches and signs will be installed by the City or CDLT after the contractor has completed Site restoration activities as described in Section 4.13.

To assist with mitigating exposure to elevated arsenic in the Phase 2 area, gravel will be used to cover the primary haul road in both the Phase 1 and 2 IRA areas. Many of the bare soil locations identified by GeoEngineers (GeoEngineers 2020) in the Phase 2 area, occurred along the primary haul road alignment. After waste rock is removed from SR05, the primary haul road from Station 1700+00 to 1712+00 and from 1736+00 to 1762+86 will be surfaced with at least 4 inches of compacted CSBC as shown on Drawing 6. The steeper sections of the road (Station 1712+00 to 1736+00 will be treated with magnesium chloride, calcium chloride or an approved equivalent. The chloride treatment will work to reduce dust generation, stabilize the soil to keeping it in place and reduce erosion for steeper portions of the road. Gravel placed on slopes steeper than 15 percent is likely to erode down the slope.

After Phase 2 IRA actions are completed by the contractor, the CDLT and/or the City will work to reclaim and abandon select hiking trails that are detrimental to the surrounding natural area. Select trails will be leveled and revegetated. Identification of the exact trails to be abandoned and methods for abandonment will be determined by the City and the CDLT. Trails to be closed, altered or improved are preliminarily presented in Future Phase 1, 2 and 3 Trail Plans, Figures 2 through 4, respectively. Final trail alterations will be confirmed between the City and the CDLT, to avoid areas with high arsenic concentrations based on the recent Bare Soils Evaluation. The CDLT and City intend to complete the Park-wide trail alterations in a phased approach, with timing between phases of trail work being dependent on the funding/manpower available to complete the work assigned in each phase. The City and the CDLT intend to complete community outreach in 2021 to gather community input on these trail plans and will incorporate (as applicable) the mitigation measures presented in Appendix B.

4.13. Restoration

Site restoration activities, after removal of waste rock at SR05, will include:

- Final confirmation sampling and grading at SR05;
- Reclamation/revegetation of SR05;
- Primary haul road finish grading and stormwater infrastructure installation (in Phase 1 and 2 areas); and
- Placement and maintenance of gravel surface on the primary haul road.

The following sections provide detailed information for each Site restoration activity.

4.13.1. Final Grading and Confirmation Sampling

Once SR05 is excavated to the approximate limits as shown on Drawing 7, the area will be final graded to match surrounding topographic surface conditions. Prior to final acceptance by the City and Ecology, the former waste rock pile footprint of SR05 will be screened with an XRF and final confirmation soil samples will be collected and analyzed (by the City's consultant engineer) to document that metals concentrations are below the Site specific background concentration for arsenic (95 mg/kg). Samples will be submitted on a standard turnaround time (about 7 days), unless the contractor requests an expedited TAT (24 to 48 hours) at their additional expense. Once final acceptance of the removal work at SR05 has been provided by the City and Ecology, SR05 and the temporary access road can be restored. The contractor will then install the primary haul road water bars and gravel surfacing in accordance with the final design project plans and specifications. The cut slopes of the primary haul road will be hydroseeded.

Once earth work activities are complete, silt fence shall be removed by the contractor and disposed at the permitted landfill discussed in Section 4.10.2. All other erosion and sediment features installed by the contractor shall remain on Site. All primary haul road gravel material imported and placed by the contractor shall remain on Site.

4.13.2. Reclamation/Revegetation of SR05 and the Primary Haul Road

Organic material recovered during clearing and grubbing, that was generated into mulch by the contractor, shall be placed over the final graded areas as much as feasible by the contractor. After excavated areas and the temporary SR05 access road have been graded smoothed to match the surrounding surfaces, they will be revegetated using the City-approved hydroseed and mulch mixture, to be presented in the final design project plans and specifications.

The mulch / hydroseed mix specified for the Phase 1 IRA (or approved equivalent) will be applied to the following areas:

- Areas where waste rock was excavated from SR05;
- The temporary access road for SR05;
- The contractor staging area; and
- Cut and fill slopes along the primary haul road where the road was widened.

4.13.3. Primary Haul Road Finish Grading and Stormwater Infrastructure Installation and Maintenance

The contractor shall regrade the primary haul road, as needed, to repair existing rutting/erosion and rutting/erosion created from hauling waste rock and equipment/vehicle usage across the Site. The contractor shall confirm that the 4 inches of compacted CSBC is installed from Station 1700+00 to 1712+00 and from 1736+00 to 1762+86. Water bars will be installed in accordance with the specified spacing and details on Drawing 6 from Station 1700+00 to 1762+86. Because of the road grade from Station 1712+00 to 1736+00, CSBC will not be installed. From Station 1712+00 to 1736+00, magnesium chloride/calcium chloride or a suitable alternative will be used to stabilize the road surface and act as a dust suppressant. Sediment from stormwater infrastructure installed as part of the primary haul road widening and at the Site entrance should be cleared of accumulated sediment prior to contractor demobilization.

4.14. Schedule

Implementation of the Phase 2 IRA is expected to be accomplished in 2021; however, project funding could result in project delays. The field season at the Site is typically between April and October, depending on rain events and snow levels. The timeframe of Phase 2 IRA construction activities has been planned to be conducted starting Summer 2021 and ending Fall 2021.

The proposed schedule is attached as Appendix G and assumes an initial mobilization of mid to late July 2020. This schedule is considered preliminary and may change depending on final design considerations and field conditions.

4.15. IRA Implementation Cost Estimate

A preliminary Construction Cost Estimate (CCE) was prepared for Phase 2 construction work and is attached as Appendix H.

The following cost estimate assumptions were used in developing the Phase 2 CCE:

- Unit costs are derived from either RS Means, estimates from local vendors, and professional experience. Estimated costs are considered to be within a margin of +/- 20 percent;
- Quantities for SR05 are estimated and based on limited investigation work completed in 2019. During the 2019 Phase 1 IRA construction activities, predicted and actual waste rock quantities deviated by as much as 30 percent.
- Permitted disposal is assumed at the WM Greater Wenatchee Regional Subtitle D Landfill; and
- Waste rock soil volumes assumes 1.5 tons per cubic yard.

5.0 HEALTH AND SAFETY PLAN

A Site-Specific Health and Safety Plan (HASP) will be prepared under separate cover by the City's consultant. The HASP will serve as the primary document for key personnel, presented in Section 4.2 above, when entering and working on the project Site. The contractor will be responsible for preparing and implementing their own HASP, that meets the requirements presented in this Report and with the final report plans and specifications.

6.0 LIMITATIONS

This Report has been prepared for use by the City of Wenatchee and City of Wenatchee's authorized agents and regulatory agencies. This Report is to be used as a guideline during construction activities associated with the improvements at the Saddle Rock, Phase 2 Interim Remedial Action Project Site. This Report can be provided to third parties for informational purposes only. The information contained herein is not intended for use by others, and it is not applicable to other sites. No other (third) party may rely on the product of our services unless we agree in advance and in writing to such reliance. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

7.0 REFERENCES

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Ecology, 2018a. Technical Memorandum, Gold Knob Prospect (aka Saddle Rock Park), Establishing Site Cleanup Levels and Areas. June 14, 2018.

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GeoEngineers, 2019b. Technical Memorandum for Saddle Rock Interim Remedial Action Field Sampling: April 2019. File No. 4296-008-00. June 26, 2019.

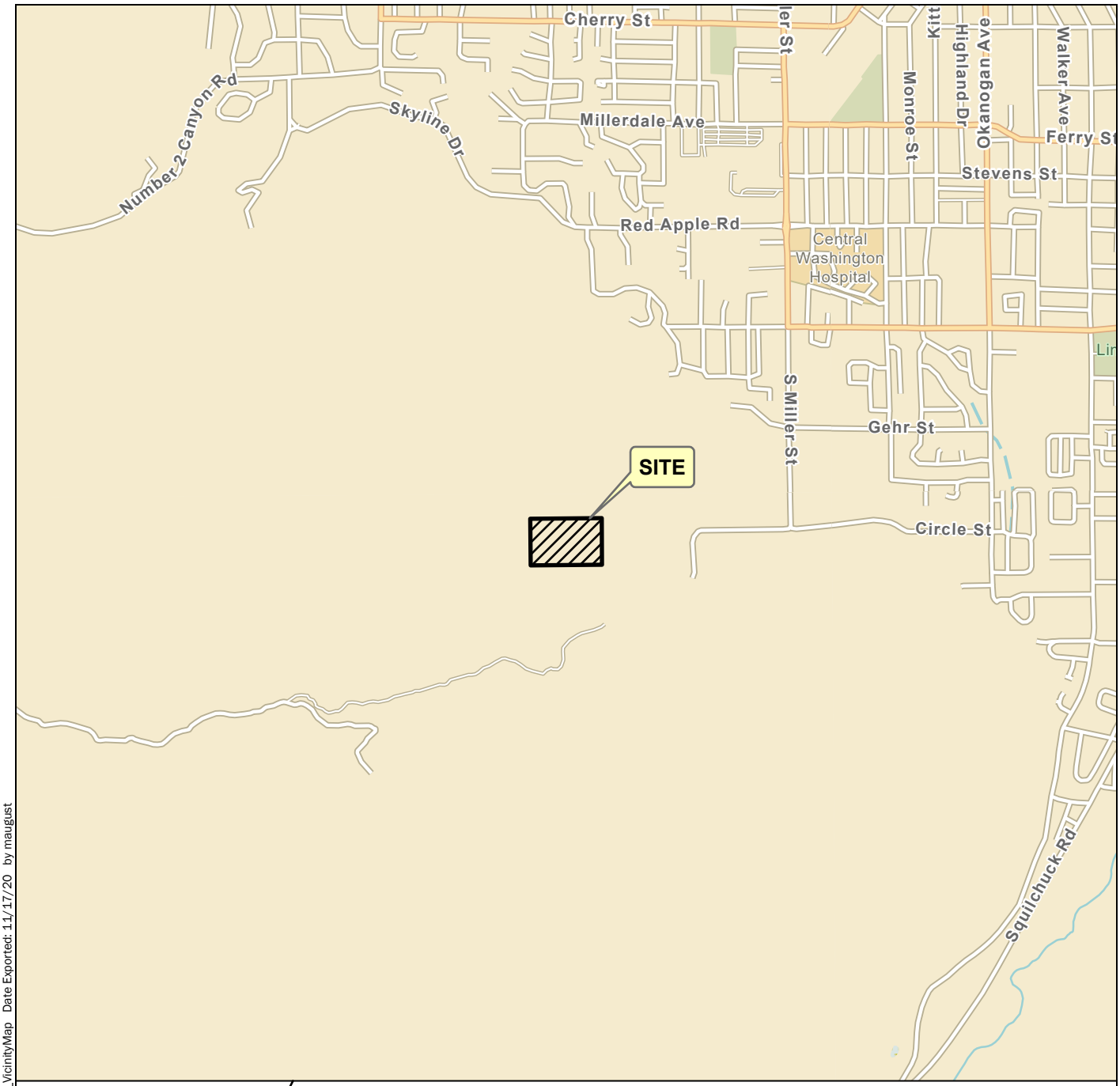
GeoEngineers, 2019c. Interim Removal Action Final Design Report, Saddle Rock Park, Wenatchee, Washington. File No. 4296-009-00. July 8, 2019.

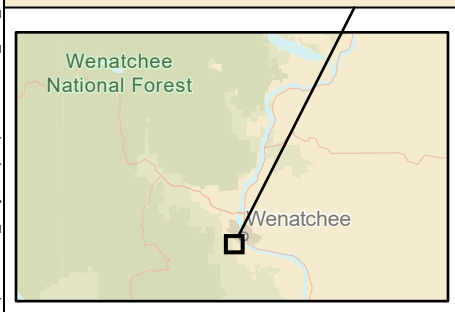
GeoEngineers, 2020. Interim Remedial Action Report, Saddle Rock Natural Area, Phase 1 IRA Construction Project, Wenatchee, Washington. File No. 4296-008-00. March 11, 2020.

Reiss_Landreau Research, 2013. An Archaeological Review and inventory of the Saddle Rock Park Development Project, Chelan County Washington. RLR Report 2012-263-28. January 2, 2013.

FIGURES

GeoEngineers





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Notes:

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

Data Source: ESRI

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 1

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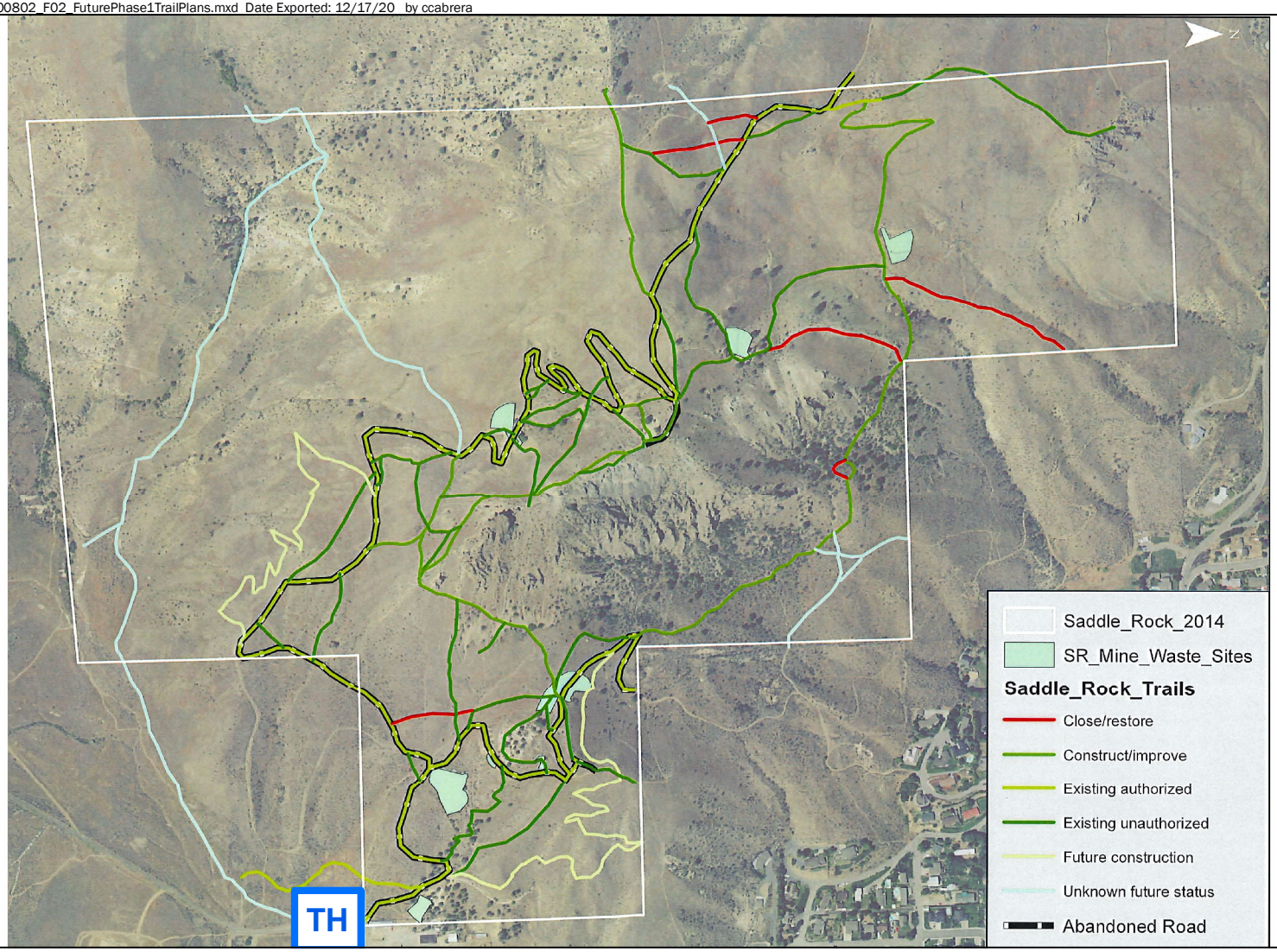

Notes:

1. Trail plans are preliminary and subject to change based on 2020 Bare Soils Investigation results.
2. Trail closures and improvements will not occur until after Phase 2 Interim Remedial Action construction activities are substantially completed.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Chelan-Douglas Land Trust planning maps.

Projection: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

TH Saddle Rock Park main trail head

Future Phase 1 Trail Plans

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 2

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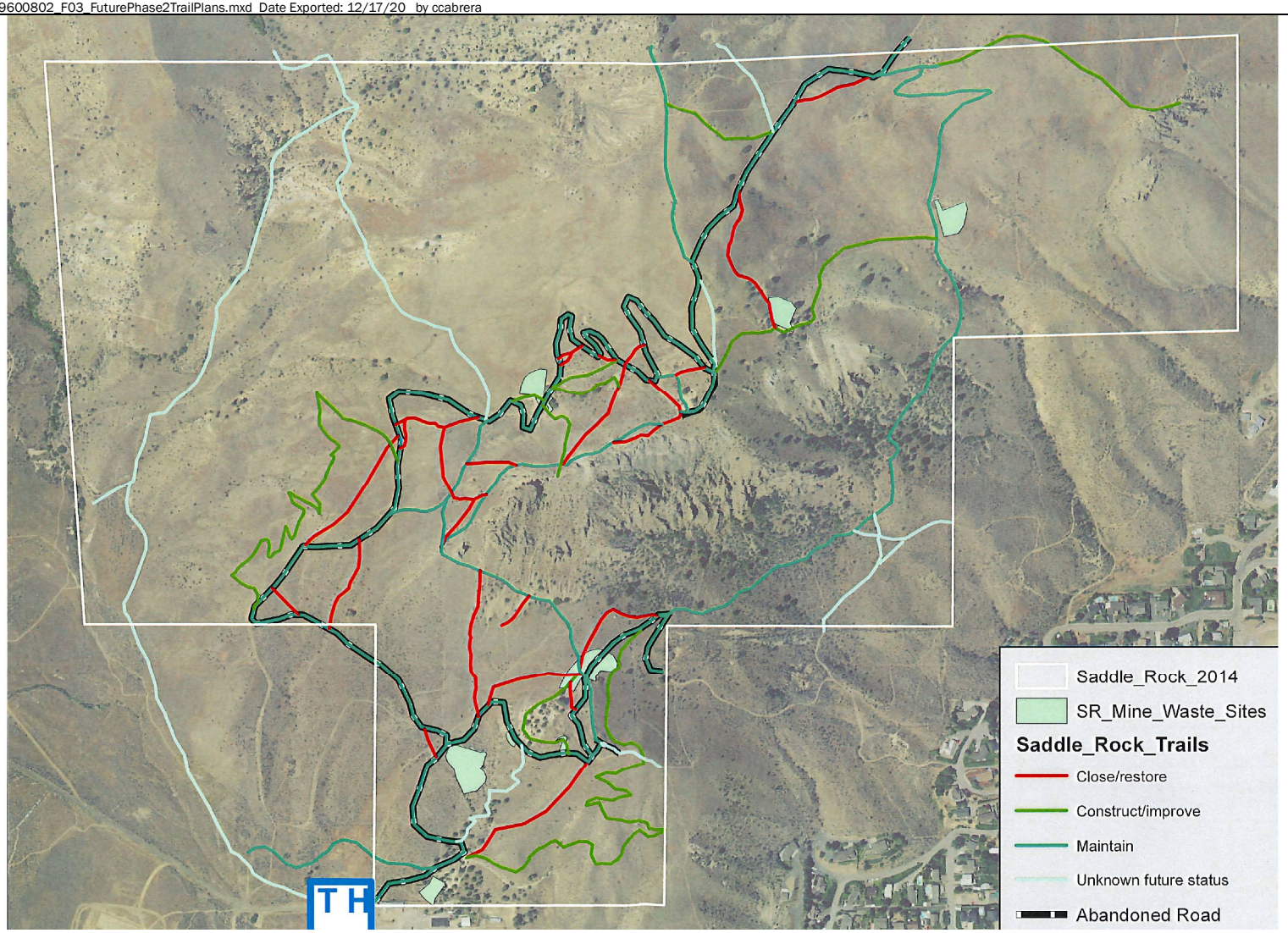

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3. The locations of all features shown are approximate.
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Data Source: Chelan-Douglas Land Trust planning maps.

Projection: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

TH Saddle Rock Park main trail head

Future Phase 2 Trail Plans

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 3

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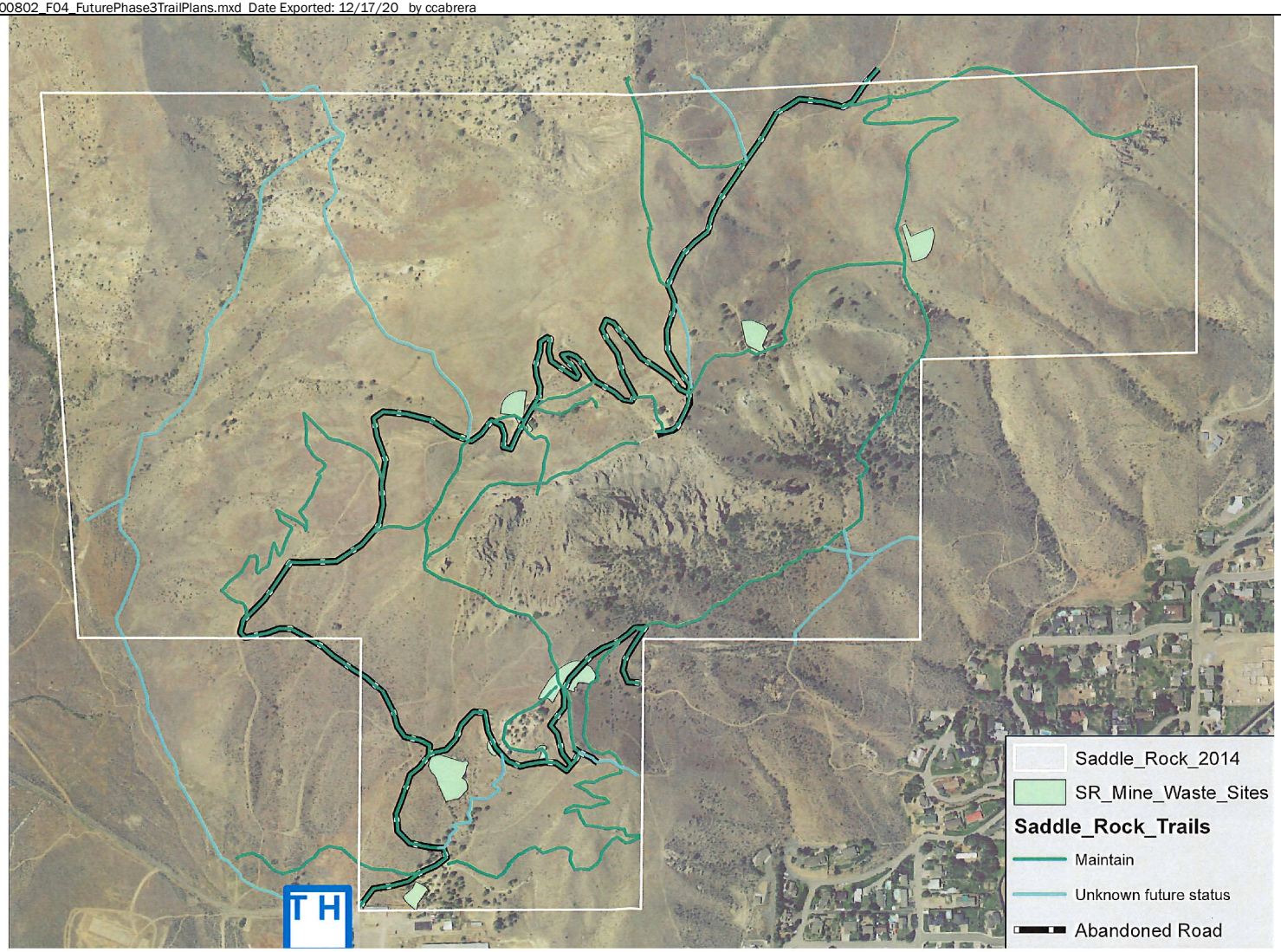

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3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic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

Data Source: Chelan-Douglas Land Trust planning maps.

Projection: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

TH Saddle Rock Park main trail head

Future Phase 3 Trail Plans

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 4

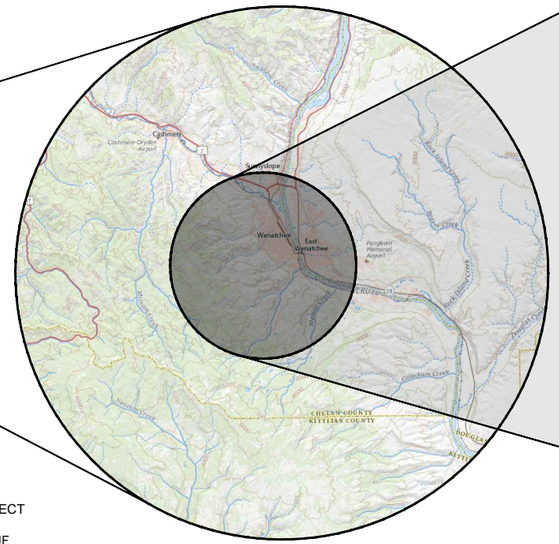
DRAWINGS

GeoEngineers

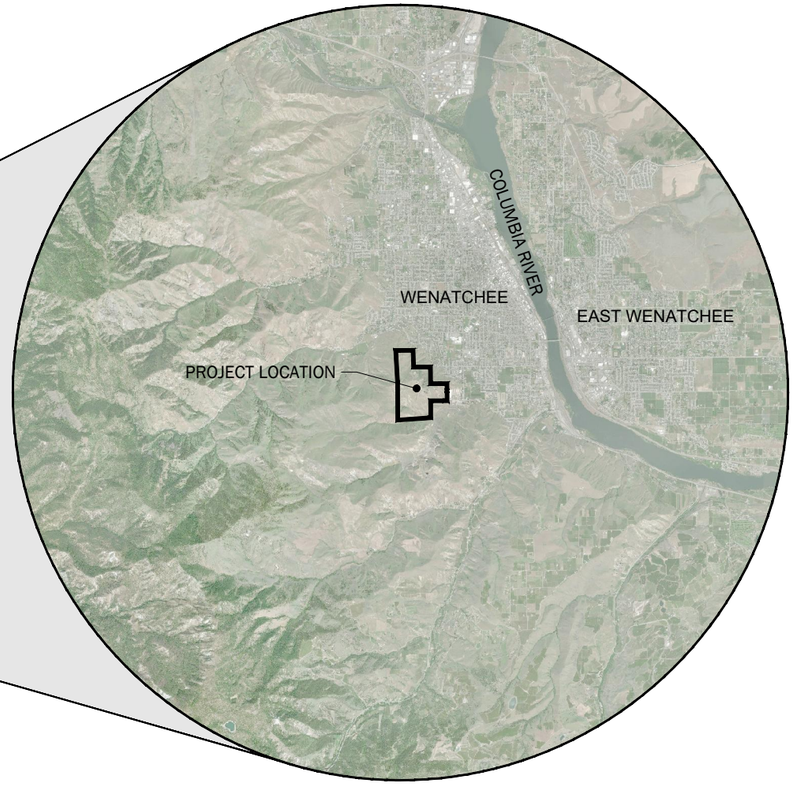
DRAFT INTERIM REMOVAL ACTION, PHASE 2

SADDLE ROCK PARK
WENATCHEE, WASHINGTON
PRELIMINARY DESIGN REPORT

Not to Scale



VICINITY MAP
Not to Scale



PROJECT SITE
Not to Scale

PROJECT LOCATION

THE PROJECT SITE IS LOCATED APPROXIMATELY 2.4 MILES WEST OF WENATCHEE, WASHINGTON. TO GET TO THE PROJECT SITE FROM CITY OF WENATCHEE TAKE SOUTHEAST ON ORONDO AVENUE TOWARD S WENATCHEE AVENUE FOR APPROXIMATELY 0.07 MILE. CONTINUE STRAIGHT TO STAY ON ORONDO AVENUE FOR APPROXIMATELY 0.7 MILE. CONTINUE ONTO CHERRY STREET FOR APPROXIMATELY 0.1 MILE. TURN LEFT ONTO S MILLER STREET FOR APPROXIMATELY 1.3 MILES. TURN RIGHT ONTO CIRCLE STREET FOR APPROXIMATELY 0.2 MILE. THE PROJECT WILL BE ON THE RIGHT ONTO SADDLE ROCK TRAIL FOR APPROXIMATELY 0.1 MILE.

Sheet Index

CONTACT INFORMATION

CITY OF WENATCHEE
CHARLOTTE MITCHELL, PE
1350 MCKITTRICK STREET
WENATCHEE, WASHINGTON 98807
PH: (509) 888-3662

GEOENGINEERS INC.
JEDIDIAH SUGALSKI, PE
523 E. SECOND AVE.
SPOKANE, WASHINGTON 99202
PH: (509) 209-2830

DRAFT SUBMITTAL - NOT FOR CONSTRUCTION

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NO.	DATE	BY	REVISION

GeoEngineers
523 E SECOND AVE : SPOKANE, WA 99202 : WWW.GEOENGINEERS.COM

JEDIDIAH R. SUGALSKI — STATE OF WASHINGTON — 49941 — REGISTERED PROFESSIONAL ENGINEER

DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

COVER SHEET

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 1 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO	1

GENERAL CONSTRUCTION NOTES:

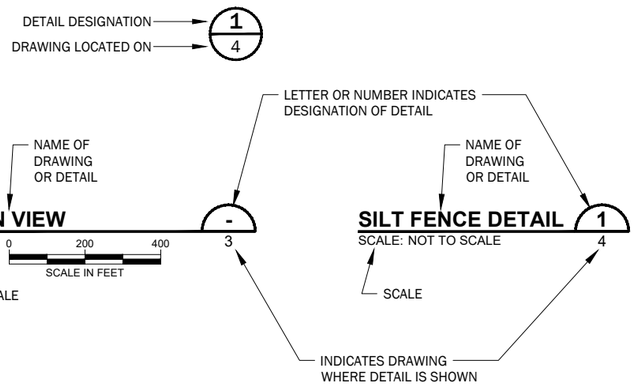
1. ALL WORK SHALL CONFORM TO THE PROJECT SPECIFICATIONS, DRAWINGS, DESIGN REPORT AND THE 2021 EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AND AMENDMENTS.
2. UNDERGROUND AND OVERHEAD UTILITIES ARE KNOWN TO EXIST IN THE AREA OF CONSTRUCTION. THE LOCATION OF EXISTING UTILITIES SHOWN IS APPROXIMATE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT ALL UTILITY OWNERS FOR LOCATIONS AND TO FIELD VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION. THE ONE-CALL NUMBER FOR UNDERGROUND UTILITIES IS 1-800-424-5555. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE INTEGRITY OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROMPTLY NOTIFY THE ENGINEER OF ANY CONFLICT WITH EXISTING UTILITIES.
3. ALL EXISTING FACILITIES, LANDSCAPE IMPROVEMENTS AND UTILITIES NOT SPECIFICALLY IDENTIFIED FOR REMOVAL SHALL BE PROTECTED THROUGHOUT CONSTRUCTION OR RESTORED AT COMPLETION OF WORK.
4. THE CONTRACTOR SHALL RESTORE ALL PRIVATE AND PUBLIC PROPERTY DISTURBED BY THE PROJECT IMMEDIATELY AFTER CONSTRUCTION.
5. CONTRACTOR SHALL MAINTAIN ACCESS TO EXISTING ROADS, DRIVEWAYS AND FIELD ACCESSES, WITH A MAXIMUM DELAY OF 10 MINUTES.
6. A COPY OF THE APPROVED PLANS AND SPECIFICATIONS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
7. THE INFORMATION SHOWN ON THESE PLANS IS APPROXIMATE AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ACTUAL CONDITIONS IN THE FIELD PRIOR TO BIDDING AND NOTICE TO PROCEED.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROTECT ABOVE AND BELOW GROUND UTILITIES DURING ALL CONSTRUCTION WORK. SPECIAL CARE SHALL BE TAKEN BY THE CONTRACTOR WHEN WORKING AROUND AND UNDERNEATH THE ABOVE GROUND ELECTRIC POWER LINES (OWNED AND OPERATED BY CHELAN COUNTY PUD) IN THE PHASE 1 CONSTRUCTION AREA. ANY DAMAGES CAUSED BY THE CONTRACTOR TO ABOVE OR BELOW GROUND UTILITIES WILL BE AT THE EXPENSE OF THE CONTRACTOR.
9. THE CONTRACTOR SHALL PROVIDE ACCESS TO ALL UTILITIES IN THE VICINITY OF THE CONSTRUCTION WORK AREAS, IN CASE OF EMERGENCY OR FOR INFRASTRUCTURE MAINTENANCE.
10. VERY STEEP SLOPES (> 20% GRADES) ARE PRESENT IN AREAS OF THE PROJECT SITE, INCLUDING ALONG THE EXISTING ROAD AND AROUND THE SR05 WASTE ROCK PILE. THE CONTRACTOR SHALL UTILIZED APPROPRIATE SAFETY MEASURES AND EQUIPMENT TO CONDUCT THEIR WORK.

EROSION AND SEDIMENT CONTROL NOTES:

1. ALL EROSION AND SEDIMENT CONTROL IMPLEMENTATION SHALL BE IN ACCORDANCE WITH THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, EASTERN WASHINGTON STORMWATER MANUAL (MOST CURRENT VERSION AVAILABLE).
2. SPCC AND TESC TO BE COMPLETED BY CONTRACTOR.
3. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATER, DRAINAGE SYSTEMS AND ADJACENT PROPERTIES IS MINIMIZED.
4. THE IMPLEMENTATION OF THESE TESC PLANS AND THE INSTALLATION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS APPROVED.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR THE ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS.
6. ALL CLEARING, GRUBBING AND GRADING SHALL BE CONTAINED WITHIN THE LIMITS ESTABLISHED BY THE ENGINEER. ALL VEGETATION OUTSIDE DESIGNATED LIMITS SHALL REMAIN UNDISTURBED.
7. ALL STOCKPILES ARE TO BE LOCATED IN SAFE AREAS AND PROTECTED FROM EROSION BY MECHANICAL OR VEGETATIVE MEANS.
8. ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY SEEDING, MULCHING, MATTING OR PLASTIC COVERING. FROM OCT. 1 TO APRIL 30, NO SOILS SHALL REMAIN UNSTABILIZED FOR MORE THAN 2 DAYS. FROM MAY 1 TO SEPT. 30, NO SOILS SHALL REMAIN UNSTABILIZED FOR MORE THAN 7 DAYS.
9. ALL PROPERTIES ADJACENT TO THE PROJECT SHALL BE PROTECTED FROM SEDIMENT DEPOSIT.
10. SEDIMENTS TRANSPORTED ONTO A ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM ROADS BY SHOVELING OR SWEEPING AND BE TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA. ALL COSTS ASSOCIATED WITH THIS WORK SHALL BE INCIDENTAL TO THE VARIOUS BID ITEMS.
11. SHOULD TESC MEASURES NOT BE PROPERLY INSTALLED AND MAINTAINED, THE OWNER MAY STOP ALL WORK PERTAINING TO THE CORRECTION OF THE TESC PROBLEMS UNTIL THE TESC MEASURES ARE RETURNED TO PROPER OPERATIONS.
12. PROTECT ALL EXISTING VEGETATION AND TREES, NOT IN IMMEDIATE FOOTPRINT OF EACH WASTE ROCK PILE. VEGETATION AND TREES WITHIN EXCAVATION FOOTPRINT OF EACH WASTE ROCK PILE SHALL BE REMOVED AND GENERATED INTO MULCH FOR FUTURE SITE RESTORATION ACTIVITIES.

DETAIL DESIGNATION:

POINT AT WHICH DETAIL IS TAKEN AND DETAIL SHOWN



DRAFT SUBMITTAL - NOT FOR CONSTRUCTION

P:\4\4296008\CAD\02\IRA Phase II Prelim Design\R00\429600802_Sht_02_General Contruction Notes.dwg

Plotted: 12/18/2020, 08:59 | syi

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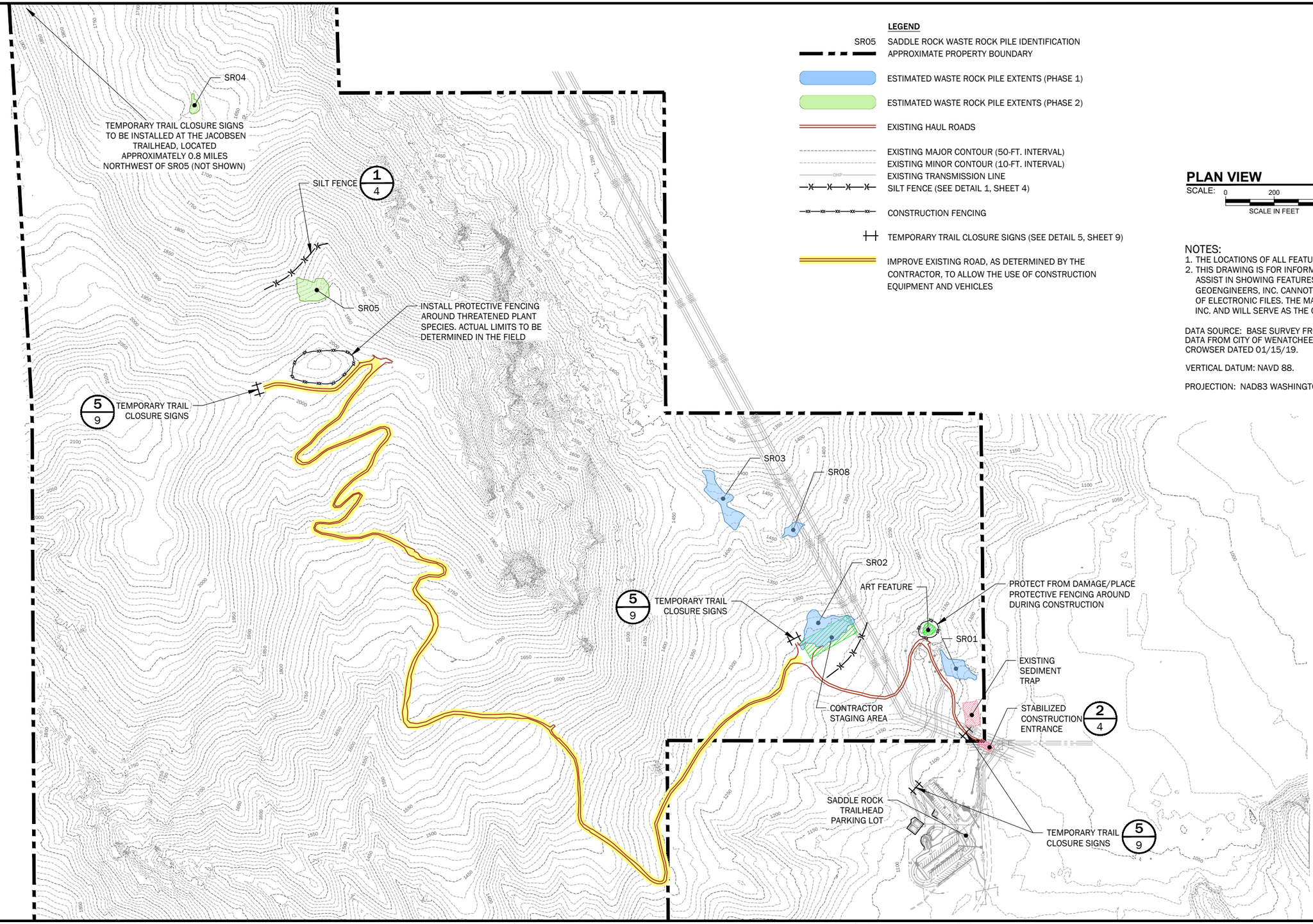
JEDIDIAH R. SKOGLAND — STATE OF WASHINGTON — 49941 — REGISTERED PROFESSIONAL ENGINEER

DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

GENERAL CONTRUCTION NOTES

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 2 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO	2



LEGEND

- SR05 — SADDLE ROCK WASTE ROCK PILE IDENTIFICATION
- APPROXIMATE PROPERTY BOUNDARY
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 1)
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 2)
- EXISTING HAUL ROADS
- EXISTING MAJOR CONTOUR (50-FT. INTERVAL)
- EXISTING MINOR CONTOUR (10-FT. INTERVAL)
- EXISTING TRANSMISSION LINE
- SILT FENCE (SEE DETAIL 1, SHEET 4)
- CONSTRUCTION FENCING
- TEMPORARY TRAIL CLOSURE SIGNS (SEE DETAIL 5, SHEET 9)
- IMPROVE EXISTING ROAD, AS DETERMINED BY THE CONTRACTOR, TO ALLOW THE USE OF CONSTRUCTION EQUIPMENT AND VEHICLES

PLAN VIEW
SCALE: 0 200 400
SCALE IN FEET

NOTES:
1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GEOENGINEERS, INC. CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GEOENGINEERS, INC. AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

DATA SOURCE: BASE SURVEY FROM DAWSON SURVEYING AND LIDAR TOPO DATA FROM CITY OF WENATCHEE DATED 01/08/19. GIS DATA FROM HART CROWSER DATED 01/15/19.

VERTICAL DATUM: NAVD 88.

PROJECTION: NAD83 WASHINGTON STATE PLANES, NORTH ZONE, US FOOT.

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DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

EROSION AND SEDIMENT CONTROL PLAN

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 3 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO 3	

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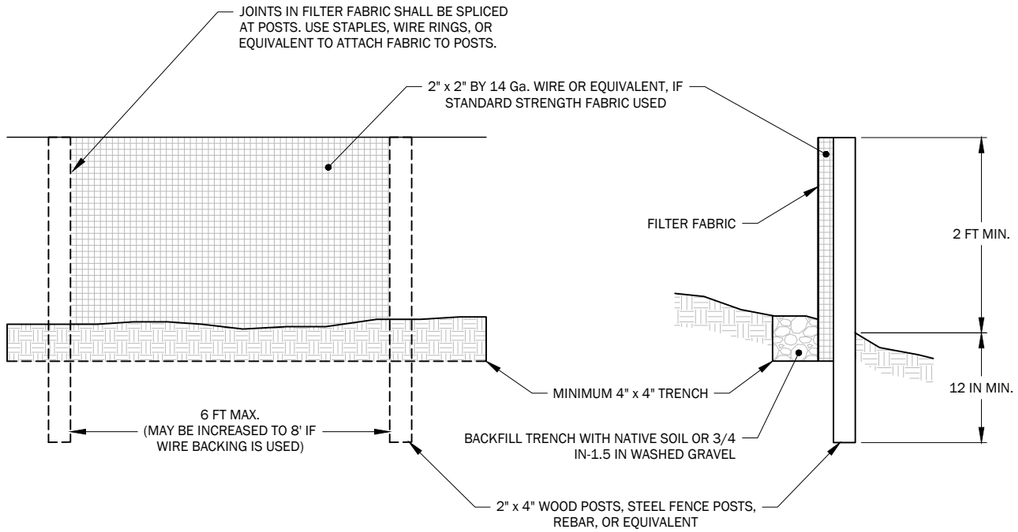
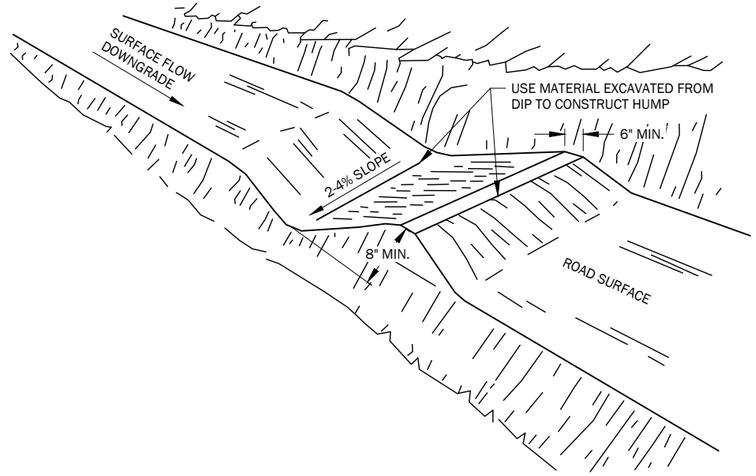
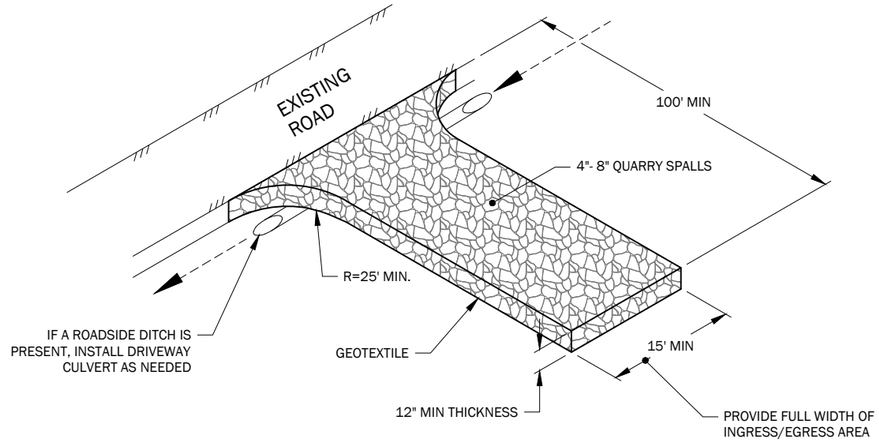


NOTES:
1. FILTER FABRIC FENCES SHALL BE INSTALLED ALONG CONTOUR WHENEVER POSSIBLE.
2. INSTALL THE ENDS OF THE SILT FENCE TO POINT SLIGHTLY UPSLOPE TO PREVENT SEDIMENT FROM FLOWING AROUND THE ENDS OF THE FENCE.

SILT FENCE DETAIL 1/4
SCALE: NOT TO SCALE



WATER BAR DETAIL 3/6
SCALE: NOT TO SCALE



NOTES:
1. IT IS RECOMMENDED THAT THE ENTRANCE BE CROWNED SO THAT RUNOFF DRAINS OFF THE PAD.

STABILIZED CONSTRUCTION ENTRANCE DETAIL 2/4
SCALE: NOT TO SCALE

P:\441296008\CAD\02\IRA Phase II Prelim Design\R001429600802_Sht_04_Erosion and Sediment Control Details.dwg
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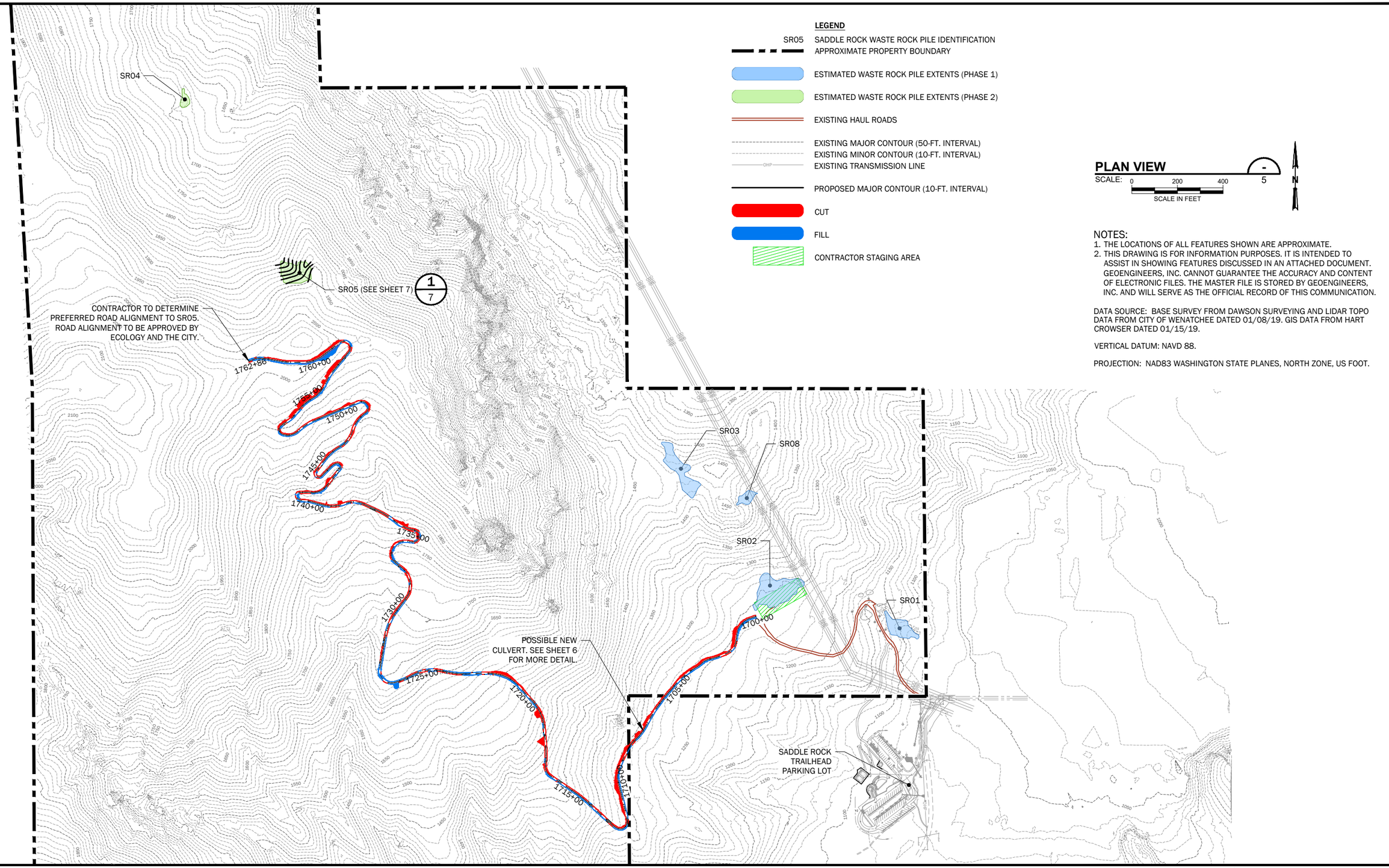
DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

EROSION AND SEDIMENT CONTROL DETAILS

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 4 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO	4

DRAFT SUBMITTAL - NOT FOR CONSTRUCTION



LEGEND

- SR05 — SADDLE ROCK WASTE ROCK PILE IDENTIFICATION
- APPROXIMATE PROPERTY BOUNDARY
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 1)
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 2)
- EXISTING HAUL ROADS
- EXISTING MAJOR CONTOUR (50-FT. INTERVAL)
- EXISTING MINOR CONTOUR (10-FT. INTERVAL)
- OHP — EXISTING TRANSMISSION LINE
- PROPOSED MAJOR CONTOUR (10-FT. INTERVAL)
- CUT
- FILL
- CONTRACTOR STAGING AREA

PLAN VIEW

SCALE: 0 200 400

SCALE IN FEET

5

N

NOTES:

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT. GEOENGINEERS, INC. CANNOT GUARANTEE THE ACCURACY AND CONTENT OF ELECTRONIC FILES. THE MASTER FILE IS STORED BY GEOENGINEERS, INC. AND WILL SERVE AS THE OFFICIAL RECORD OF THIS COMMUNICATION.

DATA SOURCE: BASE SURVEY FROM DAWSON SURVEYING AND LIDAR TOPO DATA FROM CITY OF WENATCHEE DATED 01/08/19. GIS DATA FROM HART CROWSER DATED 01/15/19.

VERTICAL DATUM: NAVD 88.

PROJECTION: NAD83 WASHINGTON STATE PLANES, NORTH ZONE, US FOOT.

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Plotted: 12/18/2020 09:00 | syj

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DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

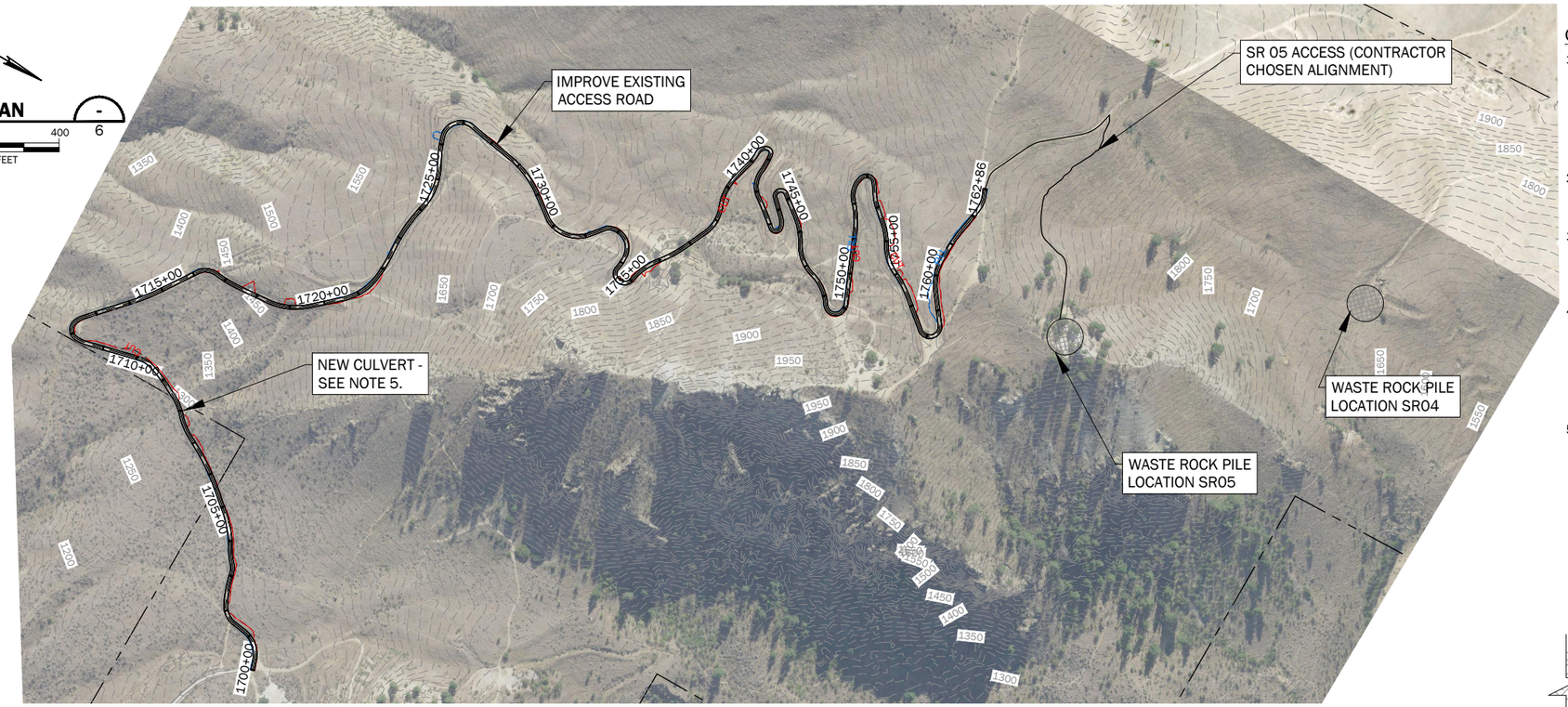
PROPOSED HAUL ROAD IMPROVEMENTS, EXCAVATION AND GRADING PLAN

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 5 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO 5	

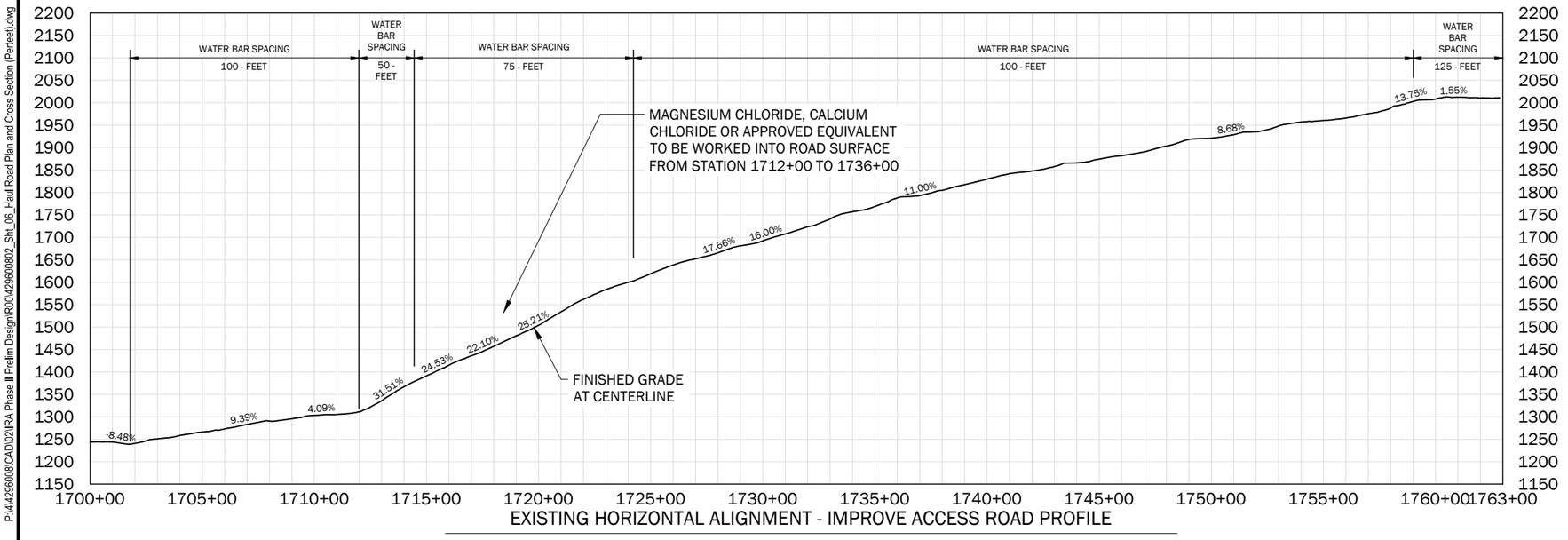
HAUL ROAD PLAN

SCALE: 0 200 400 — SCALE IN FEET

6



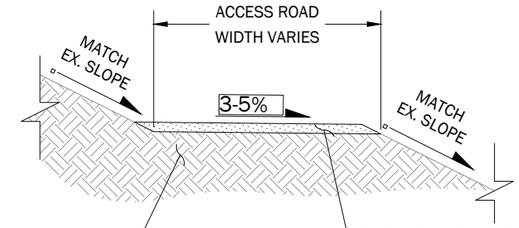
EXISTING HORIZONTAL ALIGNMENT - IMPROVE ACCESS ROAD PLAN



EXISTING HORIZONTAL ALIGNMENT - IMPROVE ACCESS ROAD PROFILE

GENERAL NOTES:

1. CONTRACTOR SHALL IMPROVE EXISTING ACCESS ROAD TO ALLOW HAULING OF WASTE ROCK FROM SR 05 PER BID ITEM "IMPROVE EXISTING ACCESS ROAD, PER EACH". METHODS AND MATERIALS FOR IMPROVEMENTS AND HAULING ARE TO BE DETERMINED BY THE CONTRACTOR. MINOR ADJUSTMENT OF HORIZONTAL ALIGNMENT IS ALLOWED, BUT MUST BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION. CONTRACTOR IS RESPONSIBLE TO GRADE THE VERTICAL ALIGNMENT TO APPROPRIATE GRADES FOR CHOSEN EQUIPMENT.
2. POST CONSTRUCTION CONDITION REQUIRES WATER BARS TO BE INSTALLED ALONG THE EXISTING ALIGNMENT PER THE SPACING TABLE AS SHOWN ON THIS SHEET.
3. WATER BARS SHALL BE INSTALLED PER DEPARTMENT OF ECOLOGY FIGURE 7.14 AND AS SHOWN IN APPENDIX B OF THE SADDLE ROCK ACCESS ROAD DRAINAGE REPORT. INSTALLATION SHALL BE PER BID ITEM "WATER BARS, PER EACH" SEE DETAIL 3 ON SHEET 4.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR CHOOSING AND CONSTRUCTING A TEMPORARY ACCESS ROAD BETWEEN THE EXISTING ACCESS ROAD AND SR 05. CONSTRUCTION SHALL BE PER BID ITEM "SR 05 ACCESS (CONTRACTOR CHOSEN ALIGNMENT), PER EACH". POST-CONSTRUCTION THE CONTRACTOR SHALL RESTORE ROADWAY TO ORIGINAL CONDITION AND PROVIDE SEEDING AND FERTILIZING OF DISTURBED AREAS PER BID ITEM "SEEDING, FERTILIZING AND MULCHING, PER ACRE."
5. CULVERT RECOMMENDED AT DRAINAGE CONVERGENCE. SIZING AND DOWNSTREAM DISPERSION METHODS TO BE DETERMINED BY ENGINEER DURING DESIGN PHASE TO MAINTAIN FULL DISPERSION BMP. CITY OF WENATCHEE TO OBTAIN AN ACCESS AGREEMENT OR EASEMENT FROM LANDOWNER FOR EXISTING ACCESS ROAD, TO INCLUDE CULVERT AND DISPERSION BMP. IF NOT OBTAINABLE, WILL EVALUATE SEPARATE SYSTEM TO DISPERSE EXISTING FLOW DURING DESIGN PHASE.



