Materials Management and Compliance Monitoring Plan

Carpenter Road Site
Olympia, Washington

for
City of Olympia

July 6, 2022

GeoEngineers
Earth Science + Technology

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File No. 0415-068-04

July 6, 2022

Prepared for:

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Table of Contents

LIST OF FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
ASTM	ASTM International
bgs	below ground surface
BMPs	best management practices
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
City	City of Olympia
CSWGP	Construction Stormwater General Permit
CY	cubic yards
DNS	Determination of Non-Significance
DOT	Department of Transportation
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
EIM	Ecology's Environmental Information Management
EPA	United States Environmental Protection Agency
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air
H:V	horizontal to vertical
ID	identification
IHSs	indicator hazardous substances
L&I	Labor & Industries
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MTCA	Model Toxic Control Act
NAVD88	North American Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
PQL	Practicable Quantitation Limit
PUD	Public Utility Department
QAPP	Quality Assurance Project Plan

QA/QC	quality assurance/quality control
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
ROW	right-of-way
SEPA	State Environmental Policy Act
RIFS	Remedial Investigation and Feasibility Study
SWMMWW	Stormwater Management Manual for Western Washington
TCLP	toxicity leaching characteristic procedure
TESC	temporary erosion and sediment control
TGB	treatment by generator
µg/sf	micrograms per square foot
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WSDOT	Washington State Department of Transportation
XRF	X-ray fluorescence

1.0 INTRODUCTION

This Materials Management and Compliance Monitoring Plan (MMCMP) has been prepared for the planned cleanup action at Carpenter Road Site (Site) on behalf of the City of Olympia (City). The Site address is 6530 Martin Way East, Lacey, Washington, 98516. The Site contains a building, which was a former City of Olympia police training facility that was used as an indoor firing range. A vicinity map is shown on Figure 1 and the property and Site layout is shown on Figure 2. The firing range activities resulted in lead contaminated dust on building components and lead contaminated soil both inside and outside the building as detailed in the combined Remedial Investigation/Feasibility Study (RI/FS) Report and Cleanup Action Plan (CAP) (GeoEngineers 2022). The City is implementing the cleanup action prior to redevelopment of the property, which includes building demolition, regrading, and construction of new solid waste operations facility which includes offices, maintenance shops, and parking areas.

The cleanup action at the Site is being performed by the City under Washington State Department of Ecology's (Ecology's) Voluntary Cleanup Program (VCP). As part of the VCP, the RI/FS and CAP was reviewed and an opinion letter on the proposed cleanup action was issued by Ecology on March 22, 2022 (Ecology 2022) to the City. The opinion provided by Ecology states that upon the completion of the proposed cleanup described in the RI/FS and CAP (GeoEngineers 2022), no further remedial action (NFA) will likely be necessary to clean up the Site[1].

This MMCMP is prepared based on conversations with Ecology's project manager and to meet the requirements of Ecology's opinion letter (Ecology 2022), and presents the following information:

- A summary of the nature and extent of contamination at the Site;
- Cleanup standards;
- A summary of the proposed cleanup action;
- A management approach for contaminated materials that will be removed from the Site as a result of the cleanup action;
- A compliance monitoring plan presenting protection, performance and confirmatory monitoring requirements applicable to the proposed cleanup action in accordance with Model Toxics Cleanup Act (MTCA);
- Schedule for the proposed cleanup action; and
- Identification of reporting requirements after the cleanup action is completed.

2.0 SITE CHARACTERIZATION

As identified in the RI/FS and CAP (GeoEngineers, 2022), the contamination from firing range activities is present both in soil and dust on materials inside the firing range building and in soil outside the building. The contaminants for firing range activities include lead, antimony, and copper. However, antimony and copper were only detected in two samples at concentrations greater than MTCA B cleanup levels. Lead was

[1] Determination of no further action by Ecology will be contingent on sampling results confirming that Site cleanup levels have been achieved at the points of compliance.

detected at concentrations greater than the MTCA Method A cleanup level in surface and subsurface soil including the samples containing antimony and copper at concentrations greater than cleanup levels. As identified in Ecology's opinion letter (Ecology 2022), lead has been determined to be the indicator hazardous substance under WAC 173-340-703 for cleanup of the Site, since cleanup of lead in soil is expected to result in cleanup of soil with copper or antimony above the cleanup levels.

Site characterization activities completed at the Site prior to 2022 are detailed in the RI/FS and CAP (GeoEngineers 2022) and included hand augers and direct push borings to characterize soil conditions inside and outside the building. The approximate location of investigations completed inside and outside the building are shown on Figures 3 and 4, respectively.

In March 2022, additional investigation activities were completed to support management of materials during the cleanup of the Site. The need for additional investigation was identified as part of a site visit completed to further document existing conditions and evaluate materials management. The additional investigation activities are summarized below and detailed in Appendix A (Technical Memorandum – Additional Site Investigation at Carpenter Road Site). The approximate locations of the additional investigations are shown on Figure 3.

- Investigation activities were completed to evaluate the potential for lead contamination to be present underneath the concrete floor located on the western half of the firing range building (Firing Lane A). It was suspected that the concrete floor was placed on top of the pre-existing asphalt (pavement) floor. It was also suspected that, if the pre-existing asphalt floor was present below the concrete floor, that the surface of the asphalt floor may have contained lead-contaminated dust before the concrete was placed on top. Therefore, as part of the additional investigation, two 4-inch diameter cores of the flooring were completed – one in the northwest corner (11535-03) and one in southwest corner (11535-04) of the concrete floor (Figure 3) and both cores revealed the presence of an asphalt (pavement) layer underneath the concrete floor. The asphalt and concrete layers were separated, and two wipe samples were collected from each core – one from each of the separated surfaces (i.e., one from the bottom of the concrete that was in contact with the asphalt and one from the surface of the asphalt pavement that was in contact with the concrete). Wipe samples were analyzed for lead. The lead content of both the wipe samples collected from northwestern core (located closer to the bullet trap) were found to be 59,000 micrograms per square foot (µg/sf). The lead content of the wipe samples collected from southwestern core (located closer to the interior building rooms) ranged from 4,100 to 5,400 µg/sf. These results identify that lead contamination is present on the bottom of the concrete floor and on the surface of the asphalt pavement.
- Investigation activities were completed to evaluate the presence/absence of a French drain around the perimeter of Firing Lane B on the eastern half of the firing range building and potential presence of lead contamination in soil. The asphalt floor in Firing Lane B contains existing saw-cutting and asphalt patching around the perimeter of the floor indicating a presence of a potential French drain. Two saw-cuts measuring 2 feet by 2 feet were completed within the alignment of the potential French drain – one in the northwest corner (11535-01) and one in south end (11535-02) of asphalt floor (Figure 3). A French drain system was observed that consists of 6-inches of pea gravel below asphalt (no pipe) at both the saw cut locations. One soil sample was collected from below the pea gravel layer at each location and analyzed for lead. The result for the soil sample collected from the northwestern saw-cut (11535-01) located closer to the bullet trap contained lead at 28,000 milligrams per kilogram (mg/kg), which exceeds the cleanup level for lead (Section 3.1). The result for the soil sample collected from the

south saw-cut (11535-02) located closer to the interior building rooms was non-detect at a practicable quantitation limit (PQL) of 33 mg/kg. Based on these results and the absence of lead contamination above cleanup levels in soil sample collected from hand auger location HA-16 (i.e., 6.1 mg/kg), it is estimated that the lead contaminated soil along the alignment of the French floor drain in limited to the northeastern/northern portion near the Firing Lane B adjacent to the former bullet trap.

- Investigation activities were also performed to estimate the percentage of bullets/bullet fragments within the north wall sloped soil berm. Twelve horizontal soil cores were completed to a depth of approximately 2-feet along the northern soil berm. Soil cores were observed to visually evaluate the vertical distribution of the bullets/bullet fragments, passed through sieves to remove the bullets/bullet fragments, and weighed to determine the percentage of bullets/bullet fragments. Bullet/bullet fragments were recovered from nine of the twelve soil sampling locations. Based on visual observations of the core, the bullets/bullet fragments were present in the top 6-to-12-inch interval. Bullets/bullet fragments were not observed in the soil cores below 12-inches in depth in any cores. The percent of recovered bullet/bullet fragments by weight in soil samples ranged from 2.7 percent (%) to 24.7%.