TYPICAL ACCESS ROAD SECTION

STA 1700+00 TO STA 1712+00 AND FROM 1736+00 TO 1762+86
EXISTING CROSS SLOPE VARIES

WATER BAR SPACING GUIDELINES	
SLOPE ALONG ROAD (1%)	SPACING (FEET)
< 5	*125*
5 - 10	*100*
10 - 20	*75*
20 - 35	*50*

CROSS SECTION

0 300 600 — HORIZONTAL SCALE IN FEET

0 150 300 — VERTICAL SCALE IN FEET

VERTICAL EXAGGERATION: 2X

P:\4\4296008\CAD\02\RA Phase II Prelim Design\R00\4296008_Sht_06_Haul Road Plan and Cross Section (Perteet).dwg

Plotted: 12/18/2020 09:00 | syi

NO.	DATE	BY	REVISION

PERTEET
2707 COLBY AVENUE, SUITE 900
EVERETT, WA 98201
425.252.7700 | 800.615.9900

JENNIFER D. SAUGEN — STATE OF WASHINGTON — 47014 — REGISTERED PROFESSIONAL ENGINEER

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DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

HAUL ROAD PLAN AND CROSS SECTION

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 6 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO	6

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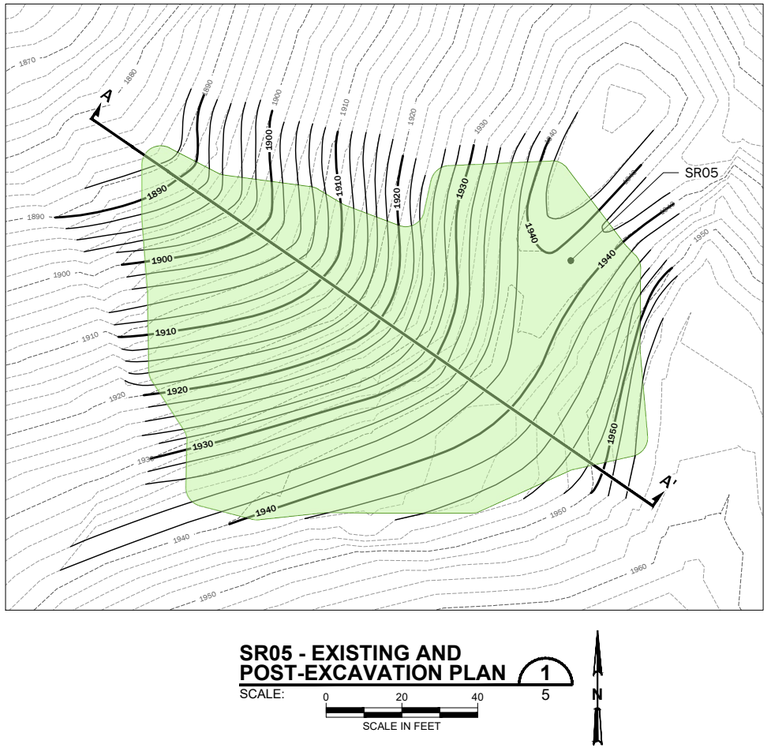
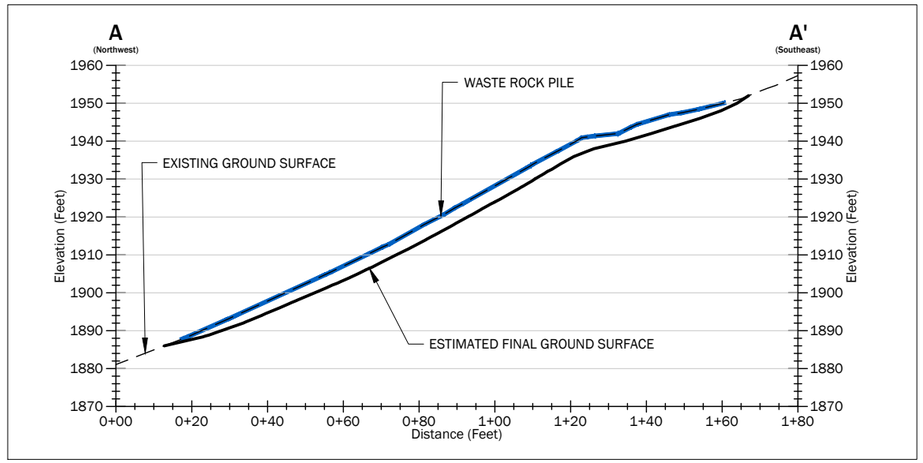


SR05 - EXISTING AND POST-EXCAVATION PLAN

SCALE: 0 20 40
SCALE IN FEET

1
5

N



SR05 - CROSS SECTION A-A'

0 20 40
HORIZONTAL SCALE IN FEET
0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION: 1X

LEGEND

- SR05 — SADDLE ROCK WASTE ROCK PILE IDENTIFICATION
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 2)
- EXISTING MAJOR CONTOUR (10-FT. INTERVAL)
- EXISTING MINOR CONTOUR (2-FT. INTERVAL)
- PROPOSED MAJOR CONTOUR (10-FT. INTERVAL)
- PROPOSED MINOR CONTOUR (2-FT. INTERVAL)
- A A' — CROSS SECTION LOCATION

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DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

SR05 EXISTING AND POST EXCAVATION GRADING PLAN AND SECTION

DRAWN: SCY	PROJ NO: 4296-008-02
DESIGN: JRS	SHEET 7 OF 9
CHECKED: NER	DATE: 12.18.20
DRAWING NO	7

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Plotted: 12/18/2020, 09:01 | syi
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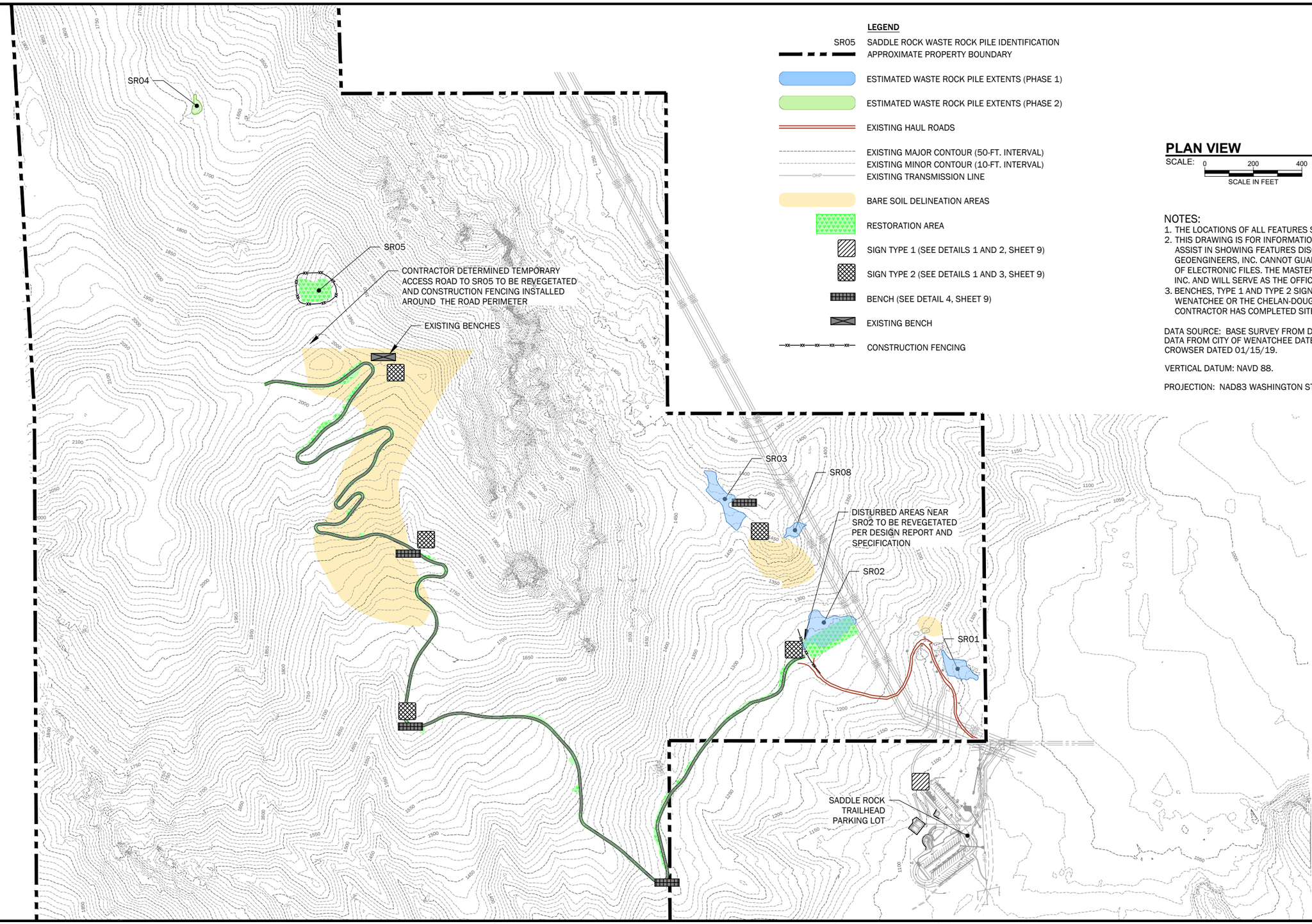

LEGEND

- SR05 — SADDLE ROCK WASTE ROCK PILE IDENTIFICATION
- APPROXIMATE PROPERTY BOUNDARY
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 1)
- ESTIMATED WASTE ROCK PILE EXTENTS (PHASE 2)
- EXISTING HAUL ROADS
- EXISTING MAJOR CONTOUR (50-FT. INTERVAL)
- EXISTING MINOR CONTOUR (10-FT. INTERVAL)
- OHP — EXISTING TRANSMISSION LINE
- BARE SOIL DELINEATION AREAS
- RESTORATION AREA
- SIGN TYPE 1 (SEE DETAILS 1 AND 2, SHEET 9)
- SIGN TYPE 2 (SEE DETAILS 1 AND 3, SHEET 9)
- BENCH (SEE DETAIL 4, SHEET 9)
- EXISTING BENCH
- CONSTRUCTION FENCING

PLAN VIEW

SCALE: 0 200 400 — SCALE IN FEET

N

NOTES:
1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE.
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3. BENCHES, TYPE 1 AND TYPE 2 SIGNS WILL BE INSTALLED BY THE CITY OF WENATCHEE OR THE CHELAN-DOUGLAS LAND TRUST (CDLT) ONCE THE CONTRACTOR HAS COMPLETED SITE RESTORATION ACTIVITIES.

DATA SOURCE: BASE SURVEY FROM DAWSON SURVEYING AND LIDAR TOPO DATA FROM CITY OF WENATCHEE DATED 01/08/19. GIS DATA FROM HART CROWSER DATED 01/15/19.

VERTICAL DATUM: NAVD 88.

PROJECTION: NAD83 WASHINGTON STATE PLANES, NORTH ZONE, US FOOT.

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DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

MITIGATION MEASURES FOR BARE SOIL AND RESTORATION PLAN

DRAWN:	SCY	PROJ NO:	4296-008-02
DESIGN:	JRS	SHEET	8 OF 9
CHECKED:	NER	DATE:	12.18.20
DRAWING NO			8

Plotted: 12/18/2020, 09:01 | syi

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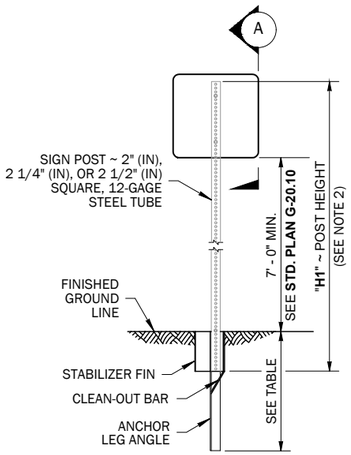
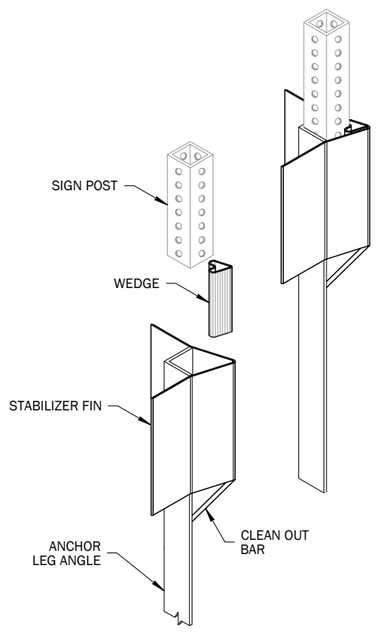
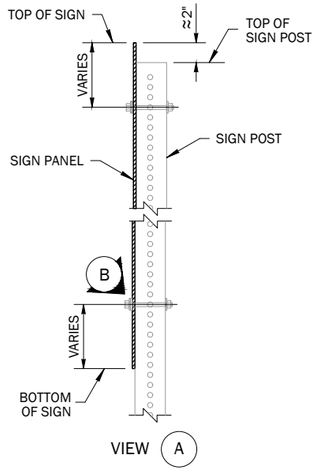


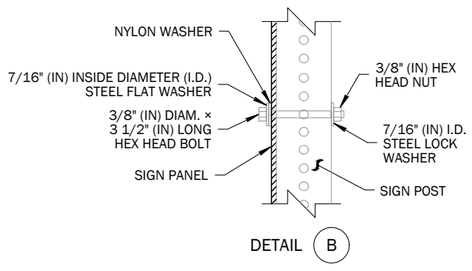
ELEVATION

TYPE ST-3 SIGN SUPPORT

BURIED DEPTH	POST SIZE
2' - 6"	2", 2 1/4"
3' - 0"	2 1/2"







STEEL SIGN SUPPORT
TYPES ST-3
INSTALLATION DETAILS

TYPE 1 AND TYPE 2 SIGN SUPPORT DETAIL 1
SCALE: NOT TO SCALE 8

NOTES

1. DIMENSIONS FOR THE PARTS USED TO ASSEMBLE THE BASE CONNECTIONS ARE INTENTIONALLY NOT SHOWN. BASE CONNECTIONS ARE PATENTED, MANUFACTURED PRODUCTS THAT ARE IN COMPLIANCE WITH NCHRP 350 CRASH TEST CRITERIA. THE BASE CONNECTION DETAILS ARE SHOWN ON THIS PLAN ONLY TO ILLUSTRATE HOW THE PARTS ARE ASSEMBLED.
2. FOR "**H1**", REFER TO THE SIGN SPECIFICATION SHEET IN THE CONTRACT.
3. A 2" (IN) POST WITH A 2 1/4" (IN) PSST ANCHOR OR A 2 1/4" (IN) POST WITH A 2 1/2" (IN) PSST ANCHOR MAY BE SUBSTITUTED. SEE CONTRACT PLANS.
4. PERFORATED SQUARE STEEL POST SHALL MEET THE REQUIREMENTS OF **STANDARD SPECIFICATION, SECTION 9-06**.
5. USE ONLY BASE CONNECTION MANUFACTURER SUPPLIED HARDWARE THAT MEETS THE REQUIREMENTS OF **STANDARD SPECIFICATION**, **SECTIONS 9-06** AND **9-28**.
6. ALL NEW SIGNS SHALL BE MANUFACTURED WITH THE SAME MATERIALS, DESIGN LAYOUT AND COLOR SCHEMES AS THE EXISTING SIGNS AT THE MAIN SADDLE ROCK TRAILHEAD. FINAL NEW SIGN DESIGN WILL BE REVIEWED AND APPROVED BY THE CITY OF WENATCHEE AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, PRIOR TO NEW SIGN MANUFACTURING AND INSTALLATION.

WARNING!
(ADVERTENCIA!)

HIGH CONCENTRATIONS OF NATURALLY OCCURRING ARSENIC ARE PRESENT IN THE ROCK AND SOIL IN THIS AREA.
(ESTÁN PRESENTES ALTAS CONCENTRACIONES DE ARSÉNICO NATURALMENTE EN LA ROCA Y EL SUELO DE ESTA ÁREA.)

REMOVE SOIL PARTICLES FROM CLOTHING BEFORE EXITING THE PARK AND WASH YOUR HANDS BEFORE CONSUMING FOOD OR DRINK.
(RETIRE LAS PARTÍCULAS DE SUELO DE LA ROPA ANTES DE SALIR DEL PARQUE Y LÁVESE LAS MANOS ANTES DE CONSUMIR ALIMENTOS O BEBIDAS.)

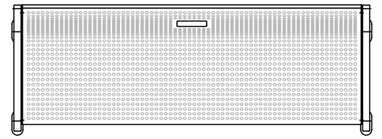
SIGN TYPE 1 DETAIL 2
SCALE: NOT TO SCALE 8

WARNING!
(ADVERTENCIA!)

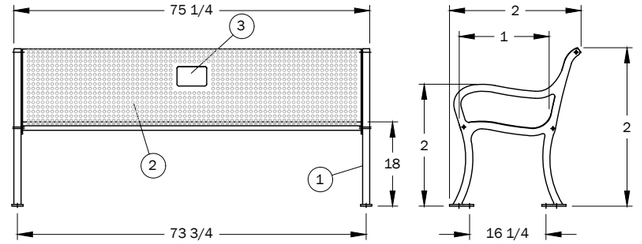
HIGH CONCENTRATIONS OF NATURALLY OCCURRING ARSENIC ARE PRESENT IN THE ROCK AND SOIL IN THIS AREA.
(ESTÁN PRESENTES ALTAS CONCENTRACIONES DE ARSÉNICO NATURALMENTE EN LA ROCA Y EL SUELO DE ESTA ÁREA.)

PLEASE STAY ON THE DESIGNATED TRAILS AND AVOID UNNECESSARY DISTURBANCE OF SITE VEGETATION.
(POR FAVOR MANTÉNGASE EN LOS SENDEROS DESIGNADOS Y EVITE LA PERTURBACIÓN INNECESARIA DE LA VEGETACIÓN DEL LUGAR.)

SIGN TYPE 2 DETAIL 3
SCALE: NOT TO SCALE 8



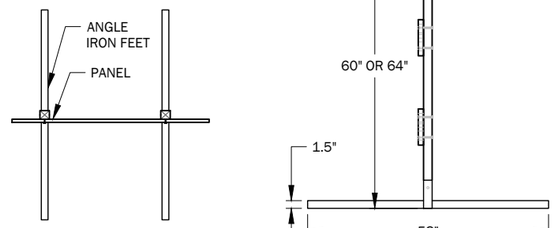
3	1	PLAQUE	7167
2	1	SEAT	8226
1	2	LEG	4007

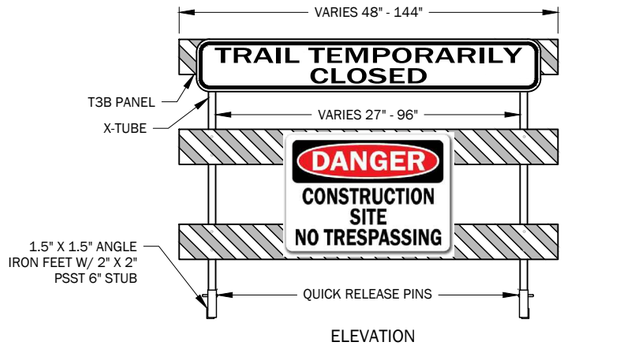


NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES AND PER ASME Y14.5M-1994.
2. DO NOT SCALE DRAWING.
3. ALL DIMENSIONS ARE AFTER PLASTISOL FINISH.

6' COURTYARD MEMORIAL - PERF BENCH DETAIL 4
SCALE: NOT TO SCALE 8





ELEVATION

TEMPORARY TRAIL CLOSURE SIGN DETAIL 5
SCALE: NOT TO SCALE 3

DRAFT SUBMITTAL - NOT FOR CONSTRUCTION

P:\4\4296008\CAD\02\IRA Phase II Prelim Design\R00\4296008O2_Sht_09_Details.dwg

Plotted: 12/18/2020, 09:01 | syi

NO.	DATE	BY	REVISION

GeoEngineers
523 E SECOND AVE : SPOKANE, WA 99202 : WWW.GEOENGINEERS.COM

JEDIDIAH R. SKOALEN — STATE OF WASHINGTON — 49941 — REGISTERED PROFESSIONAL ENGINEER

DRAFT INTERIM REMOVAL ACTION, PHASE 2
SADDLE ROCK PARK
WENATCHEE, WASHINGTON

DETAILS

DRAWN:	SCY	PROJ NO:	4296-008-02
DESIGN:	JRS	SHEET	9 OF 9
CHECKED:	NER	DATE:	12.18.20
DRAWING NO			9

APPENDICES

GeoEngineers

APPENDIX A

Technical Memorandum: Phase 2 Saddle Rock Interim Remedial Action, Bare Soils Investigation Summary, August 2020

GeoEngineers

Memorandum

523 East Second Avenue, Spokane, Washington 99202, Telephone: 509.363.3125 www.geoengineers.com

To:	Charlotte Mitchell, City of Wenatchee
From:	Justin Orr, Nick Rohrbach, and Dustin Wasley, GeoEngineers, Inc.
Date:	August 20, 2020
File:	4296-008-02
Subject:	Technical Memorandum: Phase 2 Saddle Rock Interim Remedial Action, Bare Soils Investigation Summary, August 2020.

INTRODUCTION

This technical memorandum (memo) describes the 'bare soils investigation' activities (Task 1a of the Washington State Department of Ecology [Ecology] Agreed Order [AO] scope of work [SOW]) completed in support of the Phase 2 preliminary design tasks for the interim remedial action (IRA) at the Saddle Rock Natural Area (Site) located in Wenatchee, Washington as shown in Figure 1, Vicinity Map. The Site is divided into two areas, Phase 1 and Phase 2, containing eight waste rock piles (SR-01 through SR-08) from former prospecting and mining activities. The lower four waste rock piles (SR-01 through SR-03 and SR-08) were removed in 2019 as part of Phase 1 IRA. Phase 1 location 'SR-07' was determined to not require IRA-related activities as elevated concentrations of arsenic were documented immediately upslope from the shallow exploration 'cave' at this location, and the downslope area appeared to be naturally occurring (e.g., not a result of mining activities). (GeoEngineers 2020). Waste rock pile SR-05 is planned to be removed during Phase 2 of the IRA, via mass excavation and transport off-site to a permitted landfill, in 2021. The remaining Phase 2 waste rock piles (SR-04 and SR-06) were determined to pose a minimal threat to public health or are not associated with mining activities and will be left in place (Ecology 2020).

PURPOSE

The purpose of this memo and the recently completed field investigation was to assess arsenic in bare soils influenced by human activities (not including SR-05 waste rock) within the Phase 1 and Phase 2 areas.

SUMMARY OF FIELD ACTIVITIES

GeoEngineers completed a field screening survey of human influenced bare soils (existing trails, lookout points, resting points along trails) using a hand held x-ray fluorescence (XRF) instrument on August 6, 2020. "Bare soils" were defined as areas with no vegetative cover, not including rock outcrops and undisturbed scree slopes, where the lack of vegetative cover appeared to be likely attributable to human activities. The XRF field screening survey was completed in general accordance with the methods described in the amended Sampling and Analysis Plan (SAP) submitted to the City on February 20, 2019 and amended under Task 3 of the Phase 1 IRA scope of work (GeoEngineers 2019a). Sixty-six locations (BS-01 through BS-66) were surveyed to define the extent of arsenic in bare soil throughout the Site above the Washington State Model Toxics Control Act (MTCA) Method A unrestricted land use cleanup level (CUL) of 20 milligrams per kilogram (mg/kg) and the Site-specific background concentration of 95 mg/kg established in the Revised Technical Memorandum dated June 26, 2019 (GeoEngineers 2019b). In accordance with Ecology's AO SOW Task 1a, GeoEngineers only obtained surface soil measurements using the XRF, and did not obtain soil samples for laboratory analysis.

The following section summarizes XRF field screening methods and processing procedures for the bare soils assessment in accordance with the SAP (GeoEngineers 2019a).

XRF Field Screening

A total of 66 XRF samples (BS-01 through BS-66) were obtained at the approximate locations determined in the Ecology Technical Memorandum dated October 1, 2019 (Ecology 2019), Amendment No. A-01 to AO No. DE 15823 dated April 9, 2020 (Ecology 2020), and additional locations at the discretion of GeoEngineers personnel during field activities on August 6, 2020. XRF total arsenic concentrations ranged from below the limits of detection (LOD) of the XRF to 2,103 mg/kg. A statistical analysis of the XRF field screening survey results is provided Table 1 below[1].

TABLE 1. BARE SOILS XRF FIELD SCREENING SURVEY STATISTICAL ANALYSIS

Arsenic Concentration	Samples (n)	Min	Max	Mean	Median	SD
Less than 20 mg/kg	22	<2.3	19.4	9.0	8.6	5.5
20 to 95 mg/kg	25	20.3	94.4	49.8	44.3	22.9
Greater than 95 mg/kg	19	105.3	2,103	283.3	159.9	446.8
Overall (including BS-53)	66	<2.3	2,103	103.4	36.5	262.8
Overall (excluding BS-53)	65	<2.3	344	72.7	34.9	81.8

Notes: Min = minimum; Max = maximum; SD = standard deviation; Values are shown in mg/kg

A summary of the XRF field screening survey results is presented in Table 2, XRF Total Arsenic Concentration Summary Results and shown in Figure 2, Total Arsenic Concentrations with Isometric Contours. To further delineate total arsenic concentrations in the Phase 1 area, Figure 2 additionally includes mean total arsenic concentrations from waste rock piles SR-01 through SR-03 and SR-08, collected during Phase 1 IRA activities in 2019 (GeoEngineers 2020).

Field forms including daily field notes and XRF results are provided in Attachment A. The raw XRF output files are provided in Attachment B.

SAMPLING AND ANALYSIS PLAN DEVIATIONS

XRF field duplicates were not collected during this event in accordance with the SAP and amendments. No other deviations from the approved SAP occurred during field activities.

CONCLUSIONS

Results of the bare soils XRF field screening survey identified a mean total arsenic concentration of 103.4 mg/kg, with a range of concentrations from below the LOD of the XRF to 2,103 mg/kg. However, sample BS-53 (2,103 mg/kg) is an order of magnitude greater than other readings collected at nearby locations during the survey and likely represents an isolated area of extreme hydrothermally altered mineralization in the bare soil and/or rock. When sample BS-53 is excluded from the statistical analysis, the mean total arsenic

[1]The maximum concentration of 2,103 mg/kg, collected at the BS-53 location, was an order of magnitude greater than other readings collected at nearby locations and likely represents an area of extreme hydrothermally altered mineralization. Table 1 presents statistical analyses including and excluding sample BS-53, as the elevated concentration represents a possible outlier for the data collected.

concentration is 72.7 mg/kg with a range of concentrations from below the LOD of the XRF to 344 mg/kg. Total arsenic concentrations in approximately 28 percent of the samples were greater than the Site-specific CUL of 95 mg/kg, 38 percent contained total arsenic concentrations between the MTCA Method A CUL of 20 mg/kg and 95 mg/kg and 34 percent contained total arsenic concentrations of less than 20 mg/kg,

In general, XRF samples with arsenic concentrations greater than 95 mg/kg were limited to the northwest and eastern portions of the Site. Arsenic concentrations in the central and southwest portions of the site were generally between 20 mg/kg and 95 mg/kg. The northern, northeast and southeast portions of the Site generally did not contain samples with arsenic concentrations greater than 20 mg/kg.

Based on the results of this bare soils investigation, GeoEngineers will assess potential mitigation measures to address elevated arsenic concentrations in bare soils impacted by human activities in the Phase 1 and Phase 2 areas and prepare a Mitigation Measures Assessment Report detailing mitigation options for the Site.

Please do not hesitate to reach out to discuss the results presented above, and we look forward to continuing to support this project for the City.

REFERENCES

Ecology, 2019. Technical Memorandum, Gold Knob Prospects Site (aka Saddle Rock Park), Phase 2 Interim Remedial Action Approach. October 1, 2019.

Ecology, 2020. Amendment No. A-01 to Agreed Order No. DE 15823, Gold Knob Prospects aka Saddle Rock Park, Wenatchee, Washington. April 9, 2020.

GeoEngineers, 2019a. Sampling and Analysis Plan Interim Remedial Action Design and Remedial Action, Saddle Rock Natural Area, Wenatchee, Washington. February 20, 2019.

GeoEngineers, 2019b. Revised Technical Memorandum for Saddle Rock Interim Remedial Action Field Sampling Summary: April 2019. Saddle Rock Natural Area. Wenatchee, Washington. June 26, 2019.

GeoEngineers, 2020. Interim Remedial Action Report, Saddle Rock Natural Area, Phase 1 Construction Project, Wenatchee, Washington. February 19, 2020.

Attachments:
Table 2. XRF Total Arsenic Concentration Summary Results
Figure 1. Vicinity Map
Figures 2. Total Arsenic Concentrations with Isometric Contours
Attachment A. Field Forms
Attachment B. Raw XRF Output Files

Table 2

XRF Total Arsenic Concentration Summary Results

Saddle Rock Interim Remedial Action Project

Wenatchee, Washington

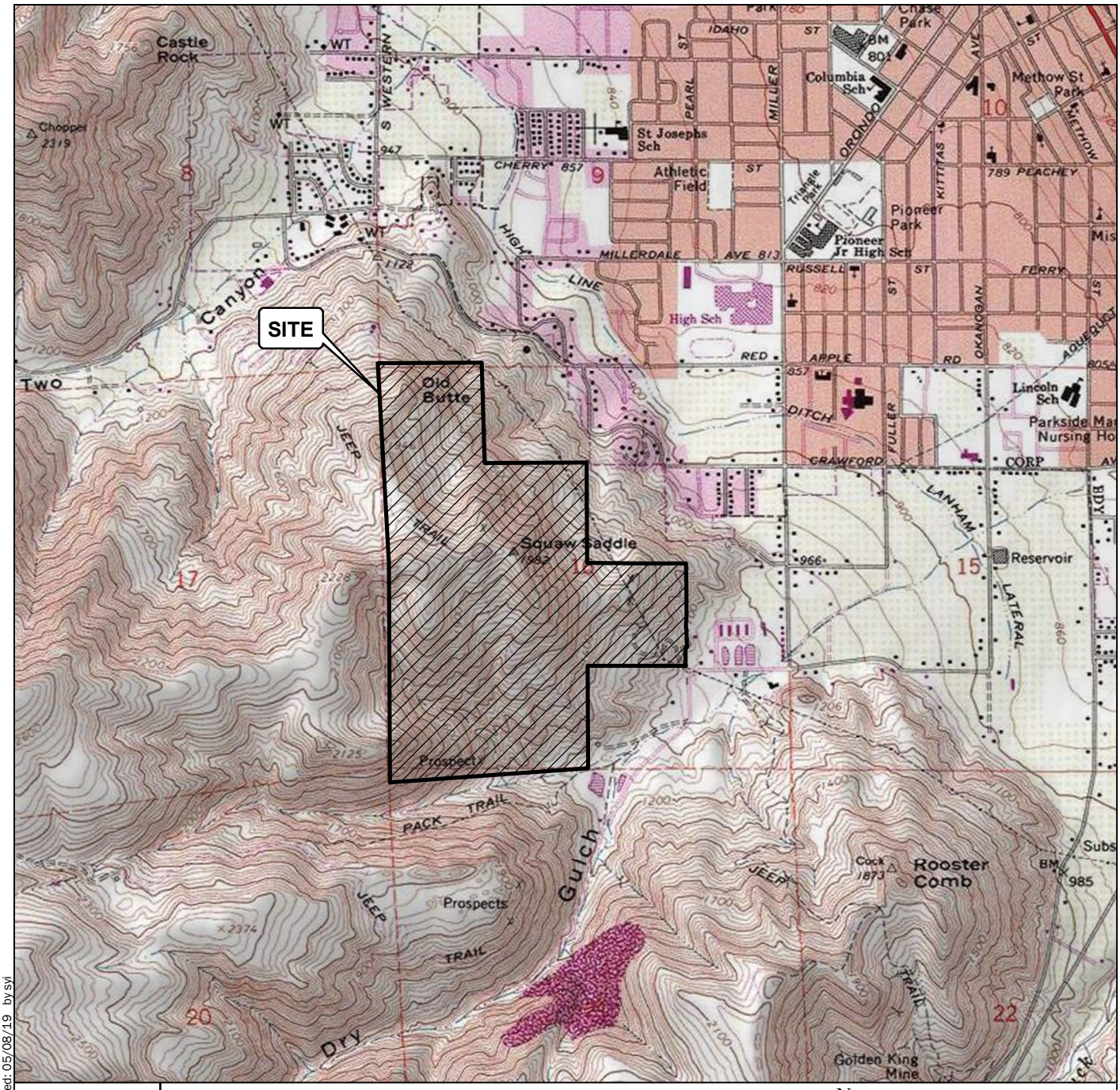
Sample Identification	Date	Time	Arsenic Concentration (mg/kg)	Final Sample Location Comments
BS-01	8/6/2020	6:54:53	10.4	main trail head
BS-02	8/6/2020	7:00:20	17.8	main trail
BS-03	8/6/2020	7:03:39	15.5	main trail
BS-04	8/6/2020	7:07:54	156.8	park dedication/rest area
BS-05	8/6/2020	7:10:38	28.2	main trail
BS-06	8/6/2020	7:13:35	31.9	main trail
BS-07	8/6/2020	7:17:20	25.4	side trail
BS-08	8/6/2020	7:21:30	53.4	side trail
BS-09	8/6/2020	7:23:44	28.3	bare rock, side trail
BS-10	8/6/2020	7:25:34	72.9	side trail
BS-11	8/6/2020	7:28:37	4.1	side trail
BS-12	8/6/2020	7:32:13	21.8	side trail
BS-13	8/6/2020	7:38:04	20.3	side trail
BS-14	8/6/2020	7:41:51	28.6	side trail
BS-15	8/6/2020	7:46:47	130.6	main trail
BS-16	8/6/2020	7:50:05	17.9	main trail
BS-17	8/6/2020	7:55:16	6.7	main trail
BS-18	8/6/2020	7:58:01	3.2	main trail
BS-19	8/6/2020	8:00:50	9.7	main trail
BS-20	8/6/2020	8:03:42	15.1	main trail
BS-21	8/6/2020	8:06:38	8.1	main trail
BS-22	8/6/2020	8:18:41	0	ND <2.3, view point
BS-23	8/6/2020	8:24:50	9.0	side trail
BS-24	8/6/2020	8:29:16	46.5	side trail
BS-25	8/6/2020	8:31:59	139.4	side trail
BS-26	8/6/2020	8:34:49	192	side trail
BS-27	8/6/2020	8:37:35	178	side trail
BS-28	8/6/2020	8:41:52	94.4	main trail
BS-29	8/6/2020	8:45:24	34.9	main trail
BS-30	8/6/2020	8:49:35	33.4	main trail
BS-31	8/6/2020	8:53:54	6.0	main trail
BS-32	8/6/2020	8:57:38	12.3	main trail
BS-33	8/6/2020	9:02:01	10.3	main trail
BS-34	8/6/2020	9:07:22	34.9	main trail
BS-35	8/6/2020	9:12:52	32.2	main trail, rest area
BS-36	8/6/2020	9:16:53	68.5	main trail
BS-37	8/6/2020	9:21:13	83.5	main trail
BS-38	8/6/2020	9:30:32	80.9	main trali
BS-39	8/6/2020	9:33:38	38.0	main trail, rest area
BS-40	8/6/2020	9:37:17	152.2	main trail
BS-41	8/6/2020	9:41:01	71.5	main trail
BS-42	8/6/2020	9:44:01	73.3	main trail
BS-43	8/6/2020	9:47:31	124.1	side trail
BS-44	8/6/2020	9:52:00	19.4	side trail

Sample Identification	Date	Time	Arsenic Concentration (mg/kg)	Final Sample Location Comments
BS-45	8/6/2020	9:58:33	11.1	ridgeline trail
BS-46	8/6/2020	10:02:02	2.8	ridgeline trail
BS-47	8/6/2020	10:06:38	3.5	bare rock, view point
BS-48	8/6/2020	10:21:15	4.9	bare rock, view point
BS-49	8/6/2020	10:23:16	4.4	bare rock, view point
BS-50	8/6/2020	10:26:08	6.6	ridgeline trail
BS-51	8/6/2020	10:30:12	44.3	ridgeline trail
BS-52	8/6/2020	10:33:45	105.3	ridgeline trail
BS-53	8/6/2020	11:15:14	2103	ridgeline trail, rest area
BS-54	8/6/2020	11:18:29	310	view point, rest area
BS-55	8/6/2020	11:23:33	168.7	side trail, view point
BS-56	8/6/2020	11:29:03	49.6	main trail
BS-57	8/6/2020	11:31:47	159.9	main trail
BS-58	8/6/2020	11:35:24	311	main trail
BS-59	8/6/2020	11:38:22	62.9	main trail
BS-60	8/6/2020	11:41:40	84.8	side trail
BS-61	8/6/2020	11:44:44	128.9	main trail
BS-62	8/6/2020	11:49:37	344	main trail
BS-63	8/6/2020	12:14:27	280	main trail
BS-64	8/6/2020	12:17:33	121.1	side trail
BS-65	8/6/2020	12:20:05	170.2	main trail
BS-66	8/6/2020	12:22:42	106.9	main trail

Notes

XRF = x-ray fluorescence

mg/kg = milligram per kilogram



Notes:

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

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 1

P:\4\4296008\GIS\MXD\429600800_T200_F01_Vicinity Map.mxd Date Exported: 05/08/19 by syi

P:\4\4296008\GIS\MXD\4296008OO_FOX_Arsenic_ISOContour.mxd Date Exported: 08/12/20 by ccabrera

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Mean total arsenic concentrations at waste rock piles from confirmation XRF samples during Phase I IRA activities

Data Source: ESRI World Imagery.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- XRF Number, (Arsenic Concentration in mg/kg) and Approximate Location
- Waste Rock Pile Number, (Mean Arsenic Concentration in mg/kg) and Approximate Location
- MTCA Method A Clean Up Level (<20 mg/kg)
- Site Specific Background Concentration (<95 mg/kg)

N W E S

275 0 275

Feet

Total Arsenic Concentrations with Isometric Contours

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 2

ATTACHMENT A
Field Forms

GeoEngineers

523 East 2nd Avenue
Spokane, WA 99202
509.363.3125

Field Report

File Number:	
4296-008-02	

Project:		Date:
Saddle Rock Phase 2 IRA		08/06/2020
Owner:	**Time of Arrival:**	**Report Number:**
City of Wenatchee	06:30am	002
Prepared by:	**Location:**	**Time of Departure:**	**Page:**
J. Orr	Wenatchee, WA	12:45pm	1 of 1
Purpose of visit:	**Weather:**	**Travel Time:**	**Permit Number:**
Bare Soils Assessment for Task 1A	Mostly cloudy, 80°F	15 minutes	N/A

Upon arrival to the site I assessed personal safety hazards: ☒ Yes or ☒ Referred to Site Safety Plan and Safety Tailgate if applicable

Safety Hazards Were Addressed by : ☒ Staying Alert to Construction and Equipment Hazards ☐ Other (describe)

Objectives

Today, Nick Rohrbach (GeoEngineers, Inc. [GEI] project manager) and I (Justin Orr, GEI staff geologist) visited site at the request of the City of Wenatchee (City) to further delineate arsenic concentrations in bare soils using X-ray fluorescence (XRF), as requested by the Washington State Department of Ecology (Ecology) and outlined in Task 1a of the Phase 2 assessment work. Charlotte Mitchell (City Project Manager) was onsite in the morning to observe bare soils sampling activities.

Health and Safety

Before beginning work activities, Nick led a tailgate meeting to discuss specific site safety concerns and general safety observations. Safety discussion topics are presented in the site-specific health and safety plan (HASP), job-hazard assessment (JHA) and COVID-19 JHA.

Bare Soils Assessment

Prior to initiating field work, the hand held XRF was checked for proper calibration following manufacturer's guidelines. The XRF indicated that calibration was completed with no errors.

GEI completed 66 bare soil assessment readings (BS-01 through BS-66) within the Phase 1 and 2 interim remediation action areas, using 90-second XRF tests. XRF sampling procedures were completed in general accordance with GEI's February 2019 Sampling and Analysis Plan, with the exception of one task. No in-field duplicates were collected during this field effort. Test locations were determined by Ecology and GEI to best represent the bare-soil areas where the public is likely to walk, stop, sit etc. The test locations and results were added to GEI's Collector internet application in the field using a smartphone and documented in the project field notebook. A GPS location was also documented for each XRF sampling 'shot'.

Discussion with Ecology

After completing the XRF soil assessment, GEI called Frank Winslow with Ecology to discuss sample locations and the sufficiency of aerial coverage. Frank and GEI concurred that the XRF sample coverage was adequate to fulfill the requirements of Task 1a.

XRF Troubleshooting

While performing tests BS-45 and BS-46, the XRF reported an error "Ambient pressure out of range." After clearing the error message, restarting the XRF power and changing the battery, we called Matt Houser with Field Environmental Instruments, Inc. (FEI) to discuss the error. He instructed us on how to reset the internal barometer. Matt also indicated that weather changes can affect this particular sensor within the XRF (a rain and wind event moved into the site towards the end of sampling activities in the field) and does not affect sample accuracy. After the reset and check of the internal barometer, field XRF 'shots' continued and reported arsenic concentrations were within expected orders of magnitude, depending the bare soil locations (known estimated arsenic concentrations collected during previous field events).

☐ **THIS FIELD REPORT IS PRELIMINARY** A preliminary report is provided solely as evidence that field observation was performed. Observations and/or conclusions and/or recommendations conveyed in the final report may vary from and shall take precedence over those indicated in a preliminary report.	**FIELD REPRESENTATIVE** Justin Orr	**DATE** 8/06/20
☐ **THIS FIELD REPORT IS FINAL** A final report is an instrument of professional service. Any conclusions drawn from this report should be discussed with and evaluated by the professional involved.	**REVIEWED BY**	**DATE**

Attachments:

Distribution:

Summary

Today, Nick Rohrbach and I completed the bare soils assessment described in Task 1a by collecting 66 bare soil assessment readings using the XRF. We began activities at 06:30 am and completed the assessment and departed site at approximately 12:45 pm.

8/6/2020 Bare Soils Assessment

Objectives: complete bare soils assessment (Task 1a)

weather: sunny, then cloudy/rain, 79°F

0630 JDO + NER onsite; review JHA + HASP

0654 begin XRF assessment (see XRF Table) at trailhead

0720 Charlotte Mitchell (City PM) onsite to observe assessment work

0730 Charlotte offsite

0956 XRF has error message: "Ambient Pressure out of Range Y/N." We restart XRF & replace battery

1030 call Matt Hauser (FEI rep) to discuss XRF alert. He instructs how to reset internal barometer & indicates Δ in weather can affect XRF baro. If readings are ~ as expected, he says this error doesn't affect sample accuracy. We continue assessment

1142 Call Frank Winslow (Ecology PM) to discuss sample loc. & coverage. He concurs coverage/locations adequate for task 1a

1221 complete bare soil readings & return to trailhead

1245 JDO + NER offsite

(AR)

90 SEC SHOTS

Point	XRF	+/-	time	NOTES
BS01	10.4	1.1	6:54 AM	(AT TRAILHEAD SIGN)
BS02	17.8	0.8	6:57	
BS03	15.5	0.9	7:01	
BS04	156.8	1.7	7:05	
BS05	28.2	1.0	7:08	
BS06	31.9	1.0	7:11	
BS07	25.4	1.1	7:14	
BS08	53.4	1.4	7:19	DIRT (ROCK OUTCROP TOP)
BS09	28.3	0.9	7:21	ROCK
BS10	72.9	1.3	7:24	
BS11	4.1	0.7	7:29	
BS12	21.8	1.0	7:36	
BS13	20.3	0.9	7:39	
BS14	28.6	1.1	7:45	
BS15	130.6	1.8	7:48	
BS16	17.9	0.8	7:53	
BS17	6.7	0.9	7:54	
BS18	3.2	0.6	7:58	
BS19	9.7	0.7	8:01	
BS20	15.1	0.8	8:04	

POINT	XRF	+/-	TIME	NOTES
BS21	8.1	0.7	8:16 AM	
BS22	<2.3	—	8:19	
BS23	9.0	0.9	8:23	
BS24	46.5	1.1	8:28	
BS25	139.4	1.8	8:30	
BS26	192	2	8:32	
BS 27	178	2	8:35	
BS 28	94.4	1.6	8:40	
BS 29	34.9	1.0	8:42	
BS 30	33.4	1.1	8:47	SR02 JUNC.
BS 31	6.0	0.8	8:51	
BS 32	12.3	0.8	8:57	
BS 33	10.3	0.7	9:00	
BS 34	34.9	1.1	9:05	
BS 35	32.2	1.0	9:11	
BS 36	68.5	1.3	9:15	
BS 37	83.5	1.6	9:18	
BS 38	80.9	1.3	9:28	
BS 39	38.0	1.0	9:31	
BS 40	152.2	1.8	9:35	BOT. SR-06
BS 41	71.5	1.5	9:39	
BS 42	73.3	1.3	9:42	
BS 43	124.1	1.7	9:45	

Rite in the Rain.

Point	XRF	+/-	Time	Notes
BS44	19.4	0.9	9:50 AM	
BS45	11.1	0.8	9:56	— (Amb. Alert start)
BS46	2.8	0.6	9:59	
BS47	3.5	0.9	10:04	Bare rock
BS48	4.9	0.7	10:19	" " /dirt
BS49	4.4	0.8		→ Bare rock test
BS50	6.6	0.8	10:24	
BS51	44.3	1.1	10:28	
BS52	105.3	1.1	10:32	
BS53	2103	8		Benches (WINDY)
BS54	310	3	11:12	
BS55	168.7	2.0	11:16	
BS56	49.6	1.2	11:21	
BS57	159.9	1.8	11:27	
BS58	311	2	11:30	
BS59	62.9	1.2	11:33	
BS60	84.8	1.5	11:36	
BS61	128.9	1.7	11:39	
BS62	344.	3	11:42	— call Frank W.
BS63	280	2	11:47	
BS64	121.1	1.6	12:13	
BS65	170.2	1.9	12:16	called FBL, did bad check
BS66	106.9	1.6	12:18	
			12:21	

* Ambient pressure noted

Rite in the Rain

ATTACHMENT B
Raw XRF Output Files

Date	Time	Reading	Mode	Elapsed Tir	Elapsed Tir	Elapsed Tir	Zn	Zn +/-	Pd	Pd +/-	Cd	Cd +/-	Pass/Fail	Pass/Fail G	Pass/Fail IV	Pass/Fail C	Best Match	Best Match	2nd Match	2nd Match	Live Time 1	Live Time 2	Live Time T	Instrument	Model	Tube Anod	Unit
8/5/2020	10:33:57	#1	Cal Check	14.89		14.89									0	0			0	0	13.21		13.21	544217	Delta Profe	Rh	%
Date	Time	Reading	Mode	Elapsed Tir	Elapsed Tir	Elapsed Tir	Zn	Zn +/-	Pd	Pd +/-	Cd	Cd +/-	Pass/Fail	Pass/Fail G	Pass/Fail IV	Pass/Fail C	Best Match	Best Match	2nd Match	2nd Match	Live Time 1	Live Time 2	Live Time T	Instrument	Model	Tube Anod	Unit
8/6/2020	6:46:17	#1	Cal Check	14.88		14.88									0	0			0	0	13.15		13.15	544217	Delta Profe	Rh	%
8/6/2020	6:54:53	#2	Soil	44.45		44.45	40	2			ND		PASS						0	0	40.85		40.85	544217	Delta Profe	Rh	PPM
8/6/2020	7:00:20	#3	Soil	88.81		88.81	41.2	1.5			ND		PASS						0	0	81.18		81.18	544217	Delta Profe	Rh	PPM
8/6/2020	7:03:39	#4	Soil	88.99		88.99	39.4	1.6			ND		PASS						0	0	82.21		82.21	544217	Delta Profe	Rh	PPM
8/6/2020	7:07:54	#5	Soil	88.89		88.89	15.8	1.2			ND		PASS						0	0	81.7		81.7	544217	Delta Profe	Rh	PPM
8/6/2020	7:10:38	#6	Soil	88.95		88.95	44.6	1.6			ND		PASS						0	0	82.07		82.07	544217	Delta Profe	Rh	PPM
8/6/2020	7:13:35	#7	Soil	89		89	32.7	1.5				16	5 PASS						0	0	82.25		82.25	544217	Delta Profe	Rh	PPM
8/6/2020	7:15:42	#8	Soil	23.57		23.57	60	4			ND		PASS						0	0	21.99		21.99	544217	Delta Profe	Rh	PPM
8/6/2020	7:17:20	#9	Soil	88.92		88.92	55.7	1.7			ND		PASS						0	0	81.78		81.78	544217	Delta Profe	Rh	PPM
8/6/2020	7:19:56	#10	Soil	6.77		6.77	93	8			ND		PASS						0	0	6.28		6.28	544217	Delta Profe	Rh	PPM
8/6/2020	7:21:30	#11	Soil	89.16		89.16	74	2			ND		PASS						0	0	83.1		83.1	544217	Delta Profe	Rh	PPM
8/6/2020	7:23:44	#12	Soil	88.77		88.77	33.7	1.3				17	5 PASS						0	0	81.07		81.07	544217	Delta Profe	Rh	PPM
8/6/2020	7:24:52	#13	Analysis Results										PASS						0	0				544217	Delta Profe	Rh	%
8/6/2020	7:25:34	#14	Soil	35.3		35.3	24.1	1.9			ND		PASS						0	0	32.16		32.16	544217	Delta Profe	Rh	PPM
8/6/2020	7:26:06	#15	Soil	29.29		29.29	24	2			ND		PASS						0	0	26.71		26.71	544217	Delta Profe	Rh	PPM
8/6/2020	7:27:03	#16	Soil	53.54		53.54	24.5	1.6			ND		PASS						0	0	48.82		48.82	544217	Delta Profe	Rh	PPM
8/6/2020	7:28:37	#17	Soil	88.85		88.85	24.4	1.3			ND		PASS						0	0	81.29		81.29	544217	Delta Profe	Rh	PPM
8/6/2020	7:30:40	#18	Soil	48.63		48.63	44	2			ND		PASS						0	0	44.29		44.29	544217	Delta Profe	Rh	PPM
8/6/2020	7:32:13	#19	Soil	88.79		88.79	44.6	1.6			ND		PASS						0	0	80.96		80.96	544217	Delta Profe	Rh	PPM
8/6/2020	7:38:04	#20	Soil	88.99		88.99	51.8	1.8			ND		PASS						0	0	82.04		82.04	544217	Delta Profe	Rh	PPM
8/6/2020	7:41:51	#21	Soil	89.07		89.07	32.2	1.5			ND		PASS						0	0	82.59		82.59	544217	Delta Profe	Rh	PPM
8/6/2020	7:46:47	#22	Soil	89.13		89.13	42.6	1.8			ND		PASS						0	0	82.89		82.89	544217	Delta Profe	Rh	PPM
8/6/2020	7:50:05	#23	Soil	89.02		89.02	33.5	1.6			ND		PASS						0	0	82.17		82.17	544217	Delta Profe	Rh	PPM
8/6/2020	7:53:38	#24	Soil	30.93		30.93	42	3			ND		PASS						0	0	28.4		28.4	544217	Delta Profe	Rh	PPM
8/6/2020	7:53:41	#25	Soil	0.34		0.34	ND				ND		PASS						0	0	0.31		0.31	544217	Delta Profe	Rh	PPM
8/6/2020	7:55:16	#26	Soil	88.93		88.93	43.6	1.5			ND		PASS						0	0	81.69		81.69	544217	Delta Profe	Rh	PPM
8/6/2020	7:58:01	#27	Soil	71.38		71.38	33	1.7			ND		PASS						0	0	66.07		66.07	544217	Delta Profe	Rh	PPM
8/6/2020	8:00:50	#28	Soil	88.82		88.82	25.1	1.3			ND		PASS						0	0	81.18		81.18	544217	Delta Profe	Rh	PPM
8/6/2020	8:03:42	#29	Soil	88.87		88.87	30.5	1.4			ND		PASS						0	0	81.45		81.45	544217	Delta Profe	Rh	PPM
8/6/2020	8:06:38	#30	Soil	88.88		88.88	42.9	1.5			ND		PASS						0	0	81.42		81.42	544217	Delta Profe	Rh	PPM
8/6/2020	8:18:41	#31	Soil	88.76		88.76	25.9	1.2			ND		PASS						0	0	80.83		80.83	544217	Delta Profe	Rh	PPM
8/6/2020	8:20:52	#32	Soil	78.82		78.82	38.4	1.7			ND		PASS						0	0	72.67		72.67	544217	Delta Profe	Rh	PPM
8/6/2020	8:24:50	#33	Soil	89.04		89.04	51.2	1.8			ND		PASS						0	0	82.33		82.33	544217	Delta Profe	Rh	PPM
8/6/2020	8:29:16	#35	Soil	88.98		88.98	18.1	1.3			ND		PASS						0	0	82.18		82.18	544217	Delta Profe	Rh	PPM
8/6/2020	8:31:59	#36	Soil	89.06		89.06	22.7	1.4			ND		PASS						0	0	82.43		82.43	544217	Delta Profe	Rh	PPM
8/6/2020	8:34:49	#37	Soil	89.16		89.16	18.4	1.4			ND		PASS						0	0	83.17		83.17	544217	Delta Profe	Rh	PPM
8/6/2020	8:37:35	#38	Soil	89.15		89.15	24.9	1.5				18	5 PASS						0	0	83.05		83.05	544217	Delta Profe	Rh	PPM
8/6/2020	8:41:52	#39	Soil	89.14		89.14	20.3	1.5			ND		PASS						0	0	83.01		83.01	544217	Delta Profe	Rh	PPM
8/6/2020	8:43:44	#40	Soil	26.24		26.24	41	3			ND		PASS						0	0	24.27		24.27	544217	Delta Profe	Rh	PPM
8/6/2020	8:43:49	#41	Soil	0.88		0.88	57	18			ND		PASS						0	0	0.81		0.81	544217	Delta Profe	Rh	PPM
8/6/2020	8:45:24	#42	Soil	88.85		88.85	47.3	1.6			ND		PASS						0	0	81.24		81.24	544217	Delta Profe	Rh	PPM
8/6/2020	8:48:01	#43	Soil	33.09		33.09	31	2			ND		PASS						0	0	30.47		30.47	544217	Delta Profe	Rh	PPM
8/6/2020	8:49:35	#44	Soil	89.01		89.01	38.3	1.6			ND		PASS						0	0	82.19		82.19	544217	Delta Profe	Rh	PPM
8/6/2020	8:53:54	#45	Soil	89.1		89.1	40.6	1.7			ND		PASS						0	0	82.69		82.69	544217	Delta Profe	Rh	PPM
8/6/2020	8:57:38	#46	Soil	89.03		89.03	34.7	1.6			ND		PASS						0	0	82.23		82.23	544217	Delta Profe	Rh	PPM
8/6/2020	9:02:01	#47	Soil	88.92		88.92	29	1.4			ND		PASS						0	0	81.7		81.7	544217	Delta Profe	Rh	PPM
8/6/2020	9:07:22	#48	Soil	89.06		89.06	41.2	1.7			ND		PASS						0	0	82.47		82.47	544217	Delta Profe	Rh	PPM
8/6/2020	9:12:52	#49	Soil	89		89	45.2	1.7			ND		PASS						0	0	82.05		82.05	544217	Delta Profe	Rh	PPM
8/6/2020	9:16:53	#50	Soil	88.98		88.98	37.7	1.6			ND		PASS						0	0	82.02		82.02	544217	Delta Profe	Rh	PPM
8/6/2020	9:21:13	#51	Soil	89.18		89.18	53.6	2			ND		PASS						0	0	83.12		83.12	544217	Delta Profe	Rh	PPM
8/6/2020	9:30:32	#52	Soil	88.83		88.83	33	1.4			ND		PASS						0	0	81.22		81.22	544217	Delta Profe	Rh	PPM
8/6/2020	9:33:38	#53	Soil	88.95		88.95	30.5	1.4			ND		PASS						0	0	81.81		81.81	544217	Delta Profe	Rh	PPM
8/6/2020	9:37:17	#54	Soil	88.97		88.97	40.4	1.6				22	5 PASS						0	0	81.97		81.97	544217	Delta Profe	Rh	PPM
8/6/2020	9:41:01	#55	Soil	89.23		89.23	35	1.7			ND		PASS						0	0	83.41		83.41	544217	Delta Profe	Rh	PPM
8/6/2020	9:44:01	#56	Soil	88.91		88.91	26.3	1.3			ND		PASS						0	0	81.61		81.61	544217	Delta Profe	Rh	PPM
8/6/2020	9:47:31	#57	Soil	89.04		89.04	21.6	1.4			ND		PASS						0	0	82.34		82.34	544217	Delta Profe	Rh	PPM
8/6/2020	9:52:00	#58	Soil	88.96		88.96	42.7	1.6			ND		PASS						0	0	81.83		81.83	544217	Delta Profe	Rh	PPM
8/6/2020	9:54:42	#59	Analysis Results										PASS						0	0				544217	Delta Profe	Rh	%

Date	Time	Reading	Mode	Elapsed Tir	Elapsed Tir	Elapsed Tir	Zn	Zn +/-	Pd	Pd +/-	Cd	Cd +/-	Pass/Fail	Pass/Fail G	Pass/Fail M	Pass/Fail C	Best Match	Best Match	2nd Match	2nd Match	Live Time 1	Live Time 2	Live Time T	Instrument	Model	Tube Anod	Unit
8/5/2020	10:33:57	#1	Cal Check	14.89		14.89										0	0		0	0	13.21		13.21	544217	Delta Profe	Rh	%
Date	Time	Reading	Mode	Elapsed Tir	Elapsed Tir	Elapsed Tir	Zn	Zn +/-	Pd	Pd +/-	Cd	Cd +/-	Pass/Fail	Pass/Fail G	Pass/Fail M	Pass/Fail C	Best Match	Best Match	2nd Match	2nd Match	Live Time 1	Live Time 2	Live Time T	Instrument	Model	Tube Anod	Unit
8/6/2020	9:54:47	#60	Analysis Results										PASS						0	0				544217	Delta Profe	Rh	%
8/6/2020	9:58:33	#61	Soil	88.91		88.91	54.2	1.7			ND		PASS						0	0	81.55		81.55	544217	Delta Profe	Rh	PPM
8/6/2020	10:02:02	#62	Soil	88.72		88.72	41	1.4			ND		PASS						0	0	80.52		80.52	544217	Delta Profe	Rh	PPM
8/6/2020	10:05:00	#63	Soil	50.95		50.95	61	3			ND		PASS						0	0	47.23		47.23	544217	Delta Profe	Rh	PPM
8/6/2020	10:05:03	#64	Analysis Results										PASS						0	0				544217	Delta Profe	Rh	%
8/6/2020	10:06:38	#65	Soil	89.11		89.11	58.2	1.9			ND		PASS						0	0	82.76		82.76	544217	Delta Profe	Rh	PPM
8/6/2020	10:21:15	#66	Soil	88.86		88.86	54.9	1.7			ND		PASS						0	0	81.28		81.28	544217	Delta Profe	Rh	PPM
8/6/2020	10:23:16	#67	Soil	89.1		89.1	70	2			ND		PASS						0	0	82.64		82.64	544217	Delta Profe	Rh	PPM
8/6/2020	10:26:08	#68	Soil	88.77		88.77	49.2	1.5			ND		PASS						0	0	80.82		80.82	544217	Delta Profe	Rh	PPM
8/6/2020	10:30:12	#69	Soil	89.02		89.02	38.8	1.6			ND		PASS						0	0	82.24		82.24	544217	Delta Profe	Rh	PPM
8/6/2020	10:33:45	#70	Soil	88.89		88.89	49.6	1.6			ND		PASS						0	0	81.51		81.51	544217	Delta Profe	Rh	PPM
8/6/2020	11:15:14	#71	Soil	88.71		88.71	12.1	1.2			ND		PASS						0	0	80.35		80.35	544217	Delta Profe	Rh	PPM
8/6/2020	11:18:29	#72	Soil	89.09		89.09	47.3	1.8			ND		PASS						0	0	82.61		82.61	544217	Delta Profe	Rh	PPM
8/6/2020	11:23:33	#73	Soil	89.08		89.08	63.2	1.9			ND		PASS						0	0	82.6		82.6	544217	Delta Profe	Rh	PPM
8/6/2020	11:25:14	#74	Analysis Results										PASS						0	0				544217	Delta Profe	Rh	%
8/6/2020	11:29:03	#75	Soil	89.01		89.01	48.6	1.7			ND		PASS						0	0	82.15		82.15	544217	Delta Profe	Rh	PPM
8/6/2020	11:31:47	#76	Soil	88.86		88.86	42.8	1.5			ND		PASS						0	0	81.37		81.37	544217	Delta Profe	Rh	PPM
8/6/2020	11:35:24	#77	Soil	88.92		88.92	31.1	1.4			ND		PASS						0	0	81.73		81.73	544217	Delta Profe	Rh	PPM
8/6/2020	11:38:22	#78	Soil	88.93		88.93	45.4	1.6			ND		PASS						0	0	81.74		81.74	544217	Delta Profe	Rh	PPM
8/6/2020	11:41:40	#79	Soil	89.02		89.02	45.7	1.7			ND		PASS						0	0	82.27		82.27	544217	Delta Profe	Rh	PPM
8/6/2020	11:43:10	#80	Analysis Results										PASS						0	0				544217	Delta Profe	Rh	%
8/6/2020	11:44:44	#81	Soil	88.98		88.98	37.5	1.5			ND		PASS						0	0	82.02		82.02	544217	Delta Profe	Rh	PPM
8/6/2020	11:49:37	#82	Soil	88.93		88.93	35.9	1.5			ND		PASS						0	0	81.72		81.72	544217	Delta Profe	Rh	PPM
8/6/2020	12:14:27	#83	Soil	88.85		88.85	36.9	1.5			ND		PASS						0	0	81.28		81.28	544217	Delta Profe	Rh	PPM
8/6/2020	12:17:33	#84	Soil	88.96		88.96	34	1.4			ND		PASS						0	0	81.93		81.93	544217	Delta Profe	Rh	PPM
8/6/2020	12:20:05	#85	Soil	88.93		88.93	43.5	1.6			ND		PASS						0	0	81.74		81.74	544217	Delta Profe	Rh	PPM
8/6/2020	12:22:42	#86	Soil	77.83		77.83	22.4	1.4			ND		PASS						0	0	71.6		71.6	544217	Delta Profe	Rh	PPM

Date	Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8	LBP Result	LPB Concer	LPB Error																
8/5/2020																											
Date	Point-Dept	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8	LBP Result	LPB Concer	LPB Error	Ti		Ti +/-	Cr		Cr +/-	Mn		Mn +/-	Fe		Fe +/-	Co		Co +/-	Ni		Ni +/-
8/6/2020																											
8/6/2020	732-01												1434	103	ND			348		14	15572		92	ND			ND		
8/6/2020	732-01												1336	70	ND			280		9	15989		64	ND			ND		
8/6/2020	732-01												1299	72	ND			163		8	12389		57	ND			ND		
8/6/2020	732-01												859	64	ND			78		7	9473		45	ND			ND		
8/6/2020	732-01												1389	74	ND			208		9	14982		66	ND			ND		
8/6/2020	732-01												1279	75	ND			206		9	13683		62	ND			ND		
8/6/2020	732-01												1274	152	ND			466		24	12200		117	ND			ND		
8/6/2020	732-01												1035	64	ND			494		11	11343		51	ND			ND		
8/6/2020	732-01												1668	298	ND			709		53	18254		288	ND			ND		
8/6/2020	732-01												1400	83	ND			578		14	16137		76	ND			ND		
8/6/2020	732-01												624	55	ND			59		6	7817		37	ND			ND		
8/6/2020																											
8/6/2020	732-01												441	84	ND			48		9	14546		89		73	17	ND		
8/6/2020	732-01												881	104	ND			67		11	15059		102	ND			ND		
8/6/2020	732-01												656	75	ND			60		8	15453		78	ND			ND		
8/6/2020	732-01												974	65	ND			88		7	18267		72	ND			ND		
8/6/2020	732-01												1673	101	ND			244		12	18704		99	ND			ND		
8/6/2020	732-01												1626	74	ND			240		9	17376		69	ND			ND		
8/6/2020	732-01												1924	83	ND			362		11	18037		77	ND			ND		
8/6/2020	732-01												1336	73	ND			178		9	10028		50	ND			ND		
8/6/2020	732-01												1260	79	ND			160		9	13674		66	ND			ND		
8/6/2020	732-01												1772	84	ND			193		10	22470		93	ND			ND		
8/6/2020	732-01												1197	112	ND			191		14	14151		100	ND			ND		
8/6/2020	732-01											ND			ND		ND				14834		1024	ND			ND		
8/6/2020	732-01												1359	69	ND			224		9	15635		64	ND			ND		
8/6/2020	732-01												1842	90	ND			152		9	11564		62	ND			ND		
8/6/2020	732-01												902	62	ND			113		7	9072		42	ND			ND		
8/6/2020	732-01												906	64	ND			122		7	9826		46	ND			ND		
8/6/2020	732-01												1477	71	ND			190		8	14802		61	ND			ND		
8/6/2020	732-01												902	60	ND			114		7	9171		42	ND			ND		
8/6/2020	732-01												1187	77	ND			199		10	13183		64	ND			ND		
8/6/2020	732-01												1469	78	ND			398		11	17650		76	ND			ND		
8/6/2020	732-01												807	66	ND			181		8	7000		39	ND			ND		
8/6/2020	732-01												1356	77	ND			157		9	13778		63	ND			ND		
8/6/2020	732-01												932	74	ND			95		8	10095		54	ND			ND		
8/6/2020	732-01												775	75	ND			96		8	15892		74	ND			ND		
8/6/2020	732-01												913	76	ND			110		8	10820		57	ND			ND		
8/6/2020	732-01												1278	136	ND			255		18	15595		127	ND			ND		
8/6/2020	732-01											ND			ND		ND				14852		667	ND			ND		
8/6/2020	732-01												1121	68	ND			282		9	15954		65	ND			ND		
8/6/2020	732-01												907	108	ND			145		13	11009		85	ND			ND		
8/6/2020	732-01												1600	77	ND			224		9	14141		64	ND			ND		
8/6/2020	732-01												1433	82	ND			351		11	19567		86	ND			ND		
8/6/2020	732-01												1356	75	ND			190		9	13086		61	ND			ND		
8/6/2020	732-01												1476	73	ND			133		8	15366		65	ND			ND		
8/6/2020	732-01												1738	83	ND			197		9	17675		77	ND			ND		
8/6/2020	732-01												1446	79	ND			259		10	18278		77	ND			ND		
8/6/2020	732-01												1322	73	ND			182		9	13113		59	ND			ND		
8/6/2020	732-01												2179	92	ND			281		11	16580		78	ND			ND		
8/6/2020	732-01												2072	73	ND			133		7	10686		47	ND			ND		
8/6/2020	732-01												2528	82	ND			179		8	13704		59	ND			ND		
8/6/2020	732-01												1921	79	ND			168		8	15642		66	ND			ND		
8/6/2020	732-01												2292	97	ND			157		10	17372		83	ND			ND		
8/6/2020	732-01												4393	98	ND			88		7	17048		69	ND			ND		
8/6/2020	732-01												2875	91	ND			81		8	18557		78	ND			ND		
8/6/2020	732-01												1326	74	ND			301		10	16602		70	ND			ND		
8/6/2020																											

Date	Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8	LBP Result	LPB Concer	LPB Error													
8/5/2020																								
Date	Point-Dept	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8	LBP Result	LPB Concer	LPB Error	Ti	Ti +/-	Cr	Cr +/-	Mn	Mn +/-	Fe	Fe +/-	Co	Co +/-	Ni	Ni +/-
8/6/2020																								
8/6/2020	732-01											1330	73	ND		337	10	17038	70	ND		ND		
8/6/2020	732-01											995	65	ND		360	10	13537	55	ND		ND		
8/6/2020	732-01											1588	106	ND		306	14	15261	92	ND		ND		
8/6/2020																								
8/6/2020	732-01											1360	81	ND		241	10	15019	70	ND		ND		
8/6/2020	732-01											1677	78	ND		606	13	20753	81	ND		ND		
8/6/2020	732-01											45804	321	ND		78	8	8890	48	ND		ND		
8/6/2020	732-01											1091	66	ND		379	10	13803	56	ND		ND		
8/6/2020	732-01											963	69	ND		221	9	14453	64	ND		ND		
8/6/2020	732-01											1426	72	ND		183	8	15556	65	ND		ND		
8/6/2020	732-01											1142	65	ND		33	6	11226	49	ND		ND		
8/6/2020	732-01											1270	78	ND		219	10	15274	70	ND		ND		
8/6/2020	732-01											1271	77	ND		130	8	17132	75	ND		ND		
8/6/2020																								
8/6/2020	732-01											1378	81	ND		249	10	18180	77	ND		ND		
8/6/2020	732-01											1300	70	ND		177	8	12713	55	ND		ND		
8/6/2020	732-01											1315	70	ND		153	8	12146	54	ND		ND		
8/6/2020	732-01											1605	77	ND		168	8	15662	67	ND		ND		
8/6/2020	732-01											1479	79	ND		280	10	16889	74	ND		ND		
8/6/2020																								
8/6/2020	732-01											1318	69	ND		143	8	11755	54	ND		ND		
8/6/2020	732-01											1445	73	ND		163	8	13465	60	ND		ND		
8/6/2020	732-01											1448	73	ND		230	9	14413	61	ND		ND		
8/6/2020	732-01											1279	69	ND		155	8	12257	55	ND		ND		
8/6/2020	732-01											1466	75	ND		199	9	15679	67	ND		ND		
8/6/2020	732-01											669	66	ND		115	8	8856	46	ND		ND		

Date	Cu	Cu +/-	As	As +/-	Se	Se +/-	Rb	Rb +/-	Sr	Sr +/-	Zr	Zr +/-	Mo	Mo +/-	Ag	Ag +/-	Sn	Sn +/-	Sb	Sb +/-	Ba	Ba +/-	Hg	Hg +/-	Pb	Pb +/-
8/5/2020																										
8/6/2020																										
8/6/2020	ND			10.4	1.1	ND			48.2	1	298	3	261	3	ND		ND		ND		ND		ND		7.2	1.3
8/6/2020		9.4	1.7	17.8	0.8	ND			40.4	0.7	295.3	1.7	168.1	1.7	ND		ND		ND			158	50	ND	10.6	1
8/6/2020	ND			15.5	0.9	ND			40.7	0.7	269.4	1.7	201.6	1.9	ND		19	4	ND		ND		ND		13.6	1.1
8/6/2020	ND			156.8	1.7	ND			53.8	0.8	212.3	1.4	158.6	1.6	ND		16	4	ND		39	8	ND		8	0.9
8/6/2020		13.9	1.9	28.2	1	ND			38.5	0.7	240.7	1.6	169.4	1.7	ND		15	4	ND		ND		ND		11.2	1
8/6/2020		13.6	1.9	31.9	1	ND			44.7	0.7	192.1	1.5	171	1.7	ND		24	5	ND		ND		ND		9.6	1
8/6/2020		17	4	22	3	ND			44.3	1.5	278	4	153	4	ND		ND		ND		ND		ND		55	3
8/6/2020		14	1.7	25.4	1.1	ND			47.4	0.7	295.7	1.7	124.6	1.5	ND		ND		ND		ND		ND		44.6	1.4
8/6/2020	ND			67	5	ND			74	3	235	6	173	7	ND		ND		ND		ND		ND		14	4
8/6/2020		15	2	53.4	1.4	ND			68.1	1	236.1	1.8	172.6	1.9	ND		35	5	ND		ND		ND		16.8	1.2
8/6/2020		6.8	1.5	28.3	0.9	ND			17.2	0.5	59	0.7	23.5	0.9	ND		53	4	ND		ND		ND		15.5	0.9
8/6/2020																										
8/6/2020		23	3	56.4	1.7	ND			47.2	1	218	2	118	2	ND		22	6	ND		ND		ND		8.6	1.4
8/6/2020		25	3	57.2	1.9	ND			50.2	1.2	202	2	113	2	ND		ND		ND		ND		ND		10.2	1.6
8/6/2020		27	2	61.1	1.4	ND			51	0.9	206.1	1.7	116.4	1.8	ND		ND		ND		ND		ND		10.2	1.2
8/6/2020		32.1	2	72.9	1.3	ND			54.2	0.8	233.2	1.5	145.7	1.6	ND		ND		ND		ND		ND		11.6	1
8/6/2020		7	2	4.6	0.9	ND			35.8	0.9	461	3	200	2	ND		ND		ND		ND		ND		8.8	1.3
8/6/2020	ND			4.1	0.7	ND			35.5	0.6	468	2	240.1	2	ND		ND		ND		ND		163	51	ND	10.2	1
8/6/2020		15.8	1.9	21.8	1	ND			50	0.8	311.7	1.9	265	2	ND		19	5	ND		ND		ND		14.3	1.1
8/6/2020		9	1.8	20.3	0.9	ND			83	1	175.2	1.4	157	1.7	ND		25	5	ND		ND		ND		10.9	1
8/6/2020		6.3	1.9	28.6	1.1	ND			73.6	1	223.4	1.7	207	2	ND		54	5	ND		106	9	ND		10.7	1.1
8/6/2020		5.6	1.8	130.6	1.8	ND			78.6	1	282	1.8	172.8	1.8	ND		ND		ND		ND		ND		15	1.2
8/6/2020	ND			15.6	1.4	ND			43.6	1.2	369	3	174	3	ND		ND		ND		ND		ND		10.5	1.6
8/6/2020	ND		ND		ND				32	10	320	30	165	28	ND		ND		ND		ND		ND		ND	
8/6/2020	ND			17.9	0.8	ND			39.3	0.7	358.5	1.9	183.3	1.7	ND		18	4	ND		ND		ND		11.2	1
8/6/2020	ND			6.7	0.9	ND			30.1	0.7	379	2	183	2	ND		23	5	ND		ND		ND		9.7	1.2
8/6/2020	ND			3.2	0.6	ND			29.9	0.6	337.7	1.8	112.4	1.5	ND		ND		ND		ND		ND		6.8	0.9
8/6/2020	ND			9.7	0.7	ND			26.2	0.6	419	2	107.4	1.5	ND		ND		ND		ND		ND		5.9	0.9
8/6/2020	ND			15.1	0.8	ND			32.8	0.6	410	2	165	1.7	ND		ND		ND		ND		ND		9.2	1
8/6/2020	ND			8.1	0.7	ND			25.2	0.5	280.9	1.6	117.3	1.4	ND		ND		ND		ND		ND		7.7	0.9
8/6/2020	ND		ND		ND				27.9	0.7	378	2	174	2	ND		ND		ND		ND		ND		11.4	1.1
8/6/2020		9.4	1.8	9	0.9	ND			43.1	0.7	360	2	167.2	1.8	ND		14	5	ND		ND		ND		20.8	1.2
8/6/2020	ND			46.5	1.1	ND			65.4	0.9	192.9	1.4	151.4	1.7	ND		19	5	ND		29	9	ND		5.5	0.9
8/6/2020		8.5	1.8	139.4	1.8	ND			69.7	0.9	203.5	1.5	199.1	1.9	ND		31	5	ND		28	9	ND		10.4	1.1
8/6/2020	ND			192	2	ND			93.3	1.1	91.6	1.1	125	1.6	4.7	1	23	5	ND		ND		ND		17.4	1.2
8/6/2020		7	1.9	178	2	ND			91	1.1	134.7	1.3	155.4	1.8	ND		25	5	ND		ND		173	56	ND	13.2	1.2
8/6/2020	ND			94.4	1.6	ND			82.2	1.1	101.7	1.1	103.4	1.6	ND		ND		ND		ND		ND		4.5	1
8/6/2020	ND			35.4	2	ND			53.1	1.5	256	3	166	3	ND		28	8	ND		ND		ND		11.2	2
8/6/2020	ND		ND		ND				47	8	233	16	151	17	ND		ND		ND		ND		ND		ND	
8/6/2020		9.4	1.7	34.9	1	ND			59.1	0.8	259.5	1.6	155.5	1.6	ND		ND		ND		ND		ND		8.2	0.9
8/6/2020		11	3	40.5	1.7	ND			46.3	1.2	213	2	183	3	ND		ND		ND		ND		ND		9.6	1.6
8/6/2020		10.8	1.9	33.4	1.1	ND			49.2	0.8	245.8	1.7	221.7	2	ND		ND		ND		ND		ND		13.1	1.1
8/6/2020		10.3	2	6	0.8	ND			35.3	0.7	346	2	154.3	1.9	ND		ND		ND		ND		ND		10.4	1.1
8/6/2020		5.6	1.8	12.3	0.8	ND			22	0.6	348	2	192.3	1.9	ND		15	5	ND		ND		ND		8.5	1
8/6/2020	ND			10.3	0.7	ND			18.7	0.5	193	1.4	159.8	1.6	ND		ND		ND		ND		ND		7	0.9
8/6/2020		9.1	1.9	34.9	1.1	ND			27	0.6	215.9	1.6	179	1.8	ND		14	5	ND		ND		ND		10.1	1.1
8/6/2020		6.6	1.8	32.2	1	ND			35.2	0.7	278.2	1.8	205.9	1.9	ND		ND		ND		ND		214	56	ND	9.3	1
8/6/2020	ND			68.5	1.3	ND			34.2	0.7	308.2	1.9	172.9	1.8	ND		ND		ND		ND		ND		8.6	1
8/6/2020	ND			83.5	1.6	ND			37	0.8	266.9	1.9	320	3	3.4	1.1	18	5	ND		ND		ND		13.6	1.2
8/6/2020		4.7	1.6	80.9	1.3	ND			26.9	0.6	184.3	1.3	201.7	1.7	ND		ND		ND		ND		ND		7.3	0.9
8/6/2020	ND			38	1	ND			25.8	0.6	211.7	1.4	300	2	ND		ND		ND		ND		ND		9	1
8/6/2020	ND			152.2	1.8	ND			37.3	0.7	194	1.4	287	2	ND		15	4	ND		27	8	ND		8.6	1
8/6/2020	ND			71.5	1.5	ND			23.7	0.7	189.9	1.6	227	2	4.7	1.1	22	5	ND		32	10	226	65	ND	10.6	1.2
8/6/2020	ND			73.3	1.3	ND			18.2	0.5	142.3	1.2	214.9	1.8	ND		ND		ND		33	8	231	58	4.9	1.1	8.2	0.9
8/6/2020	ND			124.1	1.7	ND			22.9	0.6	106.6	1.1	214.5	1.8	ND		ND		ND		31	9	ND		3.7	1.2	8	1
8/6/2020		9.5	1.8	19.4	0.9	ND			29	0.6	252.5	1.6	166.9	1.7	ND		ND		ND		ND		ND		ND		13	1
8/6/2020																										

Date	Cu	Cu +/-	As	As +/-	Se	Se +/-	Rb	Rb +/-	Sr	Sr +/-	Zr	Zr +/-	Mo	Mo +/-	Ag	Ag +/-	Sn	Sn +/-	Sb	Sb +/-	Ba	Ba +/-	Hg	Hg +/-	Pb	Pb +/-
Date																										
8/5/2020																										
8/6/2020																										
8/6/2020	10.1	1.8	11.1	0.8	ND		34.8	0.7	309.2	1.8	178.9	1.8	ND		ND		ND		ND		ND		ND		7.9	1
8/6/2020	7.6	1.6	2.8	0.6	ND		27.2	0.6	276.7	1.6	148.4	1.5	ND		ND		ND		ND		236	48	ND		9.3	0.9
8/6/2020	ND		4.5	1	ND		16.5	0.7	266	2	154	2	ND		ND		ND		ND		ND		ND		10.8	1.4
8/6/2020																										
8/6/2020	8.8	1.9	3.5	0.9	ND		15.1	0.6	273.5	1.9	144.4	1.8	3.8	1	ND		ND		ND		182	58	ND		18.8	1.2
8/6/2020	10.5	1.8	4.9	0.7	ND		23	0.6	312.2	1.8	153.6	1.7	ND		ND		ND		ND		ND		ND		10.8	1
8/6/2020	6.7	1.9	4.4	0.8	ND		14.6	0.5	224.9	1.7	139.4	1.7	ND		ND		ND		ND		1471	133	ND		10.4	1.1
8/6/2020	7.4	1.6	6.6	0.8	ND		25.1	0.5	286.7	1.6	127.2	1.5	ND		ND		ND		ND		142	47	ND		18.1	1
8/6/2020	ND		44.3	1.1	ND		18.5	0.5	261.7	1.7	130.4	1.6	ND		ND		ND		ND		ND		ND		10.6	1
8/6/2020	ND		105.3	1.5	ND		40.3	0.7	207.1	1.4	148.6	1.6	ND		ND		ND		ND		ND		ND		8.1	0.9
8/6/2020	ND		2103	8	2.5	0.6	88.1	0.9	61.4	0.8	161.9	1.5	ND		ND		ND		59	8	ND		ND		12.9	1
8/6/2020	5.8	1.9	310	3	ND		57.3	0.9	212.7	1.6	143.3	1.7	ND		21	5	ND		ND		ND		ND		9	1.1
8/6/2020	ND		168.7	2	ND		87.9	1	78.9	1	144.8	1.6	ND		16	5	ND		ND		ND		ND		7.8	1
8/6/2020																										
8/6/2020	7.1	1.8	49.6	1.2	ND		44.9	0.8	299.1	1.9	142.6	1.7	ND		ND		ND		ND		370	58	ND		9.6	1
8/6/2020	ND		159.9	1.8	ND		39.2	0.7	254.8	1.6	166.9	1.7	ND		ND		ND		27	8	ND		ND		10.8	1
8/6/2020	ND		311	2	ND		39.3	0.7	166.6	1.3	153.5	1.6	ND		ND		ND		ND		ND		ND		8.1	0.9
8/6/2020	ND		62.9	1.2	ND		32.5	0.7	409	2	174.4	1.8	ND		15	4	ND		ND		171	53	ND		6.9	1
8/6/2020	ND		84.8	1.5	ND		39.5	0.7	309.5	1.9	227	2	ND		ND		ND		ND		168	56	ND		11.5	1.1
8/6/2020																										
8/6/2020	ND		128.9	1.7	ND		39	0.7	190.5	1.4	369	2	ND		23	4	ND		ND		ND		ND		14.4	1
8/6/2020	ND		344	3	ND		50.8	0.8	184.5	1.4	299	2	ND		ND		ND		ND		ND		ND		8.9	1
8/6/2020	7.3	1.7	280	2	ND		49.7	0.7	205.8	1.4	291	2	ND		ND		ND		ND		187	52	ND		7.7	0.9
8/6/2020	ND		121.1	1.6	ND		38.3	0.7	192.2	1.4	287	2	ND		17	4	ND		ND		ND		ND		7.6	0.9
8/6/2020	ND		170.2	1.9	ND		44.6	0.7	407	2	210.8	1.9	ND		ND		ND		ND		ND		ND		6.1	1
8/6/2020	ND		106.9	1.6	ND		20.5	0.6	196.4	1.5	121.9	1.6	ND		ND		ND		ND		ND		ND		5.4	0.9

APPENDIX B
Mitigation Measures Assessment Report

[redacted]

Saddle Rock Natural Area
Phase 2 IRA Construction Project
Wenatchee, Washington

for

Mitigation Measures Assessment Report

Saddle Rock Natural Area
Phase 2 IRA Construction Project
Wenatchee, Washington

for
City of Wenatchee

November 20, 2020

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Mitigation Measures Assessment Report

Saddle Rock Natural Area
Phase 2 IRA Construction Project
Wenatchee, Washington

File No. 4296-008-02

November 20, 2020

Prepared for:

City of Wenatchee
1350 McKittrick Street
Wenatchee, Washington 98807

Attention: Charlotte Mitchell

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Justin D. Orr, GIT
Staff Geologist

Nick E. Rohrbach
Senior Environmental Scientist

Dustin G. Wasley, PE
Principal Engineer

JDO:NER:DGW:tjh

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EXECUTIVE SUMMARY

This Mitigation Measures Assessment Report (Report) describes mitigation measures to address areas of bare soil with elevated arsenic concentrations identified during Phase 2 of the Interim Remedial Action (IRA) at the Saddle Rock Natural Area (Site). The project is located at 1130 Circle Street in Wenatchee, Washington as shown in Vicinity Map, Figure 1.

The Site is subject to the requirements of the Agreed Order (AO) number DE 15823 dated October 25, 2018, and subsequent Amendment No. AO-1 dated April 9, 2020, between the City of Wenatchee (City) and Ecology. Per the AO and subsequent amendment, the City is responsible for implementing the scope of work (SOW) outlined by Ecology in the AO and amendment. The City has accepted the role as the primary party responsible for compliance with the AO and AO-1.

The Site is comprised of eight Areas of Interest (AOIs), identified as SR-01 through SR-08, where waste rock was generated from historical mine prospecting, mining or road development disturbed by naturally mineralized areas. In 2019, GeoEngineers assessed pile-specific background arsenic concentrations, refined extents of waste rock piles, identified downslope areas requiring cleanup, and established a Site-wide cleanup goal of 95 milligrams per kilogram (mg/kg) for total arsenic. GeoEngineers completed Phase 1 construction activities in late October 2019.

Phase 2 IRA activities began in August 2020 with a Bare Soils Assessment of areas with evidence of human influenced bare soils (e.g., existing trails, lookout points, resting points along trails). Results of the assessment identified a mean total arsenic concentration of 103.4 mg/kg, with a range of concentrations from below the limits of detection (LOD) to 2,103 mg/kg. Exclusion of outlier data (the one sample at a concentration of 2,103 mg/kg) indicated the mean total arsenic concentration was 72.7 mg/kg with a range of concentrations from below the LOD to 344 mg/kg. Based on the investigation, GeoEngineers proposed mitigation measures to address elevated arsenic concentrations in bare soils impacted by human activities.

Alternatives analysis was conducted to determine if potential options would meet evaluation criteria and requirements of the AO-11. A preferred alternative was then selected based on an assessment of effectiveness, implementability, responsibility and cost. Options were identified within the general response actions and were either retained or discarded if the options showed poor results against the evaluation criteria or would be unable to attain the goals and objectives of the project. From the available options, three main alternatives were evaluated. A no action alternative is not included in this analysis. Action alternatives for the site are as follows:

1. Alternative 1 – Cover and Revegetate Bare Soil Areas
2. Alternative 2 – Realign and Decommission Trail System to Avoid Bare Soil Areas
3. Alternative 3 – Institutional Controls with Existing Trail Improvements, Existing Trail Covering and Select Trail Decommissioning

From the results of the comparative analysis, Alternative 3 was selected as the preferred mitigation measure. The total estimated cost for the preferred alternative and contingency will be presented in the forthcoming Preliminary Design Report because certain construction elements are still in development (e.g., the design of the Phase 2 haul road).

This Executive Summary should be used only in the context of the full report for which it is intended.

1.0 INTRODUCTION

This Mitigation Measures Assessment Report (Report) describes potential mitigation measures to address areas of bare soil with elevated total arsenic concentrations identified during Phase 2 of the Interim Remedial Action (IRA) at the Saddle Rock Natural Area (Site). The project area is located at 1130 Circle Street in Wenatchee, Washington as shown in Vicinity Map, Figure 1.

The Site is formally identified by the Washington State Department of Ecology (Ecology) as Facility Site ID (FSID) No. 22496 and Cleanup Site ID No. 11610. The Site is subject to the requirements of the Agreed Order (AO) number DE 15823 dated October 25, 2018 (Ecology 2018b) and subsequent Amendment No. AO-11 dated April 9, 2020 (Ecology 2020a) between the City of Wenatchee (City) and Ecology. Per the AO and subsequent amendment, the City is responsible for implementing the scope of work (SOW) outlined by Ecology in the AO and amendment. The City has accepted the role as the primary party responsible for compliance with the AO and AO-1. The City is retaining ownership of the Site before and after the Phase 1 and 2 IRA are conducted. This Report was completed as part of Task 1b of Amendment A-01, which outlines the following objectives:

- **Task 1b – Assessment and Identification of Appropriate Mitigation Measures to Address Contaminated Soil Influenced by Human Activities (Non-Waste Rock Areas).** Task 1b, presented in this Report, assesses potential mitigation measures to address bare soil (impacted by human activities) with elevated arsenic concentrations. These areas were primarily hiking trails but also included the SR-04 waste rock and overburden area where waste rock arsenic concentrations were found to be consistent with surrounding native soil arsenic concentrations. This task included Phase 1 and Phase 2 areas where bare soil was present and arsenic concentrations were greater than the Method A cleanup level of 20 milligrams per kilogram (mg/kg), and in particular where arsenic concentrations were greater than the site-specific background concentration of 95 mg/kg. Elevated arsenic in areas of outcrop or scree were excluded from this investigation because those areas were anticipated to be considered "naturally occurring," if no evidence of human activities was present.

2.0 SITE DESCRIPTION AND BACKGROUND

The Saddle Rock Natural Area is documented with eight areas of interest (AOIs) originally delineated by others (2013a and 2013b) as part of their Remedial Investigation/Feasibility Study (RI/FS). The AOIs were identified as SR-01 through SR-08, where waste rock and overburden was generated from historical mining or road development disturbed by naturally mineralized areas. Since 2011, the Washington State Department of Ecology (Ecology) and others have performed multiple investigations. Additional field investigation and analysis were completed by Ecology after the RI/FS were completed, which are detailed in the Technical Memorandum, "Gold Knob Prospect (aka Saddle Rock Park), Establishing Site Cleanup Levels and Areas," (Ecology 2018a). The additional data collected by Ecology identified data gaps in the RI/FS documents. GeoEngineers was selected by the City in early January 2019 to complete the next phases of work for the Site and developed a Sampling and Analysis Plan (SAP) to be implemented during the subsequent Ecology-requested data gap assessment, waste rock pile delineations, and confirmation soil sampling during the Phase 1 and 2 IRA construction (GeoEngineers 2019a).

In April 2019, GeoEngineers (2019b) conducted a supplemental data gap field sampling event to address data gaps identified in the Ecology (2018a) Technical Memorandum. The supplemental data gap analysis

identified pile-specific background arsenic concentrations, refined later extents of waste rock piles, identified downslope areas requiring cleanup, and established a Site-wide cleanup goal of 95 mg/kg total arsenic. GeoEngineers (2020a) completed Phase 1 construction activities in late autumn 2019.

Phase 2 IRA activities began in August 2020 with the Bare Soils Assessment (GeoEngineers 2020b). For a comprehensive Site description and background, refer to GeoEngineers' Sampling and Analysis Plan (2019a) and Interim Remedial Action Construction Report (2020a).

2.1. Site-specific Cleanup Criteria

GeoEngineers (2019b) performed an additional evaluation of each identified waste rock pile and background arsenic concentrations associated with mapped hydrothermally altered rocks within the Swauk Formation mapped by Gresens (1983) during the April 2019 supplemental data gaps field sampling event. Background soil sample locations were identified upslope from waste rock piles and screened in the field with a handheld x-ray fluorescence (XRF) instrument to assess metals concentrations. A total of 97 XRF background soil samples from SR-01 through SR-05 and SR-08 were screened in the field by GeoEngineers.

XRF analysis of background total arsenic identified a mean concentration of 45.2 mg/kg, and the calculated 90th percentile was 95 mg/kg for total arsenic. Therefore, 95 mg/kg for total arsenic was established as the cleanup goal for the overall Site (Phase 1 and 2), not the original background concentration of 14.4 mg/kg established during the FS in 2013. Based on the heterogeneous formations and elevated total arsenic concentrations at various locations, 95 mg/kg represents a more reasonable cleanup goal, and better characterizes the varied background mineralization at the Site.

3.0 MITIGATION MEASURES OPTIONS

This section describes potential mitigation measures methods and technologies used to develop mitigation measures alternatives. A summary of mitigation measures and technologies is presented in Screening of Mitigation Measures, Table 1.

3.1. Institutional Controls

Institutional controls (ICs) are non-engineered instruments (e.g., administrative and legal controls) that minimize potential for human exposure to contamination and/or protect the integrity of a remedial activity. The following sections describe potential ICs assessed for the Site.

3.1.1. Restrictive Covenant

Restrictive Covenants (RCs) are a type of Proprietary Control intended to limit future land use in order to control future contact with contaminated soils and ensure maintenance of the selected mitigation measures. A RC would be recorded to impose limitations at the Site to restrict activities or future resource use that may result in unacceptable risk to human health or the environment.

It is anticipated that an RC will not be recorded with Ecology after substantial completion of Phase 2 construction activities are completed because the remaining anthropogenically generated waste rock will be removed (at SR-05). Furthermore, as indicated in the Ecology letter dated October 28, 2011, a Site RC will not be required since Recreation and Conservation Office (RCO) funds have ben utilized on this project (Ecology 2011).

3.1.2. Public Education and Signs

Signs warning the public of elevated arsenic concentrations due to natural background conditions, encouraging use of specified rest areas and/or prohibiting use of certain trails could be placed throughout the Site. Locations for sign placement may include at trailheads, former waste rock pile locations, along trails and at rest areas where elevated arsenic concentrations are present.

3.1.3. Benches

The City and Chelan-Douglas Land Trust (Land Trust) have determined four general locations for the placement of benches at the Site. Two benches have been installed at the viewpoint near the top of the mountain. Benches at the remaining two locations are planned to be installed after a new haul road is constructed during the Phase 2 IRA construction activities.

Placing benches at rest areas would reduce direct contact exposure pathways by allowing hikers to sit above bare soil with elevated arsenic concentrations. Alternatively, the benches could be placed in areas with low arsenic concentrations to encourage hikers to rest in those areas and away from elevated arsenic concentrations. The benches would be maintained in the long term with regular operations and maintenance (O&M) as part of the trail system O&M schedule.

3.1.4. Soil Removal Station

A wash or brush station could be positioned at the main trailhead to encourage hikers to remove potentially contaminated soil from their shoes or their animals' paws to reduce the possibility of exposure and transporting contaminated soil offsite. This measure is generally not effective for controlling on-site exposure to contaminated soil, especially towards upper park area (ridgeline of Saddle Rock proper).

As presented in the Technical Memorandum: Phase 2 Saddle Rock Interim Remedial Action, Bare Soils Investigation Summary (GeoEngineers 2020b), concentrations of arsenic decrease to less than 20 mg/kg along the lower half of the trail system (between Phase 1 and 2 areas) down to the main trailhead. The likelihood of left over soil, greater than 20 mg/kg arsenic, on shoes or animal paws is low based on the recent bare soils assessment data collected on the main trail system. Additionally, arsenic contaminated wash water and/or soil would accumulate at the station location, creating a potential hotspot of elevated arsenic concentrations and additional long term disposal considerations for the City. As such, this alternative was not retained for further consideration.

3.2. Trail Modifications

Trail modifications would include realignment and/or decommissioning to preclude access and limit exposure. Planned stormwater and erosion control improvements will also contribute to the long term sustainability and may assist in preventing the migration of elevated arsenic soil across the Site. The following sections provide a brief discussion of these alternatives.

3.2.1. Realignment

Realignment of existing trails at the Site is an option for avoiding naturally occurring elevated arsenic areas. Realignment of these trails could focus towards the upper elevations of the Phase 1 and 2 areas, where the arsenic has been documented to be the highest in concentrations. As part of the Phase 2 IRA construction activities, portions of the existing trail system could also be modified to allow improved access

for excavating equipment and haul trucks to SR-05. This realignment, if selected, will be presented in the preliminary design report, which is a forthcoming report.

Re-alignment of trails is a method for avoiding potentially hazardous areas in other public spaces, including in the U.S. National Forest. Recent communication between Ecology and the Forest Service indicate this alternative has been used on other public areas in Washington state (Ecology 2020b).

3.2.2. Decommissioning

The City and Land Trust are planning to decommission unsustainable trails (i.e. trails that are not part of the official trail system), and the Land Trust has committed (based on communications with the City) to assist in decommissioning these trails by providing volunteer workers to assist with this effort. Under this alternative, direct contact exposure pathways with bare soils containing elevated arsenic concentrations is reduced after trail decommissioning.

3.3. Barrier Installation over Bare Soils

Bare soil areas with elevated arsenic concentrations could be covered and revegetated to create a barrier over contaminated soil, which would control direct contact with potential human and ecological receptors. Fiber rolls, geotextile fabric and imported clean soil/on-Site-sourced soil or wood chips could be placed in areas with elevated arsenic concentrations and hydroseeded to stabilize them over the long term.

A finishing top-coarse crushed gravel layer placed along the new haul road alignment is anticipated as part of Phase 2 construction. This gravel layer would serve as a barrier and would reduce the direct contact exposure pathways in areas where the trail was not realigned from areas with high arsenic concentrations. Regular O&M would likely be needed to maintain the crushed gravel finish layer and correct erosion features that might develop in the long term.

4.0 EVALUATION CRITERIA

This section presents a description of criteria used in this Report to evaluate mitigation measure alternatives.

4.1. MTCA Disproportionate Cost Analysis

The Model Toxics Control Act (MTCA) disproportionate cost analysis (DCA) is used to evaluate which alternatives meet threshold requirements. Since this project does not fully comply with cleanup standards, it is considered an Interim Action. Nonetheless, the evaluation criteria specified in WAC 173-340-360(2) and (3) (protectiveness, permanence, cost, long-term effectiveness, management of short-term risks, implementability and consideration of public concerns) are used in this evaluation to identify a preferred alternative.

As outlined in WAC 173-340-360(3)(e), MTCA provides a methodology that uses the criteria below to determine whether the costs associated with each cleanup alternative are disproportionate relative to the incremental benefit of the alternative above the next lowest-cost alternative. The comparison of benefits relative to costs may be quantitative but will often be qualitative. Costs are disproportionate to benefits if the incremental costs of the more permanent alternative exceed the incremental degree of benefits

achieved by the other lower-cost alternative [WAC 173-340-360(e)(i)]. Where two or more alternatives are equal in benefits, the less costly alternative is selected [WAC 173-340-360(e)(ii)(c)].

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

4.1.1. Protectiveness

The overall protectiveness of a cleanup action alternative is evaluated based on several factors. First, the extent to which human health and the environment are protected and the degree to which overall risk at a site is reduced are considered. Both on-site and off-site reduction in risk resulting from implementing the alternative are considered. Protectiveness also gauges the degree to which the cleanup action may perform above the level of the specific standards presented in MTCA. Finally, it is a measure of the improvement of the overall environmental quality at a site.

4.1.2. Permanence

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

4.1.3. Cost

The analysis of cleanup action alternative costs under MTCA includes all costs associated with implementing an alternative, including design, construction, long-term monitoring and institutional controls. Costs are intended to be comparable among different alternatives to assist in the overall analysis of relative costs and benefits of the alternatives. The costs to implement an alternative include the cost of construction, the net present value of any long-term costs and agency oversight costs. Long-term costs include operation and maintenance costs, monitoring costs, equipment replacement costs and the cost of maintaining institutional controls. Cost estimates for treatment technologies describe pretreatment, analytical, labor and waste management costs. The design life of the cleanup action is estimated, and the costs of replacement or repair of major elements are included in the cost estimate. Costs are compared against benefits to assess cost effectiveness and practicability of the cleanup action alternatives.

4.1.4. Long-Term Effectiveness

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

Lower preference rankings are applied for technologies such as on-site isolation/containment with attendant engineered controls, and institutional controls and monitoring. The regulations recognize that, in most cases, the cleanup alternatives will combine multiple technologies to accomplish the Cleanup Action

Objectives (CAOs). The MTCA preference ranking must be considered along with other site-specific factors in the evaluation of long-term effectiveness.

4.1.5. Management of Short-term Risks

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

4.1.6. Implementability

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

4.1.7. Consideration of Public Concerns

The public involvement process under MTCA is used to identify potential public concerns regarding cleanup action alternatives. The extent to which an alternative addresses those concerns is considered as part of the evaluation process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, and other organizations that may have an interest in or knowledge of the site.

5.0 PROPOSED MITIGATION MEASURES ALTERNATIVES

In this section, the technologies and options for mitigation measures are used to develop alternatives to address bare soil areas where arsenic concentrations are greater than the MTCA Method A cleanup level of 20 mg/kg, and in particular where arsenic concentrations are greater than the site-specific background concentration of 95 mg/kg. This section also provides a comparative analysis of the developed mitigation measures alternatives.

The mitigation measures alternatives developed in this section are based on conceptual-level design for the implementation of individual technologies. Design parameters used to develop the alternatives are based on engineering judgment, previous experience and current knowledge of Site conditions. The final design for the selected alternative may require additional analysis to better define the scope and costs associated with the interim action and mitigation measures.

The mitigation measures alternatives were developed to be consistent with the current and future land uses at the Site. A brief description of current and future land use is presented in Section 2 of this Report.

The conceptual plans for the alternatives presented below are based on data obtained during Phase 1 of the IRA (GeoEngineers 2020a) and the bare soils field survey completed in August 2020 (GeoEngineers 2020b). Professional judgment was used to interpolate and extrapolate the extent of contamination during development of the areas anticipated to require mitigation measures. This approach was required to

develop plans that meet the goals of the respective alternatives, with an attempt to account for the known extent of contamination and using consistent methodologies between alternatives. Stormwater and erosion control improvements are also planned for each alternative, but will be confirmed and designed in the forthcoming Phase 2 Preliminary Design Report.

Each alternative leaves soil greater than the MTCA Method A cleanup level in place. The waste rock at SR-05 will be removed as part of Phase 2 construction activities. Institutional controls will be required to control future contact with contaminated soil and to ensure maintenance of soil coverings, trails and signs.

5.1. Alternative 1 – Cover and Revegetate Bare Soil Areas

Alternative 1 relies on physical barriers (covering and revegetation) to isolate contaminated soil at the Site from potential receptors, including humans. Specifically, Alternative 1 includes the following components:

- Cover (with a locally sourced Site material with a concentration less than 20 mg/kg arsenic or clean imported fill) and revegetate all bare soil areas at the Site where humans may encounter soils with elevated arsenic concentrations. This would include viewpoints, rest areas and "illegal" trails, as well as portions of the main trail system.
- Implement O&M procedures (to be determined in future design phases) to ensure revegetated areas remain intact.

Covering and revegetation of areas of bare soil is expected to be accomplished using commonly available techniques. The Interim Removal Action Final Design Report specifies methods for hydroseeding at the Site and the appropriate seed mix (GeoEngineers 2019c) that can be used to cover and revegetate bare soils areas.

The existing main trail (a four wheel drive-type road) to SR-05 may be covered with a top-course gravel. This provides a protective barrier to exposure to bare soil by placing gravel over the road/trail surface. The new gravel layer would be maintained as part of the trail system.

5.2. Alternative 2 – Realign and Decommission Trail System to Avoid Bare Soil Areas

Alternative 2 relies on isolating contaminated soils at the Site from human receptors by controlling access to select areas with elevated concentrations of total arsenic and provide a safe haul road for Phase 2 construction work activities. Specifically, Alternative 2 includes the following components:

- Realign select portions of the existing trail system (currently a four wheel drive-type road) at the Site to provide a lower steepness grade haul road for Phase 2 construction work and avoid, to the extent possible, bare soils areas where arsenic concentrations are greater than 95 mg/kg. This includes a significant area in the western portion of the Site, and a relatively small area in the eastern portion of the Site (Arsenic Iso-contours, Figure 2).
- Decommission select side trails throughout the Site, which may include regrading, revegetating and/or blocking portions of the main trail system to restrict access to these areas.
- Implement O&M procedures (to be determined in future design phases) to ensure trail decommissioning and realignment is intact.

Trail (the main existing four wheel drive road) realignment is expected to be accomplished using commonly available construction techniques. The specific construction methods would be specified during the design of the mitigation measures or by the City selected contractor.

Decommissioning of select side trails (primarily single track trails, emanating off the main existing four wheel drive trail in various places) at the Site will be accomplished by the City and Land Trust using commonly available restoration and construction techniques. A wood fencing barrier is typically used by the Land Trust in nearby other trail systems in the Wenatchee Valley; however, enforcement of the decommissioned trails may be difficult in the long term, as the single track trails often represent a preferred path for some hikers (short cuts).

5.3. Alternative 3 – Institutional Controls with Existing Trail Improvements, Existing Trail Covering and Select Trail Decommissioning

Alternative 3 combines some methods used in Alternatives 1 and 2 to isolate areas with elevated concentrations of total arsenic in soil at the Site from potential receptors including humans. Specifically, Alternative 3 includes the following components:

- Improve the existing main trail system during Phase 2 IRA construction activities by re-grading the current main trail surface, adding a suitable gravel base in select areas (primarily in steep grade areas) and install stormwater/erosion control improvements. The existing main trail system improvements would be accomplished to create a safer driving surface for equipment moving up and down the Site during Phase 2 construction. Other portions of the existing main trail in the Phase 2 area would be widened and improved for construction equipment access.
- Cover the entire Phase 1 and 2 main trail system (formerly used as the haul road during construction work) with a top coarse crushed gravel. The gravel would be placed after Phase 2 construction activities are substantially complete.
- Decommission select side trails throughout the Site as discussed in Section 5.2. These trails are primarily side trails emanating off the main trail.
- Install benches at rest areas away from areas with arsenic concentrations greater than 95 mg/kg.
- Install signs encouraging hikers to stay on established trails and away from revegetated areas.
- Implement O&M procedures (to be determined in future design phases) to maintain benches, signage, revegetated areas and trail modifications.

Areas with naturally-occurring elevated concentrations of total arsenic above the background concentration of 95 mg/kg will be left in place at the Site. The placement and design of signs to prohibit hikers from venturing from established trails would be determined (with the assistance of the Land Trust and Ecology) following final design alignment of the trail system. Installation of new benches at rest areas, to the extent practicable, away from areas with arsenic concentrations greater than 95 mg/kg would also be implemented. Two benches have been installed at the Site ridgetop, near the highest observed background arsenic concentrations, which assists in reducing potential exposure to humans.

As described above, a finishing top course gravel (installed post Phase 2 construction) along the entire Phase 1 and 2 main trail system would create a physical barrier to soils in exceedance of 20 mg/kg.

Therefore, keeping the public on the main trail via signage and education would limit or reduce the possibility of getting contaminated soil on shoes or animal paws.

5.4. Evaluation and Comparison of Alternatives

This section provides an evaluation and comparative analysis of the mitigation measures alternatives developed for the Site. The alternatives are evaluated with respect to the MTCA evaluation criteria described in Section 4.1, and then compared to each other relative to their expected performance under each criterion. The components of the three alternatives are described above in Sections 5.1 through 5.3 and are summarized and evaluated in Evaluation of Alternatives, Table 2. The results of the evaluation are summarized in Preferred Alternative Decision Matrix Summary, Table 3.

5.4.1. MTCA Disproportionate Cost Analysis

As discussed in Section 4.2, the MTCA DCA is used to determine which cleanup alternative is permanent to the maximum extent practicable. The evaluation of the level of achievement for each individual criterion, using a numeric scorings scale of 1 (lowest) to 5 (highest) is presented in Table 2 and 3, and discussed below.

5.4.1.1. *Protectiveness*

Alternative 3 achieves a high level of protectiveness as a result of a combination of methods to control contact pathways between contaminated soil and potential receptors. Alternative 1 achieves a moderate level of protectiveness because it creates a barrier between contaminated soil and potential receptors but does not restrict access to those receptors. Alternative 2 achieves a lower level of protectiveness because, although it restricts access to contaminated soil and receptors, it does not provide a barrier to reduce contact if the access restrictions fail.

5.4.1.2. *Permanence*

Each alternative has a moderate level of permanence since soils with total arsenic concentrations above 95 mg/kg are retained and they rely on varying concentrations of O&M.

5.4.1.3. *Long-term Effectiveness*

All alternatives include potential exposure to contaminated soil over the long-term. However, Alternatives 1 and 3 achieve the highest level for long-term effectiveness because they create a barrier between contaminated soil and potential receptors and restrict access to areas with elevated total arsenic concentrations. Alternative 2 provides a lower level of long-term effectiveness because enforcement of the decommissioned trails may be difficult in the long term, as these trails often represent a preferred path for some hikers (short cuts). Alternative 1 provides a moderate level of long-term effectiveness, as areas with high foot traffic and areas with steep slopes may be susceptible to increased erosion or deterioration of the cover and vegetation.

5.4.1.4. *Management of Short-term Risks*

Alternative 1 includes minimal exposure to areas with elevated arsenic concentrations and generally involves importing cover material. Alternatives 2 and 3 involve higher exposure because they require more involved earthwork and construction activities to re-establish trails and the haul road.

5.4.1.5. *Technical and Administrative Implementability*

Each alternative provides a similarly high level of technical and administrative feasibility. Regardless of the alternative selected, the Site will need similar access and require coordination with the City and Ecology.

5.4.1.6. *Cost*

For each alternative, probable remedy costs (+50/-30 percent) will be developed using a combination of published engineering reference manuals (i.e., RS Means, Heavy Construction Cost Data Manual), construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

Under Alternative 3, the City and Land Trust would plan for the development, installation and maintenance of institutional controls. The City also plans to convert the Phase 2 haul road to a permanent trail and maintenance of the trail will be performed by the Land Trust.

Under Alternative 2, the cost for the initial trail realignment will be included in the Phase 2 construction costs. The City plans to complete trail restorations in cooperation with the Land Trust, closures and O&M tasks.

Under Alternative 1, the cost to cover and revegetate a significant area is high (depending on the material source location) compared to other measures; however, select areas could be covered and revegetated during Phase 2 IRA activities to moderate the cost.

5.4.2. Reasonable Restoration Timeframe

Alternative 2 provides the shortest restoration timeframe since it only involves trail decommissioning and realignment. Alternatives 1 and 3 incorporate revegetation, which will necessitate at least one growing season to implement.

5.4.3. Consideration of Public Concerns

Alternative 3 is expected to have the highest level of public acceptance because it achieves the greatest level of compromise, protection and certainty. All alternatives would likely be somewhat disruptive, but Alternatives 1 and 2 are considered the most disruptive to hikers.

5.5. Selection of a Preferred Alternative

Selection of a preferred alternative under MTCA requires that a preference be given to alternatives that use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time frame and consider public concerns. The analysis below compares the baseline alternative (the alternative that provides the greatest degree of permanence) to the other alternatives based on degree of permanence, reasonable restoration time frame and public concerns. According to MTCA (WAC 173-340-200), a permanent solution or permanent cleanup action means a cleanup action in which cleanup standards can be met without further action being required at the Site other than the approved disposal of any residue resulting from the cleanup action.

5.5.1. Preferred Mitigation Measures Alternative

Alternative 3 is the preferred Mitigation Measures. Alternative 3 utilizes barriers, existing trail improvements/covering/decommissioning and institutional controls as evaluated and shown on Table 3.

6.0 LIMITATIONS

This report has been prepared for the exclusive use of the City of Wenatchee, their authorized agents and regulatory agencies in their evaluation of the Site. No other party may rely on this product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

7.0 REFERENCES

GeoEngineers, 2019a. Sampling and Analysis Plan, Interim Remedial Action Design and Remedial Action, Saddle Rock Natural Area, Wenatchee, Washington. File No. 4296-008-00. February 20, 2019.

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Washington State Department of Ecology, 2020a. Amendment No. A-01 to Agreed Order No. DE 15823, Gold Knob Prospects aka Saddle Rock Park, Wenatchee, Washington. April 9, 2020.

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TABLES

GeoEngineers

Table 1

Screening of Mitigation Measures

Phase 2 Saddle Rock Interim Remedial Action Project

Wenatchee, Washington

Action/ Technology	Process Option	Description	Effectiveness	Implementability	Responsibility	Relative Cost	Summary of Screening
Institutional Controls	Restrictive Covenant	Implement restrictive covenant to limit future use of Site.	Effectiveness for protection of human health would depend on enforcement of and compliance with restrictive covenant.	Technically implementable. Specific legal requirements and authority would need to be met.	City of Wenatchee	Low capital.	Not applicable given expected final Site conditions after Phase 2 IRA activities. Not retained.
	Public Education and Signs	Install and maintain educational and/or instructional signs to inform the public of elevated arsenic in native soils and methods to avoid/reduce exposure.	Generally not effective unless in combination with other measures.	Technically implementable. Locations and language of the signs would be determined after Phase 2 IRA construction activities.	City of Wenatchee/Land Trust	Negligible capital. Low O&M.	Potentially applicable in combination with other measures. Retained.
	Benches	Install and maintain benches to encourage hikers to rest in areas with lower levels of arsenic, thereby reducing or eliminating exposure to bare soils with elevated arsenic in rest areas. Two benches have already been installed at the park ridgetop.	Effective for preventing direct contact exposure.	Technically implementable. The City and Land Trust have determined general areas for placement of benches. Installation of Benches can commence after Phase 2 IRA activities are complete and the final alignment of the haul road is determined.	City of Wenatchee/Land Trust	Negligible capital. Low O&M.	Potentially applicable in combination with other measures. Retained.
	Soil Removal Stations	Install foot wash and/or brush stations at trailheads to encourage hikers to clean boots, animal paws etc. to avoid transporting contaminated soil offsite.	Generally not effective for reducing exposure on Site.	Technically implementable. Water sources are already in place and brush stations could be added at trailheads. Note: Water not available in winter	City of Wenatchee/Land Trust	low capital, moderate to high O&M.	Not applicable due to lack of effectiveness for reducing exposure while onsite. Not retained.
Trail Modifications	Realignment	Modify existing trails so that they no longer pass through areas with elevated arsenic concentrations, thereby reducing potential exposure of the general public to areas with elevated arsenic.	Effective for eliminating direct contact exposure routes. Potential for the public to re-establish routes and create shortcuts through elevated arsenic areas.	Technically implementable. A portion of the trail system will be modified to a haul road during Phase 2 IRA activities and will be converted to a permanent trail and access road at the conclusion of Phase 2 IRA.	Ecology for initial realignment/haul road, City/Land Trust for permanent road and trail maintenance	Very high capital. Low O&M.	Potentially. Retained.
	Decommissioning	Decommission select side trails to restore native conditions for the area. Selected trails would be blocked, revegetated, recontoured and/or covered.	Effective for reducing exposure risk provided restoration is maintained in the long term. Potential for the public to re-establish routes and create shortcuts through elevated arsenic areas.	Technically implementable. The City and Land Trust have expressed interest in closing select trails to protect the native conditions of the Site.	City of Wenatchee/Land Trust	Negligible capital if abandonment is assumed by the Land Trust. Low O&M.	Potentially applicable in combination with other measures. Retained.
Barrier over Bare Soils	Covering and Revegetation	Install and maintain fiber rolls, geotextile fabric, imported or onsite clean soil or wood chips in combination with revegetation methods such as hydroseeding to create a barrier between contaminated soil and the public.	Effective for preventing direct contact exposure (i.e., dermal contact or ingestion) provided coverings are maintained in the long term.	Technically implementable. Coverings may be difficult to maintain especially in areas with steep grade.	City of Wenatchee	High capital, moderate to High O&M.	Potentially applicable in combination with other measures. Retained.
	Covering Haul Road/Main Trail	Cover newly graded and/or realigned haul road to SR-05 with gravel to limit exposure to bare soils.	Effective for preventing direct contact exposure (i.e., dermal contact or ingestion) provided road is maintained in the long term.	Technically implementable. Coverings may be difficult to maintain especially in areas with steep grade.	Ecology for initial realignment/haul road, City of Wenatchee/Land Trust for permanent road and trail maintenance	High capital, moderate to High O&M.	Potentially applicable in combination with other measures. Retained.

Notes:

O&M = Operation and Maintenance

Table 2

Evaluation of Alternatives

Phase 2 Saddle Rock Interim Remedial Action Project

Wenatchee, Washington

	Alternative 1 - Cover and Revegetate Bare Soil Areas	Alternative 2 - Realign and Abandon Trail System to Avoid Bare Soil Areas	Alternative 3 - Institutional Controls with Select Trail Realignment, Select Trail Covering and Trail Abandonment
Alternative Description			
Soil	• Cover (with a locally sourced Site material with a concentration less than 20 mg/kg arsenic or clean imported fill) and revegetate all bare soils areas (trails, rest areas, view points, side trails) with elevated arsenic concentrations • Implement future O&M procedures to ensure areas remain intact	• Realign trails to avoid areas with high arsenic concentrations • Abandon select side trails • Implement future O&M procedures to ensure areas remain intact	• Cover the entire Phase 1 and 2 main trail with gravel, after Phase 2 substantial construction is complete, to limit exposure • Close select side trails • Install benches at rest areas away from or over areas with elevated arsenic concentrations • Install signs encouraging public to remain on main trail • Implement future O&M procedures to ensure areas remain intact
Cost	To be presented in the Preliminary Design Report	To be presented in the Preliminary Design Report	To be presented in the Preliminary Design Report
Timeframe	Can be implemented in one field season	Can be implemented in one field season	Can be implemented in one field season
Alternative Ranking Under MTCA			
1. Compliance with MTCA Threshold Criteria			
Protection of Human Health and the Environment	Partial - Alternative provides moderate protection of human health through capping. Relies on O&M.	Partial - Alternative provides moderate protection of human health through trail realignment and abandonment. Relies on compliance.	Yes - Alternative would protect human health through a combination of trail capping, realignment/decommissioning, and institutional controls. Relies on O&M and compliance.
Compliance With Cleanup Standards	No - Alternative would not comply with cleanup standards because total arsenic would remain at concentrations greater than cleanup levels. If a conditional point of compliance was used, the cleanup standards could be met with Alternative 1.	No - Alternative would not comply with cleanup standards because total arsenic would remain at concentrations greater than cleanup levels. If a conditional point of compliance was used, the cleanup standards could be met with Alternative 2.	No - Alternative would not comply with cleanup standards because total arsenic would remain at concentrations greater than cleanup levels. If a conditional point of compliance was used, the cleanup standards could be met with Alternative 3.
Compliance With Applicable State and Federal Regulations	Yes - Alternative complies with applicable state and federal regulations.	Yes - Alternative complies with applicable state and federal regulations.	Yes - Alternative complies with applicable state and federal regulations.
Provision for Compliance Monitoring	Yes - Alternative includes provisions for compliance monitoring.	Yes - Alternative includes provisions for compliance monitoring.	Yes - Alternative includes provisions for compliance monitoring.
2. Restoration Timeframe			
	Restoration timeframe is moderate. Revegetation will necessitate one growing season under this alternative. Because naturally-occurring contamination in soil is not being removed as part of this alternative, it would be present indefinitely.	Restoration timeframe is relatively short. No revegetation is needed. Because naturally-occurring contamination in soil is not being removed as part of this alternative, it would be present indefinitely.	Restoration timeframe is moderate. Revegetation will necessitate one growing season under this alternative. Because naturally-occurring contamination in soil is not being removed as part of this alternative, it would be present indefinitely.

	Alternative 1 - Cover and Revegetate Bare Soil Areas	Alternative 2 - Realign and Abandon Trail System to Avoid Bare Soil Areas	Alternative 3 - Institutional Controls with Select Trail Realignment, Select Trail Covering and Trail Abandonment
3. Disproportionate Cost Analysis Relative Benefits Ranking (Scored from 1-lowest to 5-highest)			
Protectiveness	Score = 4 Achieves a moderate level of overall protectiveness as a result of barrier over arsenic that pose risks to human health and the environment at the Site.	Score = 3 Achieves a moderate level of overall protectiveness as a result of limiting access to areas with arsenic that pose risks to human health and the environment at the Site.	Score = 5 Achieves a moderate level of overall protectiveness as a result covering and/or restricting access to areas with arsenic that pose risks to human health and the environment at the Site.
Permanence	Score = 3 Achieves a moderate level of permanence since soils with total arsenic concentrations above 95 mg/kg are retained and they rely on varying levels of O&M.	Score = 3 Achieves a moderate level of permanence since soils with total arsenic concentrations above 95 mg/kg are retained and they rely on varying levels of O&M.	Score = 3 Achieves a moderate level of permanence since soils with total arsenic concentrations above 95 mg/kg are retained and they rely on varying levels of O&M.
Long-Term Effectiveness	Score = 3 Involves creating a barrier between arsenic that pose risks to human health and the environment, but does not prevent access to those areas.	Score = 1 Involves trail construction and abandonment to limit access to areas with arsenic that pose risks to human health and the environment. However, hikers may ignore signs or return to using abandoned trails without other controls preventing them from doing so.	Score = 4 Involves combination of methods to reduce risk of exposure to arsenic that pose risks to human health and the environment.
Management of Short-Term Risks	Score = 4 Minimal short-term risk associated with covering and revegetating bare soils areas.	Score = 2 Involves trail construction and abandonment with higher short-term risks due to construction and earthwork.	Score = 3 Involves combination of methods to reduce risk of exposure with moderate level of earthwork needed.
Technical and Administrative Implementability	Score = 4 Involves moderate technological and administration considerations.	Score = 4 Involves moderate technological and administration considerations.	Score = 4 Involves moderate technological and administration considerations.
Consideration of Public Concerns	Score = 3 Does not remove arsenic that pose risks to human health and the environment at the Site but reduces contact pathways between arsenic and receptors. Does not restrict access to areas with high arsenic concentrations.	Score = 2 Does not remove arsenic that pose risks to human health and the environment at the Site but restricts access to areas with arsenic that pose risks to human health and the environment. Does not provide barrier between arsenic and receptors.	Score = 5 Does not remove arsenic that pose risks to human health and the environment at the Site but reduces contact pathways between arsenic and receptors and provides highest level of protection.
Total	21	15	24

Notes:

NA = Not applicable

CSZ = Contaminated Soil Zone

COC = Chemicals of Concern

Table 3

Preferred Alternative Decision Matrix Summary

Phase 2 Saddle Rock Interim Remedial Action Project

Wenatchee, Washington

Alternative Number	Alternative 1	Alternative 2	Alternative 3
Alternative Ranking Under MTCA			
1. Compliance with MTCA Threshold Criteria	2nd	3rd	1st
2. Restoration Timeframe	2nd (tied)	1st	2nd (tied)
3. DCA Relative Benefits Ranking	2nd	3rd	1st
Protectiveness	4	3	5
Permanence	3	3	3
Long-Term Effectiveness	3	1	4
Management of Short-Term Risks	4	2	3
Technical and Administrative Implementability	4	4	4
Consideration of Public Concerns	3	2	5
Total of Scores	**21**	**15**	**24**
4. Disproportionate Cost Analysis (DCA)			
Probable Remedy Cost	High	High	Moderate
Costs Disproportionate to Incremental Benefits	Yes	Yes	No
Practicability of Remedy	Practicable	Practicable	Practicable
Remedy Permanent to Maximum Extent Practicable	Yes	Yes	Yes
Overall Alternative Ranking	**2nd**	**3rd**	**1st**

Notes:

MTCA = Model Toxics Control Act

FIGURES

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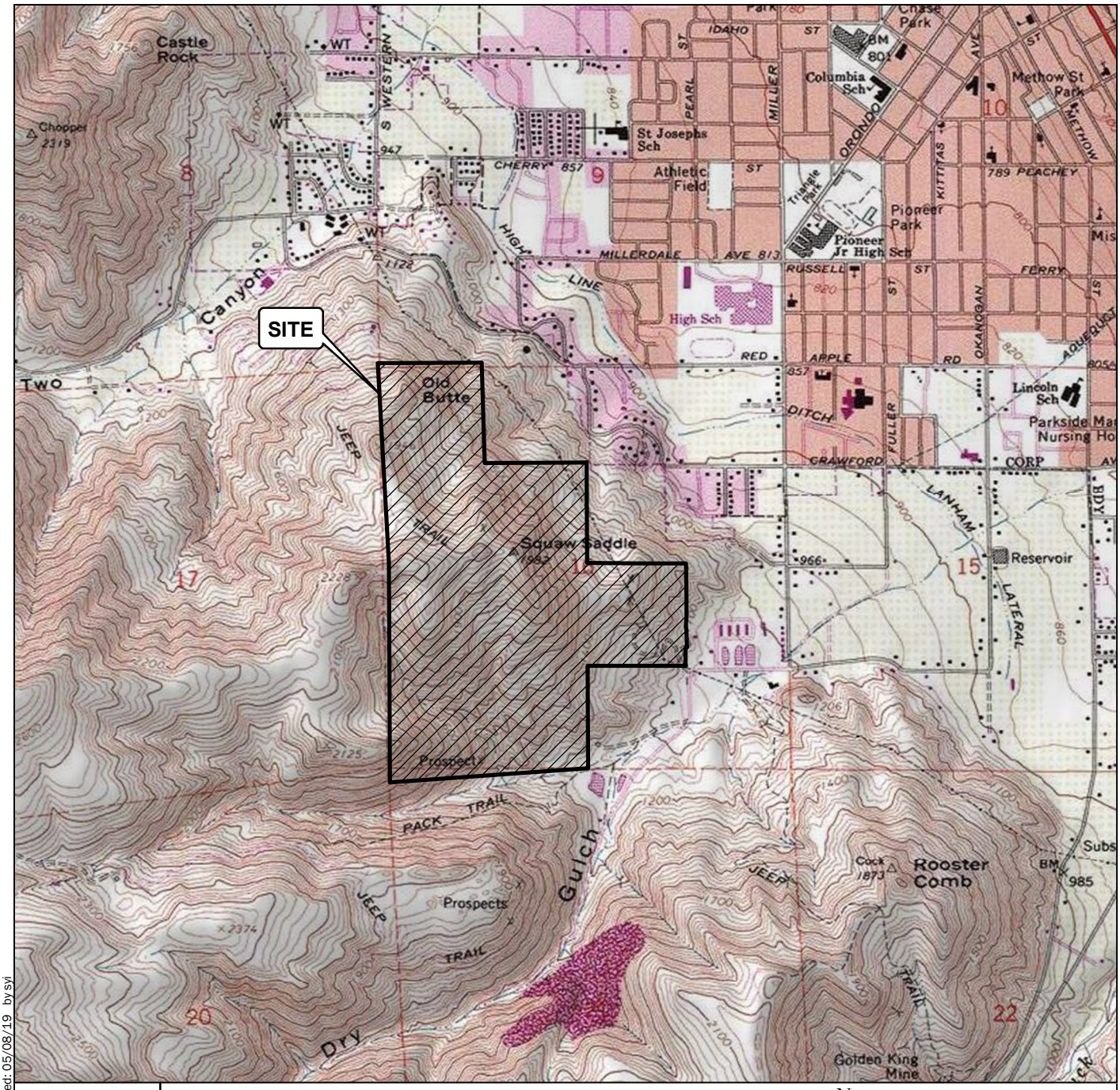

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Feet

Vicinity Map

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 1

Notes:

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

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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BS54 (310.0)
BS56 (49.6)
BS57 (159.9)
BS58 (311.0)
BS52 (105.3)
BS53 (2103.0)
BS61 (128.9)
BS51 (44.3)
BS59 (62.9)
BS60 (84.8)
BS62 (344.0)
BS63 (280.0)
BS50 (6.6)
BS64 (121.1)
BS65 (170.2)
BS49 (4.4)
BS48 (4.9)
BS45 (11.1)
BS46 (2.8)
BS47 (3.5)
BS66 (106.9)
BS44 (19.4)
BS42 (73.3)
BS43 (124.1)
BS41 (71.5)
BS40 (152.2)
BS39 (38.0)
BS38 (80.9)
BS37 (83.5)
BS36 (68.5)
BS35 (32.2)
BS34 (34.9)
BS33 (10.3)
SR-03 (70.5)
BS22 (0.0)
BS18 (3.2)
BS21 (8.1)
BS23 (9.0)
BS19 (9.7)
BS20 (15.1)
BS24 (46.5)
BS17 (6.7)
SR-08 (41.1)
BS25 (139.4)
BS27 (178.0)
BS16 (17.9)
BS26 (192.0)
BS15 (130.6)
BS14 (28.6)
BS13 (20.3)
BS28 (94.4)
BS11 (4.1)
BS29 (34.9)
BS12 (21.8)
BS09 (28.3)
SR-02 (45.6)
BS10 (72.9)
BS08 (53.4)
BS04 (156.0)
BS30 (33.4)
BS07 (25.4)
BS05 (28.2)
SR-01 (75.4)
BS06 (31.9)
BS03 (15.5)
BS31 (6.0)
BS02 (17.8)
BS32 (12.3)
BS01 (10.4)

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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Mean total arsenic concentrations at waste rock piles from confirmation XRF samples during Phase I IRA activities

Data Source: ESRI World Imagery.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- XRF Number, (Arsenic Concentration in mg/kg) and Approximate Location
- Waste Rock Pile Number, (Mean Arsenic Concentration in mg/kg) and Approximate Location
- MTCA Method A Clean Up Level (<20 mg/kg)
- Site Specific Background Concentration (<95 mg/kg)

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Feet

Total Arsenic Concentrations with Isometric Contours

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 2

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APPENDIX C
Inadvertent Discovery Procedure

Project Recommendations

During the course of inspection, RLR identified six historic mining sites, and one historic archaeological or historic property, and have uncovered evidence of a Native American traditional cultural property associated with the site. The archaeological properties have been recorded to the Washington State Department of Archaeology and Historic Preservation's Washington Information System for Architectural and Archaeological Records Data (WISAARD) database as archaeological sites. Prior to development of the project area, **Reiss-Landreau Research recommends that the stakeholders consider putting forth a district nomination for the sites associated with Saddle Rock, as their historic relationship is clear and notable. In addition, the eligibility of the sites under criterion A and B are clearly established.**

Inadvertent Discovery Procedure.

If any archaeological resources are discovered or suspected during the course of the project, activity in the immediate area shall stop until a professional archaeologist can assess the discovery.

If the inadvertent discovery is archaeological material:

1. The project proponent, Chelan County Department of Community Development and the Washington State Department of Archaeology and Historic Preservation (DAHP) will be contacted and work in that area will stop.

2. The archaeologist will contact the Project Proponent, The City of Wenatchee.

    a. Upon notification of discovery of potential archaeological deposits, a professional archaeologist will evaluate the remains.

    b. The DAHP will be given the opportunity to view the artifacts within 48 hours after the discovery or at the earliest possible time thereafter. The discovery will be kept confidential. After halting construction, securing the site, and notifying the contractor, the archaeologist will conduct a brief in-field evaluation. The purpose of the evaluation is to determine whether the discovered resources have potential to answer research questions.

    c. Evaluation protocols are described in the following section.

    d. If parties agree that the artifacts are not significant, RLR will ask the construction representatives to resume construction.

e. If parties agree that the artifacts are significant, the Washington State DAHP will issue a stop work order until further notice for all construction work in the area defined as a significant site.

Guidelines for the Discovery of Human Remains:

1. All persons who know of the existence and location of human remains must, by law, **notify the county coroner and local law enforcement**. This must be done in the most expeditious manner possible. (RCW 27.44; 68.50; 68.60);

2. Any person engaging in ground disturbing activity that encounters skeletal human remains must **cease all activity which may cause further disturbance to the remains, make a reasonable effort to protect the area from further disturbance, report the presence and location of those remains to the coroner and local law enforcement** (RCW 27.44; 68.50; 68.60). The remains should not be touched, moved, or further disturbed;

3. The county coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. (RCW 27.44; 68.50; 68.60);

4. If the county coroner determines the remains are non-forensic, then the Department of Archaeology and Historic Preservation will take jurisdiction over the remains. (RCW 27.44; 68.50; 68.60);

5. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to the affected parties. (RCW 27.44, 68.50; 68.60);

6. The DAHP will handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains if there is no federal agency involved.

APPENDIX D
Geotechnical Evaluation

for

Washington State Department of Transportation

January 4, 2021

Geotechnical Engineering Evaluation

Saddle Rock Interim Remedial Action Project
Planned Haul Road
Wenatchee, Washington

for
City of Wenatchee

January 4, 2021

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Geotechnical Engineering Evaluation

Saddle Rock Interim Remedial Action Project
Planned Haul Road
Wenatchee, Washington

File No. 4296-008-02

January 4, 2021

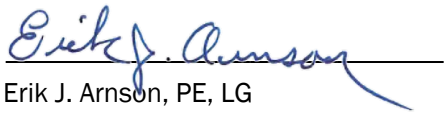
Prepared for:

City of Wenatchee
PO Box 519
Wenatchee, Washington 98801

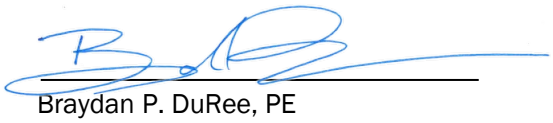
Attention: Charlotte Mitchell
Parks Capital Project Manager

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202



Erik J. Arnson, PE, LG
Senior Engineer



Braydan P. DuRee, PE
Associate

EJA:BPD:mce:tjh

Table of Contents

1.0 INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) is pleased to present the results of our geotechnical engineering services for the Phase 2, Saddle Rock Interim Remedial Action (IRA) Project. The project Site is located on the Saddle Rock Mountain, southwest of Wenatchee, Washington at the location shown in the Vicinity Map, Figure 1. The Site is a park owned by the City of Wenatchee (City) and is frequented by the public for recreational use. The Site was documented to have several mining claims, where waste rock was generated during previous mining prospecting explorations. Since 2011, the Washington State Department of Ecology (Ecology) and others have performed multiple investigations of the remnant waste rock piles exposed at the ground surface near the former mine locations. These investigations indicated that the waste rock piles contained heavy metal contaminants of concern (COC), primarily arsenic. Since arsenic and other heavy metals are hazardous to public health, the preferred remedial action includes excavating the remaining waste rock pile (SR05) and transporting off-site for proper disposal at a permitted waste disposal facility.

To complete the excavation and removal process, heavy equipment will need to access the former SR05 mine location. An existing primitive road extends from the valley floor to the top of the Site ridgeline and is the most direct access to SR05. The approximate location of the existing road is shown in the Site Plan, Figure 2. However, the existing road is on average, approximately 6- to 10-feet wide and is severely eroded in isolated locations. As such, the existing road is not suitable for heavy equipment or vehicle traffic in its present condition. Our Phase 2 project subconsultant, Perteet, Inc., conducted a realignment and new construction assessment of an alternative haul road in order to reduce the road profile grade, but the concept was abandoned by the City in favor of improving the existing road (due to estimated construction costs and potential Site impacts related to large earthwork cuts and fills). Earthwork improvements, in the form of minor widening and surfacing (as needed), will be performed to upgrade the existing road for its intended use as a construction haul road. We understand conceptual plans call for widening the road to approximately 10 feet in width, adding erosion control structures, such as water bars, and potentially surfacing portions of the road with crushed rock. The profile grade of the proposed haul road will match existing grade, resulting in some very steep segments.

2.0 SCOPE OF SERVICES

Our geotechnical engineering scope of services was presented as part of our May 8, 2020, revised proposal titled “Saddle Rock Interim Remedial Action Project – Phase 2 Additional Sampling, Environmental Design and Reporting Services.” The purpose of our services was to provide geotechnical engineering recommendations for the design of specific geotechnical aspects of the proposed road improvements, based on subsurface investigation, laboratory testing and engineering analysis. The scope of geotechnical engineering services completed by GeoEngineers for the project is summarized below.

- Completing a literature review of available reports and studies for the Site and surrounding area.
- Completing a geologic site reconnaissance to evaluate site conditions and determine test pit excavation locations.
- Exploring subsurface soil conditions by completing eight test pit excavations at the Site, as a basis for developing our geotechnical recommendations.

- Geotechnical laboratory testing of soil samples collected from the test pits to evaluate pertinent physical and engineering characteristics of Site soil.
- Providing a draft geotechnical engineering report containing logs of test pits, laboratory test results and recommendations for: cut and fill slope inclinations; slope stability; and roadway surfacing.
- Providing a final geotechnical engineering report including mutually agreed upon edits.

3.0 SITE CONDITIONS

3.1. Literature Review

3.1.1. Geologic Setting

The Washington State Department of Natural Resources (DNR) Bulletin 75 titled "Geologic 0f the Wenatchee and Monitor Quadrangles, Chelan and Douglas Counties, Washington" (Gresens 1983) maps the predominant surficial geology along the existing road alignment as (*Ts*) "Swauk(?) Formation of late Eocene age. Well-indurated light- to dark-gray felspathic sandstone interbedded with shale and conglomerate. Commonly contains thick calcite veins." The one exception, according to the map, is where the road crosses a narrow zone of intrusive igneous rock between approximate Project Stations 1707+00 and 1708+00.

3.1.2. Soil Survey Review

The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) provides online soil data through the Web Soil Survey. The Web Soil Survey maps the upper 5 feet of the surficial soil at the site along of the existing road as (*BkF*) Bjork silt loam, 45 to 65 percent slopes, with two exceptions. From approximate Project Station 1703+00 to 1704+00, the existing road crosses an area soil mapped as (*CaB*) Cashmere sandy loam, 3 to 8 percent slopes. From approximate Project Station 1728+00 to 1732+00, the existing road crosses an area soil mapped as (*BoF2*) Bjork-Rock outcrop complex, 25 to 65 percent slopes, eroded. NRCS information for each soil type is provided below.

(*BkF*) Bjork silt loam, 45 to 65 percent slopes and (*BoF2*) Bjork-Rock outcrop complex, 25 to 65 percent slopes, eroded. The Bjork soil formed on hillslopes in a parent material of residuum from schist, gneiss or sandstone with loess in the upper part. The typical soil profile consists includes: 0 to 12 inches, silt loam; 12 to 26 inches, clay loam; and 26 to 36 inches, weathered bedrock. The drainage class of the soil is "well drained," and the Hydrologic Soil Group is C.

(*CaB*) Cashmere sandy loam, 3 to 8 percent slopes. The Cashmere sandy loam formed on Alluvial fans and/or terraces in a parent material of glaciofluvial deposits. The typical soil profile consists includes: 0 to 9 inches, sandy loam; and 9 to 60 inches, sandy loam. The drainage class of the soil is "well drained," and the Hydrologic Soil Group is A.

3.2. Surface Conditions

The Site is located within the Dry Gulch Preserve on Saddle Rock mountain. The existing road is located on a southeast facing slope on the south flank of Saddle Rock mountain. The road begins near the intersection of Circle Street and Dry Gulch Road in Wenatchee and traverses the slope for approximately 6,400 lineal feet until it approaches the summit of Saddle Rock mountain. The road varies in width from about 6 to

10 feet and has gradients which vary from near level to about 32 percent. The road is "primitive" with an unpaved surface of bare soil and/or gravel that had been severely eroded in various locations by uncontrolled stormwater runoff. The surrounding slope is sparsely vegetated with native grass and sage brush.

3.3. Subsurface Exploration Program

We explored subsurface soil conditions at the site on August 5, 2020, by excavating eight test pits (TP-1 through TP-8) to depths between about 5 and 11 feet below ground surface (bgs). The test pit locations were completed along the original proposed re-alignment before the decision was made to improve the existing road alignment. The test pits were excavated by Palm Construction, Inc., under subcontract to GeoEngineers, using a track-mounted Cat 305E2 excavator. The approximate locations of the test pits, relative to existing site features, are shown on Figure 2.

Representative disturbed samples of soil and rock collected from the test pits were returned to our laboratory for examination and testing. Detailed descriptions of our site exploration and laboratory testing programs, along with exploration logs and laboratory test results, are presented in Appendix A.

3.4. Subsurface Conditions

Subsurface conditions encountered in our test pits were generally consistent with the Swauk Formation and the Bjork soil described in the previously referenced geologic and soil survey literature. In general, we encountered silty sand or silty sand overlying sandstone in our test pit explorations at the Site.

At the ground surface at the locations of test pits TP-1, TP-3 and TP-4, we encountered about 2 inches of topsoil, which we described sandy silt with organic matter (roots). At the remaining test pit locations, we encountered bare soil at the ground surface.

Below the topsoil or ground surface, we encountered loose to dense, cemented, silty fine or fine to medium sand with occasional gravel (Unified Soil Classification System [USCS] Soil Group Classification – SM). Cementation was observed to range from weak to strong. Test pits TP-1, TP-2, TP-4, TP-5 and TP-7 terminated in the silty sand at depths ranging from about 5 to 10½ feet bgs. The silty sand in test pit TP-3 transitioned to loose to medium dense, weakly cement, clayey fine to medium sand with occasional gravel (USCS Soil Group Classification – SC) at a depth of about 8 feet bgs. Test pit TP-3 terminated in the clayey sand at about 11 feet bgs. We characterize the silty and clayey sand as having moderate strength, low to moderate compressibility and permeability, and a very high susceptibility to changes in moisture content.

Below the silty sand in test pits TP-6 and TP-8, we encountered slightly weathered to decomposed, very soft to medium hard, sandstone with poor to fair rock quality and thinly- to medium-spaced bedding. Test pits TP-6 and TP-8 were terminated in the sandstone at depths of about 8 and 9 feet bgs, respectively. We characterize sandstone as having moderate to high strength, and low compressibility and permeability.

Laboratory percent fines (silt- and clay-sized soil particles passing the US No. 200 sieve) determinations on 11 representative soil samples indicate the fines content of the silty and clayey sand (SM, SC) samples tested ranged from about 20 to 49 percent with the moisture content ranging from about 6 to 11 percent.

3.5. Groundwater Conditions

We did not encounter groundwater in our test pits within the depths explored. Based on our understanding of the project, we do not anticipate groundwater will impact construction during improvement of the existing road. However, the presence, elevation and extent of groundwater varies seasonally, generally being highest in the spring and early summer months, and from year to year, which might result in intermittent seeps or springs in isolated locations at the Site during the spring season or following significant precipitation.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. General

Based on the results of our Site exploration, laboratory testing and engineering analyses, we believe the Site soil conditions are generally suitable for the proposed road improvements, provided the recommendations in the following sections are followed. A summary of some of the geotechnical-related conditions and issues associated with design and construction of the proposed improvements at the Site include the following.

4.2. Site Preparation and Earthwork

4.2.1. Initial Preparation

We anticipate initial Site preparations will include clearing of brush along the existing road, and stripping of surface vegetation and other organic matter, where present, in areas that will be widened. Root wads from bushes should be grubbed and removed. Stripping depths should be sufficient to remove vegetation and topsoil, where present, and localized zones of other soil with more than about 15 percent organic matter (by volume) that might be present in areas of the site that were not explored.

Excavations and voids resulting from clearing and grubbing should be backfilled with suitable on-site soils or imported structural fill, as defined in Section 4.3. Stripped and grubbed material should be removed and disposed or spread on site at a suitable location as directed by the City or their appointed representative. Actual stripping depths should be determined by the City or their appointed representative based on field observations at the time of construction.

4.2.2. Grading and Excavations

We understand improvements will be constructed at or near existing Site grade. As such, we anticipate grade changes likely will be in the range of plus or minus 1 foot or less but may require larger cut and fills where the road is widened. In our opinion, Site soil can be excavated using appropriately sized, conventional, excavating equipment and procedures capable of excavating in and around moderately cemented soil. Deeper excavations, such as for culverts, might require ripping of medium hard rock, if encountered.

If earthwork activities cause excessive soil disturbance after stripping or initial grading activities, removal of the disturbed soil and replacement with structural fill might be necessary. Given the sensitivity of the Site soil to moisture, we recommend earthwork construction activities occur during dry weather periods. Ground disturbance should be expected if site preparation work is conducted during periods of wet weather. All excavations to repair disturbed areas should be backfilled with suitable fill, as defined Section 4.3.

4.2.3. Subgrade Preparation

After initial site preparation and grading activities are completed by the contractor, the soil exposed at road subgrade should be compacted to a firm and dense condition. Compaction methods may include wheel rolling, tracking with heavy equipment and/or compaction with static or vibratory rollers. Other compaction methods may be used if approved by the Engineer. If the exposed soil is not near optimum moisture content, scarification of the upper 12 inches of the soil and careful moisture-conditioning (drying or moistening) might be required to adjust the soil moisture content to within 3 percent of optimum moisture content prior to compaction.

We recommend that the Engineer evaluate the condition of the subgrade at the time of construction to determine if it is consistent with the soil encountered in our explorations at the site and if it has been prepared in accordance with the project plans and specifications. Haul road soil encountered at subgrade that cannot be compacted to the specified criteria or is otherwise unsuitable, as determined by the Engineer, should be removed to a depth of 2 feet below subgrade or firm bearing, whichever is less, and replaced with structural fill placed as recommended in Section 4.3. Removal of unsuitable soil should not be performed unless approved by the Engineer.

4.2.4. Excavation Slopes

Widening of the existing road will require excavation (cut) slopes in some locations and potentially, for culvert installation. Excavations deeper than 4 feet should be shored or sloped at stable inclinations if workers are required to enter such excavations. Temporary slopes and shoring for utility excavations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring."

In our opinion, site soil classifies as Type B or C for excavation purposes (Chapter 296-155-664 WAC), depending on the fines content and soil cementation. The maximum allowable temporary slope is 1H;1V (horizontal:vertical) for Type B soil, and 1.5H:1V for Type A soil, provided excavations are less than 20 feet deep located above a groundwater table or seepage zones. This guidance is based on our assumption that all surface loads are kept a minimum distance of at least one-half the depth of the cut away from the top of the slope. Flatter slopes will be necessary if surface loads are imposed above the cuts a distance equal to or less than one-half the depth of the cut. These recommendations are provided for planning purposes only. The Contractor performing the work is responsible for site safety and determining the appropriate temporary slope based on the WAC requirements.

Based on available topographic information, the steepest natural slope in the vicinity of the existing road is located above and east of the road near Project Station 1735+00. The slope is inclined up to about 1.5H:1V and does not exhibit visual evidence of deep-seated instability but does show evidence of surficial erosion. Based on these observations, in our opinion, the natural angle of repose of the Site soil on this slope is about 34 degrees or greater.

The angle of repose of a slope correlates to the angle of internal friction of the slope soil which is representative of the shear strength of the soil. Silty sand soil generally has an internal angle of friction in the range of 30 to 34 degrees but can be higher or lower. Given these observations, it is our opinion that cut and fill slopes of 1.5H:1V or shallower should be stable with respect to significant slope failure. In steep portions of the road alignment, maximum 1.5H:1V permanent cut and fill slopes may be used to widen the haul road. Surficial erosion should be anticipated on slopes inclined steeper than about 2H;1V, requiring

periodic maintenance. Where the topography is less steep, consideration should be given to flatten the slopes to 2H:1V, to reduce the potential for erosion and maintenance.

Surface drainage should be directed away from slope faces. Slopes should be seeded as soon as possible to encourage the development of a vegetative cover or otherwise protected. Raveling and erosion of the slope face could occur with time until a vegetation cover is established, or protection is placed. Raveling and erosion of slopes steeper than 2H;1V could occur even after vegetation is established, and ongoing maintenance should be anticipated.

4.3. Structural Fill

4.3.1. General

Soil used to construct the roadway improvements is classified as structural fill for the purposes of this report. Structural fill material requirements vary, depending upon its use as described below. Structural fill, whether on-site soil or imported, should be free of debris, organic material, frozen soil and particles larger than 6 inches in maximum dimension. We anticipate the Phase 2 construction contractor may need to place structural fill in select areas along the existing road (to be utilized as the primary 'haul road'), but the majority of existing road soil conditions are anticipated to be suitable for vehicle and equipment traffic, once road improvements have been made.

4.3.2. Use of On-site Soil

The suitability of on-site soil for use as structural fill depends on soil gradation and/or moisture content at the time of compaction. As stated, the silty sand (SM) soil samples collected from our test pits at the Site had fines contents ranging from 20 to 49 percent by weight and, in our opinion, are highly moisture sensitive.

While the on-site soil may be used as structural fill, in our opinion, it likely will require careful moisture-conditioning, either wetting or drying, to achieve acceptable compaction levels. Such moisture-conditioning might require extra time on the contractor's part and likely will not be possible during wet weather conditions.

4.3.3. Fill Placement and Compaction Criteria

Structural fill should be placed in loose lifts not exceeding 12 inches in thickness (or a thickness compatible with the compaction equipment used, not to exceed 12 inches) and mechanically compacted to a firm and dense condition. Each lift should be conditioned to the proper moisture content for compaction prior to applying compaction efforts. Compaction can be completed by track walking equipment or other means specified in the contract documents.

We recommend the Engineer be on site during earthwork operations to observe site preparation and structural fill placement. Soil conditions should be evaluated as it is prepared by using method or performance specifications, such as visual evaluation, probing and proof-rolling of the structural fill and recompacted on-site soil, to check for compliance with final contract documents and recommendations in this report.

4.4. Weather Considerations

As stated previously, the on-site silty sand soil is highly moisture sensitive. As the moisture content of the soil increases, the strength decreases. During wet weather, as the soil approaches saturation, it becomes soft and muddy. Performing earthwork in these conditions will lead to severe disturbance of near-surface soil. During dry weather, the on-site soil should be less susceptible to disturbance and provide better support for construction equipment and vehicles. In addition, drying of soil that is above its optimum moisture content is most effective during extended periods of warm, dry weather.

The wet weather season generally begins in November and continues through May in eastern Washington. If possible, this project should be constructed, during the dry season between June and October. However, periods of wet weather may occur during any time of year. If wet weather earthwork is unavoidable, we recommend that the following steps be taken if surficial soil conditions begin to deteriorate:

- Stop earthwork activities during and immediately after periods of heavy precipitation.
- Grade the ground surface in and around the work area so that areas of ponded water do not develop.
- Accumulated water should be removed from the work area in accordance with the project Stormwater Pollution Prevention Plan (SWPPP).
- Areas of uncompacted soil should be sealed by rolling with a smooth-drum roller before precipitation occurs.
- Construction traffic should be restricted to specific areas of the Site, preferably areas that are not susceptible to disturbance.
- Construction activities should be scheduled so that the length of time that soil is exposed to moisture is reduced to the extent practical.

4.5. Road Surfacing

4.5.1. Drainage

Long-term performance of the road surface is influenced significantly by how well it is drained. Uncontrolled stormwater runoff can erode the road surface leading to channels and other damage in the roadbed. Proper grading of the road surface can help reduce such damage by directing stormwater off the road. Such positive drainage can be accomplished by crowning the subgrade to drain to each side of the road and/or super-elevating the road to drain to one side or the other. In either case, we recommend a minimum 2 percent cross slope to promote drainage. In addition, we recommend water bars be installed across the road to intercept stormwater sheet flow on the road and direct it to the shoulder. Water bar spacing will depend on the road gradient with smaller water bar spacing required on steeper sections of the road.

4.5.2. Gravel Surfacing

It might be necessary to place gravel surfacing in select areas of the existing road alignment while the road is being used as the 'haul road' to remove the SR05 waste rock material, especially if work is occurring during wet weather. We anticipate only selected areas of the existing road may require gravel surfacing; however, the contractor should determine the extent and thickness required to complete the project during project bidding. We understand the contractor will surface portions of the existing road (the 'haul road') with final gravel surfacing after substantial construction is completed.

We recommend gravel surfacing consist of Crushed Surfacing Base Course (CSBC) or Crushed Surfacing Top Course (CSTC) meeting criteria in *Section 9-03.9(3)* of the Washington State Department of Transportation (WSDOT) *2020 Standard Specifications for Road, Bridge and Municipal Construction (M41-10)*. Alternative material gradations may be used if approved by the Engineer.

Typical minimum gravel surfacing thickness for infrequently used roads accessed by passenger vehicles is 6 inches. The gravel section is usually increased if the road is frequently travelled and/or supports heavy loads, such as truck traffic. In such cases, gravel thicknesses of 12 to 18 inches are common. Laboratory testing of one representative sample from test pit TP-3, indicated a California Bearing Ratio (CBR) of about 4 for native soils compacted to 90 percent MDD. Typically, for moderate-volume gravel roads and for a CBR of 4, a minimum gravel surfacing thickness of 12 inches would be recommended. However, since this road will be a low-volume road after its use as a haul road, it is likely not warranted to place 12 inches of gravel surfacing after completion of this project.

Gravel sections thinner than 6 inches may be used with the understanding that the surfacing will require more frequent maintenance and that the rock surfacing will likely not provide adequate support if the subgrade soils are wet and could result in severe rutting. In the case of gravel surfacing, such maintenance usually consists of regrading the surface, replenishing the gravel to its original thickness and compacting it.

Gravel placed on road surfaces with gradient of about 15 percent or more often rapidly develops ruts and potholes, as it is displaced down the slope by the tires of vehicles attempting to climb such steep grades. The gravel may also be unstable for vehicles descending slopes steeper than about 15 percent. As such, these road sections require significantly more maintenance than sections with lower gradients.

Once the gravel surfacing has been displaced, it remains in a loose condition and can shift under vehicle tires, potentially reducing the traction and control of the vehicles. For sections of road with gradients of about 15 percent or steeper, we recommend gravel surfacing be omitted and the bare soil chemically treated, as described below. If gravel is placed on such steep gradients, we also suggest it be chemically treated to help bind the material and resist displacement.

4.5.3. Chemical Treatment

Chemicals, such as calcium chloride and magnesium chloride, sometimes referred to as “road salts,” are used for both deicing of roads, dust control and improving the ride on unpaved roads. These chemicals are mixed with water and usually applied with a water truck equipped with spray nozzles. For unpaved roads, these chemicals seep into the road surface and bind the soil particles together as they crystalize. These treatments need to be reapplied over time with the application frequency depending on traffic volume and weather. Wet weather and higher traffic volumes will break down the chemicals faster than infrequent traffic and dry weather conditions. Chemical treatment of unpaved road surfaces is often performed annually for higher volume gravel roads; however, the City may determine a suitable application interval, based on the road condition and frequency of use as part of their maintenance plan.

For estimating purposes, treatment typically requires about 0.5 gallons of water mixed with calcium chloride or magnesium chloride be applied per square yard of soil for dust control. However, up to 0.7 gallons per square yard might be required on steep gradients or where the road surface is rough. Also, prewetting of the road surface might be required before applying the mix under certain circumstances.

5.0 LIMITATIONS

We have prepared this report for the City of Wenatchee for the proposed Saddle Rock Interim Remedial Action Project in Wenatchee, Washington. The City of Wenatchee may distribute copies of this report to its authorized agents and regulatory agencies, as may be required for the project.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. The conclusions, recommendations and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix B titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

FIGURES

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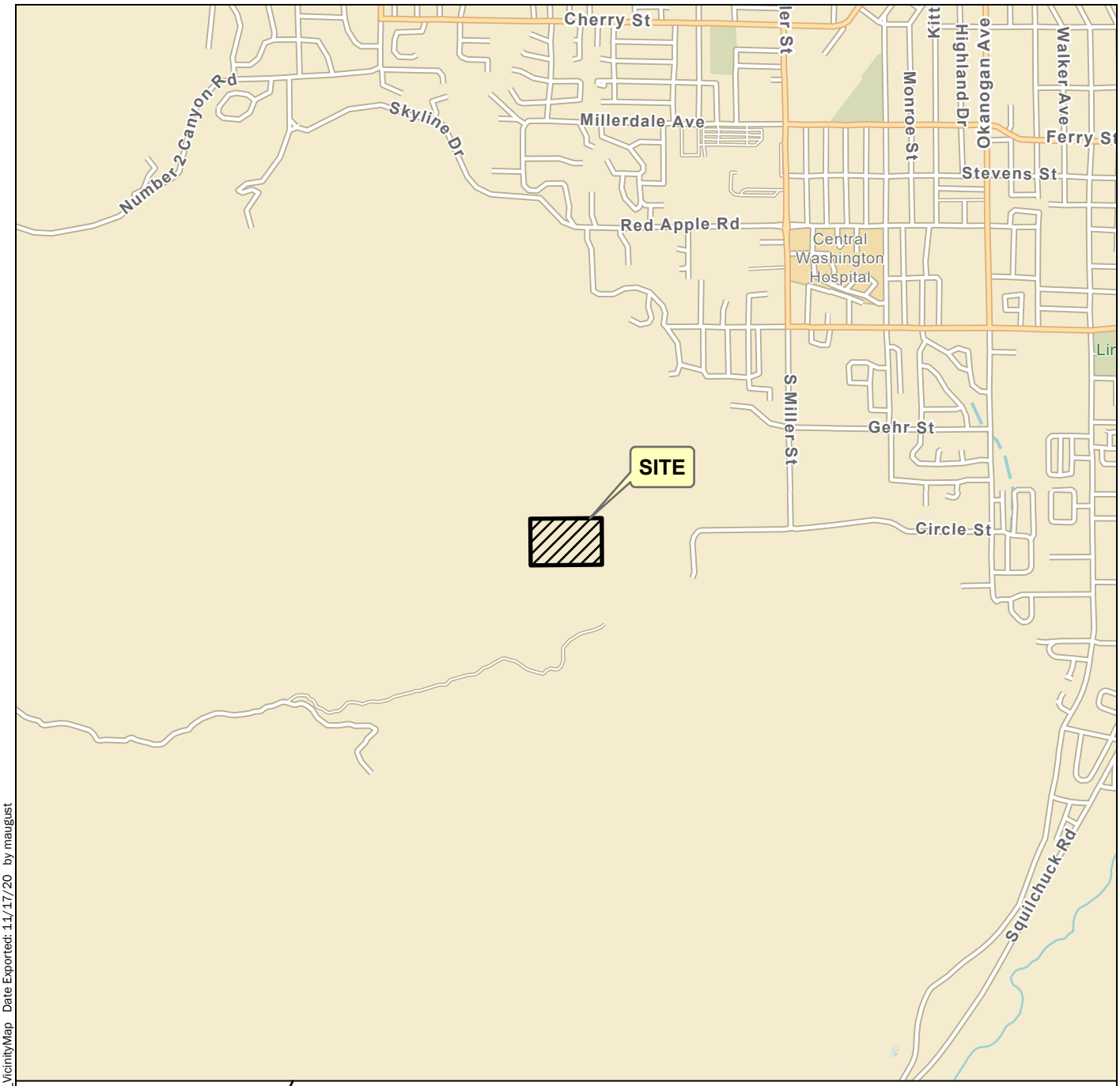

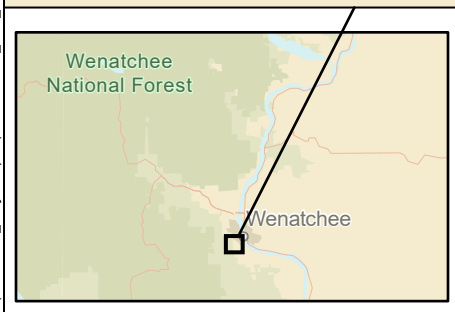

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Notes:

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

Data Source: ESRI

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 1

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Legend

- Approximate Test Pit Location
- Phase 2 Construction Access Road
- Phase 2 Construction Haul Road

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Notes:

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

Data Source: ESRI

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Site Plan

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

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Figure 2

P:\4\4296008\GIS\4296008_Project\4296008_Project.aprx\4296008_Project Date Exported: 11/20/20 by maugust

APPENDICES

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APPENDIX A
Field Explorations and Laboratory Testing

APPENDIX A
FIELD EXPLORATIONS AND LABORATORY TESTING

Field Explorations

We explored subsurface soil conditions along portions of the existing road on August 5, 2020, by excavating eight test pits (TP-1 through TP-8) to depths between about 5 and 11 feet below ground surface (bgs). The test pits were excavated by Palm Construction, Inc., under subcontract to GeoEngineers, using a track-mounted Cat 305E2 excavator. The approximate locations of the test pits, relative to existing site features, are shown on Figure 2.

Representative grab and bulk samples of soil were collected from the test pits and placed in sealed plastic bags for transportation to our soil laboratory for further examination and testing. The explorations were continuously monitored by GeoEngineers' field staff who examined and classified the soil encountered and obtained the representative soil samples. Soil encountered in the explorations was classified in general accordance with ASTM International (ASTM) D 2488 (visual-manual procedure) and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the explorations are presented in Logs of Test Pits, Figures A-2 through A-9. The logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials, or their characteristics change, although these changes might be gradual.

Locations of the explorations were selected by GeoEngineers, based on the proposed preliminary road realignment. The planned test pit locations were established in the field by our representative using GISPro Software on an iPad using available satellites with GPS and/or triangulation from cell towers. The exploration locations should be considered accurate to the degree implied by the method used.

Laboratory Testing

Representative soil samples were selected for laboratory tests to evaluate select geotechnical engineering characteristics of the site soil to confirm or revise our field classification. Soil samples obtained from the explorations were visually classified in the field and/or in our laboratory using the Unified Soil Classification System (USCS) and ASTM classification methods. ASTM test method D 2488 (Practice for Description and Identification of Soils) was used in the field to visually classify the soil samples, while ASTM D 2487 (Classification of Soils for Engineering Purposes) was used to classify the soil based on laboratory tests results. These classification procedures are described in Figure A-1 and incorporated in the exploration logs shown in Figures A-2 through A-9.

The test procedures were performed in general accordance with the applicable ASTM test procedures ("in general accordance" means certain local and common descriptive practices and methodologies have been followed). The laboratory soil testing program is summarized in Table A-1, Summary of Laboratory Testing.

TABLE A-1. SUMMARY OF LABORATORY TESTING

Standard Test Method for:	Test Method Designation	Total Tests Performed	Results Location
Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D 4318	2	Presented in Figure A-10 and in the applicable logs in the 'Remarks' column.
Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing	ASTM D 1140	11	Presented in the applicable exploration logs in the 'Fines Content (%)' column.
Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))	ASTM D 1557	1	Presented in Figure A-11.
Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils	ASTM D 1883	1	Presented in Figure A-12.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

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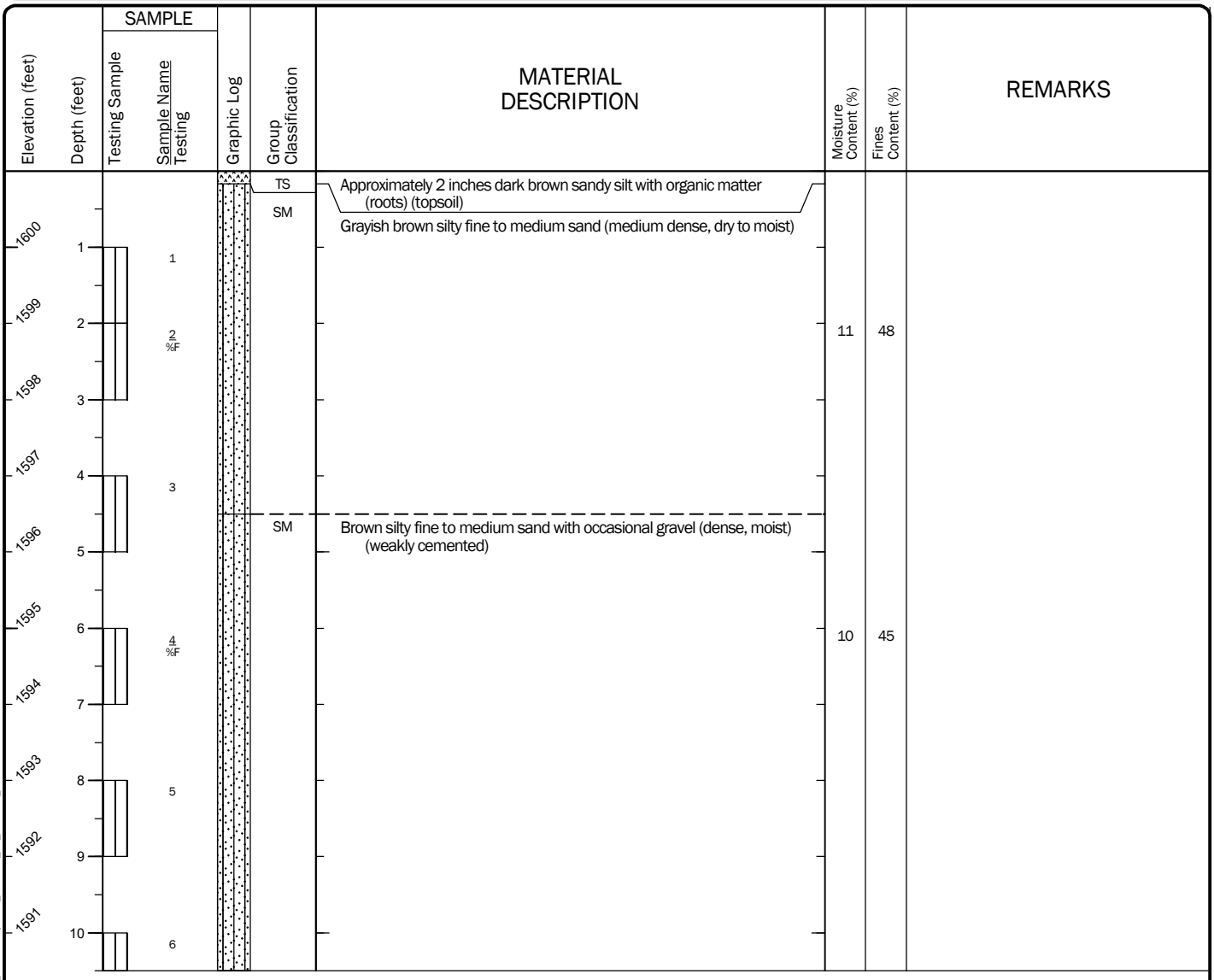
Figure A-1

Date Excavated 8/5/2020	Total Depth (ft) 10.5	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed Caving not observed	
Surface Elevation (ft) 1601 Vertical Datum NAVD88		Easting (X) 1763056 Northing (Y) 145306		Coordinate System WA State Plane North Horizontal Datum NAD83 (feet)	



Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-1

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-2
Sheet 1 of 1

Date Excavated 8/5/2020	Total Depth (ft) 9	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed Caving not observed	
Surface Elevation (ft) 1525 Vertical Datum NAVD88		Easting (X) 1763311 Northing (Y) 145081		Coordinate System WA State Plane North Horizontal Datum NAD83 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
1524	1		1		SM	Grayish brown silty fine to medium sand (medium dense, dry to moist)			
1523	2		2		SM	Brown silty fine to medium sand with occasional gravel (dense, moist)			
1522	3								
1521	4		3 %F				10	49	
1520	5					Becomes weakly cemented			
1519	6		4						
1518	7								
1517	8		5						
1516	9								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

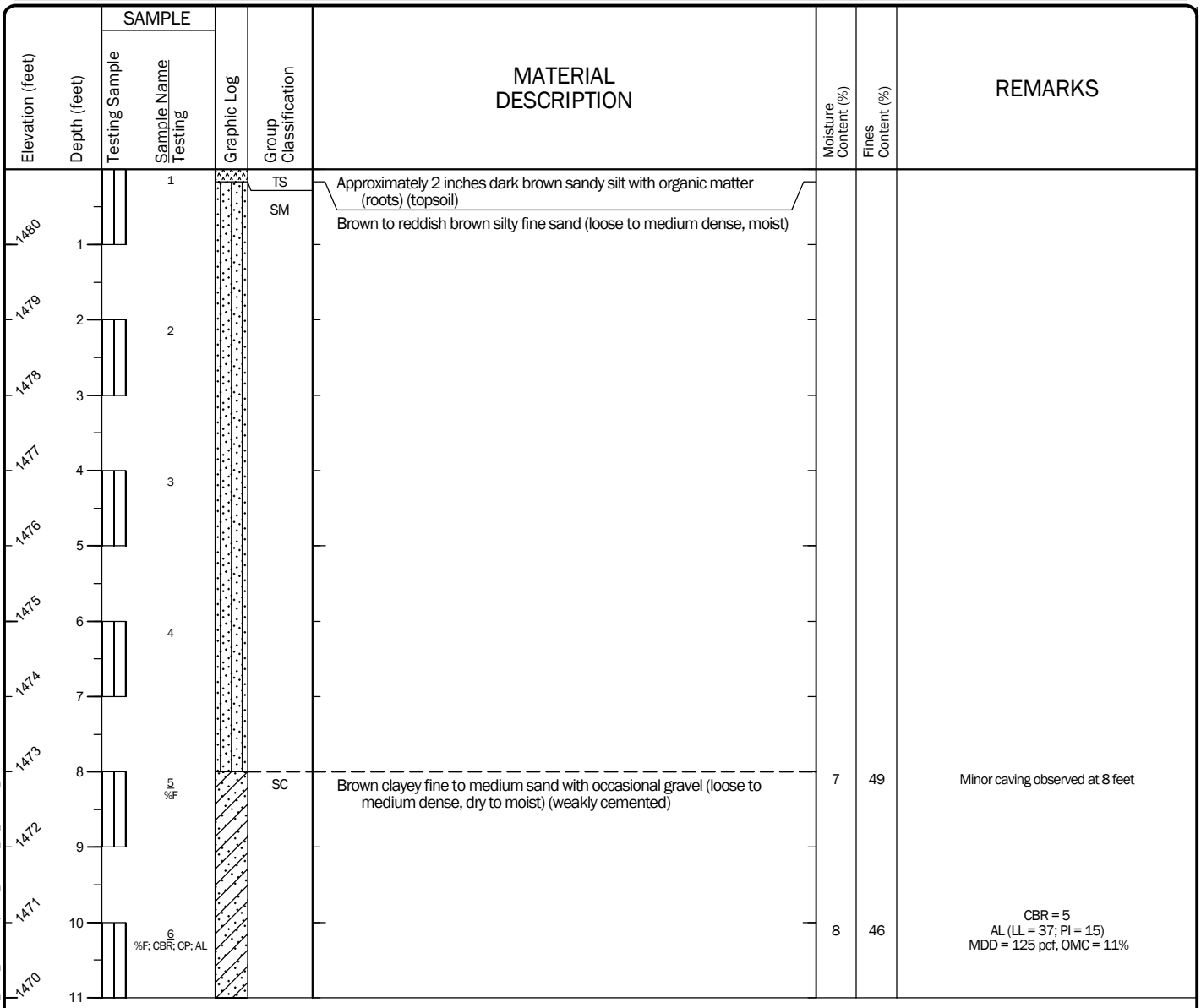
Log of Test Pit TP-2

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-3
Sheet 1 of 1

Date Excavated	8/5/2020	Total Depth (ft)	11	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	1481 NAVD88	Easting (X) Northing (Y)	1763219 144894	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	



Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

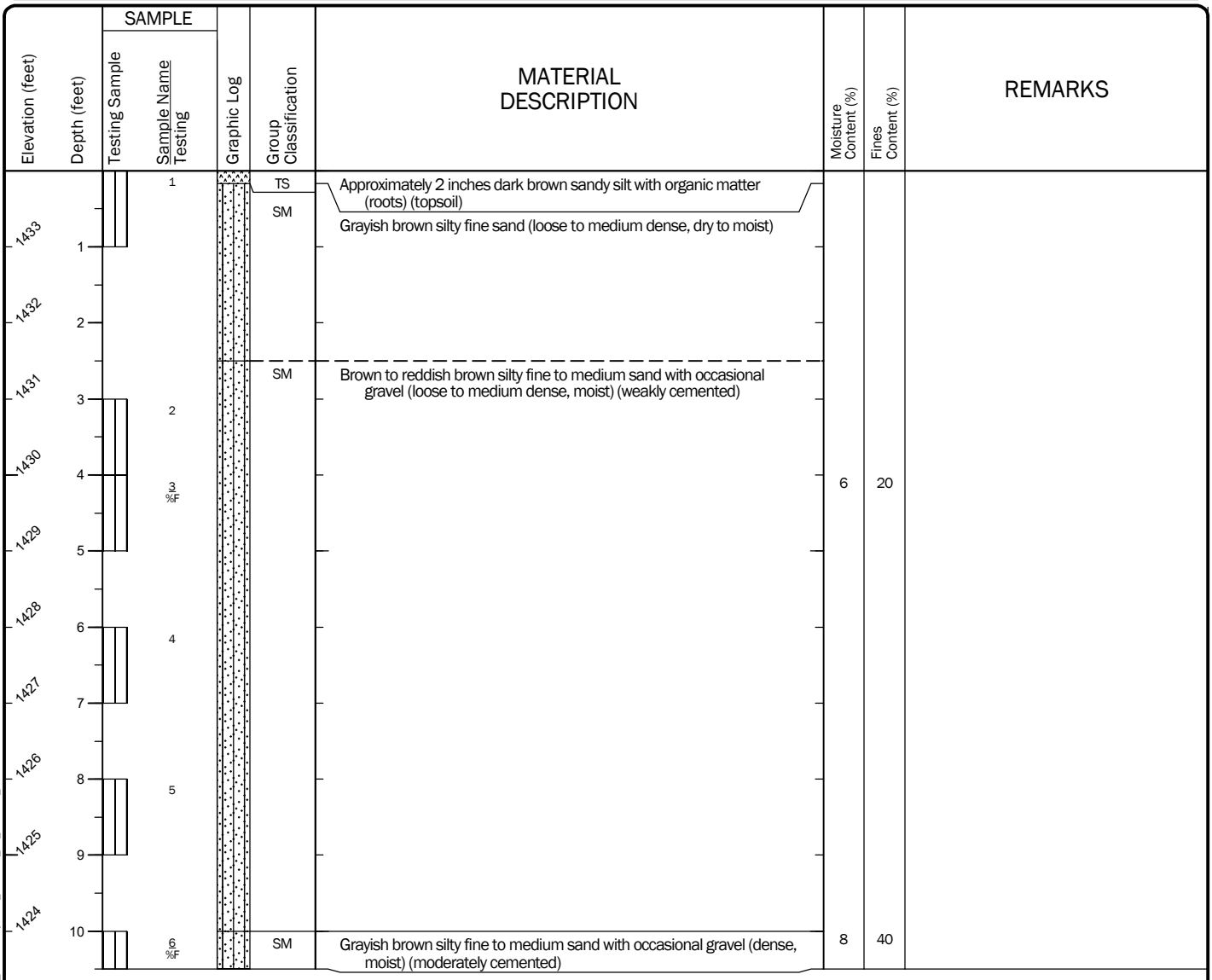
Log of Test Pit TP-3

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-4
Sheet 1 of 1

Date Excavated	8/5/2020	Total Depth (ft)	10.5	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	1434 NAVD88	Easting (X) Northing (Y)	1763442 144807	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	



Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

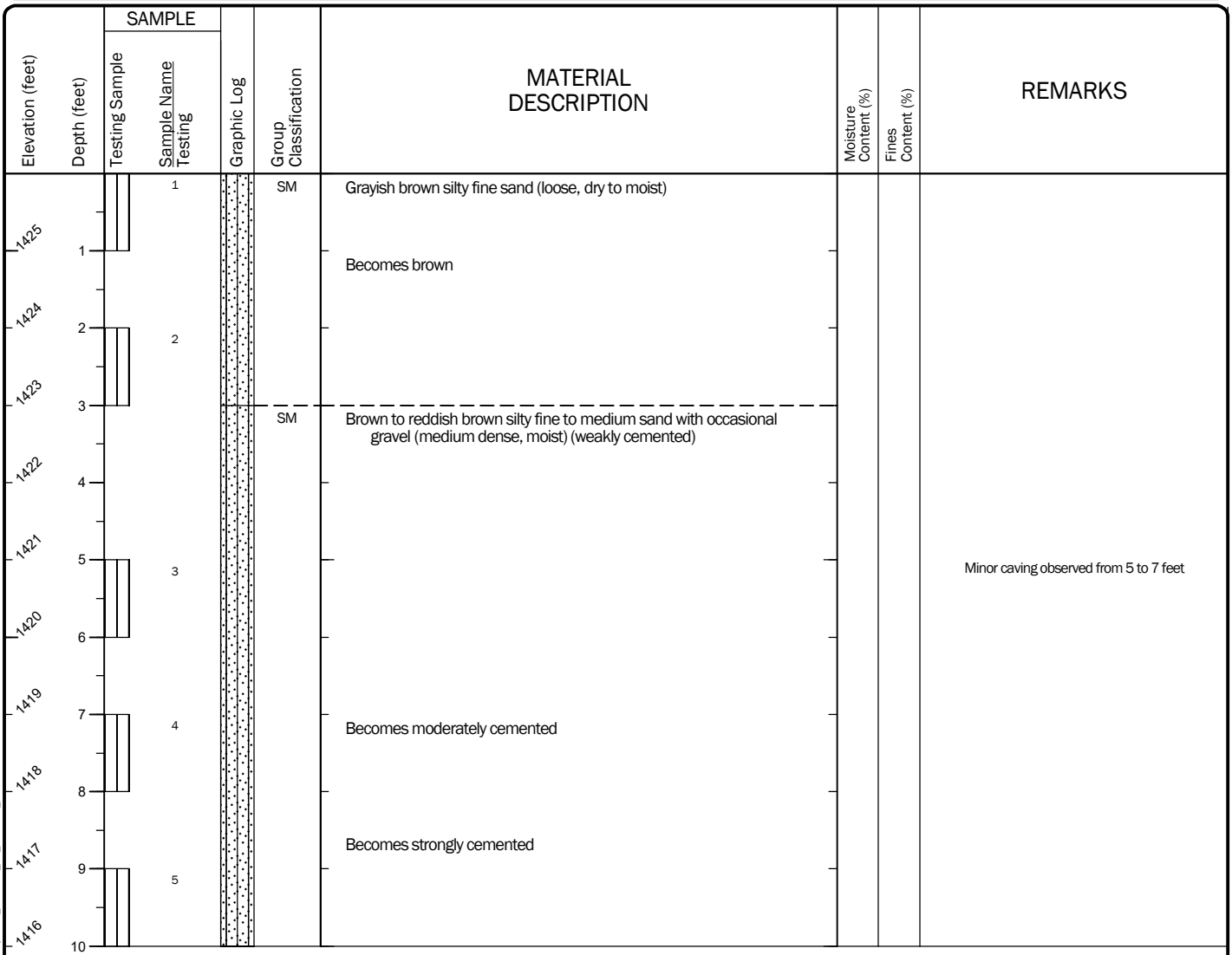
Log of Test Pit TP-4

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-5
Sheet 1 of 1

Date Excavated	8/5/2020	Total Depth (ft)	10	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	1426 NAVD88	Easting (X) Northing (Y)	1763543 144920	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	



Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-5

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-6
Sheet 1 of 1

Date Excavated	8/5/2020	Total Depth (ft)	8	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed See "Remarks" section for caving observed
Surface Elevation (ft) Vertical Datum	1407 NAVD88	Easting (X) Northing (Y)	1763615 145043	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
1406	1		1		SM	Brown silty fine sand with cobble-sized strongly cemented clasts (medium dense to dense, dry to moist)			
1405	2		2 %F; AL				8	37	AL (non-plastic)
1404	3								
1403	4		3 %F		Sandstone	Brown sandstone, moderately weathered to predominantly decomposed, very soft to soft, poor rock quality, thinly to medium spaced bedding	5	24	Minor caving observed from 4 to 8 feet
1402	5								
1401	6								
1400	7		4						
1399	8								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

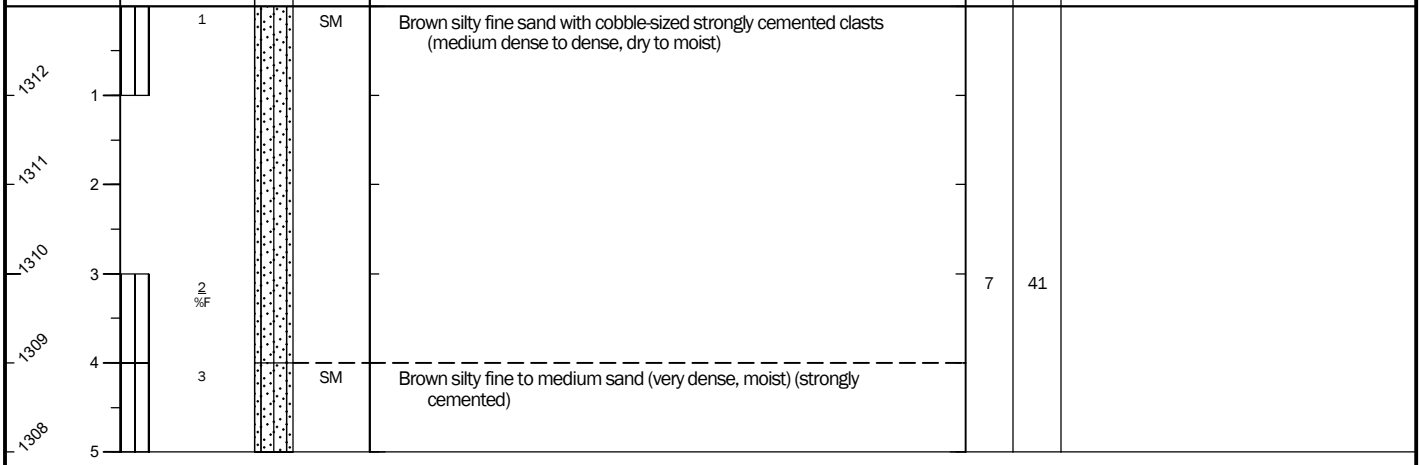
Log of Test Pit TP-6

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-7
Sheet 1 of 1

Date Excavated	8/5/2020	Total Depth (ft)	5	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	1313 NAVD88	Easting (X) Northing (Y)	1763827 144979	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	



Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

Log of Test Pit TP-7

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-8
Sheet 1 of 1

Date Excavated	8/5/2020	Total Depth (ft)	9	Logged By JDO Checked By EJA	Excavator Palm Construction, Inc. Equipment CAT 305E2	Groundwater not observed Caving not observed
Surface Elevation (ft) Vertical Datum	1302 NAVD88	Easting (X) Northing (Y)	1763941 145159	Coordinate System Horizontal Datum	WA State Plane North NAD83 (feet)	

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
1301	1		1		SM	Brown silty fine sand (loose to medium dense, dry)			
1300	2		2 %F		SM	Brown to reddish brown silty fine to medium sand with occasional gravel (medium dense to dense, moist) (strongly cemented) (weathered rock)	6	27	
1299	3								
1298	4								
1297	5								
1296	6		3						
1295	7								
1294	8		4		Sandstone	Reddish brown sandstone, slightly to moderately weathered, medium hard, fair rock quality, thinly spaced bedding			
1293	9								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Aerial Imagery. Vertical approximated based on Aerial Imagery.

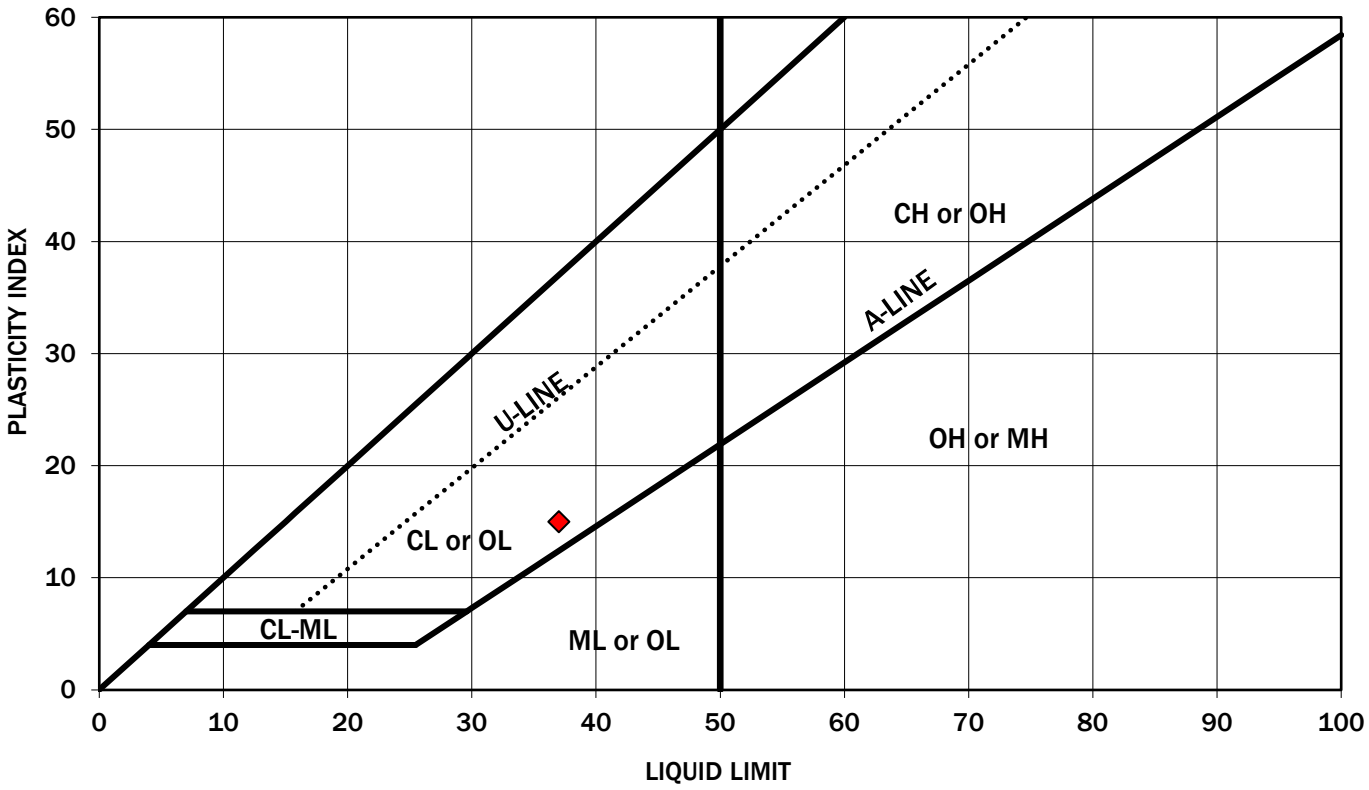
Log of Test Pit TP-8

GeoEngineers

Project: Saddle Rock Interim Remedial Action Project
Project Location: Wenatchee, Washington
Project Number: 4296-008-02

Figure A-9
Sheet 1 of 1

PLASTICITY CHART



Symbol	Boring Number	Depth (feet)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Soil Description
◆	TP-3	10 – 11	8	37	15	Clayey sand (SC)

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The liquid limit and plasticity index were obtained in general accordance with ASTM D 4318.

Atterberg Limits Test Results

Saddle Rock Interim Remedial Action Report
Wenatchee, Washington

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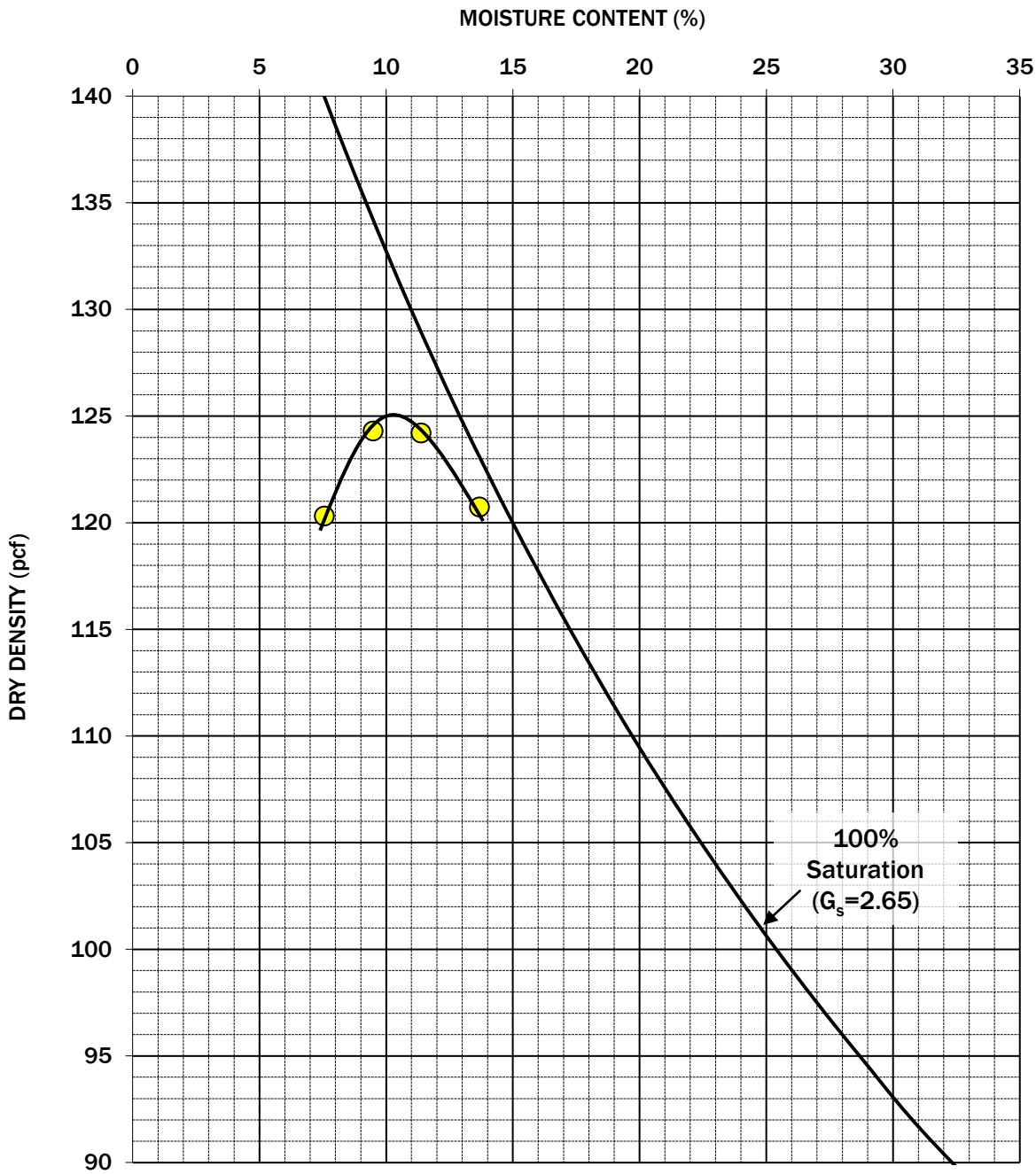
Figure A-10



Symbol	Boring Number	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
▲ Corrected ● Uncorrected	TP-3	10 – 11	Clayey fine to medium sand with occasional gravel (SC)	n/a 11	n/a 125

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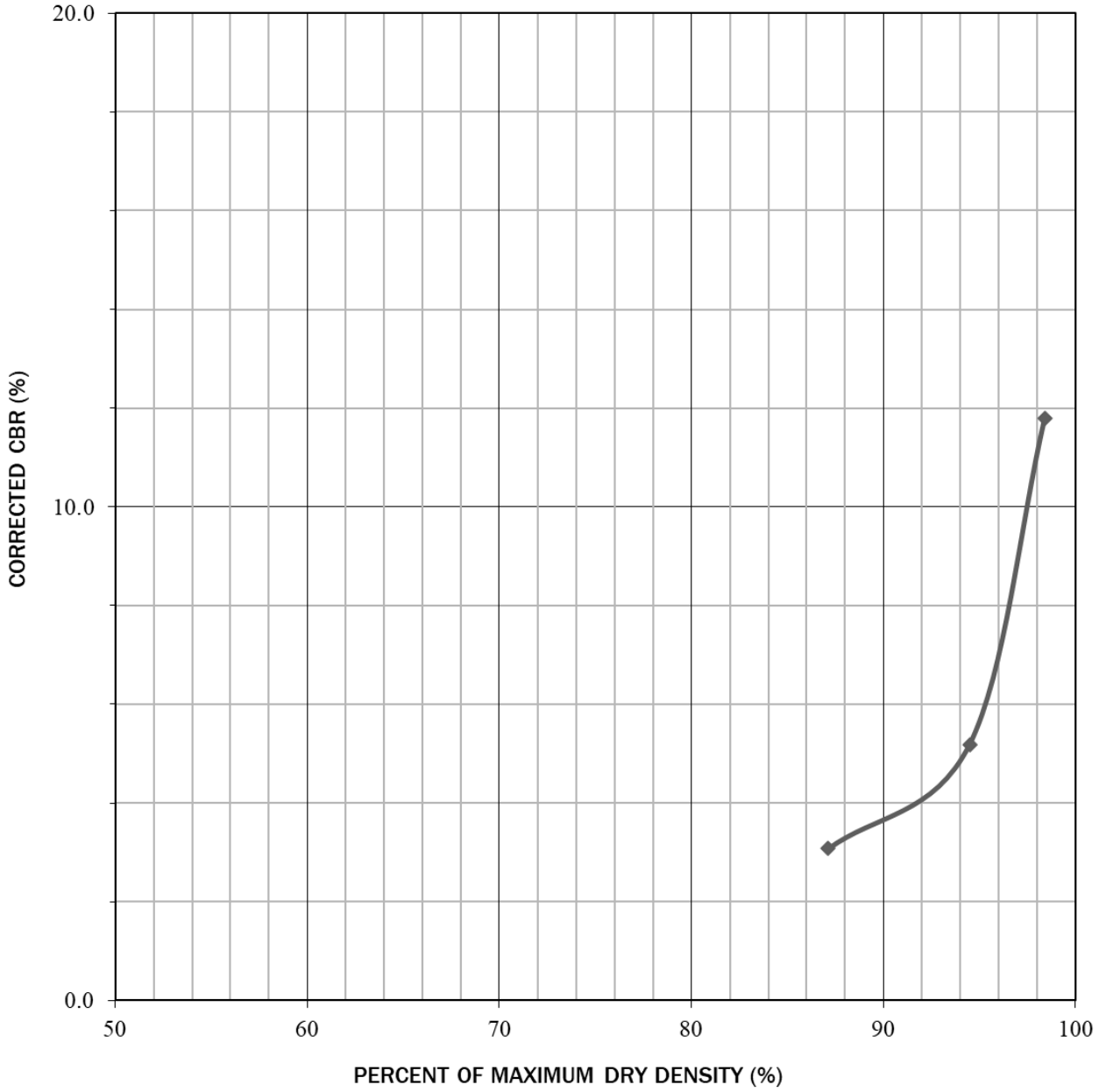
The Proctor results were obtained in general accordance with ASTM D 1557.

Compaction Test Results

Saddle Rock Interim Remedial Action Report
Wenatchee, Washington

GeoEngineers

Figure A-11



Exploration Number	Depth (feet)	Compaction Test Method	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
TP-3	10 – 11	D1557, B	Clayey fine to medium sand with occasional gravel (SC)	11	125

The California Bearing Ratio was obtained in general accordance with ASTM D 1883.

California Bearing Ratio Test Results

Saddle Rock Interim Remedial Action Report
Wenatchee, Washington

GeoEngineers

Figure A-12

4296-008-02 Date Exported: 11/18/2020

APPENDIX B
Report Limitations and Guidelines for Use

APPENDIX B
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the City of Wenatchee and for the Project specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with the City of Wenatchee dated August 29, 2019, and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is based on a Unique Set of Project-Specific Factors

This report has been prepared for the proposed Saddle Rock Interim Remedial Action Project in Wenatchee, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;

1 Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical and Geologic Findings are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- encourages contractors to conduct additional study to obtain the specific types of information they need or prefer.

Contractors are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as

they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

GeoEngineers

APPENDIX E
Drainage Report

Draft Drainage Report

Phase 2 Interim Remedial Action Project

October 2020

PERTEET
Better communities, by design

505 5TH AVENUE S, SUITE 300
SEATTLE, WA 98104
206.436.0515

Draft Drainage Report

Project:	Phase 2 Interim Remedial Action Project City of Wenatchee Wenatchee, Washington
Date:	October 2020
Civil Engineer:	Perteet Inc. 505 5th Avenue S, Suite 300 Seattle, Washington 98104 Phone #: 206.436.0515
Perteet Project Manager:	Jennifer Saugen, PE
Lead Drainage Design Engineer:	Nichole Pellett, PE

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INTRODUCTION

The purpose of this drainage report is to provide a description of the drainage approach being used on the Phase 2 Interim Remedial Action Project. The report summarizes the design criteria, applicable standards, and the water quality and flow control requirements for the project.

The project will extend northwest from the Saddle Rock Trailhead for approximately 6300 feet. A primitive road exists in the Phase 1 and 2 areas that is approximately 6 feet to 10 feet wide, from the park trailhead up to the park ridgetop. This existing primitive road will be minimally improved so as to allow the travel of appropriate construction vehicles and equipment during construction along the roadway. The road will be improved and widened to a consistent 10-foot width. Improvements also include installing water bars along the roadway to prevent erosion (see the Design Criteria Minimum Requirements section of this report). The improved road will be used to remove a waste rock pile as a result of historic mining activities at the site. A vicinity map is shown in Figure 1.

EXISTING SITE CONDITIONS

The project site is currently undeveloped and consists of soil, rock, and gravel, with areas of erosion. Existing roadway grade varies from 0% to 33%. The project site is located within the Dry Gulch Preserve, located to the west of Wenatchee City limits. The project consists of improving the existing gravel road (average width of 6-foot) with a 10-foot wide gravel roadway. The ground cover consists primarily of dryland grasses and shrubs. A stormwater swale was installed as a part of the Phase 1 Interim Removal Action, located downhill of SR01 and SR02. The swale is still in use and is expected to remain after Phase 2 is complete. There is no existing stormwater infrastructure present in the vicinity of the primitive road within the project limits of Phase 2. Any stormwater runoff in the project area that is not infiltrated into the soil sheet flows south and east toward low points and ultimately will route beneath Dry Gulch Rd in a 42" culvert. This site consists of one Threshold Discharge Area (TDA). The TDA Key Map can be seen in Figures A-17 and A-18 in Appendix A. See also Figures A-1 through A-4 for the existing drainage condition figures and see the Downstream Analysis section of this report for more information. See Figure 1 for a Vicinity Map of the site.

Figure 1. Vicinity Map

On-site soils consist of the following soils:

- BkF Bjork silt loam, 45 to 65 percent slopes
- BoF2 (Bjork-Rock outcrop complex, 25 to 65 percent slopes, eroded)
- CaB (Cashmere sandy loam, 3 to 8 percent slopes)
- CaC (Cashmere sandy loam, 8 to 15 percent slopes)
- CwB (Cowiche silt loam, 3 to 8 percent slopes)
- CwE (Cowiche silt loam, 25 to 45 percent slopes)
- Ro (Rock outcrop)

See Figure 2 for a view of the site soils, gathered from the National Resource Conservation Service website.

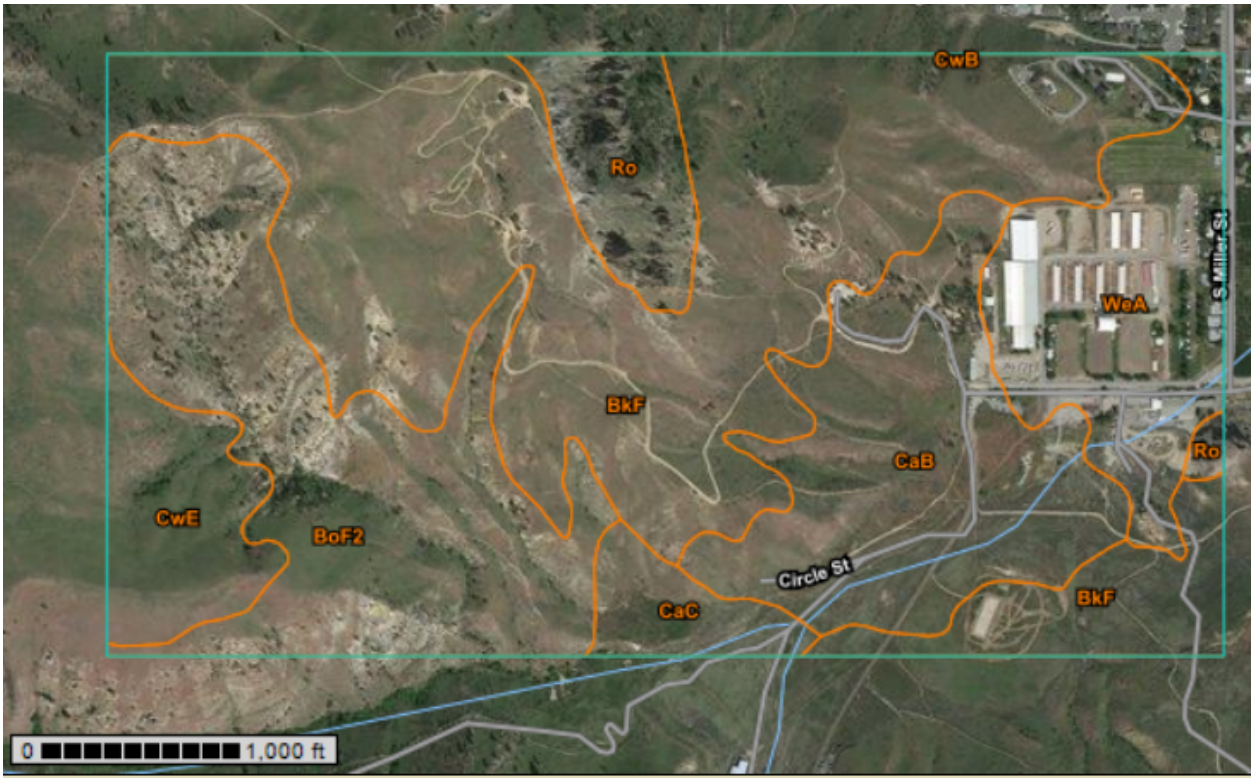

Figure 2. Site Soil Map

DEVELOPED SITE CONDITIONS

The proposed project will improve approximately 6,400 lineal feet of an existing gravel roadway that is approximately 6 to 10-feet wide with a consistently 10-foot wide gravel roadway as required for construction equipment (see the Design Criteria Minimum Requirements section of this report). See the Proposed Drainage Conditions Map in Appendix A (Figures A-9 through A-12).

OFF-SITE ANALYSIS

Perteet visited the site on Monday, July 27, 2020. The weather was sunny and windy with a temperature around 80 degrees Fahrenheit. The purpose of the visit was to complete a site analysis. In addition, GIS and Google Earth Pro were used to complete the upstream and downstream analysis.

Upstream Analysis

The project is located on a bluff in the Dry Gulch Preserve located to the west of Wenatchee, WA. The most northeast end of the roadway is located at the top of the bluff. Therefore, at the top of the roadway there is no upstream offsite runoff. The road then winds down the hill and upstream runoff sheet flows across the road as it winds down the bluff from the west and the north. Refer to Figure A-19 in appendix A of this report for the Upstream Analysis Map.

Downstream Analysis

Runoff sheet flows down the bluff generally towards the south and the east generally towards the trailhead location. It is ultimately captured in a 42" culvert that crosses under Dry Gulch Rd located to the south of the intersection with Circle St (see Figure A-20. Downstream Analysis in Appendix A). The runoff is then routed into infiltration ponds to the east of the culvert outfall outside of the project limits.

DESIGN CRITERIA (MINIMUM REQUIREMENTS)

The City of Wenatchee has adopted the Department of Ecology Stormwater Management Manual for Eastern Washington, and has approved the use of the 2019 draft manual. According to Chapter 2.6 of the manual, the project type is a "redevelopment" which is "the replacement or improvement of impervious surfaces, including buildings and other structures, and replacement or improvement of impervious parking and road surfaces, that is not part of a routine maintenance activity."

The project lies within Climate Region 2.

Table 1 provides a brief discussion of the applicability to this project of each core element in the Eastern Washington Stormwater Management Manual.

Table 1. Summary of Core Elements Required.

Core Element		Required or Exempt
1	Preparation of a Stormwater Site Plan	Yes – required for all Redevelopment projects
2	Construction Stormwater Pollution Prevention	Yes – required for all Redevelopment projects
3	Source Control of Pollution	Yes – required for all Redevelopment projects
4	Preservation of Natural Drainage Systems	Yes – required for all Redevelopment projects
5	Runoff Treatment	Exempt – The project adds more than 5000 SF of NPGIS (not PGIS) since it is not a high use site and does not discharge to a UIC well. It also satisfies the requirement for Full Dispersion. See the flow chart for determining applicable core elements for redevelopment projects (Figure 2.2), from the 2019

		ecology manual, located in Appendix B, for further detail. Basic Treatment – Yes see above. Metals Treatment – No. This is a roadway with an Average Daily Traffic (ADT) that is less than 7,500 vehicles per day. It is a maintenance road that will rarely see traffic. Oil Control – Exempt, only required for high use sites. Phosphorus Treatment – Exempt, only required for sites that discharge to a water body that has phosphorus treatment requirements designated by the federal, state, or local government. The Columbia River is not listed as such a water body.
6	Flow Control	Exempt This project creates more than 10,000 square feet of new impervious surfaces and does not discharge directly to an exempt body of water. However, the following projects and discharges are exempt from flow control requirements to protect stream morphology. 1) Any project able to disperse, without discharge to surface waters, the total 25-year runoff volume for the proposed development condition on property that is under the functional 2019 Stormwater Management Manual for Eastern Washington, Chapter 2 – Page 97. See the guidelines for dispersion in Chapter 6.5 – Dispersion BMPs, particularly BMP F6.42: Full Dispersion. Details on that BMP have been included in Appendix C for convenience.
7	Operation and Maintenance	Required. Operation and maintenance guidelines are included as Appendix D of this report.
8	Local Requirements	Required for all New Development projects

Site design plans for the project will be created showing the proposed improvements and how to implement them. These plans include Site Preparation plans showing all temporary erosion and sediment control elements, and Roadway Plans showing all roadway and stormwater elements. The Roadway Plans bring the project into compliance with Core Element #1, and the Site Preparation Plans are a step toward compliance with Core Element #2. To become fully compliant with Core Element #2, the project will be required to have a Construction Stormwater Pollution Prevention Plan (CSWPPP). Source Control BMPs applicable to all sites are as follows:

- S101E: BMPs for Formation of a Pollution Prevention Team
- S102E: BMPs for Preventative Maintenance/Good Housekeeping
- S104E: BMPs for Spill Prevention and Cleanup
- S105E: BMPs for Employee Training
- S106E: BMPs for Inspections
- S107E: BMPs for Record Keeping
- S108E: BMPs for Correcting Illicit Connections to Storm Drains

Core Element #3, Source Control of Pollution will be met for this project through the planned flow control BMP. The planned flow control BMP for this site is BMP F6.42: Full Dispersion. This site is projected to be a maintenance roadway. No refueling or vehicle washing operations will take place on the site. Proper maintenance of the on-site stormwater facilities which consist of BMP 203E: Water Bars will be the only necessary Source Pollution Control BMP. See Appendix C to view these BMPs.

This project complies with Core Element #4, Preservation of Natural Drainage Systems, by continuing to allow runoff to discharge as it currently does across the bluff.

Per Core Element #8, the project is required to apply any local requirements as well. The City of Wenatchee's Stormwater Standards add no additional requirements to the project.

See Appendix D for the Operations and Maintenance Manual required for compliance with Core Element #7.

WATER QUALITY TREATMENT (CE #5)

This project is exempt from water quality treatment based on chapter 2 page 91 of the 2019 Stormwater Management Manual for Eastern Washington, "Runoff treatment is required for all projects creating 5,000 SF or more of new pollution generating impervious surface (PGIS) and replaced surface unless the discharge satisfies the requirements for full dispersion. The land use calculations assumed conservatively that the total new non pollution generating impervious surface (NPGIS) added was a consistent widening of the roadway from 6-feet to 10-feet. This project creates 37,716 SF of new NPGIS surfaces and satisfies the requirements for full dispersion (see Table 2).

FLOW CONTROL

The Phase 2 Interim Remedial Action Project is exempt from flow control because it meets local requirements for full dispersion. Table 2 provides a summary of surface types in the existing and proposed conditions. See also Figures A-5 through A-8 for the Existing Land Use areas and Figures A-13 through A-16 for the Proposed Land use areas in Appendix A of this report. A TDA Key Map has also been included in Figures A-17 and A-18. Flow control will be provided with BMP F6.42: Full Dispersion. See Appendix C for required compliance with Core Element #6.

Table 2. Summary of Surface Types.

Surface Type	Existing Condition (Square Feet)	Proposed Condition (Square Feet)
PGIS	0	0
NPGIS	37,716	37,716
Pervious Surface (Landscaped or Undeveloped)	50,674	25,530
Replaced NPGIS		0
New NPGIS		25,144
Total Area	88,390	88,390
Total Impervious	37,716	62,861
New Impervious Surface	N/A	37,716

As mentioned previously, the site meets the requirements using Full Dispersion to treat the runoff.

PROJECT CONVEYANCE

Stormwater will continue to sheet flow as it already does in the existing condition. Therefore, no conveyance calculations will be required.

The site meets the requirements using of BMP 203E: Water Bars to treat the runoff. A water bar is a small ditch or ridge of material that is constructed diagonally across a road or right-of-way to divert stormwater runoff from the road surface. See Appendix C for required compliance with Core Element #5.

Water bars are the most feasible BMP for controlling flow rates for this site. A water bar is a small ditch or ridge of material that will be constructed diagonally across the roadway to divert stormwater runoff from the road surface. Water bars shall be placed as required based on roadway slopes. The proposed roadway slopes are to range from just 0% to nearly 30%. Per Table 7.17 of the ecology manual, water bars must be placed as follows:

Table 3. Water Bar Spacing Guidelines.

Slope Along Road (%)	Spacing (feet)
< 5	125
5-10	100
10-20	75
20-35	50

APPENDIX A

Report Figures

MATCH LINE STA 1737+00 – SEE FIGURE A–2

1737+00
1738+00
1739+00
1740+00
1741+00
1742+00
1743+00
1744+00
1745+00
1746+00
1747+00
1748+00
1749+00
1750+00
1751+00
1752+00
1753+00
1754+00
1755+00
1756+00
1757+00
1758+00
1759+00
1760+00
1761+00
1762+00
1762+86

SADDLE ROCK ACCESS ROAD

TDA 1

SCALE
80 0 80 160
FEET

LEGEND
- TDA BOUNDNARY
- EXISTING NPGIS
- SHEET FLOW ARROW

EXHIBIT DRAWING
FOR INFORMATIONAL
PURPOSES ONLY

PERTEET
2707 COLBY AVENUE, SUITE 900
EVERETT, WA 98201
425.252.7700 | 800.615.9900

SADDLE ROCK ACCESS ROAD
EXISTING DRAINAGE CONDITIONS

FIGURE
A-1

MATCH LINE STA 1722+00 – SEE FIGURE A–3

1722+00
1723+00
1724+00
1725+00
1726+00
1727+00
1728+00
1729+00
1730+00
1731+00
1732+00
1733+00
1734+00
1735+00
1736+00
1737+00

TDA 1

SADDLE ROCK ACCESS ROAD

MATCH LINE STA 1737+00 – SEE FIGURE A–1

SCALE
80 0 80 160
FEET

LEGEND
- TDA BOUNDARY
- EXISTING NPGIS
- SHEET FLOW ARROW

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SADDLE ROCK ACCESS ROAD
EXISTING DRAINAGE CONDITIONS

FIGURE
A-2

MATCH LINE STA 1722+00 – SEE FIGURE A–2

MATCH LINE STA 1706+60 – SEE FIGURE A–4

2+00
1721+00
1720+00
1719+00
1718+00
1717+00
1716+00
1715+00
1714+00
1713+00
1712+00
1711+00
1710+00
1709+00
1708+00
1707+00

TDA 1

SADDLE ROCK ACCESS ROAD

SCALE
80 0 80 160
FEET

LEGEND
- TDA BOUNDARY
- EXISTING NPGIS
- SHEET FLOW ARROW

EXHIBIT DRAWING
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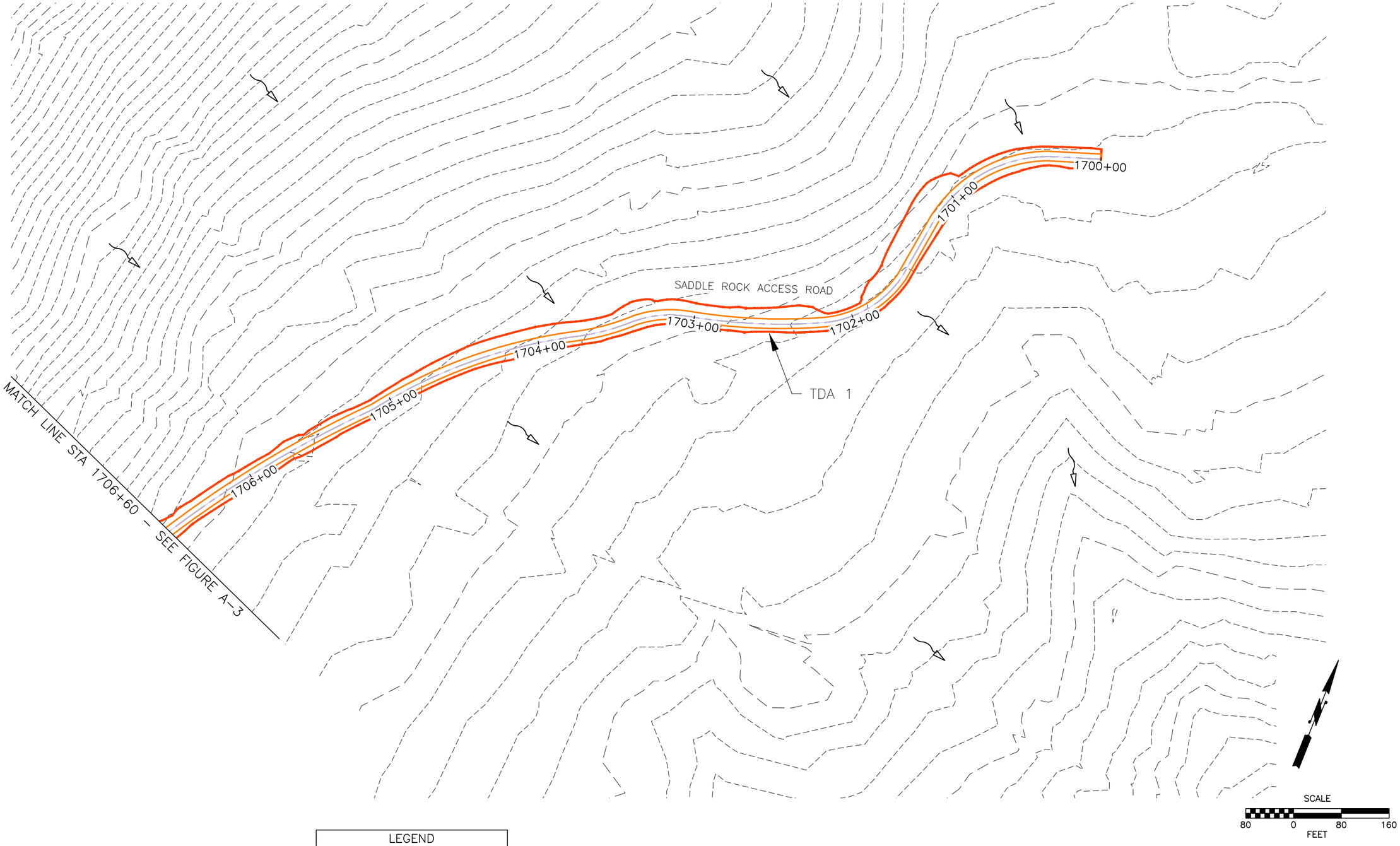
425.252.7700 | 800.615.9900

SADDLE ROCK ACCESS ROAD
EXISTING DRAINAGE CONDITIONS

FIGURE
A-3



LEGEND

- TDA BOUNDARY
- EXISTING NPGIS
- SHEET FLOW ARROW

EXHIBIT DRAWING
FOR INFORMATIONAL PURPOSES ONLY

PERTEET
2707 COLBY AVENUE, SUITE 900
EVERETT, WA 98201
425.252.7700 | 800.615.9900

SADDLE ROCK ACCESS ROAD
EXISTING DRAINAGE CONDITIONS

FIGURE
A-4

MATCH LINE STA 1737+00 – SEE FIGURE A–6

1737+00
1738+00
1739+00
1740+00
1741+00
1742+00
1743+00
1744+00
1745+00
1746+00
1747+00
1748+00
1749+00
1750+00
1751+00
1752+00
1753+00
1754+00
1755+00
1756+00
1757+00
1758+00
1759+00
1760+00
1761+00
1762+00
1762+86

SADDLE ROCK ACCESS ROAD

LEGEND

- TDA BOUNDARY
- EXISTING PGIS
- EXISTING NPGIS
- EXISTING PERVIOUS

EXISTING LAND USE SUMMARY

TDA	EXISTING PERVIOUS	EXISTING PGIS	EXISTING NPGIS
TDA 1	50,674 SF	0 SF	37,716 SF

SCALE
80 0 80 160
FEET

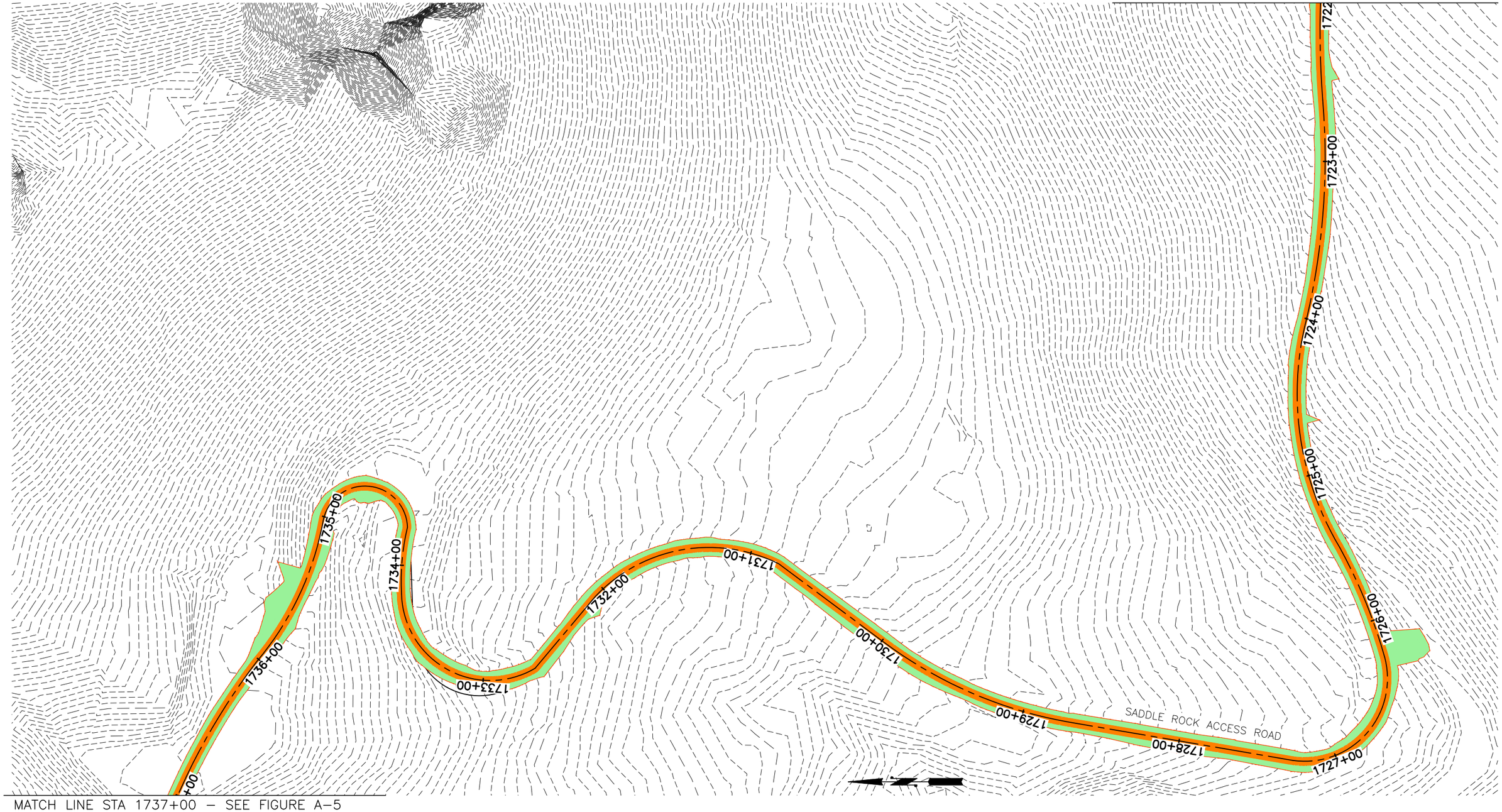
EXHIBIT DRAWING
FOR INFORMATIONAL
PURPOSES ONLY

PERTEET
2707 COLBY AVENUE, SUITE 900
EVERETT, WA 98201
425.252.7700 | 800.615.9900

SADDLE ROCK ACCESS ROAD
EXISTING LAND USE

FIGURE
A-5

MATCH LINE STA 1722+00 – SEE FIGURE A–7



MATCH LINE STA 1737+00 – SEE FIGURE A–5

LEGEND

- TDA BOUNDARY
- EXISTING PGIS
- EXISTING NPGIS
- EXISTING PERVIOUS

EXISTING LAND USE SUMMARY

TDA	EXISTING PERVIOUS	EXISTING PGIS	EXISTING NPGIS
TDA 1	50,674 SF	0 SF	37,716 SF

SCALE
80 0 80 160
FEET

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SADDLE ROCK ACCESS ROAD
EXISTING LAND USE

FIGURE
A-6

MATCH LINE STA 1722+00 – SEE FIGURE A–6

MATCH LINE STA 1706+60 – SEE FIGURE A–8

1722+00
1721+00
1720+00
1719+00
1718+00
1717+00
1716+00
1715+00
1714+00
1713+00
1712+00
1711+00
1710+00
1709+00
1708+00
1707+00

SADDLE ROCK ACCESS ROAD

SCALE
80 0 80 160
FEET

LEGEND

- TDA BOUNDARY
- EXISTING PGIS
- EXISTING NPGIS
- EXISTING PERVIOUS

EXISTING LAND USE SUMMARY

TDA	EXISTING PERVIOUS	EXISTING PGIS	EXISTING NPGIS
TDA 1	50,674 SF	0 SF	37,716 SF

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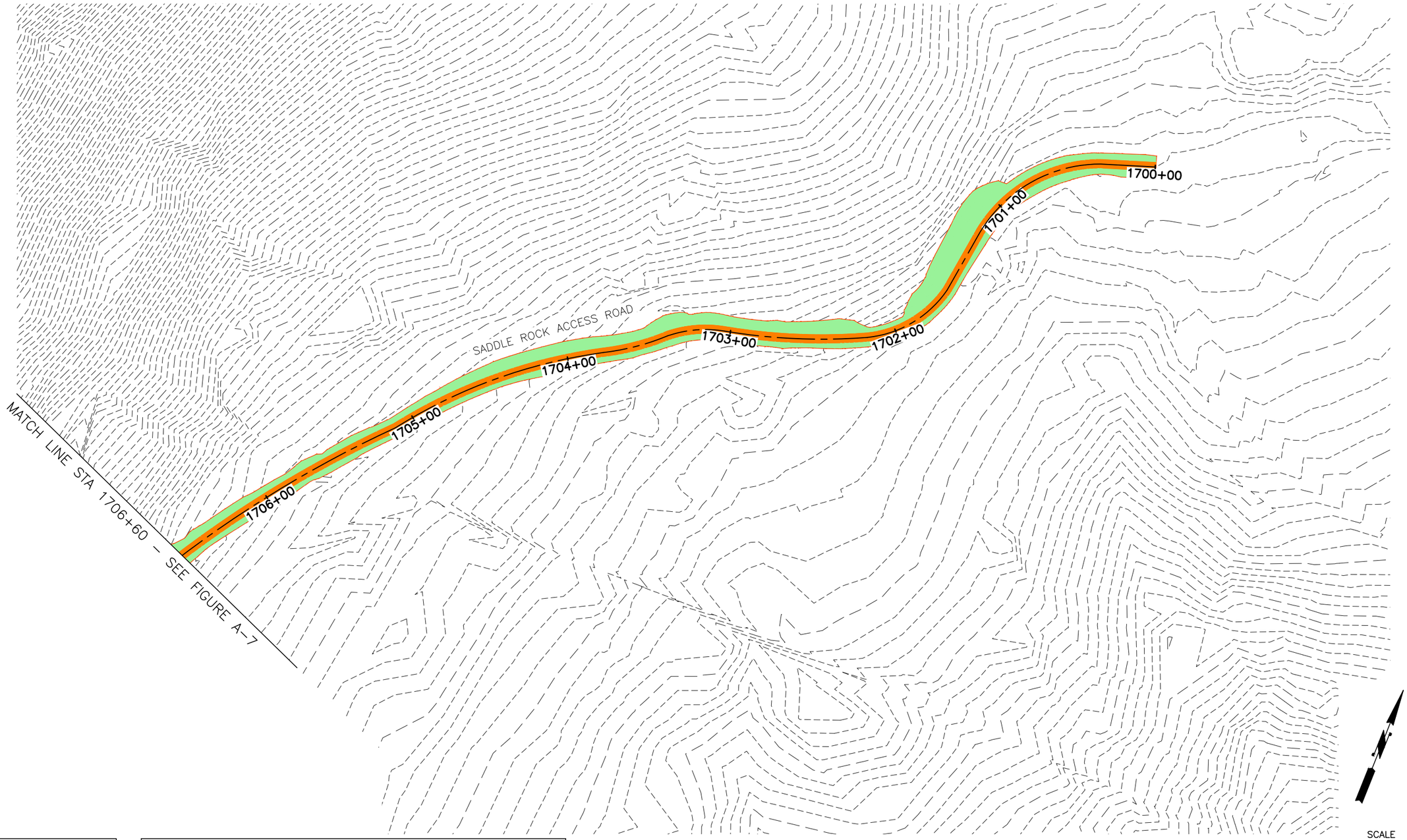
SADDLE ROCK ACCESS ROAD
EXISTING LAND USE

FIGURE
A-7

Oct 30, 2020 - 2:41pm christina.oare X:\Wenatchee, City of\Projects\20190234 - Saddle Rock Access Road\CADD\05 - Exhibits\Drainage Exhibits\FIGURE A5-A8 Existing Land Use.dwg Layout Name: Figure A-7



LEGEND

- TDA BOUNDARY
- EXISTING PGIS
- EXISTING NPGIS
- EXISTING PERVIOUS

EXISTING LAND USE SUMMARY

TDA	EXISTING PERVIOUS	EXISTING PGIS	EXISTING NPGIS
TDA 1	50,674 SF	0 SF	37,716 SF

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SADDLE ROCK ACCESS ROAD
EXISTING LAND USE

FIGURE
A-8

MATCH LINE STA 1737+00 – SEE FIGURE A-10

SADDLE ROCK ACCESS ROAD

1737+00
1738+00
1739+00
1740+00
1741+00
1742+00
1743+00
1744+00
1745+00
1746+00
1747+00
1748+00
1749+00
1750+00
1751+00
1752+00
1753+00
1754+00
1755+00
1756+00
1757+00
1758+00
1759+00
1760+00
1761+00
1762+00
1762+98

LEGEND

- TDA BOUNDARY
- REPLACED NPGIS
- NEW NPGIS
- SHEET FLOW ARROW

SCALE
80 0 80 160
FEET

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SADDLE ROCK ACCESS ROAD
PROPOSED DRAINAGE CONDITIONS

FIGURE
A-9

MATCH LINE STA 1722+00 – SEE FIGURE A-11

1722+00
1723+00
1724+00
1725+00
1726+00
1727+00
1728+00
1729+00
1730+00
1731+00
1732+00
1733+00
1734+00
1735+00
1736+00
1737+00

SADDLE ROCK ACCESS ROAD

MATCH LINE STA 1737+00 – SEE FIGURE A-9

LEGEND

- TDA BOUNDARY
- REPLACED NPGIS
- NEW NPGIS
- SHEET FLOW ARROW

SCALE
80 0 80 160
FEET

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SADDLE ROCK ACCESS ROAD
PROPOSED DRAINAGE CONDITIONS

FIGURE
A-10

MATCH LINE STA 1722+00 – SEE FIGURE A-10

MATCH LINE STA 1706+60 – SEE FIGURE A-12

2+00
1721+00
1720+00
1719+00
1718+00
1717+00
1716+00
1715+00
1714+00
1713+00
1712+00
1709+00
1708+00
1707+00
1710+00
1711+00

SADDLE ROCK ACCESS ROAD

LEGEND

- TDA BOUNDARY
- REPLACED NPGIS
- NEW NPGIS
- SHEET FLOW ARROW

SCALE
80 0 80 160
FEET

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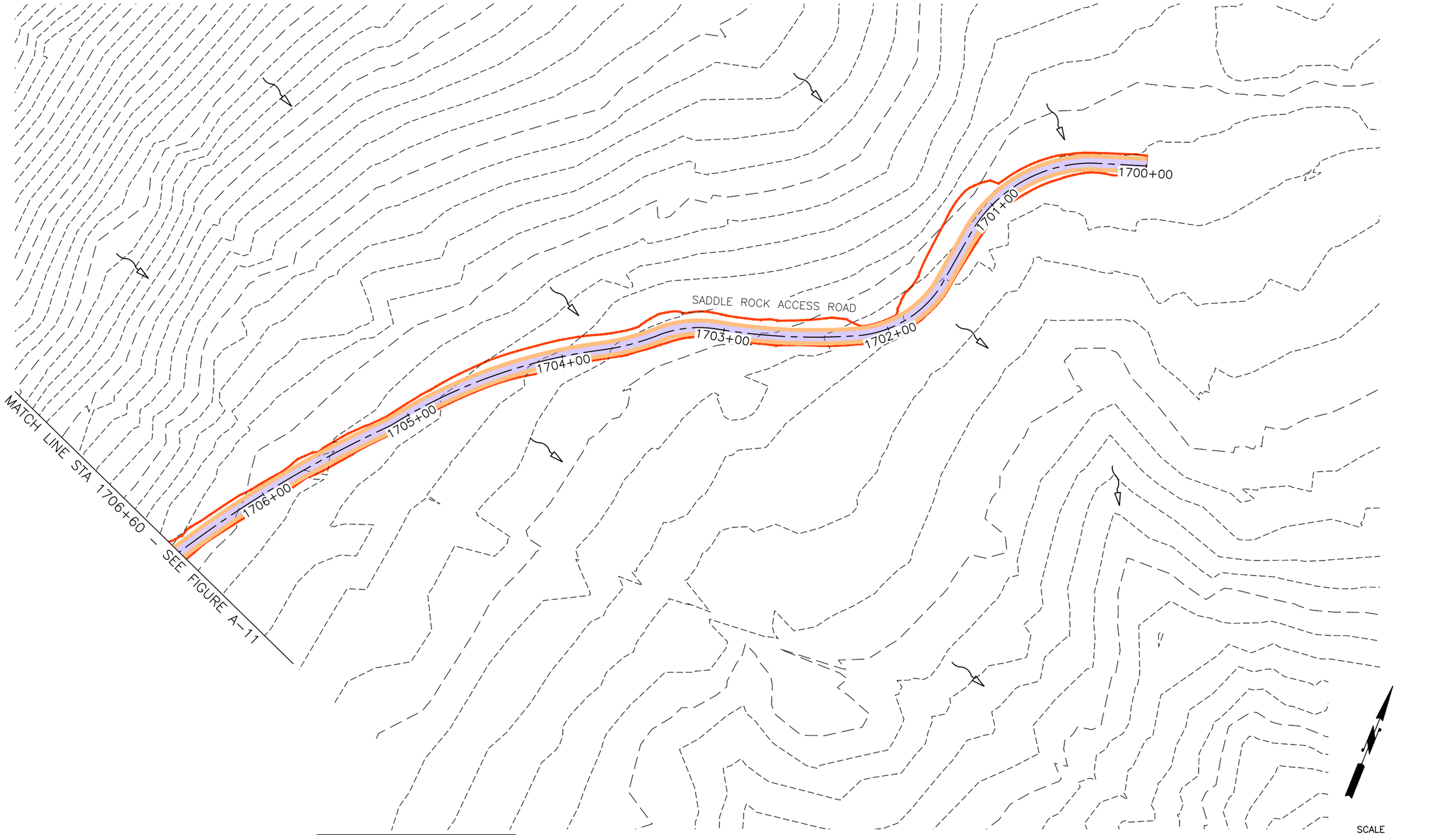
SADDLE ROCK ACCESS ROAD
PROPOSED DRAINAGE CONDITIONS

FIGURE
A-11



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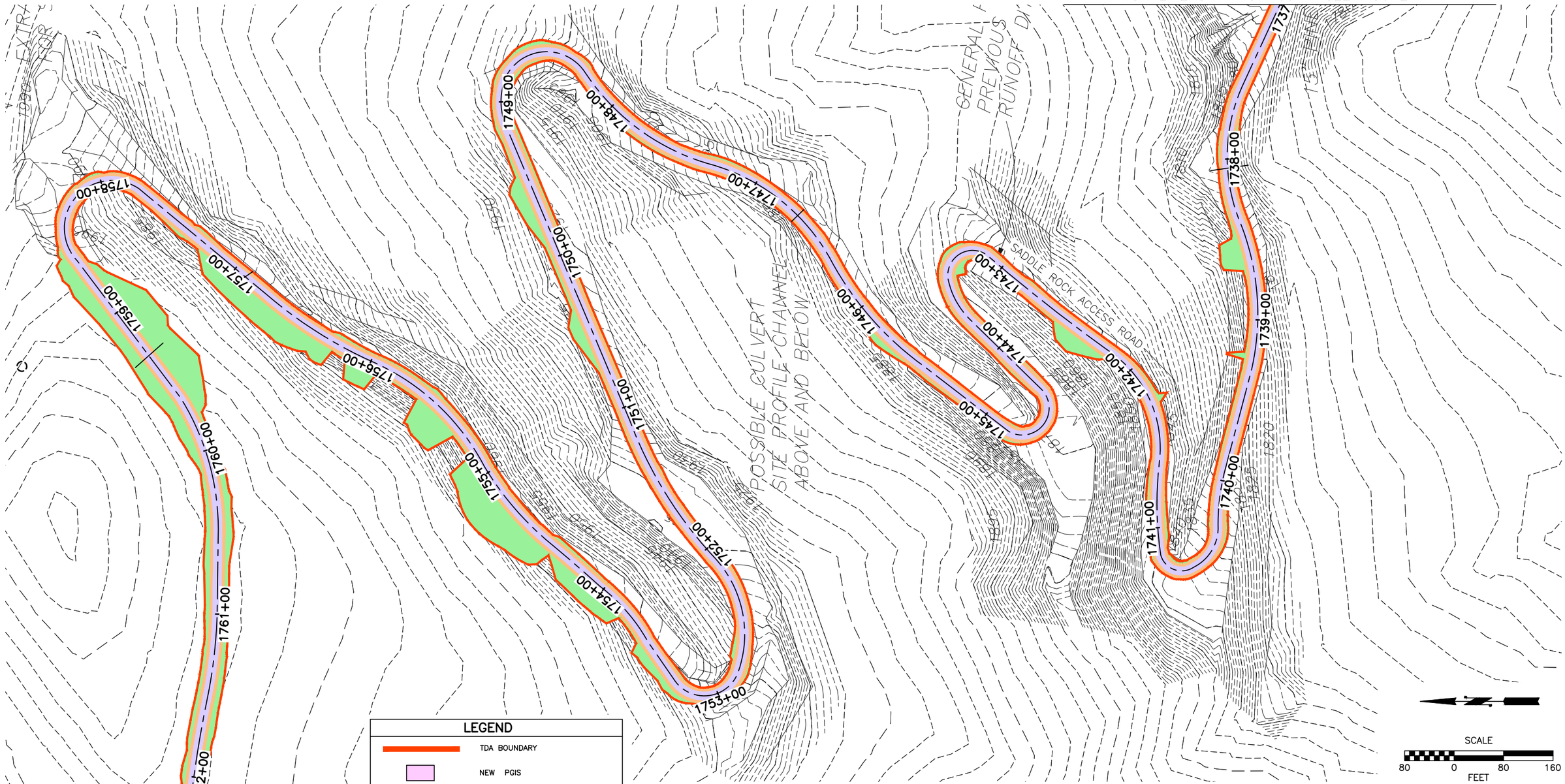
SADDLE ROCK ACCESS ROAD
PROPOSED DRAINAGE CONDITIONS

FIGURE
A-12

MATCH LINE STA 1737+00 – SEE FIGURE A–14



LEGEND

- TDA BOUNDARY
- NEW PGIS
- CONVERTED PGIS (FROM NPGIS)
- REPLACED PGIS
- NEW NPGIS
- REPLACED NPGIS
- EXISTING AND PROPOSED PERVIOUS
- EXISTING PGIS (TO REMAIN)
- EXISTING NPGIS (TO REMAIN)

PROPOSED LAND USE SUMMARY

TDA	NEW PGIS	REPLACED PGIS	CONVERTED PGIS	NEW NPGIS	REPLACED NPGIS	EXISTING AND PROPOSED PERVIOUS	EXISTING PGIS (TO REMAIN)	EXISTING NPGIS (TO REMAIN)
TDA 1	0 SF	0 SF	0 SF	25,144 SF	0 SF	25,530 SF	0 SF	37,716 SF

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SADDLE ROCK ACCESS ROAD
PROPOSED LAND USE

FIGURE
A-13

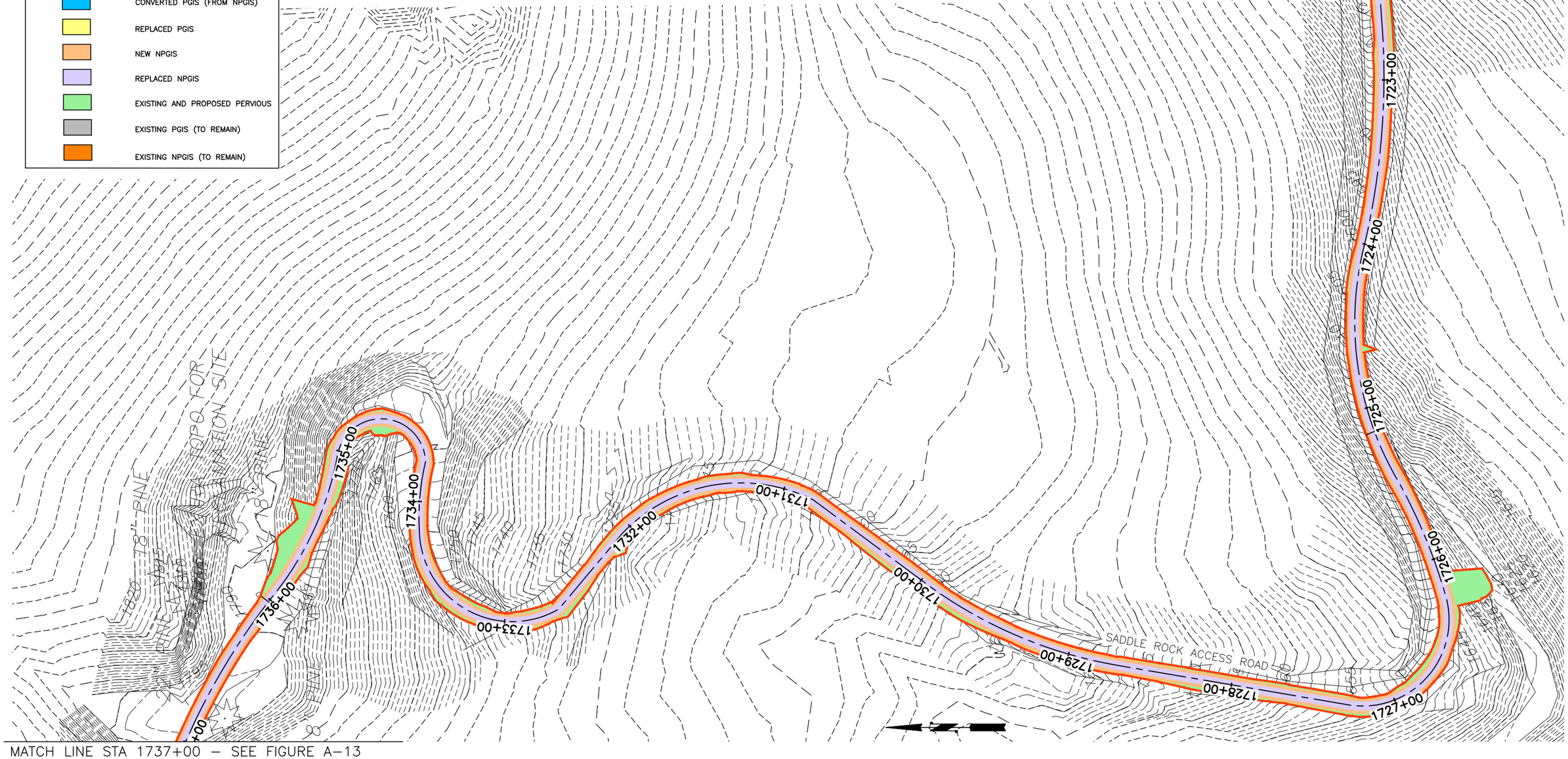
MATCH LINE STA 1722+00 – SEE FIGURE A–15

LEGEND

- TDA BOUNDARY
- NEW PGIS
- CONVERTED PGIS (FROM NPGIS)
- REPLACED PGIS
- NEW NPGIS
- REPLACED NPGIS
- EXISTING AND PROPOSED PERVIOUS
- EXISTING PGIS (TO REMAIN)
- EXISTING NPGIS (TO REMAIN)

PROPOSED LAND USE SUMMARY

TDA	NEW PGIS	REPLACED PGIS	CONVERTED PGIS	NEW NPGIS	REPLACED NPGIS	EXISTING AND PROPOSED PERVIOUS	EXISTING PGIS (TO REMAIN)	EXISTING NPGIS (TO REMAIN)
TDA 1	0 SF	0 SF	0 SF	25,144 SF	0 SF	25,530 SF	0 SF	37,716 SF



MATCH LINE STA 1737+00 – SEE FIGURE A–13

SCALE
80 0 80 160
FEET

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SADDLE ROCK ACCESS ROAD
PROPOSED LAND USE

FIGURE
A-14

Oct 30, 2020 - 2:47pm christina.oare X:\Wenatchee, City of\Projects\20190234 - Saddle Rock Access Road\CADD\05 - Exhibits\Drainage Exhibits\FIGURE A13-A16 Proposed Land Use.dwg Layout Name: Figure A-14

MATCH LINE STA 1722+00 – SEE FIGURE A-14

MATCH LINE STA 1706+60 – SEE FIGURE A-16

EXTRA TOPO FOR POSSIBLE TURNOUT AT "LOOKOUT"

POSSIBLE CULVERT SITE PROFILE CHANNEL ABOVE AND BELOW

4' WIRE FENCES

SADDLE ROCK ACCESS ROAD

1721+00
1720+00
1719+00
1718+00
1717+00
1716+00
1715+00
1714+00
1713+00
1712+00
1711+00
1710+00
1709+00
1708+00
1707+00

LEGEND

- TDA BOUNDARY
- NEW PGIS
- CONVERTED PGIS (FROM NPGIS)
- REPLACED PGIS
- NEW NPGIS
- REPLACED NPGIS
- EXISTING AND PROPOSED PERVIOUS
- EXISTING PGIS (TO REMAIN)
- EXISTING NPGIS (TO REMAIN)

SCALE
80 0 80 160
FEET

PROPOSED LAND USE SUMMARY

TDA	NEW PGIS	REPLACED PGIS	CONVERTED PGIS	NEW NPGIS	REPLACED NPGIS	EXISTING AND PROPOSED PERVIOUS	EXISTING PGIS (TO REMAIN)	EXISTING NPGIS (TO REMAIN)
TDA 1	0 SF	0 SF	0 SF	25,144 SF	0 SF	25,530 SF	0 SF	37,716 SF

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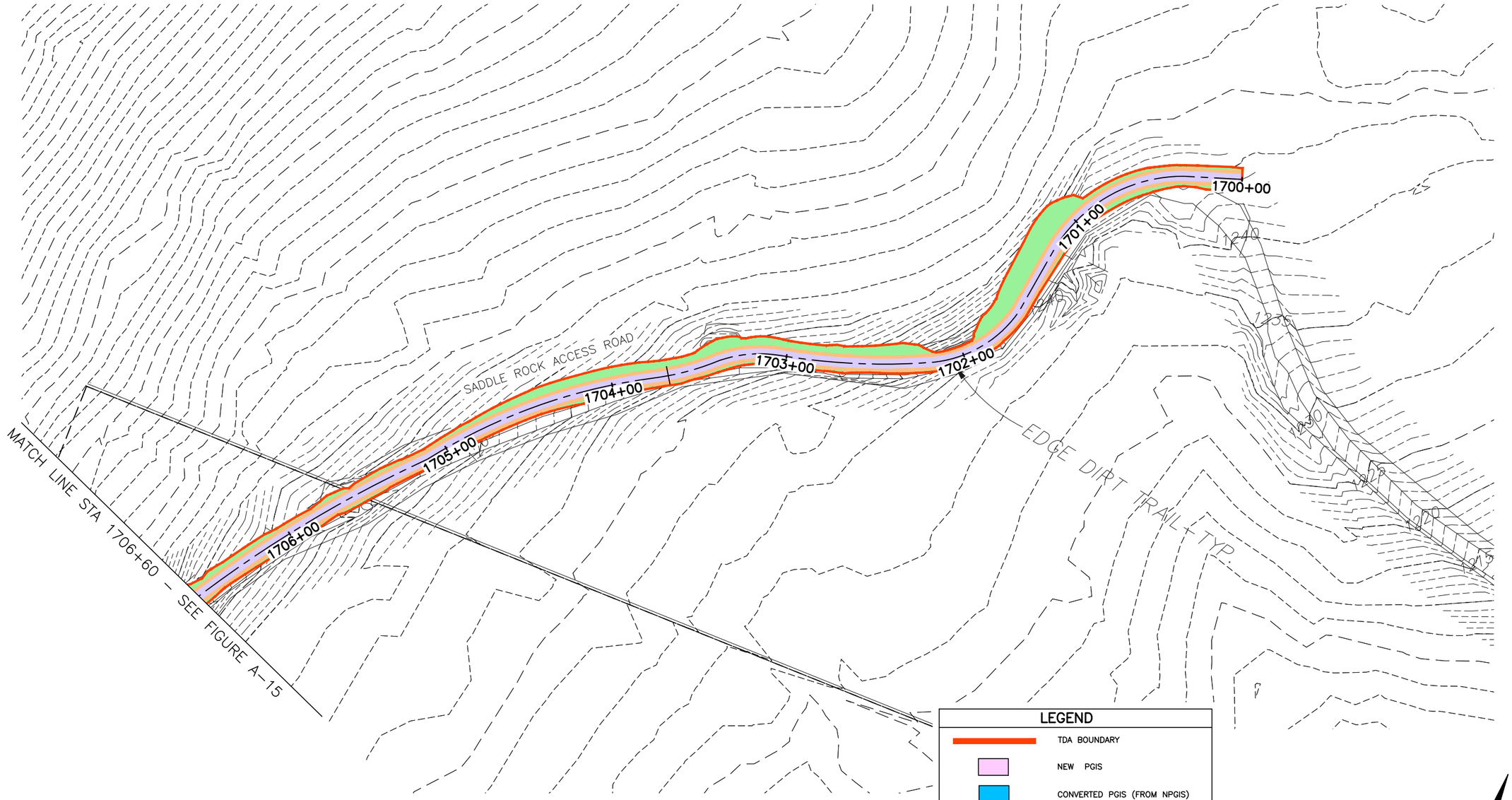
SADDLE ROCK ACCESS ROAD
PROPOSED LAND USE

FIGURE
A-15



PROPOSED LAND USE SUMMARY								
TDA	NEW PGIS	REPLACED PGIS	CONVERTED PGIS	NEW NPGIS	REPLACED NPGIS	EXISTING AND PROPOSED PERVIOUS	EXISTING PGIS (TO REMAIN)	EXISTING NPGIS (TO REMAIN)
TDA 1	0 SF	0 SF	0 SF	25,144 SF	0 SF	25,530 SF	0 SF	37,716 SF

LEGEND

- TDA BOUNDARY
- NEW PGIS
- CONVERTED PGIS (FROM NPGIS)
- REPLACED PGIS
- NEW NPGIS
- REPLACED NPGIS
- EXISTING AND PROPOSED PERVIOUS
- EXISTING PGIS (TO REMAIN)
- EXISTING NPGIS (TO REMAIN)

SCALE
80 0 80 160
FEET

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SADDLE ROCK ACCESS ROAD
PROPOSED LAND USE

FIGURE
A-16

MATCH LINE STA 1720+50 – SEE FIGURE A–18

SADDLE ROCK ACCESS ROAD

TDA 1

LEGEND

TDA BOUNDARY

TDA LIMITS

SCALE

80 0 80 160

FEET

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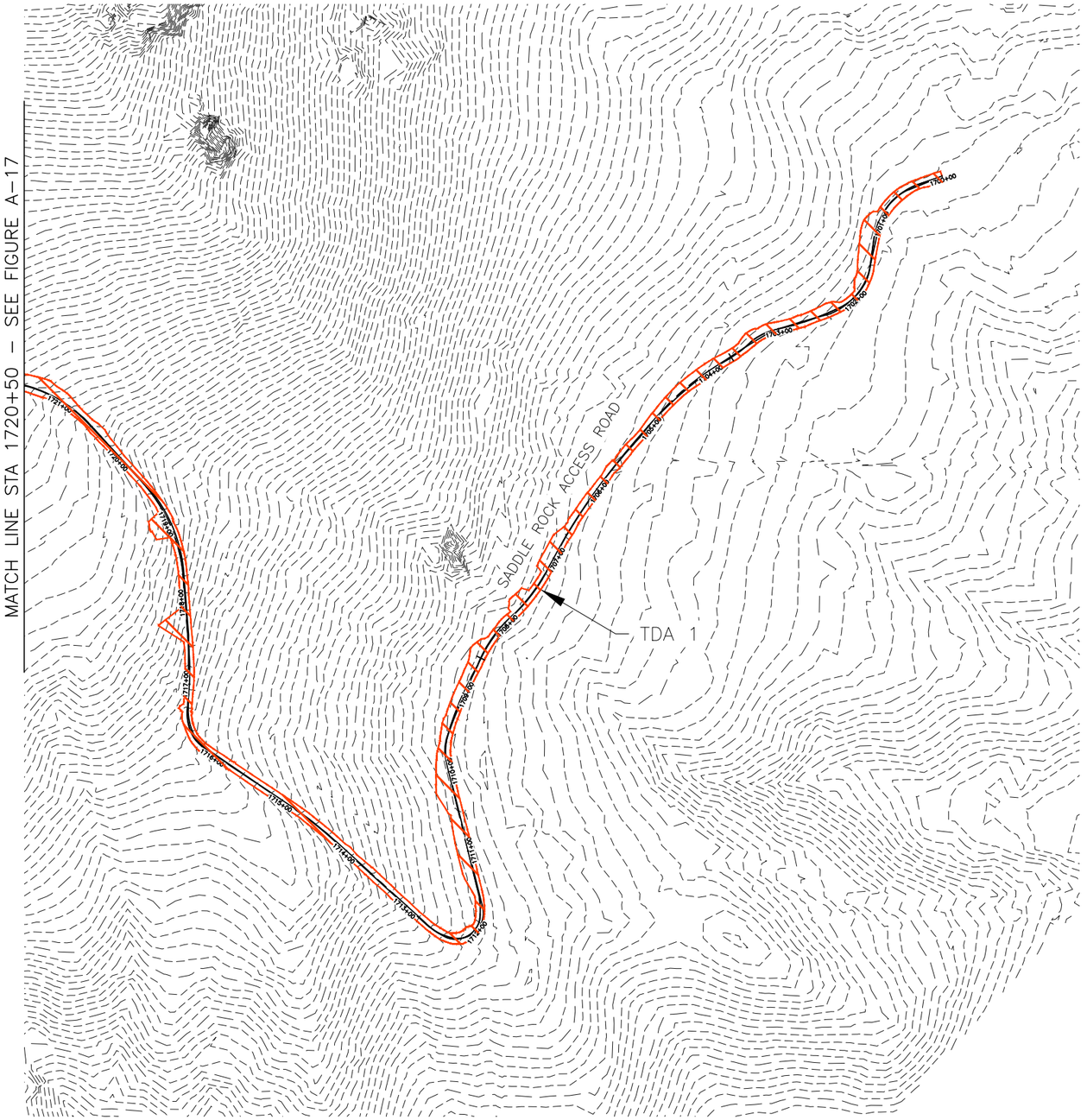
SADDLE ROCK ACCESS ROAD
TDA KEY MAP

FIGURE
A-17



LEGEND

- TDA BOUNDARY
- TDA LIMITS

SCALE
80 0 80 160
FEET

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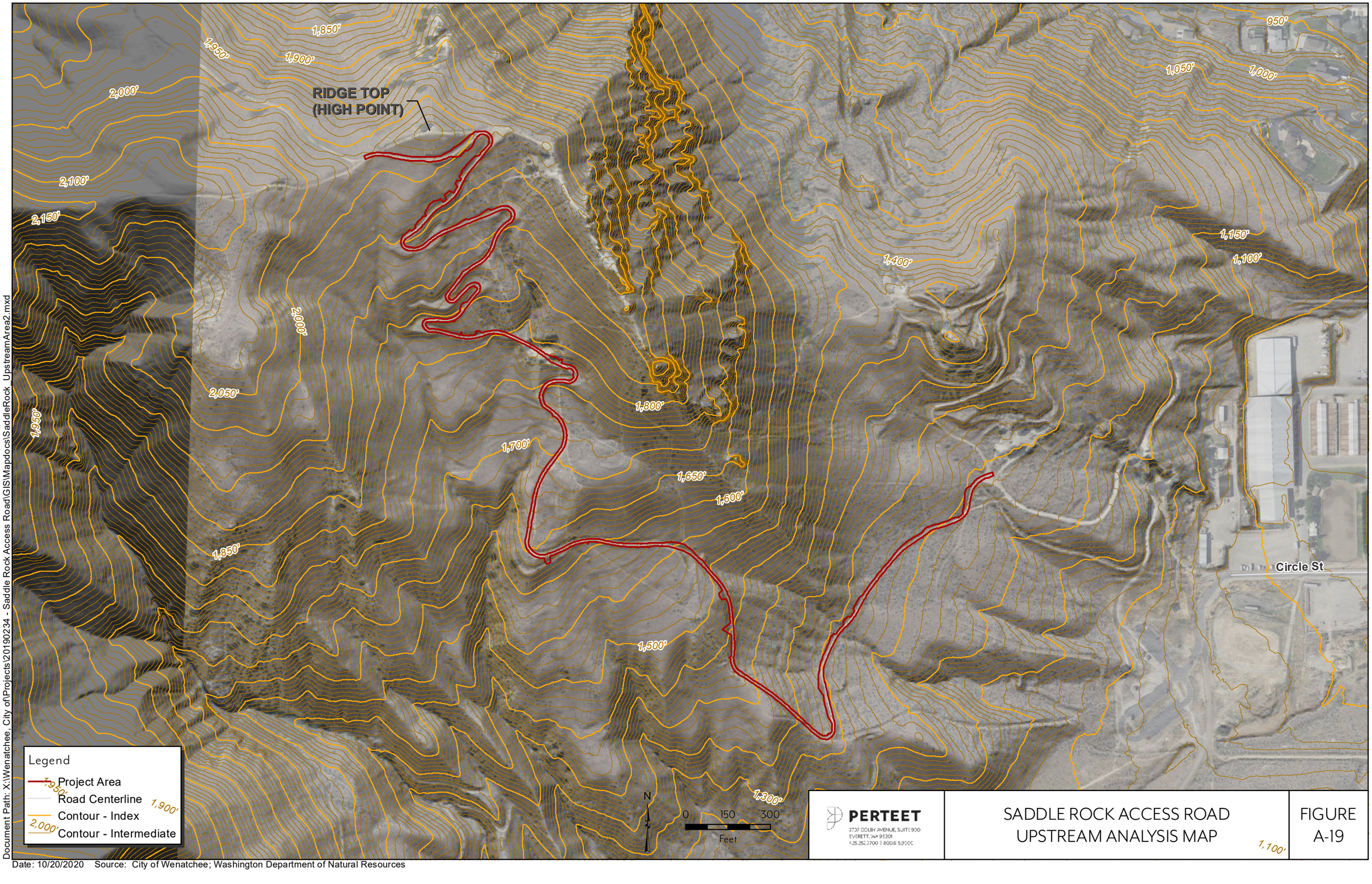
SADDLE ROCK ACCESS ROAD
TDA KEY MAP

FIGURE
A-18



Document Path: X:\Wenatchee, City of\Projects\20190234 - Saddle Rock Access Road\GIS\Mapdocs\SaddleRock_UpstreamArea2.mxd

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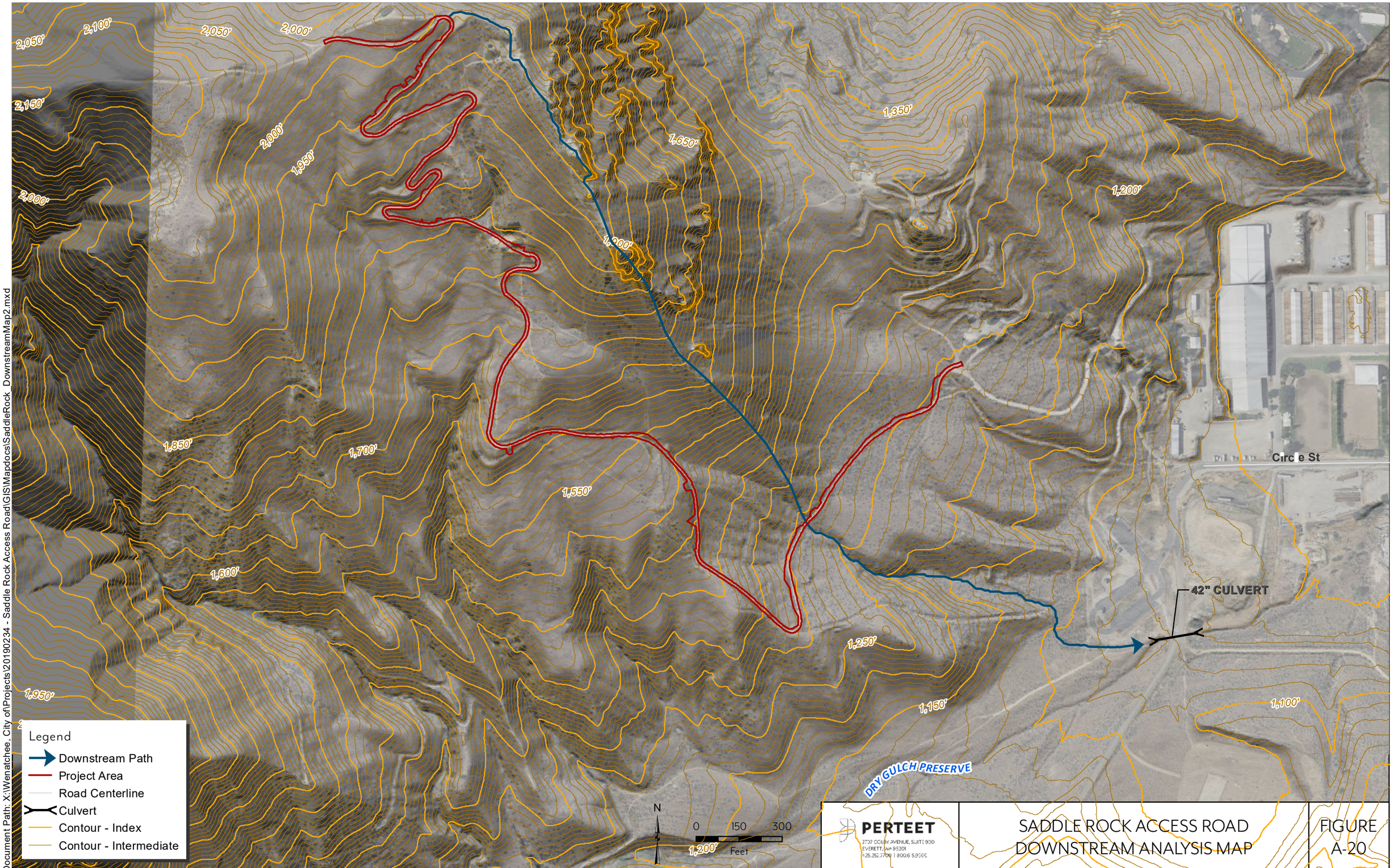
SADDLE ROCK ACCESS ROAD
UPSTREAM ANALYSIS MAP

FIGURE
A-19

Date: 10/20/2020 Source: City of Wenatchee; Washington Department of Natural Resources



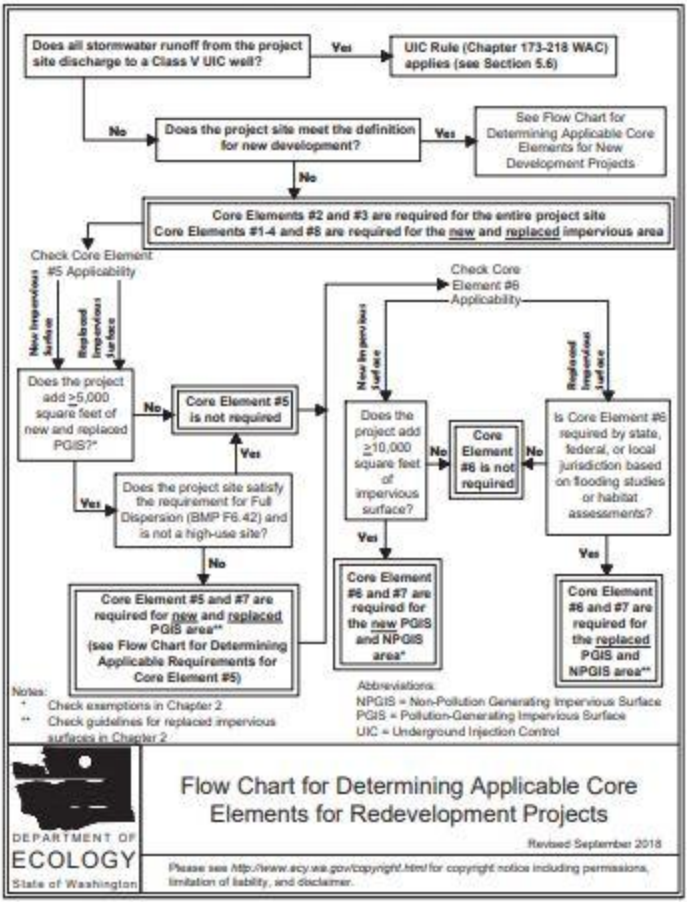
Document Path: X:\Wenatchee, City of\Projects\20190234 - Saddle Rock Access Road\GIS\Mapdocs\SaddleRock_DownstreamMap2.mxd

Date: 10/20/2020 Source: City of Wenatchee; Washington Department of Natural Resources

APPENDIX B

Minimum Requirements Figure

Figure 2.2: Flow Chart for Determining Applicable Core Elements for Redevelopment Projects



APPENDIX C

Department of Ecology BMPs

BMP C203E: ter B rs

Purpose

A water bar is a sma ditch or ridge of materia that is constructed diagona y across a road or right-of-way to divert stormwater runoff from the road surface, whee tracks, or a sha ow road ditch. See Figure 7.14: Water Bars.

Conditions of Use

C earing right-of-way and construction of access for power ines, pipe ines, and other simi ar insta - ations often require ong narrow rights-of-way over s oping terrain. Disturbance and compaction promotes gu y formation in these c eared strips by increasing the vo ume and ve ocity of runoff. Gu y formation may be especia y severe in tire tracks and ruts. To prevent gu ying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using sma predesigned diversions.

Give specia consideration to each individua out et area, as we as to the cumu ative effect of added diversions. Use grave to stabi ize the diversion where significant vehic e traffic is anticipated.

Design and Installation Specifications

- Height: 8 inches minimum, measured from the channe bottom to the ridgetop.
- Side s ope of channe : 2H:1V maximum; 3H:1V or f atter when vehic es wi cross.
- Top width of ridge: 6 inches minimum.
- Locate water bars to use natura drainage systems and to discharge into we -vegetated stab e areas.
- See Tab e 7.17: Water Bar Spacing Guide ines for spacing guide ines for water bars.

T ble 7.17: ter B r Sp cing Guidelines

Slope Along Road (%)	Spacing (feet)
< 5	125
5 to 10	100
10 to 20	75
20 to 35	50
> 35	Use rock- ined ditch

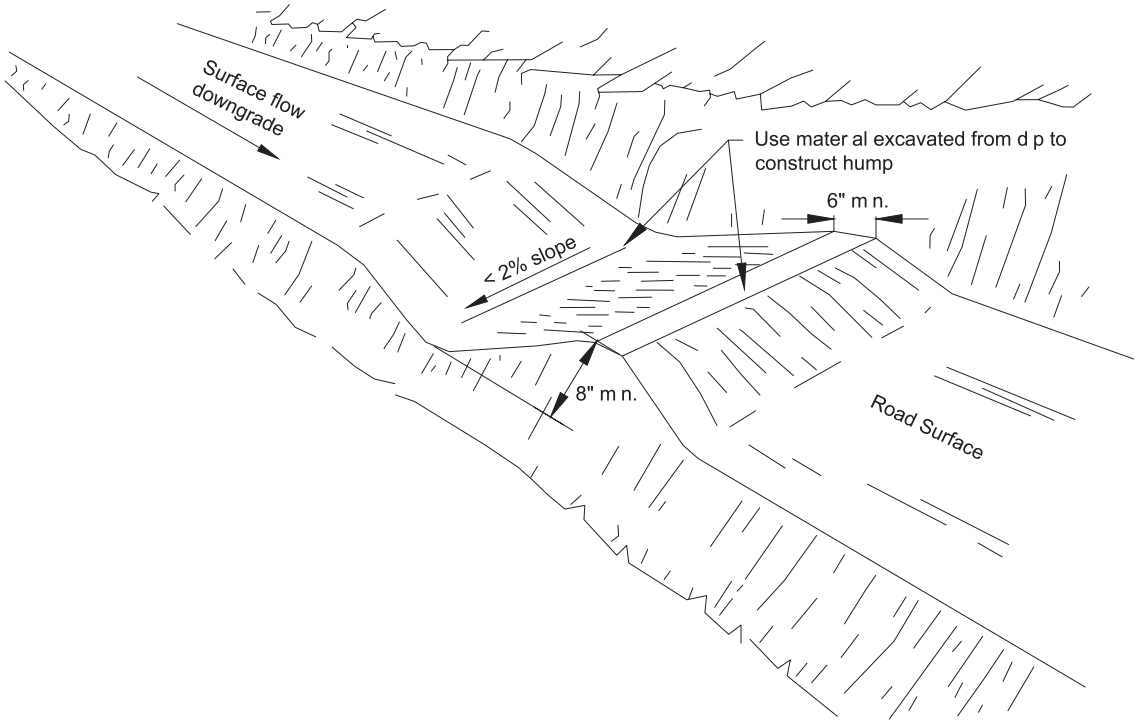
- Grade of water bar and ang e: Se ect an ang e that resu ts in a ditch s ope < 2%.
- Insta the water bar as soon as the c earing and grading is comp eted. When uti ities are being insta ed, reconstruct the water bar as construction is comp eted on each section.
- Compact the water bar ridge.

- Stabilize eed and mulch the portion that are not ubjected to traffic. Place gravel in the area cro ed by vehicle .
- Note that BMP C2 8E: Triangular Silt Dike (TSD) can be u ed to create the ridge for the water bar.

Maintenance Standards

- Periodically in pect water bar for wear and after every heavy rainfall for wear and ero ion damage.
- Immediately remove ediment from the flow area and repair the dike.
- Check outlet area and make timely repair a needed.
- When permanent road drainage i e tabli hed and the area above the temporary water bar i permanently tabilized remove the dike and fill the channel to blend with the natural ground and appropriately tabilize the di turbed area.

Figure 7.1 Water Bars



NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Wash ngton

Water Bars

Rev sed June 2016

BMP F6.42: F Dispersion

This BMP allows for fully dispersing" runoff from impervious surfaces and cleared areas of commercial and residential development sites that protect a portion of the site (or for large sites, a portion of an area within a subbasin drainage on the site) in a natural, native vegetation cover condition. Natural vegetation is preserved and maintained in accordance with guidelines. Runoff from roofs, driveways, and roads within the development is dispersed within the site by using the areas of preserved vegetation.

Note: Full dispersion is not subject to Underground Injection Control (UIC) regulations. However, Figure 6.32: Standard Dispersion Trench With Notched Grade Board shows a standard dispersion trench that is subject to UIC regulations; see 5.6 Subsurface Infiltration (Underground Injection Control Wells).

Applications and Limitations

This BMP is primarily intended for areas of new development. A sliding scale for the amount of preserved vegetated area is provided to allow application to other sites.

- Up to 10% of the site that is impervious surface can be rendered ineffective impervious area by dispersing runoff from it into the native vegetation area. Any additional impervious areas (this BMP recommends limiting additional impervious areas to < another 10% for rural areas) are considered effective impervious surfaces with the exception of roofs served by drywells.
- Types of development that retain a percentage of the site (or for large sites, a portion of an area within a subbasin drainage on the site) in a natural forested or other native vegetation cover condition may also use these BMPs to avoid triggering the flow control BMP requirement or to minimize its use at the site.

General Criteria

Impervious areas of residential developments can meet flow control requirements by distributing runoff into native vegetation areas that meet the limitations and design guidelines below if the ratio of impervious area to native vegetation area does not exceed 15%. Vegetation must be preserved and maintained according to the following requirements:

- The preserved area should be situated to minimize the clearing of existing native vegetation, to maximize the preservation of wetlands, and to buffer stream corridors.
- The preserved area should be placed in a separate tract or protected through recorded easements for individual lots.
- If feasible, the preserved area should be located downslope from the building sites, since flow control and water quality are enhanced by flow dispersion through undisturbed soils and native vegetation.
- The preserved area should be shown on all property maps and should be clearly marked during clearing and construction on the site.
- Vegetation and trees should not be removed from the natural growth retention area, except for the removal of dangerous and diseased trees.

Design Pro e ure

The amount of vegetation that must be preserved and maintained for full dispersion is based on a "sliding s ale" that varies between 20% and 65% depending on the per entage of the site with impervious surfa e that drains into the native vegetation area, as shown in Table 6.10: Per entage of Site With Undisturbed Native Vegetation Versus Per entage of Site With Impervious Surfa e Draining to Areas of Preserved Native Vegetation.

Table 6.10: Percentage of Site With Undisturbed Native Vegetation Versus Percentage of Site With Impervious Surface Draining to Areas of Preserved Native Vegetation

Percentage of Site With Impervious Surface Draining to Native Vegetation Area	Percentage of Site With Undisturbed Native Vegetation
10.0	65
9.0	60
8.25	55
7.5	50
6.75	45
6.0	40
5.25	35
4.5	30
3.75	25
3.0	20

Roof Downspouts

Roof surfa es that are onne ted to drywells are onsidered "fully dispersed" provided that they are designed a ording to lo al requirements. Otherwise, the roof runoff is assumed to run into the street, and that volume must be added to the volume dispersed in the roadway dispersion omponent of this BMP.

Driveway Dispersion

Driveway surfa es are onsidered to be "fully dispersed" if the site meets the required ratio of impervious surfa es to preserved native vegetation above, and if they omply with the driveway dispersion BMPs (BMP F6.40: Con entrated Flow Dispersion and BMP F6.41: Sheet Flow Dispersion) and have flow paths through native vegetation > 100 feet. This also holds true for any driveway surfa es that omply with the roadway dispersion BMPs des ribed below.

Roadway Dispersion BMPs

Roadway sur a es are onsidered to be " ully dispersed" i the site meets the required ratio o impervious sur a es to preserved native vegetation above, and i they omply with the ollowing dispersion requirements:

- Roadway runo dispersion is allowed only on rural neighborhood olle tors and lo al a ess streets. To the extent easible, driveways should be dispersed to the same standards as roadways to ensure adequate water quality prote tion o downstream resour es.
- The road se tion shall be designed to minimize olle tion and on entration o roadway runo . heet low over roadway ill slopes (i.e., where roadway subgrade is above adja ent right-o -way) should be used wherever possible to avoid on entration.
- When it is ne essary to olle t and on entrate runo rom the roadway and adja ent upstream areas (e.g., in a dit h on a ut slope), on entrated lows shall be in rementally dis harged rom the dit h via ross ulverts or at the ends o ut se tions. These in remental dis harges o newly on entrated lows shall not ex eed 0.5 ubi eet per se ond (s) at any one dis harge point rom a dit h or the 100-year storm. Where lows at a parti ular dit h dis harge point were already on entrated under existing site onditions (e.g., in a natural hannel that rosses the roadway alignment), the 0.5 s limit would be in addition to the existing on entrated peak lows.
- Dit h dis harge points with up to 0.2 s dis harge or the 100-year storm shall use ro k pads or dispersion tren hes to disperse lows. Dit h dis harge points with between 0.2 and 0.5 s dis harge or the 100-year storm shall use only dispersion tren hes to disperse lows.
- Dispersion tren hes shall be designed to a ept sur a e lows (ree dis harge) rom a pipe, ulvert, or dit h end, shall be aligned perpendi ular to the low path, and shall be minimum 2 by 2 eet in se tion, 50 eet in length, illed with 0.75- to 1.5-in h washed ro k, and provided with a level not hed grade board (see Figure 6.32: tandard Dispersion Tren h With Not hed Grade Board). Mani olds may be used to split lows up to 2 s dis harge or the 100-year storm between up to our tren hes. Dispersion tren hes shall have a minimum spa ing o 50 eet.
- A ter being dispersed with ro k pads or tren hes, lows rom dit h dis harge points must traverse a minimum o 100 eet o undisturbed native vegetation be ore leaving the proje t site, or entering an existing on-site hannel arrying existing on entrated lows a ross the road alignment.

  Note: In order to provide the 100- oot low path length to an existing hannel, some roadway runo may unavoidably enter the hannel undispersed. Also note that water quality treatment may be waived or roadway runo dispersed through 100 eet o undisturbed native vegetation.
- Flow paths rom adja ent dis harge points must not interse t within the 100- oot low path lengths, and dispersed low rom a dis harge point must not be inter epted by another dis harge point. To enhan e the low ontrol and water quality e e ts o dispersion, the low path shall be ≤ 15% slope, and shall be lo ated within designated open spa e.

  Note: Runo may be onveyed to an area meeting these low path riteria.
- Dit h dis harge points shall be lo ated a minimum o 100 eet upgradient o steep slopes (i.e.,

slopes > 40% wetlands and streams.

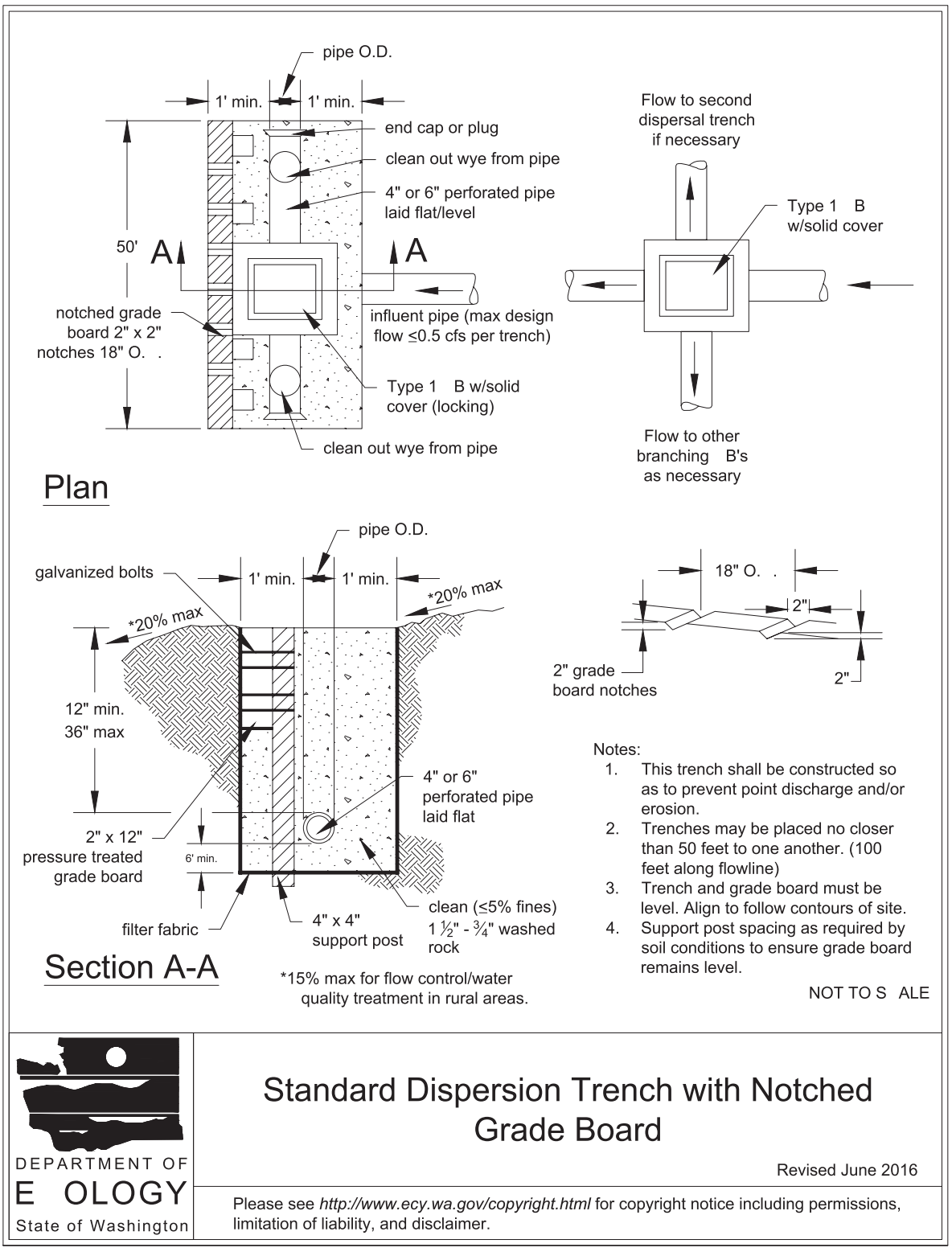
- Where the local jurisdiction determines there is a potential for significant adverse impacts downstream (e.g. erosive steep slopes or existing downstream drainage problems dispersion of roadwa runoff ma not be allowed or other measures ma be required.

Cleared Area Dispersion BMPs

The runoff from cleared areas that consist of bare soil nonnative landscaping lawn and/or pasture is considered to be “full dispersed” if it is dispersed through ≥ 25 feet of native vegetation in accordance with the following criteria:

- The contributing flow path of cleared area being dispersed must be ≤ 150 feet.
- Slopes within the 25-foot-minimum flow path through native vegetation should be ≤ 8%. If this criterion cannot be met due to site constraints the 25-foot flow path length must be increased 1.5 feet for each 1% increase in slope above 8%.

Figure 6.3 Standard Dispersion Trench With Notched Grade Board



Construction Criteria

See the construction criteria for BMP F6.40 Concentrated Flow Dispersion.

Operation and Maintenance Criteria

See the operation and maintenance criteria for BMP F6.40 Concentrated Flow Dispersion.

BMP F6.43: Channelized Flow Dispersion

This BMP redisperses influent channelized flows to natural or engineered dispersion areas.

General Criteria

Channelized flow dispersion criteria for all soil types are summarized below.

Flows to Be Dispersed

Dispersion areas should be suited to handle stormwater runoff from tributary areas so that ideally there is no runoff leaving the dispersion area.

Siting Criteria

See the siting criteria for BMP F6.40 Concentrated Flow Dispersion.

Setback Requirements

See the setback requirements for BMP F6.40 Concentrated Flow Dispersion.

Redispersion Design Criteria

Flows collected in a pipe or ditch conveyance system require energy dissipation and dispersal at the end of the conveyance system before entering the dispersion area. See Figure 6.32 Standard Dispersion Trench With Notched Grade Board for a typical detail for flow dispersion trench. Guidance for the design of energy dissipaters can be found in *Hydraulic Design of Energy Dissipators for Culverts and Channels* (FHWA, 2006) and in the latest version of the WSDOT *Hydraulics Manual*.

Concentrated runoff from the flow contributing area and adjacent upstream areas (such as in a ditch or cut slope) must be incrementally discharged from the conveyance system (e.g., ditch, gutter, or storm drain) via cross culverts or at the ends of cut sections. These incremental discharges of newly concentrated flows must not exceed 0.5 cubic feet per second (cfs) at any single discharge point from the conveyance system for the 100-year design flow (see hydrologic modeling methods in Chapter 4 - Hydrologic Analysis and Design). Where flows at a particular discharge point are already concentrated under existing site conditions (for example, in a natural channel that crosses a roadway alignment), the 0.5 cfs limit would be in addition to the existing concentrated peak flows.

Discharge points with up to 0.2 cfs discharge for the 100-year design flow may use rock pads or dispersion trenches to disperse flows. Discharge points with between 0.2 and 0.5 cfs discharge for the 100-year design flow must use only dispersion trenches to disperse flows.

Design dispersi n renches accep surface fl ws (free discharge) fr m a pipe, culver , r di ch end; aligned perpendicular he fl w pa h; a minimum f 2 by 2 fee in sec i n; 50 fee in leng h; filled wi h 0.75 1.5 inch diame er washed r ck; and pr vided wi h a level n ched grade b ard (see Figure 6.32: S andard Dispersi n Trench Wi h N ched Grade B ard). Use manif lds spli fl ws up 2 cfs discharge f r he 100 year peak fl w be ween f ur renches (maximum). Pr vide a minimum spacing f 50 fee f r dispersi n renches.

Af er being dispersed wi h r ck pads r renches, fl ws fr m discharge p in s mus raverse he required fl w pa h leng h f he dispersi n area bef re en ering an exis ing n si e channel carrying exis ing c ncen ra ed fl ws away fr m he r adway alignmen .

Note: T pr vide he required fl w pa h leng h an exis ing channel, s me r adway run ff may unav idably en er he channel undispersed.

D n all w fl w pa hs fr m adjacen discharge p in s in ersec wi hin he required fl w pa h leng hs, and ensure dispersed fl w fr m a discharge p in is n in ercep ed by an her discharge p in .

L ca e di ch discharge p in s a minimum f 100 fee upgradien f s eep sl pes (sl pes > 40% wi hin a ver ical eleva i n change f ≥ 10 fee), we lands, and s reams.

Where he l cal jurisdic i n de ermines ha here is a p en ial f r significan adverse impac s d wns ream (such as er sive s eep sl pes r exis ing d wns ream drainage pr blems), dispersi n f r adway run ff may n be all wed, r her measures may be required.

Level Spreaders and Energy Dissipaters

Where gravel level spreaders are n l ca ed be ween he fl w c n ribu ing area and he dispersi n area, side sl pes leading na ural dispersi n areas sh uld be ≤ 25% (4H:1V). Side sl pes ha are 25% 15% (7H:1V) sh uld n be c nsidered par f he dispersi n area. Sl pes > 25% are all wed if he exis ing side sl pes are well vege a ed and sh w n signs f er si n pr blems. See la es versi n f he WSDOT HRM.

Where gravel level spreaders are l ca ed be ween he fl w c n ribu ing area and he dispersi n area, c nsider fl w c n ribu ing area side sl pes ≤ 33% par f he na ural dispersi n area if exis ing side sl pes are well vege a ed and sh w n signs f er si n pr blems (WSDOT, 2011). See la es versi n f he WSDOT HRM.

F r any exis ing sl pe ha will lead a na ural dispersi n area, if evidence f channelized fl w (rills r gullies) is presen , use a fl w spreading device bef re h se fl ws are all wed en er he dispersi n area.

Design Procedure

Natural Channelized Flow Dispersion

The f ll wing cri eri n is specific channelized fl w dispersi n ha discharged n sl pes ≤ 15% all Type A and s me Type B s ils, depending n sa ura ed hydraulic c nduc ivi y ra es.

- F r sa ura ed hydraulic c nduc ivi y ra es (K_{sa} , as de ermined in 6.3.3 General Cri eria f r Infil ra i n BMPs) f 4 inches per h ur (in/hr) r grea er, he dispersi n area sh uld be ≥ 50%

APPENDIX D

Operations and Maintenance

505 5th Ave S, Suite 300, Seattle, WA 98104 | P 206.436.0515

The tables below summarize conditions when maintenance should occur for each type of stormwater facility proposed on-site. At the very least, facilities should be visually inspected twice per year and after large rainfall events. Maintenance is recommended early in the spring after the last expected snowfall has melted.

Table 1. Water Bars.

Activity	Objective	Schedule	Notes
Periodically inspect water bars for wear and after every heavy rainfall. Immediately remove sediment from the flow area and repair the dike. Check outlet areas and make timely repairs as needed.	Repair damage due to erosion.	Twice annually (October and January).	N/A
When permanent road drainage is established and the area above the temporary water bar is permanently stabilized, remove the dike and fill the channel to blend with the natural ground, and appropriately stabilize the disturbed area.	Establish permanent feature.	After the site has been stabilized.	N/A

Table 2. Full Dispersion.

Activity	Objective	Schedule	Notes
Preserved area should be placed in a separate tract or protected through recorded easements for individual lots.	Maintain the treatment BMP.	N/A	Site is located in a nature preserve.

APPENDIX F
Sampling and Analysis Plan

Sampling and Analysis Plan
Interim Remedial Action Design and Remedial Action

Saddle Rock Natural Area
Wenatchee, Washington

for
City of Wenatchee

February 20, 2019

GeoEngineers
Earth Science + Technology

Sampling and Analysis Plan
Interim Remedial Action Design and Remedial Action

Saddle Rock Natural Area
Wenatchee, Washington

for
City of Wenatchee

February 20, 2019

GeoEngineers

523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Sampling and Analysis Plan
Interim Remedial Action Design and Remedial Action

Saddle Rock Natural Area
Wenatchee, Washington

File No. 4296-008-00

February 20, 2019

Prepared for:

City of Wenatchee
PO Box 519
1350 McKittrick Street
Wenatchee, Washington 98801

Attention: Charlotte Mitchell, PE, Parks Capital Projects Manager

Prepared by:

GeoEngineers, Inc.
523 East Second Avenue
Spokane, Washington 99202
509.363.3125

Ryan M. Tobias
Senior Environmental Scientist

Nick E. Rohrbach
Senior Environmental Scientist

Dustin G. Wasley, PE
Principal Engineer

RMT:NER:DGW:tjh

cc: Frank Winslow
Washington State Department of Ecology

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ACRONYMS AND ABBREVIATIONS

AO	Agreed Order
AOI	Area of Interest
bgs	Below Ground Surface
CFR	Code of Federal Regulations
COC	Constituent of Concern
cy	Cubic Yard
DNR	State of Washington Department of Natural Resources
Ecology	State of Washington Department of Ecology
EDD	Electronic Data Deliverable
EIM	Environmental Information Management
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
GPS	Global Positioning System
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	Investigation-Derived Waste
IRA	Interim Remedial Action
LiDAR	Light Detection and Ranging
mg/kg	milligrams per kilogram
OME	Office of Minerals Exploration
OSHA	Occupational Safety and Health Administration
PLS	Professional Land Surveyor
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI/FS	Remedial Investigation/Feasibility Study
RLR	Reiss-Landreau Research
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure

ACRONYMS AND ABBREVIATIONS (CONTINUED)

USBM	U.S. Bureau of Mines
USGS	U.S. Geological Survey
XRF	x-ray fluorescence

1.0 INTRODUCTION

This combined Sampling and Analysis Plan (SAP) presents the proposed scope of work to conduct an Interim Remedial Action (IRA) Design data gap assessment and to complete confirmation sampling during the IRA implementation at the Saddle Rock Natural Area (Site) located in Wenatchee, Washington (Vicinity Map, Figure 1). The Site is comprised of eight areas of interest (AOIs) originally delineated by Hart Crowser (2013a and 2013b) as part of their Remedial Investigation/Feasibility Study (RI/FS) for the City of Wenatchee (City). The AOIs were identified as SR-01 through SR-08 and were associated with historical mining activities and elevated metals concentrations in waste rock piles (Areas of Interest, Figure 2). The RI identified arsenic as the primary constituent of concern for human-health receptors.

During the FS, Hart Crowser performed a background soils assessment from undisturbed areas across the Site, which resulted in a screening level for arsenic of 14.4 milligrams per kilogram (mg/kg). This screening level was determined to be the cleanup level for a proposed IRA for the waste rock piles. Based on these results, Hart Crowser (2013b) developed costs to implement three remedial alternatives for waste rock at the Site.

In November 2013, the City proposed that Alternative 1, excavation and offsite disposal of waste rock and downslope soils, would be their preferred alternative for the Site. However, during development of the Agreed Order (AO), the Washington State Department of Ecology (Ecology) identified two data gaps associated with waste rock pile delineation for cleanup. These data gaps are detailed in Ecology's (2018) "Technical Memorandum, Gold Knob Prospect (aka Saddle Rock Park) – Establishing Site Cleanup Levels and Areas" and are summarized below.

- Data Gap 1 – The extent of contamination in the downslope "toe" areas of the waste rock piles was not fully defined. Therefore, sampling and analysis is needed to define the areas to be excavated prior to implementation of IRA cleanup.
- Data Gap 2 – Ecology found that the geological map in the RI Report was not consistent with the Geological Map of the Wenatchee Quadrangle (Gresens 1983; Figure 3). Further investigation revealed hydrothermally altered rocks were mapped within the Swauk Formation at the location of some of the waste rock piles. Ecology concluded native soils in the hydrothermally altered units may have considerably higher concentrations of total arsenic than in the adjacent formations. Thus, the original cleanup level of 14.4 mg/kg for total arsenic may not be appropriate, and geological occurrence should be considered in determining natural background concentrations for total arsenic.

This SAP provides standard operating procedures (SOPs) and guidance for activities that will be implemented during the data gap assessment, waste rock pile delineation(s) and confirmation sampling during the IRA implementation. Quality assurance/quality control (QA/QC) procedures for the project are outlined in the Quality Assurance Project Plan (QAPP) which is provided as Appendix A. Site health and safety during field activities will be governed by the site-specific Health and Safety Plan (HASP) which is provided as Appendix B.

The goal of the IRA data gap assessment is to further evaluate soil conditions (upslope and downslope of each waste rock pile), collect soil samples for chemical analysis, and obtain other data to address the

aforementioned data gaps. Data collected from the IRA data gap assessment will be used to support preparation of an IRA Design for the Remedial Action.

2.0 BACKGROUND

The Saddle Rock Natural Area is a 325-acre parcel located immediately west of Wenatchee, Washington (Figure 1). The Site is developed with a parking area and hiking trails, which are popular with recreational hikers and are used during school field trips. The hiking trails pass adjacent to the waste rock piles, potentially exposing hikers and students to elevated concentrations of arsenic and other metals.

As discussed, the Hart Crowser (2013a) RI identified eight AOIs at the Site (SR-1 through SR-08) as shown in Figure 1. Ecology has since determined waste rock pile SR-07 is minimally disturbed by human activities. The constituents of concern within SR-07 are believed by Ecology to be naturally occurring and no cleanup of this area is therefore anticipated. Cleanup of the remaining seven AOIs is to be divided between Phase 1 (lower four waste rock areas) and Phase 2 (upper three waste rock piles). The phasing will occur due to funding considerations; since the lower four waste rock piles contain approximately 87 percent of the contaminated materials and are significantly easier to reach than the Phase 2 waste rock areas.

2.1. Geology and Gold Mineralization

The Saddle Rock area is underlain by several thousand feet of continental shale, sandstone, conglomerate and coaly sediments of the early Eocene Swauk Formation. Gold mineralization at the Site is associated with the Gold King Anticline, which is overturned and cut by thrust faults, and extends about four miles northwestward across Saddle Rock. Elongate altered mineralized zones, locally referred to as “reefs”, are scattered across the anticline within the formation. The reefs exhibit varying degrees of hydrothermal alteration and deformation. The gold-silver mineralization is typically epithermal with porcelaneous quartz veins (OME 1965; USGS 1966).

A total of six reefs have been explored within the Gold King Anticline (USGS 1966). AOIs SR-01, SR-02, SR-03 and SR-08 are located proximate to the thrust fault corresponding to the “A Reef”, while AOIs SR-04 and SR-05 appear to be situated in the vicinity of the “F Reef” and “G Reef”. AOI SR-06 is positioned west of a thrust fault within the Swauk Formation mapped by Gresens (1983).

2.2. Site History

According to the cultural resources survey of the Site by Reiss-Landreau Research (RLR 2013), three mines historically operated within the Saddle Rock Park property boundary (Sunrise Mine, Squaw Saddle Mine and Gold Knob Mine).

2.2.1. Early Mining History

The majority of the mining claims originally located at the Site between 1908 and 1909 were likely associated with the Squaw Saddle Mining and Milling Company, incorporated in 1909. AOIs SR-01, -02, -03 and -08 were situated within or adjacent to the Keegan No. 4 Lode Claim. SR-03 may have also been part of a 20-acre placer mining claim under the name Charles Robert Browne located in 1908. AOI SR-04 was located in 1909 in the Little Wonder Lode, and SR-05 was discovered in 1909 as part of the Shamrock Lode. The Washington Lode Claim was discovered in 1908 and incorporated AOI SR-06 (Table A). Each of

the aforementioned lode claims were leased from the State of Washington Department of Natural Resources (DNR).

2.2.2. Land Use Activities 1940's – 1960's

A contract for mining between Martin Keegan and the State of Washington was issued in 1949 for leasing rights for 20 years on 80 acres encompassing the SR-01, SR-02, SR-03 and SR-08 AOIs. The contract was assigned to the Wenatchee Mining Partnership in 1954. In addition, an Indenture and Prospecting Lease was granted to J.J. Keegan by the State of Washington in 1952 and 1954 for 2 years of prospecting at SR-04. A contract of mining was also issued between 1957 and 1959 with the Lovitt Mining Company and James A. O'Conner, A.J. O'Conner, and J.R. Conrad (lessees from the State of Washington) for leasing rights for 20 years in connection with AOI SR-05 (OME 1965). In 1962, James A. O'Conner filed a Real Estate Contract for Mining with the State of Washington for road building and ore removal (except coal and timber cutting) at SR-05.

In 1957, AOIs SR-01, SR-02 and SR-03 may have been worked as the E. H. Lovitt Public Mine after a Proof of Labor record was filed. Mr. Lovitt had 7 days to improve the land by building roads, cutting timber, and blasting. The main trail and other substantial trails throughout the southeastern portion of Saddle Rock Park were possibly improved under this Proof of Labor. The source piles at SR-06 (236 cubic yards [cy]) may have also been the result of road work performed in 1957 (RLR 2013) (Table A).

2.2.3. Operational History

Minimal information is available regarding the operational history at the Site. Huntting (1943 and 1956) and the U.S. Bureau of Mines (USBM 1965) described a cinnabar occurrence on Squaw Saddle. However, this report was likely erroneous. Huntting (1955) also reported the Gold Knob Mine at the Site was a gold and silver deposit in quartz stockwork within Swauk sandstone, leased by J.J. Keegan from DNR, and subleased by the Anaconda Copper Mining Company. Development was described as several diamond drill holes, approximately 800 feet of crosscutting through silicified zones, and a 90-foot winze. Patton and Cheney (1971) also indicated exploratory adits were developed at the A, F and G Reefs, but they did not encounter any ore.

TABLE A. SUMMARY OF THE HISTORY AND MINING FEATURES AT THE SITE

Area of Interest	Mine Name/Company	Lode Claim	Discovery Date	Land Use Activities (1940's – 1960's)	Features
SR-01	Squaw Saddle Mining and Milling Company	Keegan No. 4	May 1908	1949 - Contract for mining between Martin Keegan and DNR issued for leasing rights for 20 years on 80 acres. 1957 - may have been worked as the E. H. Lovitt Public Mine after a Proof of	Cavity in exposed bedrock, backfilled with rocky debris, an outcrop and an approximate 155 cy waste rock pile. A vertical timbered mine opening is present at the source pile.
SR-02			May 1908		Sealed adit and an approximate 3,023 cy waste rock pile.

Area of Interest	Mine Name/Company	Lode Claim	Discovery Date	Land Use Activities (1940's – 1960's)	Features
SR-03			May 1908	Labor record was filed.	No apparent mining features are present at this 2,002-cy source pile.
SR-04	Squaw Saddle Mining and Milling Company	Little Wonder	August 1909	1952, 1954 - Indenture and Prospecting Lease granted to J.J. Keegan by DNR for2 years of prospecting.	30-foot-wide, 100-foot long trench, open adit, and about 88 cy of waste rock.
SR-05		Shamrock	May 1909	1957 to 1959 - Contract of mining issued with the Lovitt Mining Company and lessees from DNR for leasing rights for 20 years.	About 426 cy of waste rock is present, and material on either side of the road appears to contain waste rock.
SR-06		Washington	May 1908	1957 – Road work likely performed under Lovitt Proof of Labor. 1962 - James A. O'Conner filed a Real Estate Contract for Mining with DNR for road building and ore removal.	Unknown if human impacted arsenic concentrations and whether cleanup of this area will be required. Source piles totaling about 236 cy are present.
SR-07	No known mining activity	Keegan No. 4	N/A	N/A	No waste rock has been observed. Minimally disturbed by human activities, COCs are believed by Ecology to be naturally occurring and no cleanup of this area is anticipated.
SR-08	Unknown	Keegan No. 4	Unknown	1949 - Contract for mining between Martin Keegan and DNR issued for leasing rights for 20 years on 80 acres.	Sealed adit and an approximate 115 cy waste rock pile.

Notes: N/A = not applicable; COCs = constituents of concern

2.2.4. Park History

As early as 1909, Wenatchee Mayor J.A. Gellaty remarked about the possibility of acquisition of the Site from the state for a future park (DNR 2018). Unsuccessful attempts to purchase the Site for a park were undertaken in the 1940's and 1960's. In 2011, the City completed the purchase of the property with the

assistance and support of the Chelan-Douglas Land Trust, Washington State Recreation Conservation Office, and local citizens. The City dedicated the property as the Saddle Rock Regional Park on July 16, 2011.

2.3. Previous Investigations

Several environmental investigations have been performed at the Site. These investigations include:

- Phase I Environmental Site Assessment (ESA) by Cascadia Technical Services (2011).
- Remedial Investigation by Hart Crowser (2013a).
- Feasibility Study by Hart Crowser (2013b).
- Technical Memorandum, Gold Knob Prospect (aka Saddle Rock Park) – Establishing Site Cleanup Levels and Areas (Ecology 2018)

GeoEngineers reviewed the RI/FS reports and visited the Site during the request for proposal site meeting and on January 17, 2019. This SAP describes the proposed tasks to assess the abovementioned data gaps in Section 1.0 and for future confirmation sampling during the IRA implementation.

2.4. Data Gaps

As discussed, Ecology (2018) identified two data gaps associated with waste rock pile delineation for cleanup.

- Data Gap 1 – The extent of contamination in the downslope "toe" areas of the waste rock piles was not fully defined. Therefore, sampling and analysis is needed to define the areas to be excavated prior to implementation of cleanup.
- Data Gap 2 – Ecology found that the geological map in the RI Report was not consistent with the 1983 Geological Map of the Wenatchee Quadrangle. Further investigation revealed hydrothermally altered rocks were mapped within the Swauk Formation at the location of some of the waste rock piles. Ecology concluded native soils in the hydrothermally altered units may have considerably higher concentrations of total arsenic than in the adjacent formations. Thus, the original cleanup level of 14.4 mg/kg for total arsenic may not be appropriate, and geological occurrence should be considered in determining natural background concentrations for total arsenic.

2.5. Special training Requirements/Certification

The Superfund Amendments and Reauthorization Act of 1986 required the Secretary of Labor to issue regulations providing health and safety standards and guidelines for workers engaged in hazardous waste operations. Occupational Safety and Health Administration (OSHA) regulations (29 Code of Federal Regulations [CFR] 1910.120) require training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health.

All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet OSHA regulations. For occasional workers, such as professional surveyors, a 24-hour HAZWOPER training course will be completed along with one supervised onsite field work day.

3.0 SCOPE OF SERVICES

This combined SAP covers the data gap investigation for the IRA Design and the confirmation sampling that will be conducted as part of the IRA implementation. Specifically, it describes the recommended sampling locations, sample collection protocols, laboratory analytical methods, data evaluation procedures, and quality control criteria to support both field efforts. The sampling protocols defined in this SAP covers both Phase 1 and 2 waste rock pile locations, therefore, future IRA implementation can occur without additional sampling mobilizations.

Data quality objectives, special training/certification, and documentation will conform to the requirements of the QAPP which is presented in Appendix A. Field work will be performed in general accordance with the HASP which is presented in Appendix B.

3.1. IRA Design Data Gap Investigation

The goal of the data gap investigation will be to gather sufficient new data that, in combination with existing data, will establish source-specific background concentrations, refine waste rock quantities, assist with costing for the Remedial Action. Our general approach will consist of the following tasks:

- X-ray fluorescence (XRF) screening of upslope and downslope soils three depth intervals. The initial depth will be the nearest surficial soil encountered below sod/duff/organics. Depths will be reported as 0 to 2 inches, 2 to 4 inches, and 4 to 6 inches, using total arsenic as the indicator for the Site.
- Collection of confirmation soil samples for laboratory analysis from the areas indicating the highest concentrations of total arsenic from the XRF.
- Refinement of the lateral extent of contamination using the background concentrations developed for each source pile.
- The Ecology (2018) memorandum indicated arsenic is the primary contaminant of concern that exceeded both human health and ecological receptor scenario concentrations. Therefore, it is appropriate to use this contaminant for screening purposes. As such, all XRF samples will be screened for total arsenic in the field during the background/downslope investigation (IRA Design - Estimated Samples, Table 1). Soil sampling activities will occur following completion of the XRF assessment at each pile, and samples will be analyzed at an Ecology-accredited laboratory for total arsenic via Environmental Protection Agency (EPA) Method 6020B (IRA Design Upslope/Downslope Soils Data Gaps Assessment, Table 2).

3.1.1. Sample Collection Protocol

Field screening with an XRF device and confirmation soil sampling will occur during the IRA Design data gap investigation. The data gap assessment will incorporate upslope and downslope evaluations and confirmation sampling of soils to assist with development of source-specific background concentrations and delineation of downslope contamination (Table 1).

The following XRF protocols will be implemented during this phase of work:

- Source piles SR-01, -02, -03, -04, -05 and -08 will be screened with the XRF device from at least five upslope and five downslope locations, at depths of 0, 4 and 6 inches (30 total XRF samples per pile).

- Source pile SR-06 may be associated with a road cut and will require additional assessment. At least 15 upslope and downslope locations will be sampled with the XRF at the three depth intervals (90 total XRF samples).
- Pile SR-07 is minimally disturbed by human activities and is considered by Ecology (2018) to be naturally occurring. Therefore, this pile will not be assessed further.
- XRF screening will be utilized within a 20-foot by 20-foot grid pattern downslope from the waste rock pile(s). Intermediate grid spacing of 10 feet will be used to refine the downslope arsenic impacted area(s).

After the XRF evaluation is complete, confirmation soil samples will be collected as follows (Table 2):

- A total of 4 soil samples will be collected for laboratory analysis from upslope/downslope locations at source piles SR-01, -02, -03, -04, -05 and -08. In addition, 12 soil samples will be collected from upslope/downslope locations at source pile SR-06.
- Soil samples will be collected using a decontaminated stainless-steel shovel, or trowel. The soil samples will be submitted to an Ecology-accredited laboratory to be analyzed for total arsenic per EPA Method 6020B. Soil sampling locations will be determined in the field and will be based on XRF analysis and indications of the highest arsenic concentrations at each pile.
- Field results of total arsenic concentrations will be statistically compared between upslope and downslope locations.

If downslope results are statistically greater than the upslope results, additional characterization of the downslope areas will be conducted to delineate the total area of impact as follows (Table 1):

- Up to 5 downslope locations may be evaluated by the XRF for further characterization from source piles SR-01, -02, -03, -04, -05 and -08. XRF sampling will occur at the 0-, 4- and 6-inch depth intervals (15 XRF samples per pile).
- After completion of the further XRF evaluation, downslope soil samples will be collected from the areas exhibiting total arsenic concentrations in excess of 20 mg/kg, or the highest total arsenic concentrations. Determination of the sample locations will be made in field. Samples will be submitted for laboratory analysis of total arsenic barium, iron, lead, manganese, mercury, selenium, silver per EPA Series 6020B/7471B (Table 2).

If downslope results are not statistically greater than the upslope results, no additional characterization of the downslope areas will be conducted under this task.

3.1.2. Development of Background Soil Concentrations

Due to the mineralized nature and geologic setting of the Site, the original cleanup level of 14.4 mg/kg total arsenic developed by Hart Crowser (2013a) may not be appropriate for the waste rock piles. Therefore, XRF screening and laboratory sampling of undisturbed areas during the upslope assessment will be complete to allow development of background concentrations of total arsenic specific to each waste pile. A total of 15 upslope XRF samples are anticipated from SR-01, SR-02, SR-03, SR-04, SR-05 and SR-08. Pile SR-06 will require at least 45 XRF samples from upslope locations. After collection of upslope total arsenic concentrations with the XRF and laboratory analyses of the soil samples, background

concentrations will be calculated from the 90th percentile concentration or 4 times the 50th percentile for each waste rock pile. These background concentrations will establish the basis for cleanup of each waste rock pile. Cleanup concentrations will be calculated and corroborated with Ecology.

3.2. Waste Rock Pile Delineation and Site Features

Following establishment of background concentrations of total arsenic at each of the waste rock piles, the GeoEngineers field team will further inspect the Site and inventory mine-related features. The inventory will include photographs, an assessment of conditions, and a survey of each waste rock pile and other Site features by a State of Washington Professional Land Surveyor (PLS). Mine and reclamation-related features may include:

- Waste rock piles
- Workings (adits, shafts, trenches, etc.)
- Access roads and routes
- Staging locations

3.2.1. Visual Assessment

GeoEngineers will perform an initial visual inspection of the source piles at the Site to identify areas with potential mining-related impacts. This will include areas with obvious anthropogenic influence, piles devoid of vegetation, and/or areas immediately downslope from intrusions (e.g., adits, shafts, winzes, etc.). We will endeavor to distinguish between overburden, which may be relatively innocuous, and actual waste rock, and will confirm these observations in the field.

3.2.2. Physical Assessment

Following development of background concentrations for each waste source, GeoEngineers will refine source pile dimensions and physically delineate the boundaries of excavation. We will complement existing laboratory analytical results obtained during the RI/FS (Hart Crowser 2013a and 2013b) with additional data obtained from the portable XRF to flag boundaries dividing background from mining-related waste in the field. The boundaries will be delineated with pin flags or stakes to allow location by a PLS.

3.2.3. Waste Rock Pile Survey and Volume Estimation

After the waste rock piles are physically delineated in the field, the PLS will field survey and add the limits of the waste rock piles onto the topographic Light Detection and Ranging (LiDAR) base map, so that an accurate volume of waste rock at each location will determined for design purposes. We will incorporate the waste rock pile topographical projections on the LiDAR base map and utilize this survey data to develop individual waste rock pile cross section profiles , which will assist in estimating volumes of waste rock piles to be removed to achieve the accepted cleanup goals.

3.3. IRA Confirmation Sampling

The goal of the IRA confirmation sampling will be to document the effectiveness of waste rock removal by sampling areas excavated and confirming remnant soils are below the background concentrations developed during the IRA Design. Confirmation sampling and analysis will occur after the waste rock piles have been removed during the IRA such that only native materials remain and/or arsenic XRF

concentrations are below cleanup levels. The following sections provide a general approach to the anticipated screening, sampling and analysis procedures. However, results of the initial sampling, further reconnaissance, and information collected during the IRA Design may alter this approach. Deviations from these procedures will be documented in the final IRA Design, or amendment to this SAP. The general approach will consist of the following tasks:

- Field test the limits of excavation by collecting XRF readings within established grid intersections within the boundaries of the excavations.
- When the XRF arsenic concentrations indicate sufficient excavation has occurred, discrete confirmation soil samples will be collected for laboratory analysis.

XRF screening will also focus on total arsenic (Remedial Action - Estimated Samples, Table 3). However, confirmation soil samples will be collected and analyzed by an Ecology-accredited laboratory for total arsenic, as well as barium, iron, lead, manganese, mercury, selenium and silver via EPA Series 6020B/7471B (Remedial Action Confirmation Soil Sampling, Table 4).

3.3.1. Confirmation Sampling Protocol

During the IRA, GeoEngineers will use an XRF device to field test the limits of excavations. In general, XRF readings will be collected at grid intersections within the boundaries of the excavations. Table 4 presents the anticipated confirmatory sampling grid approach for each waste rock pile. Initial excavation will cease once native soils have been reached, and confirmation samples will be collected at depths of 0 to 2 inches below the new ground surface (Table 4). The determination of background concentrations of total arsenic for each waste rock pile will be performed during the IRA Design data gap investigation (Section 3.1.2). Following completion of the IRA, the waste source removal areas will be re-surveyed by the PLS to obtain accurate estimates of total volume removed.

4.0 FIELD METHODS AND PROCEDURES

This section contains field methods and standard operating procedures for collecting field data, collecting samples, and required documentation. In general, these field methods apply to both the IRA Design sampling and IRA confirmation sampling. Field methods and procedures discussed include:

- Collecting soil samples;
- Field measurement methods;
- Decontamination procedures;
- Handling and storing investigation-derived waste (IDW);
- Sample location control;
- Sampling and analytical methods;
- Sample handling and custody requirements;
- Data management and documentation; and
- Sample identification.

4.1. Soil Sample Collection Procedures

GeoEngineers field representatives will collect background/downslope soil samples based on the highest total arsenic XRF readings identified at each waste rock pile. Soil will be sampled using a decontaminated stainless-steel shovel, trowel, or new, clean nitrile gloves, and transferred into a laboratory-prepared container, labeled with a water proof pen, and placed on "blue ice" or double-bagged wet ice in a clean plastic-lined cooler. Each sample will be documented on a chain-of-custody including sample name, sample collection date and time, sample type, sample depth, requested analytical methods and sampler name.

Sampling equipment will be decontaminated between each sampling attempt as described in Section 4.3. The sample coolers will be delivered to the Ecology-accredited analytical laboratory under standard chain-of-custody procedures described in the QAPP.

In general, soil samples will be collected using the following procedures:

1. Identify the approximate sample location in the field based on the highest XRF readings of total arsenic.
2. Once a final sampling location is identified, photograph the location and then remove forest duff, leaves, grass, twigs or other organics, and/or debris with a clean trowel, shovel or gloved hand. Approximately 1 square foot of area should be cleared and prepared for sampling. Cleared material should be placed aside and will be replaced over the sampling area once the samples are collected.
3. The sampler will use a clean pair of nitrile gloves and excavate soil to a depth of between approximately 0 to 6 inches with a clean stainless-steel shovel or trowel. Excavated material will be placed into the appropriate containers provided by the laboratory. Containers will be labeled with the sample ID, date and time the sample was collected (Section 4.9).
4. Sample areas will be field screened in accordance with Section 3.1.1.
5. Once the container is full, the cap will be screwed on tightly. If needed, the container threads will be cleaned to remove debris.
6. Sample containers will be placed into an insulated cooler with ice.
7. Reusable sampling equipment will be decontaminated using the procedures outlined in Section 4.3.

4.2. XRF Field Measurement Documentation and Procedures

GeoEngineers field representatives will record Site surface observations in a bound field notebook during XRF evaluations. In addition, field measurements will be stored in the XRF device and recorded on a mobile device to document total arsenic concentrations and depths for data management. Sample locations will be documented with real-time differentially corrected Global Positioning System (GPS) technology using a Geo7x Trimble unit and associated Zephyr-2 Antenna or equivalent handheld data collection unit with 10 centimeter to sub-meter accuracy. Field XRF results will be used to select samples to submit for chemical analysis.

4.2.1. In-Situ XRF Measurements

It is anticipated surficial soil samples will be measured with the following in-situ XRF procedure:

- Prior to taking in-situ XRF measurements, the location will be cleared of any vegetation (e.g., grass, duff, pine needles, etc.) and will be leveled to provide a flat surface on which to place the XRF window.

- The soil substrate will be inspected for evidence of excessive moisture or heterogeneity, which could affect analysis.
- If the soil substrate is determined to suitable for in-situ XRF analysis, the trigger of the XRF will be depressed for approximately 60 seconds on the surficial soil to collect a measurement.

4.2.2. Ex-Situ XRF Measurements

Sample measurements at vertical depths will likely necessitate collection of small quantities of soil for ex-situ XRF measurement, with the following procedure:

- The soil samples will be collected at the desired depth interval and mixed in a stainless-steel bowl.
- If necessary, the soil sample will be dried and homogenized prior to analysis. The homogenized sample will be placed in a plastic Ziploc bag.
- The soil sample will then be analyzed by focusing the lens on the sample bag and depressing the XRF trigger for at least 60 seconds.

4.3. Decontamination Procedures

The objective of the decontamination procedures described herein is to minimize the potential for cross-contamination between sample locations. A designated decontamination area will be established for decontamination of reusable sampling equipment. Most sampling equipment (bowls, trowels, etc.) will be stainless steel, and will be decontaminated before sampling. Equipment decontamination consists of the following:

1. Brush equipment with a nylon brush to remove large particulate matter.
2. Rinse with potable tap water.
3. Wash with non-phosphate detergent solution (Liquinox® and potable tap water).
4. Rinse with potable tap water.
5. Final rinse with distilled water.

4.4. Handling of Investigation Derived Waste

IDW will primarily consist of minor quantities of soil removed for XRF screening and sampling. These soils will be placed back into the holes form which they are derived. Disposable items, gloves and protective overalls, paper towels, etc., will be placed in plastic bags after use transported to GeoEngineers' Spokane, Washington office and disposed as solid waste.

4.5. Sampling and Analytical Methods

Analytical method requirements will adhere to the QAPP, presented in Appendix A. During laboratory procurement, analytical method reporting limits for each proposed analysis will be compared to the reporting limits listed in the QAPP to ensure the data generated will be sufficient for assessment purposes.

4.6. Sample Handling and Custody Requirements

Samples will be handled in accordance with the QAPP. A complete discussion of the sample identification and custody procedures is provided in the QAPP.

4.7. Field Measurement and Observation Documentation

4.7.1. Field Notebooks

Field measurements and observations will be recorded in a project field notebook and mobile device with appropriate GPS application capabilities. Daily logs will be dated, and pages will be consecutively numbered. Entries will be recorded directly and legibly in the daily log and signed and dated by the persons conducting the work. If changes are made, the changes will not obscure the previous entry, and the changes will be signed and dated. At a minimum, the following data will be recorded in the log book:

- Purpose of activity;
- Location of activity;
- Description of sampling reference point(s);
- Date and time of activity;
- Sample number identification;
- Soil/media sample depth below ground surface (bgs);
- Sample number and volume;
- Sample transporting procedures;
- Field measurements and screening observations;
- Calibration records for field instruments;
- Visitors to Site;
- Relevant comments regarding field activities; and
- Signatures of responsible personnel.

4.7.2. Electronic Data Acquisition

The XRF raw data will be exported from the instrument as excel spreadsheets and processed in a spreadsheet program for daily submittal to the City and Ecology. Data generated during the XRF screening will also be recorded on a mobile device with a form-based application so Ecology and the City can access information on a daily basis. The application will contain smart logic and can be exported in the standard reporting style, which will allow real-time access and reduce data entry errors. Data will include XRF total arsenic concentrations, depths of screening and sample locations.

4.8. Data Management and Documentation

4.8.1. Field Data

Data logs and data report packages will be located in the project file system in GeoEngineers' Spokane, Washington office. Data reports will be available in both hard copy and electronic formats. Laboratory data reports will include internal laboratory quality control checks and sample results. Data logs and packages that are anticipated to be generated during the Site assessment include laboratory data report packages, boring logs, field sampling data sheets and chain-of-custody forms.

XRF data captured on mobile devices will be uploaded and will immediately available in the ArcGIS software platform for interpretation. Data will be available to be viewed in real-time by the City and Ecology to support decision-making. Summary analysis will also be available in the application and further analysis may performed of data in ArcGIS.

4.8.2. Laboratory Analytical Data

Laboratory analytical data will be supplied to GeoEngineers in both electronic data deliverable (EDD) format and hard copy format. The hard copy will serve as the official record of laboratory results. The EDDs will contain only data reported in the hard copy reports (e.g. only reportable results).

Upon receipt of the analytical data, the EDD will be uploaded to a project database and reduced into summary tables for each group of analytes and media. Upon completion of the summary tables, the accuracy of the data reduction will be verified using the hard copy of the data received from the laboratory. Any exceptions will be noted and corrected. The EDD data will be submitted to Ecology's Environmental Information Management (EIM) system. Summary data will be provided to Ecology in both hard and electronic versions of those reports.

4.9. Sample Identification

Sample identification is important in order to provide concise data management and to quickly determine sample location and date when comparing multiple samples. Soil samples for the sites will adhere to the following general format:

Data Gap Soil Sample Number Example: **SR01-DS-01-04 or SR01-US-01-04**

Where:

SR01	=	Source Pile No. 1
DS or US	=	Downslope or Upslope
01	=	Sample Number
04	=	inches below ground

Post Excavation IRA Confirmation Soil Sample Number Example: **SR01-CS-01-02**

Where:

SR01	=	Source Pile No. 1
CS	=	Confirmation Sample
01	=	Sample Number
02	=	Inches below ground

5.0 DATA VALIDATION AND USABILITY

Upon receipt of the sample data from the laboratory, the data will be validated and evaluated for usability in accordance with the QAPP (Appendix A).

6.0 REPORTING

Data generated in support of the IRA Design will be incorporated as a technical memorandum in the final IRA design document. The technical memorandum will include a discussion of the results of the sampling and analysis, data presented in a tabulated format, maps depicting sample locations, calculations to identify cleanup concentrations, QA/QC review, deviations from the SAP, and conclusions/ recommendations.

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TABLES

GeoEngineers

Table 1

IRA Design - Estimated Samples

Saddle Rock Natural Area

Wenatchee, Washington

Source Pile	Upslope XRF Sample Locations	Downslope XRF Sample Locations	XRF Samples	Lab Samples[1]
Background/Downslope Assessment				
SR-01	5	5	30	4
SR-02	5	5	30	4
SR-03	5	5	30	4
SR-04	5	5	30	4
SR-05	5	5	30	4
SR-06	15	15	90	12
SR-08	5	5	30	4
QA/QC[2]	--	--	48	--
Futher Downslope Characterization[3]				
SR-01	--	5	15	2
SR-02	--	5	15	2
SR-03	--	5	15	2
SR-04	--	5	15	2
SR-05	--	5	15	2
SR-08	--	5	15	2
Total Samples	**45**	**75**	**408**	**48**

Notes:

[1]Laboratory samples will be analyzed for total arsenic per EPA Method 6020B

[2]QA/QC samples will be analyzed for evey 10 sample locations.

[3]Further downslope characterization will only be completed if XRF screeing identifies a statistically significant difference between upslope and downslope arsenic concentrations.

Table 2

IRA Design Upslope/Downslope Soils Data Gaps Assessment

Saddle Rock Natural Area

Wenatchee, Washington

Sample Number	Sample Media	Location	Depth	Sample Container	Environmetal Testing[1]	Assessment[2]	Analytical Method	Holding Time	Perservation
SR-01									
SR01-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR01-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR01-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR01-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR01-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR01-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-02									
SR02-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR02-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR02-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR02-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR02-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR02-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-03									
SR03-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR03-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR03-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR03-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR03-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR03-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-04									
SR04-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR04-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR04-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR04-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR04-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR04-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C

Sample Number	Sample Media	Location	Depth	Sample Container	Environmetal Testing[1]	Assessment[2]	Analytical Method	Holding Time	Perservation
SR-05									
SR05-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR05-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR05-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR05-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR05-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR05-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-06									
SR06-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-US-03	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-US-04	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-US-05	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-US-06	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-DS-05	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR06-DS-06	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR-08									
SR08-US-01	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR08-US-02	Soil	Upslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR08-DS-01	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR08-DS-02	Soil	Downslope	TBD	8 oz glass jar	Total arsenic	Background/Downslope	EPA 6020B	180 Days	Cool to 4°± 2 C
SR08-DS-03	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR08-DS-04	Soil	Downslope	TBD	8 oz glass jar	Total metals	Further Downslope	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C

Notes:

[1]Total arsenic, barium, iron, lead, manganese, mercury, selenium, and silver are analyzed by EPA Series 6010/6020B/7471A.

[2]Further downslope characterization will only be completed if XRF screeing identifies a statistically significant difference between upslope and downslope arsenic concentrations.

Table 3

Remedial Action - Estimated Samples

Saddle Rock Natural Area

Wenatchee, Washington

Source Pile	Pile Area[1] (square feet)	Grid	Grid Cell Area (square feet)	XRF Samples	Lab Samples[2]
SR-01	2,089	10 x 10	100	21	2
SR-02	12,569	15 x 15	225	56	5
SR-03	9,020	15x 15	225	40	4
SR-04	474	7 x 7	49	10	1
SR-05	4,608	15 x 15	225	20	2
SR-06[3]	3,187	15 x 15	225	14	2
SR-08	1,242	10 x 10	100	12	1
QA/QC[4]	--	--	--	35	--
Total	**33,189**	--	**1,149**	**208**	**17**

Notes:

[1]Estimated from the Hart Crowser (2013) Remedial Investigation. Additional confirmatory sampling will be required if additional excavation is needed.

[2]Laboratory samples will be analyzed for total arsenic, barium, iron, lead, manganese, mercury, selenium, and silver per EPA Series 6010/6020B/7471A.

[3]Cleanup of pile SR-06 may not be necessary based on information leaerned during the IRA Design.

[4]QA/QC samples will be analyzed with the same frequency as for the IRA Design Sampling and Analysis Program.

Table 4

Remedial Action Confirmation Soil Sampling

Saddle Rock Natural Area

Wenatchee, Washington

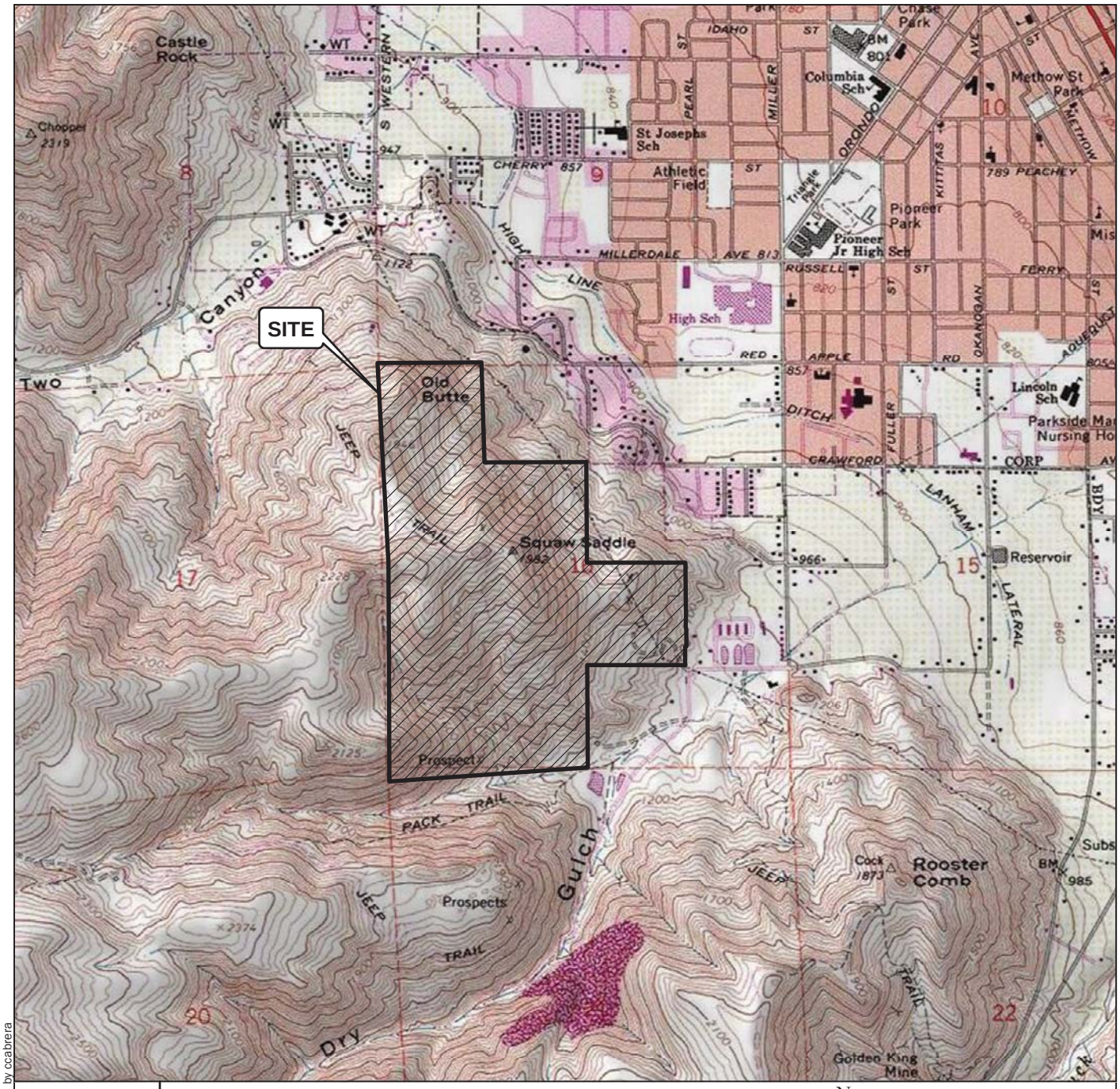
Sample Number	Sample Media	Location	Depth (inches)	Sample Containers	Environmetal Testing[1]	Assessment	Analytical Method	Holding Time	Preservation
SR-01									
SR01-CS-01	Soil	10 x 10 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR01-CS-02	Soil	10 x 10 foot grid	0 - 2	8 oz glass jar	total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-02									
SR02-CS-01	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR02-CS-02	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR02-CS-03	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR02-CS-04	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR02-CS-05	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-03									
SR03-CS-01	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR03-CS-02	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR03-CS-01	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR03-CS-02	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-04									
SR04-CS-01	Soil	7 x 7 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-05									
SR05-CS-01	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR05-CS-02	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-06									
SR06-CS-01	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR06-CS-02	Soil	15 x 15 foot grid	0 - 2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C
SR-08									
SR08-US-01	Soil	10 x 10 foot grid	0 -2	8 oz glass jar	Total metals	Confirmation	EPA 6020B/7471B	180 days/Hg 28 days	Cool to 4°± 2 C

Notes:

[1]Total arsenic, barium, iron, lead, manganese, mercury, selenium, and silver are analyzed by EPA Series 6010/6020B/7471A.

FIGURES

GeoEngineers



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Feet

Notes:

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

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

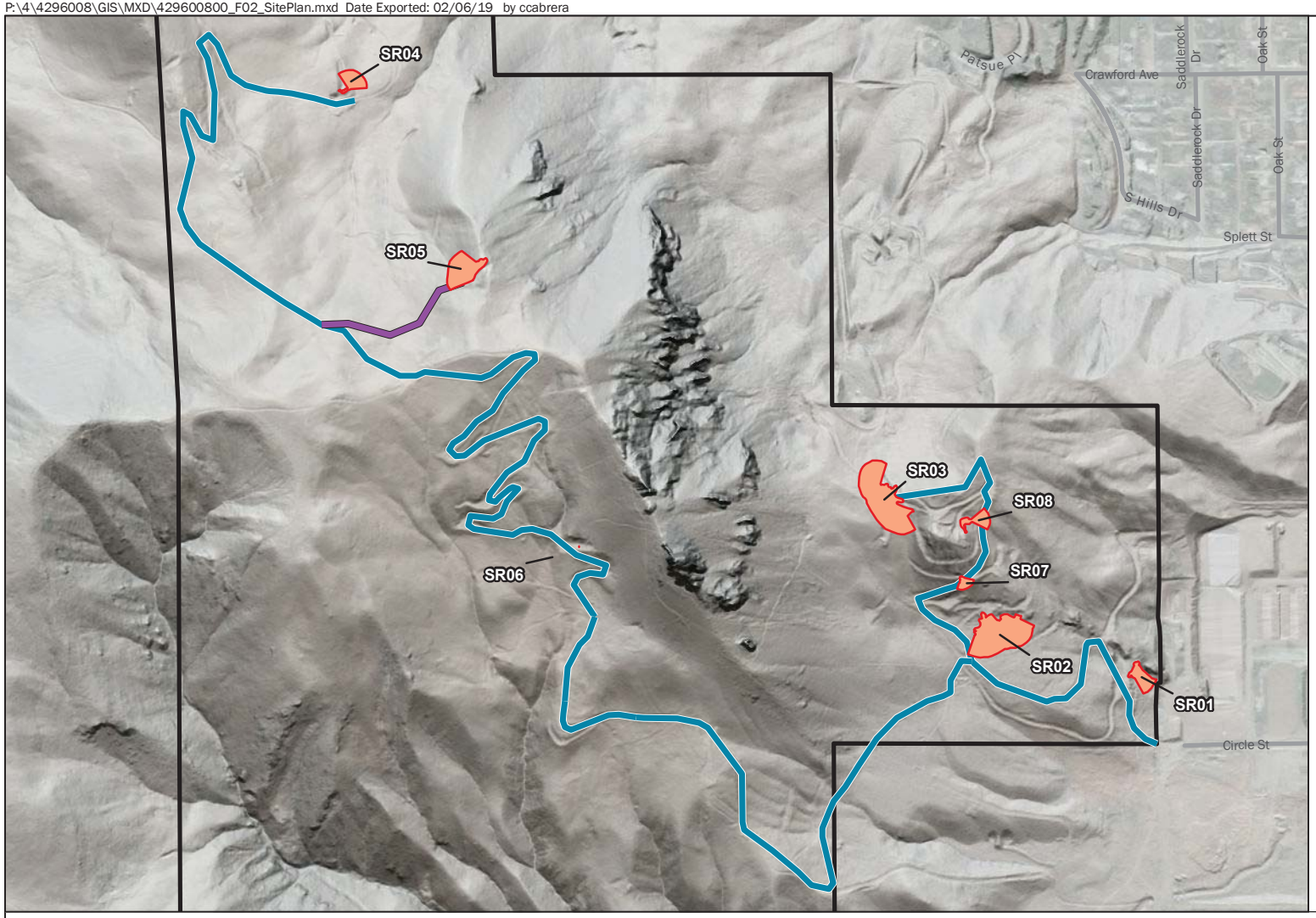
Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 1

P:\4\4296008\GIS\MXD\4296008_F01_VM.mxd Date Exported: 02/05/19 by ccabrera

P:\4\4296008\GIS\MXD\429600800_F02_SitePlan.mxd Date Exported: 02/06/19 by ccabrera



Legend

- Approximate Property Boundary, Saddle Rock Park
- Waste Rock Pile Locations
- Existing Roads/Trails
- Planned Temporary Access Road

Notes:

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

Data Source: WADNR LiDAR Portal, ESRI (Basemap). Existing waste rock piles and associated roads/trails obtained from RFQ package (Feasibility Study Saddle Rock Park, Wenatchee, Washington. (June 28, 2013)).

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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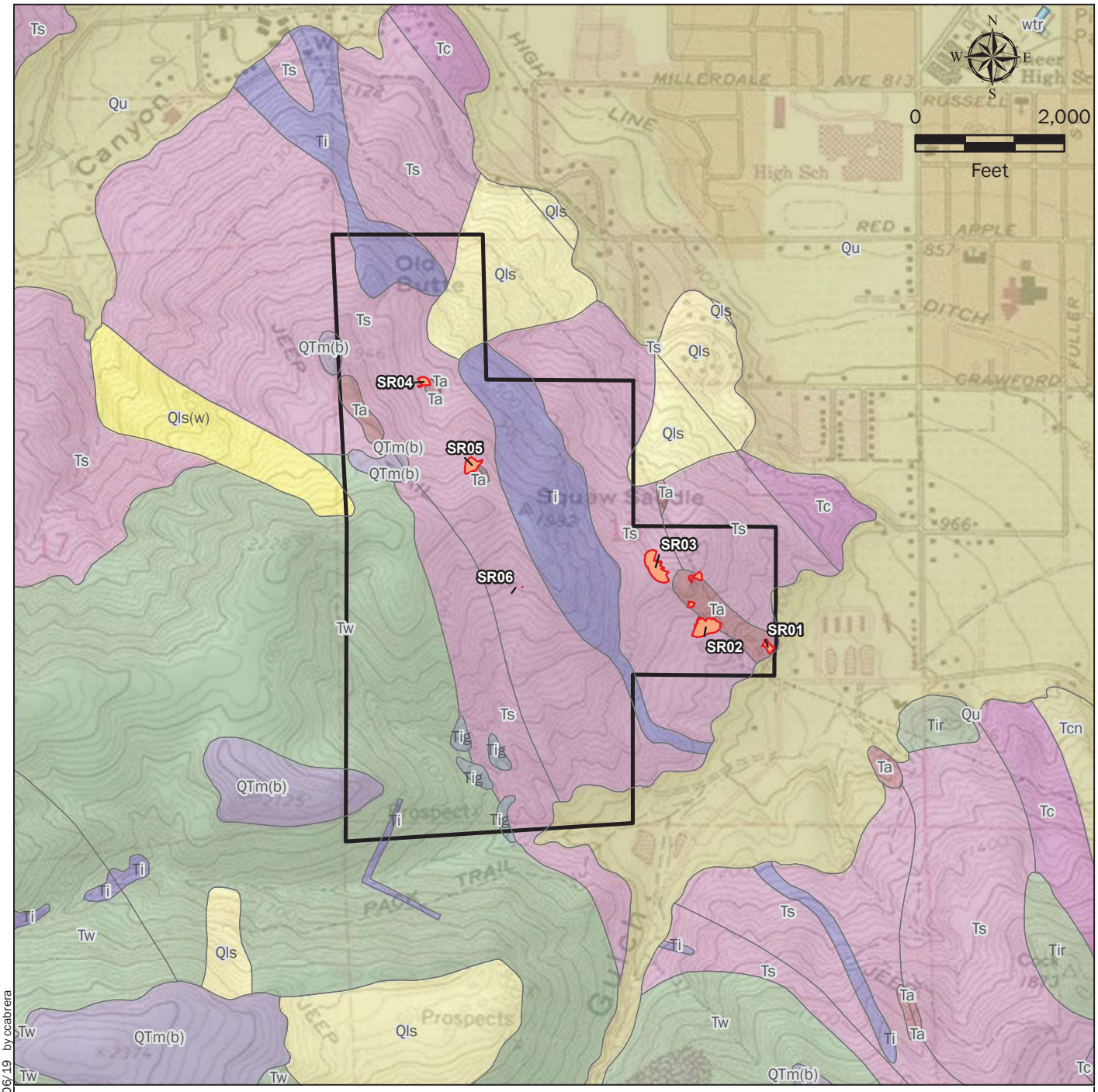
Areas of Interest

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 2



Legend

- Approximate Property Boundary
- Waste Rock Pile Locations
- QTm(b): Mass wasting deposits
- Qls: Landslide deposits
- Qls(w): Landslide deposits, Wenatchee Formation
- Qu: Fluvial deposits
- Ta: Hydrothermally altered rocks
- Tc: Chumstick Formation
- Tcn: Nahahum Canyon Member of the Chumstick Formation
- Ti: Hornblende andesite
- Tig: Unnamed gabbro
- Tir: Biotitoc Rhyodacite porphyry
- Ts: Swauk(?) Formation
- Tw: Wenatchee Formation of Oligocene age
- Water

Notes:

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

Data Source: ESRI; USGS, 1983 Gresens report,
https://ngmdb.usgs.gov/ngm-bin/pdp/zui_viewer.pl?id=27926
https://www.dnr.wa.gov/GIS
Projection: WGS 1984 Web Mercator Auxiliary Sphere

Geologic Map of the Wenatchee Quadrangle, Washington

Saddle Rock Interim Remedial Action Project
Wenatchee, Washington

GeoEngineers

Figure 3

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APPENDICES

GeoEngineers

APPENDIX A
Quality Assurance Project Plan

APPENDIX A
QUALITY ASSURANCE PROJECT PLAN
INTRODUCTION

This Quality Assurance Project Plan (QAPP) was developed for the Interim Remedial Action (IRA) data gap investigation and IRA implementation confirmation sampling activities at the Saddle Rock Natural Area (Site) located in Wenatchee, Washington. Sampling procedures are outlined in the accompanying SAP. This QAPP serves as the primary guide for the integration of quality assurance (QA) and quality control (QC) functions into assessment activities. The QAPP presents the objectives, procedures, organization, functional activities, and specific QA and QC activities designed to achieve data quality goals established for the project. This QAPP is based on guidelines specified in Chapter 173-340-820 of the Washington Administrative Code (WAC) and Ecology Requirements for Quality Assurance Project Plans (Ecology 2016).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that precision, accuracy, representativeness, completeness, and comparability of data generated meet the specified data quality objectives.

PROJECT MANAGEMENT

Project Organization and Responsibilities

Descriptions of the responsibilities, lines of authority, and communication for the key positions to QA/QC are provided below. This organization facilitates the efficient production of project work, allows for an independent quality review, and permits resolution of QA issues before submittal.

Project Leadership and Management

The Project Manager's (PM) duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight, and providing overall production and review of project deliverables. Nick Rohrbach is the PM for activities at the Site. The Principal-in-Charge is responsible to the City and State of Washington Department of Ecology (Ecology) for fulfilling contractual and administrative control of the project. Dustin Wasley, PE, is the Principal-in-Charge for the project.

Field Coordinator

The Field Coordinator is responsible for the daily management of activities in the field. Specific responsibilities include the following:

- Provides technical direction to field staff.
- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.
- Supervises field screening and equipment calibration with a portable x-ray fluorescence (XRF) device.

- Supervises compilation of field data and laboratory analytical results.
- Assures data are correctly and completely reported.
- Implements and oversees field sampling in accordance with project plans.
- Supervises field personnel.
- Coordinates work with on-site subcontractors.
- Schedules sample shipment with the analytical laboratory.
- Ensures appropriate sampling, testing, and measurement procedures are followed.
- Coordinates the transfer of field data, sample tracking forms, and log books to the PM for data reduction and validation.
- Participates in QA corrective actions, as required.

The Field Coordinator for exploration activities at the Site is Ryan Tobias or suitably-qualified equivalent.

Laboratory Data Quality Assurance (QA) Leader

The GeoEngineers project QA Leader is under the direction of Nick Rohrbach and Dustin Wasley, PE, who are responsible for the project's overall QA. The Project QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. Denell Warren is the QA Leader, who has the following responsibilities:

- Serves as the official contact for laboratory data QA concerns.
- Responds to laboratory data, QA needs, resolves issues, and answers requests for guidance and assistance, if needed.
- Reviews the implementation of the QAPP and the adequacy of the data generated from a quality perspective.
- Maintains the authority to implement corrective actions, as necessary.
- Evaluates the laboratory's final QA report for any condition that adversely impacts data generation if data qualifiers are reported.

Laboratory Management

The subcontracted laboratories conducting sample analyses for this project are required to obtain approval from the QA Leader before the initiation of sample analysis to assure that the laboratory QA plan complies with the project QA objectives. The Laboratory's Project Manager administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensure implementation of the QA Plan.
- Serve as the laboratory point of contact.
- Activate corrective action for out-of-control events.
- Issue the final QA/QC report.
- Administer QA sample analysis.

- Comply with the specifications established in the project plans as related to laboratory services.
- Participate in QA audits and compliance inspections.

The chemical analytical laboratory Project Manager will be Mr. Karl Hornyik OnSite Environmental Inc. (OnSite), (425) 883-3881.

Health and Safety

A site-specific HASP will be used for IRA Design and Remedial Action confirmation field activities and is presented as Appendix B. The Field Coordinator will be responsible for implementing the HASP during sampling activities. The PM will discuss health and safety issues with the Field Coordinator on a routine basis during the completion of field activities.

The Field Coordinator will conduct a tailgate safety meeting each morning before beginning daily field activities. The Field Coordinator will terminate any work activities that do not comply with the HASP. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP. GeoEngineers will review subcontractor HASPs before commencement of their work at the Site.

DATA QUALITY OBJECTIVES

The QA objective for technical data is to collect environmental monitoring data of known, acceptable and documentable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures, and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness and reporting limits) and qualitative factors (representativeness and comparability). The measurement quality objectives associated with these data quality factors are summarized in Measurement Quality Objectives, Table A-1 and are discussed below.

Analytes and Matrices of Concern

Soil samples will be collected during the assessment. Methods of Analysis and Practical Quantitation Limits (PQLs) (Table A-2) summarize the analyses to be performed at the Site.

Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Individual instruments often can detect, but not accurately

quantify, compounds at concentrations lower than the MDL, referred to as the instrument detection limit (IDL). Although results reported near the MDL or IDL provide insight to site conditions, QA dictates that analytical methods achieve a consistently reliable level of detection known as the PQL. The PQL is the lowest standard on the calibration curve and the lowest level that can be reliably achieved within established precision and accuracy limits. The MDL is the minimum chemical concentration that can be analyzed with 99 percent confidence that the analyte concentration is greater than zero. The contract laboratory will provide numerical results for all analytes and report them as detected at or above the PQL or non-detected below the PQL.

Achieving a stated detection limit for a given analyte is helpful in providing statistically useful data. Intended data uses, such as comparison to numerical criteria or risk assessments, typically dictate specific project target reporting limits (TRLs) necessary to fulfill stated objectives. The PQLs for site contaminants of potential concern (COPCs) are presented in Table A-2. These reporting limits were obtained from an Ecology-certified laboratory (OnSite).

The analytical methods and processes selected will provide PQLs less than the TRLs under ideal conditions. However, the reporting limits in Table A-2 are considered targets because several factors may influence final detection limits. First, moisture and other physical conditions of soil affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as non-detected, but at a value much higher than a specified TRL. Data users must be aware that high non-detected values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize site conditions.

Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons and duplicate comparisons for samples.

This value is calculated by:

$$RPD\,(\%) = \frac{|\,D_1 - D_2\,|}{(\,D_1 + D_2\,)/2}\ X\ 100,$$

Where:

D_1 = Concentration of analyte in sample.
D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control sample duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Persons performing the evaluation must review one or more pertinent documents (EPA 2017) that address criteria exceedances and courses of action. Relative percent

difference goals for this effort are 20 percent in soil for all analyses, unless the duplicate sample values are within 5 times the reporting limit. In this case, the absolute difference is used instead of the RPD. The absolute difference control limit for soil is two times the lowest reporting limit of the two samples.

Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported value versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest. Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detected results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detected values are considered accurate while detected results may be higher than the true value.

For this project, accuracy will be expressed as the percent recovery of a known matrix spike or laboratory control sample (blank spike) concentration:

$$Recovery\ (\%) = \frac{Spiked\ Result - Unspiked\ Result}{Known\ Spike\ Concentration}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (EPA 2017) that address criteria exceedances and courses of action. Accuracy criteria for MS and laboratory control spikes are found in Table A-1 of this QAPP.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those delineated within the SAP and this QAPP.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

Completeness

Completeness establishes whether a sufficient amount of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

$$Completeness = \frac{number\ of\ valid\ measurements}{total\ number\ of\ data\ points\ planned} x\ 100$$

Comparability

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. Holding times are presented in Test Methods, Sample Containers, Preservation and Holding Time, Table A-3.

Field Blanks

As metals are the only analysis to be performed, field blanks will not be analyzed. Laboratory blanks are discussed below.

Laboratory Blanks

According to the *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA 2017), "The purpose of laboratory blank analysis is to determine the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process. Analytical results for blanks will be interpreted in general accordance with *National Functional Guidelines for Inorganic Superfund Methods Data Review* and professional judgment.

DOCUMENTATION AND RECORDS

Field Observations

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs while on-site. The field logs will be prepared on field report forms or in a bound logbook. Entries in the field logs and associated sample documentation forms will be made in the field in waterproof ink, and corrections will consist of line out deletions that are initialed and dated. Individual logbooks will become part of the project files at the conclusion of the site characterization field explorations.

Field Screening

Field screening of soil samples with an XRF device will include the following:

- Project name, number and location

- Sample ID number
- Sample Location Coordinates
- Date and time of sample collection
- Sample collector's initials/Name

Soil Sampling

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Sampler's name(s)
- Date and time of sample collection
- Sample matrix (soil)
- Type of sampling equipment used
- Field instrument (e.g., hand tools) readings
- Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.)
- Preliminary sample descriptions (e.g., lithology, field screening results)
- Sample preservation
- Sample transport/shipping arrangements
- Name of recipient laboratory

In addition to the sampling information, the following specific information will also be recorded in the field log for each investigation location or in a daily field report:

- Sampling team members
- Time of arrival/entry on Site and time of Site departure
- Other personnel present at the Site
- Summary of pertinent meetings or discussions with contractor personnel
- Deviations from sampling plans, QAPP procedures, and HASP
- Changes in field personnel and responsibilities with reasons for the changes
- Levels of safety protection

The handling, use and maintenance of field logs and reports are the Field Coordinator's responsibility.

Analytical Chemistry Records

Laboratories will be responsible for internal checks on data reporting and will correct errors identified during the laboratory QA review. All laboratories must be accredited by Ecology for the required analytical methods.

Close contact will be maintained with the laboratories to resolve any quality control problems in a timely manner. The laboratories will be required to provide the following:

- **Project Narrative**—This summary, in the form of a cover letter, will present any problems encountered during any aspect of analysis. The summary will include, but not be limited to, a discussion of QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered by the laboratory, and their resolutions, will be documented in the project narrative.
- **Records**—Legible copies of the chain-of-custody forms will be provided as part of the data package. This documentation will include the time of receipt and the condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented.
- **Sample Results**—The data package will summarize the results for each sample analyzed. The summary will include the following information, as applicable:
    - Field sample identification code and the corresponding laboratory identification code
    - Sample matrix
    - Date of sample extraction/digestion
    - Date and time of analysis
    - Weight and/or volume used for analysis
    - Final dilution volumes or concentration factor for the sample
    - Total solids in the samples
    - Identification of the instruments used for analysis
    - MDLs and RLs
    - All data qualifiers and their definitions
- **QA/QC Summaries**—These summaries will contain the results of all QA/QC procedures. Each QA/QC sample analysis will be documented with the same information as that required for the sample results (see above). The laboratory will make no recovery or blank corrections. The required summaries are listed below.
    - The calibration data summary will contain the concentrations of the initial calibration and daily calibration standards and the date and time of analysis. The response factor, percent relative standard deviation (%RSD), RPDs, and retention time for each analyte will be listed, as appropriate. Results for standards analyzed at the RL to determine instrument sensitivity will be reported.
    - The internal standard area summary will report the internal standard areas, as appropriate.
    - The method blank analysis summary will report the method blank analysis associated with each sample and the concentrations of all compounds of interest identified in these blanks.
    - The laboratory replicate summary will report the RPD for all laboratory replicate analyses. The QC limits for each compound or analyte will be listed.
    - The laboratory control sample/laboratory control sample duplicate (LCS/LCSD) and/or matrix spike/matrix spike duplicate (MS/MSD) analyses summary will report the percent recovery (%R) and RPD results of the analyses, as applicable. The QC limits for each compound or analyte will be included in the data package.
    - The relative retention time summary will report the relative retention times for the primary and confirmation columns of each analyte detected in the samples, as appropriate.

Data Reduction

Data reduction is the process by which original data are converted or reduced to a specified format or unit to facilitate the analysis of the data. For example, a final analytical concentration may need to be calculated from a diluted sample result. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. The laboratory personnel will reduce the analytical data for review by the Quality Assurance Leader and Project Manager.

During chemical analysis, samples are occasionally diluted after the initial analysis if the estimated concentration curve for one or more of the target analytes is above the calibration curve. In these instances, concentrations from the initial analysis will be identified as the "best result" for all target analytes other than the chemical(s) that was originally above the calibration range. The "best result" for this qualified analyte(s) will be taken from the diluted sample.

DATA GENERATION AND ACQUISITION

Sample Process Design

Soil sampling will be conducted by GeoEngineers' field personnel. Soil samples are to be analyzed for total arsenic, only, during the data gap/waste rock pile delineation efforts. Soil samples will be collected and analyzed, during the IRA confirmation phase, for total arsenic, as well as barium, iron, lead, manganese, mercury, selenium, and silver via EPA Series 6020B/7471B. Sample procedures and sample frequencies are described in Section 4.1 of the SAP. Decontamination procedures are provided in Section 4.3 of the SAP.

Field Screening Procedures

The potential presence of contamination in samples collected from soil will be evaluated using an XRF portable device. Field screening results will be recorded in field logs and stored electronically. Visual screening methods consisting of observations for the presence of waste rock, unusual color and/or staining indicative of possible contamination will be used during investigation activities.

Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling, and documentation. All samples will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table A-3.

Sample containers will be labeled with the following information at the time of sample collection:

- Project number
- Sample name
- Sampling depth interval (if applicable)
- Date and time of collection

The sample collection activities will be noted on the field logs. The Field Coordinator will monitor consistency between sample containers/labels, field logs and chain of custody forms.

Sample Handling and Custody

Sample Storage

Samples will be placed in a cooler with "blue ice" or double-bagged "wet ice" immediately after they are collected. The objective of the cold storage will be to attain a sample temperature of 4 ± 2 degrees Celsius. Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Table A-3.

Sample Shipment

The samples will be transported and delivered to the analytical laboratory in the coolers. Field personnel will transport and hand-deliver samples that are being submitted to a laboratory for analysis. Samples that are being submitted to an out-of-town laboratory for analysis will be transported by a commercial express mailing service on an overnight basis. The Field Coordinator will monitor that the shipping container (cooler) has been properly secured using clear plastic tape and custody seals.

Measures will be implemented to minimize the potential for sample breakage, which includes packaging materials and placing sample bottles in the cooler in a manner intended to minimize damage. Sample bottles will be appropriately wrapped with bubble wrap or other protective material before being place in coolers.

Chain-of-custody Records

Field personnel are responsible for the security of samples from the time the samples are taken until the samples have been received by the shipper or laboratory. A chain-of-custody form will be completed at the end of each field day for samples being shipped to the laboratory. Information to be included on the chain-of-custody form includes:

- Project name and number.
- Sample identification number.
- Date and time of sampling.
- Sample matrix and number of containers from each sampling point.
- Depth of subsurface soil sample.
- Analyses to be performed.
- Names of sampling personnel and transfer of custody acknowledgment spaces.
- Shipping information including shipping container number.

The original chain-of-custody record will be signed by a member of the field team and bear a unique tracking number. Field personnel shall retain carbon copies and place the original and remaining copies in a plastic bag, placed within the cooler or taped to the inside lid of the cooler before sealing the container for shipment. This record will accompany the samples during transit by carrier to the laboratory.

Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analysts name or initial, time and date.

Analytical Methods

The methods of chemical analysis are identified in Table A-2. All methods selected represent standard methods used for the analysis of total metals analytes in soil. The laboratory project manager will determine the remedy to be used if the project RLs cannot be attained, in consultation with GeoEngineers Quality Assurance Leader.

Quality Control

Table A-4 summarizes the types and frequency of QC samples to be analyzed, including both field screening QC and laboratory QC samples.

Field Duplicates

Field duplicates serve as a measure for precision. Under ideal field conditions, field duplicates (sometimes referred to as splits), are created by thoroughly mixing a volume of the sample matrix, placing aliquots of the mixed sample in separate containers, and identifying one of the aliquots as the primary sample and the other as the duplicate sample. Field duplicates measure the precision and consistency of laboratory analytical procedures and methods, as well as the consistency of the sampling techniques used by field personnel.

A minimum of one field duplicate per 10 XRF samples will be analyzed for total arsenic. In addition, one low arsenic concentration performance standard (10 mg/kg) and one high arsenic concentration performance standard sample (100 mg/kg) will be collected at the beginning and end of each field day (Table A-4). The XRF value should be within +/- 20 percent of the stated value of the standard.

Field duplicates will not be collected as part of this project for laboratory analysis. Field duplicates are not considered applicable for samples collected for laboratory total metals analysis from waste rock samples.

Trip Blanks

Trip blanks accompany samples for volatile organic compound (VOC) analysis during field sampling and delivery to the laboratory. Trip blanks will not be analyzed during this investigation because VOC analyses are not part of the sampling and analysis plan.

Equipment Rinsate Blanks

Rinsate blanks will not be analyzed during this investigation as rinsates are not expected to be generated.

Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data validation process. The analytical laboratory will follow standard method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks
- Internal standards
- Calibrations
- MS/matrix spike duplicates (MSD)
- LCS/laboratory control spike duplicates (LCSD)
- Laboratory replicates or duplicates

Laboratory Blanks

Laboratory procedures employ the use of several types of blanks, but the most commonly used blank for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of a soil-like material having undergone a contaminant destruction process. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. If a substance is found in the method blank, then one (or more) of the following likely occurred:

- Measurement apparatus or containers were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Contaminated analytical equipment was not properly cleaned.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. Given method blank results, validation rules assist in determining which substances in samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines state, ". . . there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

Calibrations

Several types of calibrations are used, depending on the method, to determine whether the methodology is 'in control' by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

Matrix Spike/Matrix Spike Duplicates

The MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. MS/MSD data are reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix affects cannot be determined due to dilution and/or high levels of related substances in the sample. An MS is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by subtracting the sample result from the spike result, dividing by the spiked amount, and multiplying by 100.

The samples for the MS and MSD analyses should be collected from a boring or sampling location that is believed to exhibit low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for these analyses. This MS/MSD sample will be a composite to achieve a level of representativeness and reproducibility in the data.

Laboratory Control Sample/Laboratory Control Sample Duplicates

Also known as laboratory control spikes, LCSs are similar to MSs in that a known amount of one or more of the target analytes are spiked into a prepared media and a percent recovery of the spiked substances are calculated. The primary difference between a MS and LCS is that the LCS media is considered "clean" or contaminant free. For example, laboratory water typically used for standard preparation is used in the LCS water analyses. The purpose of an LCS and LCSD is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance and analyst performance. LCS data must be reviewed in context with other controls to determine if out-of-control events occur.

Laboratory Replicates/Duplicates

Laboratories often utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly occur as a second analysis on the extracted media.

Instrument Testing, Inspection and Maintenance

The field coordinator will be responsible for overseeing the testing, inspection and maintenance of all field equipment. The laboratory project manager will be responsible for laboratory equipment testing, inspection, and maintenance requirements. The calibration methods used in calibrating the analytical instrumentation are described in the following section.

Instrument Calibration and Frequency

Field Instrumentation

Equipment and instrumentation calibration facilitate accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use and environmental conditions. The basic calibration frequencies are described below.

The XRF calibration check will be run at a frequency consistent with manufacturer's recommendations. At a minimum, the instrument will be calibrated prior to fieldwork, and calibration checks will be performed on every 10 samples thereafter to asses potential instrument drift. This will be conducted in conjunction with performance standard checks with Ecology-supplied media. The calibration results will be recorded in the field logbook.

Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's SOPs. Calibration documentation will be retained at the laboratory.

All instrument calibrations and their appropriate chemical standards are to comply with the specific methods within United States Environmental Protection Agency (EPA) SW-846, Test Methods for Evaluating Solid Waste, Physical and Chemical Methods, 3rd Edition, December 1996 and the Laboratory SOPs. Calibration documentation, initial (ICALs) and continuing (CCALs), will be retained at the Laboratory.

Inspection of Supplies and Consumables

Supplies and consumables for the field sampling effort will be inspected upon delivery and accepted if the condition of the supplies is satisfactory. For example, jars will be inspected to ensure that they are the correct size and quantity and were not damaged in shipment.

Data Management

XRF Data

Raw XRF data will be exported from the instrument as excel spreadsheets and processed in a spreadsheet program for daily submittal to Ecology. Data generated during the XRF screening will also be recorded on a mobile device with a form-based application so Ecology and the City can access information on a daily basis. The application will contain smart logic and can be exported in the standard reporting style, which will allow real-time access and reduce data entry errors. Data will include XRF total arsenic concentrations, depths of screening, and sample locations.

Laboratory Data

The laboratory will report data in formatted hardcopy and digital formats. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, data qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates, and quantitation limits. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory electronic data deliverable (EDD) requirements will be established by GeoEngineers, Inc. with the contract laboratory. The laboratory will send final analytical testing results to the Project Manager.

Following completion of the soil sampling, the relevant data generated as part of the project will be reported to Ecology. The EDD data will be submitted to Ecology's Environmental Information Management (EIM) system. Summary data will be provided to Ecology in both hard and electronic versions of those reports.

ASSESSMENT AND OVERSIGHT

Assessment and Response Actions

Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements described in this QAPP. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation and volume;
- Field QC samples collected at the frequency specified;
- Chain-of-custody protocols; and
- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

Response Actions for Field Sampling

The Field Coordinator, or a designee, will be responsible for correcting equipment malfunctions throughout the field sampling effort and resolving situations in the field that may result in nonconformance or noncompliance with the QAPP. Corrective measures will be documented in the field report.

Corrective Action for Laboratory Analyses

Laboratories are required to comply with their current written SOPs. The laboratory project manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the laboratory project manager. A narrative describing the anomaly, the steps taken to identify and correct it, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package.

DATA VALIDATION AND USABILITY

Data Review, Verification and Validation

The data validation and usability elements of the QAPP as detailed below address the QA/QC activities that occur after data collection and/or data generation is complete. Implementation of these elements ensures that the data conform to the specified criteria and will achieve the project objectives.

The data are not considered final until validated. All data, including laboratory and field QC sample results, will be summarized in a data validation report. The data validation report will focus on data that did not meet the MQOs specified in Table A-1. The data validation report will be included as an appendix to the final report. The data validation report will also describe any deviations from this QAPP and actions taken to address those deviations.

Level II (Stage 2B) laboratory data packages will be obtained for all soil samples. These data will be reviewed for the following QC parameters:

- Holding times and sample preservation
- Method blanks
- LCS/LCSD analyses
- MS/MSD analyses
- Laboratory Duplicates/replicates
- Calibrations (initial and continuing)
- Internal standards
- Instrument tunes

In addition to these QC parameters, other documentation such as sample receipt forms and case narratives will be reviewed to evaluate laboratory QA/QC.

Verification and Validation Methods

Hard-copy laboratory reports will be generated providing the analysis-specific information including final sample analytical results, reportable field and laboratory QA/QC analytical results, MDLs and MRLs. The laboratory data will also be reported via electronic media using the tabular outputting capabilities of standard software formats.

The term "reporting limit" will be used interchangeably with "quantitation limit" to mean the lowest concentration at which an analyte can be quantified subject to the quality control criteria of the analytical method. These terms are different from "MDL," which refers to the lowest concentration that the analytical method can ideally detect.

Data validation qualifiers including "U," "J" and "R" will be used following the reported laboratory results to explain data quality issues affecting the laboratory data to the data user. These qualifiers are explained as follows:

- "U" indicates that a compound was analyzed for, but not detected. The associated numerical value is the estimated sample quantitation limit, which is corrected for dilution and percent moisture.
- "J" indicates that a compound was detected below the reporting limit and the value is estimated or the value was estimated by the validator because the of instrument bias reasons.
- If any target analytes are found in a laboratory method blank, it will be regarded as blank contamination. In these cases, the result of a given analyte in the method blank will be compared to any positive result of the same analyte in the associated field samples. If a field sample result is less than ten times the result that is reported in the method blank, the result will be considered blank contamination. Accordingly, the result will be qualified as non-detected "U" at the elevated reporting limit. Otherwise the positive result in the field sample will be considered real.
- "R" indicates results should not be used. If there are two analyses reported by the laboratory for one sample (as in the case of dilutions), the validator will use the method described in Section 4.3 of this QAPP to make the final assessment. As there should be only one reported result per analyte for a given sample, any extraneous results will be qualified as not-reportable, "R", and will not be used.

Reconciliation with User Requirements

A data quality assessment will be conducted by the project Quality Assessment Leader to identify cases where the projects MQOs were not met.

REFERENCES

State of Washington Department of Ecology (Ecology). 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. July 2004 (Revised December 2016), Publication No. 04-03-030 (Revision of Publication No. 01-03-003). Environmental Assessment Program, Manchester, Washington 98353.

U.S. Environmental Protection Agency. 2017. Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-2017-001, January 2017.

Table A-1

Measurement Quality Objectives

Saddle Rock Natural Area

Wenatchee, Washington

Laboratory Analysis	Reference Method	Check Standard (LCS) %R Limits[1,2]	Matrix Spike (MS) %R Limits[2]	Surrogate Standards (SS) %R Limits[1,2]	MSD Samples or Lab Duplicate (Dup) RPD Limits
		Soil	Soil	Soil	Soil
Total Metals	EPA 6020B/7471B	80%-120%	75%-125%	NA	≤20%

Notes:

[1]Recovery Ranges are estimates. Actual ranges will be provided by the laboratory when contracted.

[2]Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.

Method numbers refer to EPA SW-846 Analytical Methods or Washington State Department of Ecology (Ecology) recommended analytical methods.

%R = percent recovery; LCS = Laboratory Control Sample; MS/MSD = Matrix Spike/Matrix Spike Duplicate; RPD = Relative Percent Difference; NA = Not Applicable

Table A-2

Methods of Analysis and Practical Quantitation Limits (Soil)

Saddle Rock Natural Area

Wenatchee, Washington

Analyte	Analytical Method	Practical Quantitation Limit (mg/kg)	Screening Levels[1] (mg/kg)	MTCA Method A Cleanup Level (mg/kg)
Total Metals				
Arsenic	EPA 6020B	1.0	14.4	20
Barium	EPA 6020B	1.0	160	NE
Iron	EPA 6010D	10	29,324	NE
Lead	EPA 6020B	1.0	50	250
Manganese	EPA 6010D	1.0	753	NE
Mercury	EPA 7471B	0.050	0.1	2
Selenium	EPA 6020B	0.50	0.3	NE
Silver	EPA 6020B	1.0	2.0	NE

Notes:

[1]Screening Levels identified by Hart Crowser (2013) during the Remedial Investigation.

mg/kg = milligrams per kilogram; NE = Not established

Table A-3

Test Methods, Sample Containers, Preservation and Holding Time[1]

Saddle Rock Natural Area

Wenatchee, Washington

Analysis	Method	Soil			
		Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
Total Metals	EPA Methods 6020B and 7471B[2]	100 g	4 or 8 oz glass wide mouth with Teflon-lined lid	Cool to 4°± 2 C	180 days (28 days for Mercury)

Notes:

[1]Holding Times are based on elapsed time from date of collection.

[2]Arsenic, barium, iron lead, manganese, silver and selenium analyzed by EPA Method 6020B; Mercury analyzed by EPA Method 7471B.

oz. = ounce; g = gram; C = Celsius

Table A-4

Quality Control Samples Type and Frequency

Saddle Rock natural Area

Wenatchee, Washington

Parameter	Field QC - XRF			Laboratory QC			
	Low Arsenic Performance Standard (10 mg/kg)	High Arsenic Performance Standard (100 mg/kg)	XRF Field Duplicates	Method Blanks	LCS	MS / MSD	Lab Duplicates
Metals	1/day	1/day	1/10 samples	1/batch	1/batch	1/batch	1/batch

Notes:

An analytical lot or batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/ MSD (or MS and lab duplicate).

No more than 20 field samples can be contained in one batch.

XRF = x-ray fluorescence; LCS = Laboratory control sample; MS = Matrix spike sample; MSD = Matrix spike duplicate sample

mg/kg = milligrams per kilogram

APPENDIX B
Health and Safety Plan

APPENDIX B
HEALTH AND SAFETY PLAN
INTRODUCTION

This Health and Safety Plan (HASP) has been prepared for the Interim Remedial Action (IRA) Design data gap assessment at the Saddle Rock Natural Area (Site) located in Wenatchee, Washington. This HASP is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the Site safety plan for the Saddle Rock IRA Design project. This plan is to be used by GeoEngineers personnel on this Site and must be available during sampling and analysis. If the work entails potential exposures to other substances or unusual situations, this plan will be revised to include additional health and safety information to meet the Site conditions. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Program Manual and are subject to review by the GeoEngineers Health and Safety Program Manager.

Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, Form 1 (Appendix A) shall be signed by the subcontractor. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

WORK PLAN

The City of Wenatchee (City) is implementing an IRA Design to complete a Remedial Action to address waste rock associated with historical mining activities at the Site. The City's preferred alternative involves the excavation, transportation and disposal of waste materials at a permitted, lined and monitored landfill and sealing any open adits. The general project information is presented below:

GENERAL PROJECT INFORMATION

Project Name:	Interim Remedial Action Design Saddle Rock Natural Area
Project Number:	04296-008-00
Type of Project:	Interim Remedial Action Design
Start/Completion:	March 2019
Subcontractors:	Professional Land Surveyor (48 Degrees North)

Site Description

The Saddle Rock Natural Area is a 325-acre parcel located immediately west of Wenatchee, Washington. It is a local landmark in the Wenatchee Valley and has been a popular destination for hikers, bicyclists and horseback riders for decades. The street address is 1200 Circle Street in Wenatchee, Washington. Portions of the project area are situated on relatively steep slopes in upland shrub-steppe habitat.

Figure 1 shows the location of the Site relative to surrounding features. Figure 2 shows the general vicinity of the Saddle Rock Natural Area and proposed work zones.

Site History

Historically, three mines operated within the Saddle Rock Park property boundary (Sunrise Mine, Squaw Saddle Mine, and Gold Knob Mine). Mining claims were originally located at the Site between 1908 and 1910. Waste rock generated at the Site likely originated from lode claims, which were leased from Washington State Department of Natural Resources (DNR). However, later prospecting and development in the 1950s and 1960s may have displaced some of the waste materials and resulted in the current trail system at the park. In 2011, the City of Wenatchee completed the purchase of the property with the assistance and support of the Chelan-Douglas Land Trust, Washington State Recreation Conservation Office and local citizens. The City of Wenatchee dedicated the property as the Saddle Rock Regional Park on July 16, 2011.

Detailed information regarding background information, including Site location, physical description, use history, summary of previous environmental investigations and identification of preliminary hazardous substances are presented in the SAP.

Field Activities

Field investigation will be completed to assess two data gaps associated with the Site. These include:

- Data Gap 1 – The extent of contamination in the downslope "toe" areas of the waste rock piles was not fully defined. Therefore, sampling and analysis is needed to define the areas to be excavated prior to implementation of cleanup.
- Data Gap 2 – Ecology found that the geological map in the RI Report was not consistent with the Geological Map of the Wenatchee Quadrangle (Gresens 1983). Further investigation revealed hydrothermally altered rocks were mapped within the Swauk Formation at the location of some of the waste rock piles. Ecology concluded native soils in the hydrothermally altered units may have considerably higher concentrations of total arsenic than in the adjacent formations. Thus, geological occurrence should be considered in determining natural background concentrations for total arsenic.

The following activities are anticipated for GeoEngineers field personnel during the implementation of the work plan:

Anticipated Field Activities (Check All That Apply)	
☒ Safety Meeting Record Form 2	☐ Vapor Measurements
☒ Job Hazard analyses (JHA) Form 3	☐ Product Sample collection
☒ Site Reconnaissance	☐ Soil Stockpile Testing
☐ Exploratory Borings	☐ Remedial Excavation
☐ Construction Monitoring	☐ Recovery of Free Product
☒ Surveying	☐ Monitoring Well Installation
☐ Test Pit Exploration	☐ Monitoring Well Development
☒ Soil Sample Collection	☐ Underground Storage Tank (UST) Removal Monitoring

Anticipated Field Activities (Check All That Apply)	
☐ Groundwater Sampling	☒ Other: Waste Rock Delineation
☐ Groundwater Depth and Free Product Measurement	☐ Other: Click here to enter text.

List of Field Personnel and Training

Anticipated field personnel include are summarized in the following table. Field personnel will have appropriate training (HAZWOPER, first aid, respirator fit test, HAZWOPER supervisor training) and up to date certifications.

FIELD PERSONNEL AND TRAINING

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hr Refresher Training	First Aid/ CPR	Date of Respirator Fit Test
Nick Rohrbach	40-hour	January 2019	August 2018	To be refreshed prior to field work
Ryan Tobias	40-hour	August 2018	October 2017	November 2018
Laura Hanna, LG	40-hour	July 2018	August 2018	May 2017

Chain of Command Functional Responsibility

Key individuals and project roles are summarized in the following table. A description of the responsibilities, lines of authority and communication for the key individuals are summarized below.

Chain of Command	Title	Name	Telephone Numbers
1	**Current Owner**	City of Wenatchee - Charlotte Mitchell, PE	(o) 509.888.3662
2	**Project Manager**	Nick Rohrbach	(c) 509.899.9389
3	**Principal-In-Charge**	Dustin Wasley, PE	(o) 509.209.2842
4	**Health and Safety Program Manager**	Mary Lou Sullivan	(o) 253.722.2425
5	**Site Safety Officer (SSO)**	Ryan Tobias	(c) 503.931.3157
4	**Field Personnel**	Laura Hanna, LG	(c) 503.603.6662
6	**Subcontractor(s)**	Erik B. Gahringer, PLS	(o) 509.436.1640

- **Health and Safety Program Manager (HSM)** – GeoEngineers' Health and Safety Program Manager (HSM) is responsible for implementing and promoting employee participation in the program. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

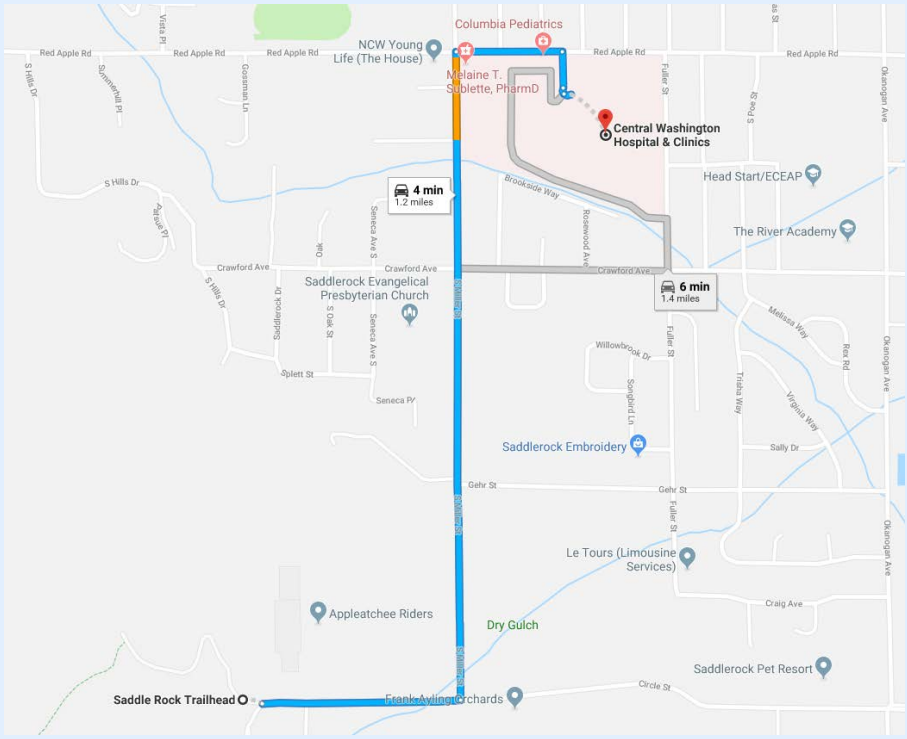
- **Project Manager (PM)** – PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or Site Safety Plan. He or she is also responsible for assuring that appropriate HASPs complying with this manual are developed. The PM will provide a summary of chemical analysis to personnel completing the HASP. PMs shall also see that their project budgets consider health and safety costs. The PM shall keep the HSM informed of the project's health- and safety-related matters as necessary. The PM shall designate the project Site Safety Officer (SSO) and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in site safety plans and checklists to appropriate field personnel. Additionally, the PM and SSO shall hold a site safety briefing before any field activities begin. The PM is responsible for transmitting health and safety information to the SSO when appropriate.
- **Site Safety Officer/HAZWOPER** – The SSO will have the on-site responsibility and authority to modify and stop work or remove personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and cardiopulmonary resuscitation (CPR) qualified and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced fieldwork experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

  Duties of the SSO include the following:

  - Implementing the HASP in the field and monitoring compliance with its guidelines by staff.
  - Being sure that all GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
  - Maintaining adequate and functioning safety supplies and equipment at the site.
  - Setting up work zones, markers, signs and security systems, if necessary.
  - Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
  - Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
  - Directing personnel to wear PPE and guiding compliance with all health and safety practices in the field.
  - Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified and corrective action taken.
  - Documenting all site accidents, illnesses and unsafe activities or conditions, and reporting them to the PM and the HSM.
  - Directing decontamination operations of equipment and personnel.

- **Field Employees** – All employees working on site that have the potential of coming in contact with hazardous substances or physical hazards are responsible for participating in the health and safety program and complying with the site-specific health and safety plans. These employees are required to:
    - Participate and be familiar with the health and safety program as described in this manual.
    - Notify the SSO that when there is need to stop work to address an unsafe situation.
    - Comply with the HASP and acknowledge understanding of the plan.
    - Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to incidents or accidents that could result in physical injury or exposure to hazardous materials.
    - Participate in health and safety training, including initial 40-hour Occupational Safety and Health Administration (OSHA) course, annual 8-hour HAZWOPER refresher, and First Aid/CPR training.
    - Participate in the medical surveillance program if applicable.
    - Schedule and take a respirator fit test annually.
    - Any field employee working on site may stop work if the employee believes the work is unsafe.
- **Contractors Under GeoEngineers Supervision** – Contractors working on the site under GeoEngineers supervision or direct control that have the potential of coming in contact with hazardous substances or physical hazards shall have their own health and safety program that is in line with the site-specific health and safety plan.

EMERGENCY INFORMATION

Hospital Name	**Central Washington Hospital & Clinics**
Hospital Address	**1201 S. Miller Street** **Wenatchee, WA 98801**
Phone Number (Hospital ER)	**(509) 662-1511**
Driving Distance	**1.4 Miles**
Driving Directions	**1. Head southeast toward Saddlerock Trailhead** **2. Continue onto Circle St** **3. Turn left onto S Miller St** **4. Turn right onto Red Apple Rd** **5. Turn right onto Rosewood Ave** **6. Continue straight** **7. Turn left**
Driving Map	

Standard Emergency Procedures

- **Get help**
  - Send another worker to phone 9-1-1 (if necessary)
  - As soon as feasible, notify GeoEngineers' Project Manager
- **Reduce risk to injured person**
  - Turn off equipment

- Move person from injury location (if in life-threatening situation only)
- Keep person warm
- Perform CPR (if necessary)

- **Transport injured person to medical treatment facility (if necessary)**
  - By ambulance (if necessary) or GeoEngineers vehicle
  - Stay with person at medical facility
  - Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation

HAZARD ANALYSIS

A hazard analysis has been completed as part of this HASP. The hazard analysis was performed considering known and potential hazards at the site and surrounding areas, as wells as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work. Updates will be made as necessary and documented in the Job Hazard Analyses (JHA) Form 3 (Appendix A) or daily field log.

The following are known applicable hazards.

Physical Hazards

Anticipated physical hazards that may be encountered at the Site are summarized in the following table.

Anticipated Physical Hazards (Check All That Apply)
☐ Drill rigs and Concrete Coring
☐ Backhoe
☒ All-terrain vehicle (ATV)
☐ Crane
☐ Front End Loader
☐ Excavations/trenching (1:1 slopes for Type B soil)
☐ Shored/braced excavation if greater than 4 feet of depth
☒ Overhead hazards/power lines
☒ Tripping/puncture hazards (debris on-site, steep slopes or pits)
☐ Unusual traffic hazard – Street traffic in the right of way
☒ Heat/Cold, Humidity
☐ Utilities/ utility locate
☐ Noise
☐ Over Water Work

Safe Work Practices and Mitigation Procedures

- High-visibility vests will be worn by on-site personnel to ensure they can be seen by coworkers, subcontractors and the public.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances, where possible. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety Officer in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Steep slopes are present throughout the site, which present logistical and mobilization difficulties. When working in steep terrain, personnel will take extra caution to avoid slips and falls. Work in steep terrain may require additional time, which will be addressed at each of the waste rock piles prior to conducting sampling activities.
- Personnel will not enter any adits, shafts, winzes, or other historical mining-related features during fieldwork. Care will be taken while traversing the site to avoid stopes or other fall hazards.
- Work may require use of ATVs to access site features during sampling. A pre-ride examination will be performed on the ATV prior to use each day, which will include inspection of headlights, break lights, steering, throttle, brakes, and controls. Due to potential from rollover, DOT-approved helmets will be worn at all times during ATV operation. The ATV will be operated at low speeds across the site to reduce risk of rollover or encounters with unanticipated trenches, adits, or stopes.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on site.

Heat Stress Prevention

Keep workers hydrated in a hot outdoor environment requires more water be provided than at other times of the year. When employee exposure is at or above an applicable temperature listed in the Heat Stress table below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times
- All employees have the opportunity to drink at least one quart of drinking water per hour

HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

Cold Stress Prevention

Working in cold environments presents many hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

Biological Hazards

Anticipated biological hazards that may be encountered at the Site are summarized in the following table.

Anticipated Biological Hazards (Check All That Apply)	
☒ Poison Ivy or other vegetation	Click here to enter text.
☒ Insects or snakes	Click here to enter text.
☐ Hypodermic needles or other infectious hazards	Click here to enter text.
☒ Wildlife	Click here to enter text.
☒ Other: Hantavirus, Rabies	Click here to enter text.

Safe Work Practices and Mitigation Procedures

Biological hazards can come in the form of wildlife such as rodents, wild animals, insects and spiders. Each of the hazards can present concerns. Exposure can be minimized by following the measures below:

- Rodents and Wildlife –Live animals can inflict wounds and can spread diseases such as Bubonic Plague and Rabies.
  - Avoid contact with wild or stray animals. If bitten or scratched, get medical attention immediately.
  - Avoid contact with rats or rat-infested buildings. If you can't avoid contact, wear protective gloves and wash your hands regularly.
  - Avoid contact with animal and bird droppings. Particles can become airborne and, if inhaled, cause sickness.
  - Report dead animals to the proper authorities so they can be disposed of properly.
  - Report cougar sightings to the Washington Department of Fish and Wildlife (WDFW).
- Insects, Yellow Jackets and Spiders - Hazardous insects and spiders include:
  - Mosquitoes: Rain and flooding may lead to increased numbers of mosquitoes, which can carry diseases such as West Nile virus or dengue fever.
  - Yellow Jacket and Wasp stings: If you receive multiple stings seek help immediately. Watch for signs of allergic reaction to stings, which typically happen within the first few hours.
  - Spiders: The black widow and hobo spider are poisonous spiders that hide behind objects and in rubble piles. Their bites can be severe, causing pain, nausea, fever, and breathing difficulty.

- Ticks: often inhabit long grass and the ends of low-hanging branches. They may be abundant and active in spring when adults who have over-wintered start moving around looking for a host to feed.

- **Protective Measures** – Exposure can be minimized by following the measures:
  - Wear long pants, long sleeves, and socks. Tuck pants into boots or socks to provide an insect barrier.
  - Be alert when working around abandoned buildings or debris.
  - Wear work gloves and stay on the lookout for spiders and ticks.
  - Seek medical attention if bitten by a poisonous spider or deer tick or if you experience severe symptoms.
  - Avoid scented soaps and perfumes.
  - Don't leave food, drinks, and garbage out uncovered.
  - If a black bear is visible, alter your route to move away from the bear's area. If it approaches, do not run. Remain calm, continue facing the bear and slowly back away. If the bear continues to approach, attempt to scare the bear away by shouting and acting aggressively. If a black bear attacks, fight back using fists, sticks, rocks, and EPA registered bear pepper spray (if available).
  - Never approach a cougar. Although most cougars will avoid a confrontation, all cougars are unpredictable. Always give a cougar an avenue of escape. Stay calm and talk to the cougar in a confident voice. Do not run - back away from the cougar slowly and always keep eye contact. Sudden movement may trigger an attack. Make yourself appear as large as possible with arms extended. Do not crouch or attempt to hide. If possible, pick up sticks or branches and wave them around. If a cougar attacks, fight back. Use rocks, sticks, fists, etc. to defend yourself.

Ergonomic Hazards

Anticipated ergonomic hazards that may be encountered at the Site are summarized in the following table.

Anticipated Ergonomic Hazards (Check All That Apply)	
☒ Repetitive Movement	Click here to enter text.
☒ Lifting Heavy Objects	Click here to enter text.
☐ Confined Space	Click here to enter text.
☐ Vibration	Click here to enter text.
☒ Awkward Posture	Click here to enter text.
☐ Noise	Click here to enter text.
☒ Hand Tools	Click here to enter text.
☐ Other: Click here to enter text.	Click here to enter text.

Safe Work Practices and Mitigation Procedures

- **Engineering Controls** – Implement physical change to the workplace, which eliminates/reduces the hazard on the job/task, including:
  - Use a device to lift and reposition heavy objects to limit force exertion.
  - Reduce the weight of a load to limit force exertion.

- Reposition a work table to eliminate a long/excessive reach and enable working in neutral postures.
- Redesign tools to enable neutral postures.

- **Administrative Controls** - Establish efficient processes or procedures, including:
  - Require that heavy loads are only lifted by two people to limit force exertion.
  - Establish systems so workers are rotated away from tasks to minimize the duration of continual exertion, repetitive motions, and awkward postures. Design a job rotation system in which employees rotate between jobs that use different muscle groups.
  - Staff "floaters" to provide periodic breaks between scheduled breaks.
- **Personal Protective Equipment** - Use protection to reduce exposure to ergonomics-related risk factors, Including:
  - Use padding to reduce direct contact with hard, sharp, or vibrating surfaces.
  - Wear good fitting thermal gloves to help with cold conditions while maintaining the ability to grasp items easily.

Chemical Hazards

Anticipated chemical hazards that may be encountered at the Site are summarized in the following table. Fact sheets summarizing the hazardous substance and their health effects are presented in Appendix B.

SUMMARY OF ANTICIPATED CHEMICAL HAZARDS, EXPOSURE ROUTES AND EXPOSURE LIMITS

Compound/ Description	Exposure Limits/IDLH	Exposure Routes	Symptoms/Health Effects
Arsenic	PEL 0.05 mg/m^3 IDLH 5.0 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Ulceration of nasal septum; dermatitis; GI disturbances; peripheral neuropathy; respiratory irritation; hyperpigmentation of skin
Barium	PEL 0.5 mg/m^3 IDLH 50 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Changes in heart rhythm or paralysis in humans. Small doses result in vomiting, abdominal cramps, diarrhea, difficulties in breathing, increased or decreased blood pressure, numbness around the face, and muscle weakness
Iron	PEL 1 mg/m^3 IDLH 2,500 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Chronic exposure to iron oxide fumes or dusts may result in development of a benign pneumoconiosis. Inhalation of excessive concentrations of iron oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens.
Lead	PEL 0.05 mg/m^3 IDLH 100 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Lassitude; insomnia; facial pallor; abnormalities; weight loss, malnutrition, constipation, abdominal pain; colic; anemia; gingival lead line; tremors; paralysis of the wrist and ankles; encephalopathy; kidney disease; irritated eyes; hypertension

Compound/ Description	Exposure Limits/IDLH	Exposure Routes	Symptoms/Health Effects
Manganese	PEL 500 mg/m^3 IDLH 5 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy. This combination of symptoms when sufficiently severe is referred to as "manganism."
Mercury	PEL 0.05 mg/m^3 IDLH 10 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Irritated eyes, skin; cough, chest pain, dyspnea, bronchitis, pneumonia; tremors, insomnia, irritability, indecision, headache, lassitude; stomatitis, salivation; GI disturbances, abnormalities, low weight; proteinuria
Selenium	PEL 0.2 mg/m^3 IDLH 1 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Dizziness, fatigue, and irritation of mucous membranes have been reported in people exposed to selenium in workplace air at concentrations higher than legal levels
Silver	PEL 0.01 mg/m^3 IDLH 10 mg/m^3	Inhalation, skin absorption, skin and eye contact, ingestion	Exposure to dust containing high levels of silver compounds (silver nitrate or silver oxide) may cause breathing problems, lung and throat irritation and stomach pain.

Notes:

If a State has established a PEL more restrictive than the OSHA limits, then the applicable State limit becomes the legal limit.
IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
mg/m^3 = milligrams per cubic meter
PEL = permissible exposure limit

Safe Work Practices and Mitigation Procedures

- **Engineering Controls** - Implement physical change to the workplace, which eliminates/reduces the hazard on the job/task, including:
  - Change process to minimize contact with hazardous chemicals.
  - Isolate or enclose the process.
  - Use of wet methods to reduce generation of dusts or other particulates.
  - General dilution ventilation.
- **Administrative Controls** - Establish efficient processes or procedures, including:
  - Rotate job assignments.
  - Adjust work schedules so that workers are not overexposed to a hazardous chemical.
- **Personal Protective Equipment** - Use protection to reduce exposure to ergonomics-related risk factors, Including:
  - Wear gloves.
  - Wear eye protection.
  - Wear protective clothing.

- Wear respiratory protection for dusts or other particulates (if present).

X-Ray Fluorescence Safety

The handheld x-ray fluorescence (XRF) unit emits x-rays to analyze concentrations of metals in the field. X-rays are emitted from the lens via a focused beam. The x-rays emitted from an XRF can penetrate many substrates, and therefore, caution will be used when handling and operating the device. The following [procedures will be followed while operating the XRF:

- When using the XRF device, exposure will be minimized exposure using protective clothing, eye wear and gloves.
- The operator will always be aware of the instrument's radioactive source and the direction of X-rays beams.
- The operator will never point the open source at anyone. Moreover, the XRF will not be pointed at another person, whether it is energized or de-energized.
- The devices will never be used to analyze material that is being held in a person's hand.
- Never point the instrument into the air and perform a test.
- Always be certain that the beam is not pointed at anyone and assume that the beam may pass through testing material and any table the testing material upon which it is placed.

Hazard Reporting and Documentation

Additional hazards that are specific to your site should be identified here or on the JHA (Form 3; Appendix A). Daily field logs should include evaluation of:

- *Physical Hazards* (excavations and shoring, equipment, traffic, tripping, heat stress, cold stress and others)
- *Biological Hazards* (snakes, spiders, ticks, wasps, animals, poison ivy, pollen, and others present)
- *Ergonomic Hazards* (lifting heavy loads, tight work spaces, etc.)
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present)

AIR MONITORING PLAN

An air monitoring plan has been prepared as part of development of this HASP. The air monitoring plan is based on the results of the chemical exposure assessment and the known and potential inhalation hazards on site. The air monitoring plan addresses steps necessary to limit worker exposure. Non-occupational exposures are not addressed in this plan.

Air Monitoring Instrumentation (Check All That Apply)
☐ Multi-Gas Detector (may include oxygen, carbon monoxide, hydrogen sulfide, lower explosive limit)
☐ Dust Monitor
☒ Other (i.e., detector tubes or badges) Please specify: Visual Monitoring

Monitoring Frequency (Check All That Apply)
☒ Continuous while handling samples
☐ 15 minutes
☐ 30 minutes
☐ Hourly

SITE CONTROL PLAN

Work zones will be all waste rock piles and the immediate vicinity. Employees should work upwind of the waste sources if possible. To the extent practicable, use the buddy system. All personnel from GeoEngineers and subcontractor(s) should be made aware of safety features during each morning's safety tailgate meeting (location of fire extinguishers, cell phone numbers, etc.). For medical assistance, see "Emergency Information" above.

A contamination reduction zone should be established for personnel before leaving the Site or before breaking for lunches etc. The zone should consist of garbage bags into which used PPE should be disposed. Personnel should wash hands at the Site before eating or leaving the Site.

Traffic or Vehicle Access Control Plans

Fieldwork will be completed within a park, in an off-road setting. The park will remain open during fieldwork, and caution will be maintained if hikers are present during sample collection activities.

Site Work Zones

Hot zone/exclusion, contamination and decontamination zones: within waste rock piles and the immediate upslope/downslope vicinity.

A contamination reduction zone will be established just outside the exclusion zone for the decontamination of sampling equipment. Care will be taken to prevent the spread of contamination. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Scrub brushes;
- Spray rinse applicator;
- Plastic garbage bags; and
- Container of Alconox/water solution and Alconox powder.

Buddy System

Personnel on site will use the buddy system (pairs), particularly whenever communication is restricted.

Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on site, with the pair remaining in proximity to assist each other in case of emergencies. The team

should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown) and an agreed upon location for an emergency assembly area.

In instances where communication cannot be maintained, you should consider suspending work until it can be restored. If this is not an option, the following are some examples for communication:

- Hand gripping throat: Out of air, can't breathe.
- Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
- Hands on top of head: Need assistance.
- Thumbs up: Okay, I'm all right; or, I understand.
- Thumbs down: No, negative.

Emergency Action

Emergency Action Plan for the Site is summarize below.

- Personnel on-site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- Wind indicators visible to all on-site personnel should be provided by the Site Safety and Health Supervisor to indicate possible routes for upwind escape. Alternatively, the Site Safety and Health Supervisor may ask on-site personnel to observe the wind direction periodically during Site activities.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Accident Report for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

For medical assistance, see the "Emergency Information" section above.

Decontamination Procedures

Decontamination, at a minimum, should include removing and disposing of PPE when exiting the exclusion zone; and washing your hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using bucket and brush provided on site in the contamination reduction zone. If needed, inner gloves will then be removed, and respirator, hands and face will be washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and wash before eating, drinking or leaving the site.

Waste Disposal or Storage

Used PPE is to be placed in a plastic bag for disposal.

Sampling, Managing and Handling Drums and Containers

Drums and containers will not be used to store waste materials on-site.

Sanitation

Washrooms are present at the Saddle Rock Trailhead

Lighting

Field work will be generally conducted during daylight hours; artificial lighting is not anticipated to be necessary.

PERSONAL PROTECTIVE EQUIPMENT

After the initial and/or daily hazard assessment has been completed the appropriate personal protective equipment (PPE) will be selected to ensure worker safety. Task-specific levels of PPE shall be reviewed with field personnel during the pre-work briefing conducted before the start of site operations.

Site activities include handling and sampling solid surface and subsurface material (material may potentially contain elevated concentrations of arsenic). Site hazards include potential exposure to contaminated media, and physical hazards such as trips/falls.

Visual air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on site to be used as necessary. P100 cartridges are used for protection against dust and metals.
- Level D PPE, unless a higher level of protection is required, will be worn at all times on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating. Smoking will not be allowed at the Site.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

Applicable Personal Protection Gear (Check All That Apply)
☒ Hardhat (if overhead hazards, or client requests)
☐ Steel-toed boots
☒ Safety glasses (if dust, particles, or other hazards are present or client requests)
☒ Reflective vest (if working near traffic or equipment)
☐ Hearing protection
☐ Rubber boots

Gloves (Check All That Apply)
Gloves (Specify):
☒ Nitrile
☐ Latex
☐ Liners
☐ Leather
☐ Other (specify) Click here to enter text.

Protective Clothing (Check All That Apply)
☐ Tyvek (if dry conditions are encountered, Tyvek is sufficient) (modified Level D or Level C)
☐ Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue) (modified Level D or Level C)
☒ Cotton (Level D)
☒ Rain gear (as needed) (Level D)
☒ Layered warm clothing (as needed) (Level D)

Inhalation Hazard Protection (Check All That Apply)
☒ Level D (no respirator)
☐ Level C (respirators with organic vapor/HEPA P100 filters)
☐ Level B (Self Contained Breathing Apparatus— STOP, Consult the HSM)

Personal Protective Clothing Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear respiratory protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

Respirator Cartridges

No action levels identified in the Chemical Hazards Table (above), are expected to be exceeded via the inhalation exposure route. However, site personnel should don respiratory protection appropriate for the heavy metals, if windy weather occurs and air borne dust is produced from the waste rock pile(s). A half-face or full-face air purifying respirator with a National Institute for Occupational Safety and Health (NIOSH)-approved HEPA P100 combination cartridge (Level C), will be appropriate for these chemicals of concern. Monitoring frequency should be continuous while using Level C respiratory protection. The SSO closely monitor personnel using respiratory protection, including observing for signs of fatigue or respiratory distress, the potential for cartridge breakthrough or increased resistance to inhalation. The frequency and duration of breaks should be increased for personnel working in respiratory protection.

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be approved and NIOSH-certified. A cartridge change-out schedule shall be developed based on the site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

Respirator Inspection and Cleaning

The Site Safety Officer shall periodically (weekly) inspect respirators at the project site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

PERSONNEL MEDICAL SURVEILLANCE

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of "Employees Covered" in OSHA 1910.120(f)(2), which states that a medical surveillance program is required for the following employees:

1. All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.
2. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations.
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
4. Members of HAZMAT teams.

DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for Hazardous Waste Operations and Emergency Response (HAZWOPER) projects:

- Field Log
- Health and safety pre-entry briefing acknowledgment (Form 1)
- Safety Meeting Record (Form 2)
- Job Hazard Analyses (Form 3)
- Accident/Exposure Report Form (Form 4)
- Conditional forms available at GeoEngineers office: Accident Report

The Field Log is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

FORM 1
HEALTH AND SAFET PRE-ENTRY BRIEFING AND ACKNOWLEDGEMENT OF THE SITE HEALTH AND SAFETY PLAN FOR GEOENGINEERS' EMPLOYEES, SUBCONTRACTORS AND VISITORS
SADDLE ROCK INTERIM REMEDIAL ACTION DESIGN PROJECT
FILE NO. 4296-008-00

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level and degree of exposure to hazardous substances they're likely to encounter;
- All site-related emergency response procedures; and
- Any identified potential fire, explosion, health, safety or other hazards.

Conduct briefings for employees, contractors and subcontractors, or their representatives as follows:

- A pre-entry briefing before any site activity is started.
- Additional briefings, as needed, to make sure that the Site-specific HASP is followed.
- Make sure all employees working on the Site are informed of any risks identified and trained on how to protect themselves and other workers against the Site hazards and risks.
- Update all information to reflect current sight activities and hazards.
- All personnel participating in this project must receive initial health and safety orientation. Thereafter, brief tailgate safety meetings will be held as deemed necessary by the Site Safety Officer.
- The orientation and the tailgate safety meetings shall include a discussion of emergency response, site communications and site hazards.

(All of GeoEngineers' Site workers shall complete this form, which should remain attached to the HASP and be filed with other project documentation). Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

I hereby verify that a copy of the current HASP has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on site. I agree to comply with all required, specified safety regulations and procedures.

Print Name **Signature** **Date**

_____

_____

_____

_____

FORM 2
SAFETY MEETING RECORD
SADDLE ROCK INTERIM REMEDIAL ACTION DESIGN PROJECT
FILE NO. 04296-008-00

Safety meetings should include a discussion of emergency response, site communications and site hazards.

- Use in conjunction with the HASP and Job Hazard Analyses (JHA) Form 3 to help identify hazards.

Date: _____ **Site Safety Officer (SSO):** _____

Topics: _____

Attendees:

Print Name **Signature:**

_____

_____

_____

_____

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FORM 3
JOB HAZARD ANALYSES (JHA) FORM
SADDLE ROCK INTERIM REMEDIAL ACTION DESIGN PROJECT
FILE NO. 04296-008-00

This form can be used for analyses of daily hazards where there are multiple tasks and ongoing projects and for record keeping purposes. Make copies as needed.

Project: Waste Rock Sampling **File No:** 4296-008-00	**Date:** 2/20/2019	**Site Location:** 1200 Circle Street, Wenatchee, Washington

Development Team:	**Position/Title:**	**Reviewed by:**	**Position/Title:**
Ryan Tobias	SSO	Nick Rohrbach	PM
Name	Position	Name	Position

Minimum Required Protective Equipment: (see critical actions for task-specific requirements)

PPE	**Equipment**	**Tools**	**Actions**
☒ Hard Hat	☐ Safety Beacons	☒ Cell/Satellite Phone	☒ Stay Visible
☒ High Visibility Vest	☐ Safety Cones	☐ Digital Camera	☒ Equipment Inspection
☐ Safety Shoes/Waders	☒ First Aid Kit	☒ iPad	☒ Work in Pairs
☒ Gloves	☒ Fire Extinguisher	☐	☐ Safety Control/Traffic Plan
☒ Safety Glasses	☒ Eye Wash/ Drinking Water	☐	☐

Job Steps	**Potential Hazards**	**Critical Actions to Mitigate Hazards**
Pre-Field Work	■ Vehicle Inspection ■ Unfamiliar Locations ■ Site Parking	■ Inspect the vehicle before departure: ▪ Check for tire cuts, fluid leaks, flat tires, body damage, windshield cracks, and other damage. ▪ Check lights, wipers, fluid levels, and seat belts. ■ Study the area maps, photos and use GPS and compass skills. ■ Identify the safest spot to park field vehicles.
Traveling to Work Site (Paved Roads)	■ Unfamiliar Roads ■ Mechanical Failure ■ Flat Tire ■ Vehicle Fire ■ Vehicle Collision ■ Other Hazards	■ Use only vehicles appropriate for the work needs and the driving conditions expected. ■ Ensure the vehicle has a complete and current first aid kit and fire extinguisher. ■ Place heavy objects behind a secure safety cage if they must be carried in a passenger compartment. ■ Use parking brake, and don't leave vehicle unattended while it is running. ■ Ensure vehicle has fuel to get to and from your destinations. ■ Inform your Project Manager of your destination and estimated time of return. ■ Carry extra food, water, and clothing. ■ Drive defensively.

Job Steps	Potential Hazards	Critical Actions to Mitigate Hazards
Arrival to Work Site	■ Job site hazards and steps to prevent injury. ■ Appropriate personnel protective equipment not worn. ■ Traffic Hazards ■ Other Hazards	■ Conduct a tailgate safety meeting discussing the jobs, the hazards and actions that will be taken to prevent injury. All subcontractors including the traffic control personnel will be part of the tailgate meeting. ■ Discuss "Stop Work Authority" as it applies to each site member. ■ Discuss appropriate PPE including high visibility clothing such as reflective vest. ■ Notify project manager of work activities and location. Ensure that the general or earthwork contractor has set up an exclusion zone surrounding work area that includes demarcation of the active personnel work zone.
Site/Work Conditions	■ Falls ■ Foot Injuries ■ Stress and Impact Injuries ■ Forest Fires ■ Lightning ■ Personal Safety ■ Unusual traffic hazards ■ Biological Hazards ■ Communication	■ Identify and use safe travel routes. Do not exceed physical abilities or equipment design. ■ Take extra precautions when encountering steep, loose, wet conditions. ■ Use pack equipment properly. Carry weight on hips, not back. ■ Warm up and stretch the appropriate muscle groups before and after hitting the trail. ■ Test and use secure footing. Move cautiously and deliberately. Never run. ■ Wear safety-toed boots with good, non-skid soles that are tall enough to support ankles. ■ Know basic first aid. Completion of a basic first aid course is required. ■ Use footwear appropriate to the terrain and load being carried. ■ Know how to fall. Roll, protect the head and neck, and do not extend arms to break the fall. ■ Use a flashlight after dark. ■ Travel after dark only in an emergency. ■ Discuss applicable hazard mitigation measures - Insects, Vegetation, Wildlife. ■ Verify cell phone is working. ■ Maintain communication with Project Manager or 'buddy' throughout job task. ■ Verify location and contact numbers for emergency medical assistance or 911. ■ Bring plenty of water, stay hydrated. ■ Refer to GeoEngineers Personal Safety Program.
Job Steps	**Potential Hazards**	**Critical Actions to Mitigate Hazards**
Communication	Additional Hazards, i.e., No communication in case of emergency	■ Verify cell phone is working. ■ Maintain communication with Project Manager throughout job task. ■ Verify location and contact numbers for emergency medical assistance or 911.
	Additional Hazards, i.e., Emergency	■ **Dial 911** ■ Hospital Route (Attached Fall Protection Plan)

Required Control Measures: (check the box when complete)
☐ Perform a pre-work vehicle inspection (First Aid kit, fire extinguisher).
☐ Drive defensively looking out for the other guy.
☐ Conduct a pre-work safety meeting.
☐ Use a Safety Watch to monitor equipment Minimum Approach Distance (MAD) and to keep personnel clear if needed.
☐ Wear Personal Protective Equipment (PPE).
☐ Ensure training is current (First Aid, defensive driving, etc.).
☐ Conduct Task Safety Assessments throughout the job.
Additional Comments:

Daily Hazard Assessment Record of Safety Meetings

Signature	Date	Signature	Date

FORM 4
ACCIDENT/EXPOSURE REPORT FORM
SADDLE ROCK INTERIM REMEDIAL ACTION DESIGN PROJECT
FILE NO. 4296-008-00

To (Supervisor): _____ From (Employee): _____

Telephone (with area code): _____

Name of injured or ill employee: _____

Date of accident: Time of accident: Exact location of accident:

_____

Narrative description of: **accident**/**exposure** (circle one):

_____

_____

_____

_____

_____

Medical attention given on site:

_____

_____

_____

_____

Nature of illness or injury and part of body involved: Lost Time? Yes ☐ No ☐

_____

_____

Probably Disability (check one):

Fatal	Lost work day with days away from work	Lost work day with days of restricted activity	No lost work day	First Aid only
☐	☐	☐	☐	☐

Corrective action taken by reporting unit and corrective action that remains to be taken (by whom and when):

_____

_____

Employee Signature: Date:

Name of Supervisor:

GeoEngineers

APPENDIX G
Revised Agreed Order Schedule

PHASE 2 SCHEDULE OF DELIVERABLES

The schedule for deliverables described in the Agreed Order and the Scope of Work is presented below. If the date for submission of any item or notification required by this Schedule of Deliverables occurs on a weekend, state or federal holiday, the date for submission of that item or notification is extended to the next business day following the weekend or holiday. Where a deliverable due date is triggered by Ecology notification, comments or approval, the starting date for the period shown is the date the CITY received such written notification, comments or approval unless otherwise noted below. Where triggered by Ecology receipt of a deliverable, the starting date for the period shown is the date that Ecology receives the deliverable by email.

Task	SOW Deliverable	Deliverable description	Subtask Duration	Completion Times	Estimated Date
	Effective date of Agreed Order Amendment			After signing and public notice.	04/30/20, pending potential COVID-19 work restrictions.
1a	As in Bare Soils Technical Memorandum	Submittal of draft report to CITY & Ecology	90 days	Within 90 calendar days following the effective date of the Agreed Order	
		Ecology review of report	30 days	Within 30 calendar days following receipt of draft report	
		Submittal of final document to Ecology[1]	30 days	Within 30 days following receipt of Ecology comments	
1b	Bare Soils Mitigation Measures Assessment Report	Submittal of draft report to CITY & Ecology	90 days	Within 90 calendar days following the effective date of the Agreed Order	
		Ecology review of report	30 days	Within 30 calendar days following receipt of draft report	
		Submittal of final document to Ecology[1]	30 days	Within 30 days following receipt of Ecology comments	

2	IRA Preliminary Design and Cost Estimate	Submittal of draft document to Ecology	90 days	Within 90 calendar days following Ecology approval of reports from Tasks 1a and 1b	
		IRA Preliminary Design Review Telephone Meeting	1 day	Within 10 calendar days following receipt of draft document	
		Submittal of final document to Ecology[1]	30 days	Within 30 days following receipt of Ecology comments	
3	Design Report and Bid Package	Submittal of draft document to CITY & Ecology[2]	90 days	Within 90 calendar days following the effective date of the Agreed Order	
		Ecology review of bid package	30 days	Within 30 calendar days of submittal of draft document	
		Submittal of final document to Ecology[1]	30 days	Within 30 days following receipt of Ecology comments	
	Procurement of Construction CONTRACTOR	Bidding by City	60 days	Within 60 days following City & Ecology approval of design document and bid package	
		Selection & Contracting of CONTACTOR	30 days	Within 30 days of bid due deadline.	
4	IRA Field Implementation	IRA Field Implementation Kickoff Meeting	1 day	Immediately following City selection of Contractor	
		Start of IRA Field Implementation	1 day	Within 1 day following Kickoff meeting	
		Completion of IRA Field Implementation[2]	90 days	Within 90 days of Field Implementation Start	

5	IRA Completion Report	Submittal of draft document to CITY & Ecology	60 days	Within 60 days following completion of field implementation	
		Ecology review of draft document	30 days	Within 30 calendar days following receipt of draft document	
		Submittal of final document to Ecology[1]	30 days	Within 30 calendar days of City & Ecology approval of responses to comments	

1 – Ecology reserves the right, at the sole discretion of Ecology, to require one additional comment and document revision round, if needed. All Ecology comments must be addressed to Ecology's satisfaction prior to document finalization.

2 – Any field delays due to weather or safety considerations shall be considered by Ecology.

APPENDIX H
Construction Cost Estimate

Phase 2 IRA Construction Cost Estimate
Saddle Rock Park Project - City of Wenatchee
Wenatchee, Washington

Scope Item	Unit	Unit Cost[1]	Quantity	Extended
Remedial Construction Cost Estimate				
Logistics				
Mobilization/Bonding [2]	LS	$34,249	1	$34,249
Site Clearing and Grubbing [3]	ACRE	$3,500	3.1	$10,850
Staging Area / Temporary Facilities / Orange Construction Fencing / Park Closure Controls [4]	LS	$20,000	1	$20,000
			Task Sub-Total	**$65,099**
Road Improvements				
Improve Existing Road for Haul [5]	LS	$90,000	1	$90,000
SR 05 Temporary Access Road (Contractor Determined Alignment)	LS	$30,000	1	$30,000
Crushed Surfacing Base Course [6]	Ton	$50	977	$48,838
Magnesium Chloride/Calcium Chloride Stablization Station 1712+00 to 1736+00	LF	$4	2,400	$9,600
			Task Sub-Total	**$178,438**
Incidentals				
Temporary Water Pollution & Erosion Control	LS	$10,000	1	$10,000
Excavated Water Bars (per recommended spacing based on slope)	EA	$250	104	$26,000
Schedule A Culvert Pipe 24 Inch Diameter	LF	$100	50	$5,000
Dispersion Structure @ End of Culvert Pipe	EA	$7,500	2	$15,000
Dust Suppressant/Wildfire Preparation During Construction (water and truck and/or trailer)	Day	$200	50	$10,000
Seeding and Mulching [7]	AC	$8,000	4.9	$39,200
New Benches (to be purchased and installed by City employees)	EA	$1,500	4.0	$6,000
High Arsenic Warning Sign (to be purchased and installed by City employees)	EA	$1,000	1.0	$1,000
Trail Closed Signs (to be purchased and installed by Land Trust employees/for 'side' trails off main trail/existing road)	EA	$1,000	5.0	$5,000
Consultant Construction Oversight/Engineering, Confirmation Sampling and Documentation	LS	$110,000	1.0	$110,000
			Task Sub-Total	**$227,200**
Excavate Waste Rock and Transport to Loading Area				
SR05	CY	$40	1,200	$48,000
			Task Sub-Total	**$48,000**
Load, Transport, and Waste Rock Disposal in Landfill[8]				
Load Waste Rock into Waste Management Trucks	CY	$4	1,200	$4,800
Transport[9]	Ton	$8	1,800	$14,400
Disposal[9]	Ton	$41	1,800	$73,800
			Task Sub-Total	**$93,000**
			Remedial Action Sub-Total	$611,737
			Contingency (20%)	$122,347
			Sales Tax (8.5%) (excludes contingency)	$51,998
			Phase 2 Remedial Action Estimated Total with 20% Contingency	**$786,081**

Notes:

[1]Unit costs derived from either RS Means, WSDOT UBA, estimates from local vendors, and professional experience. Estimated costs are considered to be within a margin of +/- 20 percent.

[2] Ten percent of construction total, not including waste rock disposal (Lines 31-34).

[3] Five feet each side of existing roadway, includes temporary access to SR-05.

[4]Assumes temp fencing around art feature (Phase 1 area), contractor staging area, along rare flower area and temporary trail/park closure signs and barricades.

[5]Assumes minimum 10-foot width roadway from SR02 staging area to park ridgeline. Contractor to determine/anticipated widening at corners for equipment. 10% contingency embedded in cut/fill calcs already.

[6]Four-inch depth, 5/8-inch-minus, haul, place, compacted (after substantial construction completion) from Station 1700+00 to 1712+00 and from 1736+00 to 1762+86

[7]Assumes providing seed and mulch at SR05 and cut/fill areas along the primary haul road. Cost is high per acre since contractor will not be able to drive a standard mulching truck up the grade and will likely need to pull a trailer behind a backhoe/something similar.

[8]Assumes disposal at Waste Management's Greater Wenatchee Regional Landfill.

[9]Assumes 1.5 tons per cubic yard

CY = cubic yard; LF = linear foot; LS = lump sum estimate; EA = Each; AC = Acre; TN = Ton

GeoEngineers