The following is the summary of lead contamination at the Site.

TABLE 1 – SUMMARY OF LEAD CONTAMINATION

Building Interior/Exterior	Area	Nature of Lead Contamination
Interior	North wall sloped soil berm	Lead bullets in soil, lead dust on soil
	East and west walls sloped soil berms	Lead dust on soil
	Within firing range	Lead dust on concrete and on Ecology blocks and other materials and between the concrete floor and underlying, pre-existing asphalt floor located on the western side of the building (Firing Lane A)
	French floor drain in the northeastern/northern portion of Firing Lane B	Lead contamination in soil within the alignment of French floor drain
Exterior	Soils adjacent to structure to east and west	Runoff from dust precipitating on the roof and discharging from gutter downspouts
	Structure Roof	Potential lead dust on structure roof

The depth of soil contamination in the building interior is estimated to range from the surface to approximately 24-inches below ground surface (bgs). The depth of soil contamination adjacent to the exterior of the building is estimated to range from the surface to approximately 30-inches bgs. The approximate horizontal extent of soil contamination inside and outside of the building is shown on Figures 3 and 4, respectively.

Groundwater is considered to be of low risk from the lead, copper, and antimony in soil since these metals have relatively low mobility in non-acidic waters (runoff and groundwater at the Site would not be expected to have low pH conditions). Three piezometers were installed at the Site and groundwater levels measured. Approximate locations of the piezometers are shown on Figure 2. The depth to groundwater measured at three piezometers at the Site ranged from ten (10) feet bgs to the east to 28 feet bgs to the west. Impacts to groundwater from the lead in soil at the Site are considered unlikely. Therefore, groundwater is not considered media of concern at the Site.

3.0 CLEANUP STANDARDS

Cleanup standards include (1) chemical concentrations in environmental media that are protective of human health and the environment; and (2) locations where the cleanup levels must be met (points of compliance). As identified in Ecology's opinion letter (Ecology 2022), the following are the Site cleanup levels and points of compliance:

3.1. Cleanup Levels

As noted in Section 2.0, Ecology has selected lead as an indicator hazardous substance under WAC 173-340-703 for cleanup of the Site. Therefore, lead will serve as monitoring parameter for verification sampling at the limits of planned remedial excavation. The lead cleanup level selected for the Site is 220 milligrams per kilogram (mg/kg) as described in Ecology's opinion letter (Ecology 2022).

3.2. Points of Compliance

The points of compliance are throughout the Site. Cleanup levels based on the direct contact pathway apply to soils to a depth of 15 ft bgs.

4.0 DESCRIPTION OF THE CLEANUP ACTION

As presented in the RI/FS and CAP (GeoEngineers 2022), the cleanup action for the Site includes the following:

- Installation of temporary Site controls including site security, temporary erosion and sediment controls (TESC) and traffic controls.
- Performing Site preparation activities including setting up a contractor laydown area and material management and stockpile areas, and performing utility locates.
- Deconstruct and clean or spray dust abatement spray (if necessary) on metal building components (e.g., metal frame, metal roof, ventilation system components, etc.) and transport off Site for recycling. Clean and reuse concrete ecology blocks. Cleaning, if performed, will be completed using methods (vacuum cleaners with high-efficiency particulate air [HEPA] filters or wet cleaning) that prevent or minimize generation of airborne dust.
- Remove concrete floor located in the western side of the building and separate it from the underlying asphalt floor. The demolished concrete floor will be recycled only if concrete/asphalt floors can be successfully separated, cleaning of concrete surfaces is possible and the post-cleaning confirmatory sampling of concrete surfaces document that the applicable regulatory criteria is met. If separating concrete/asphalt floors is not possible or if the concrete surfaces cannot be cleaning, then the demolished concrete floor will be transported to a permitted landfill for disposal. Disposal characterization of concrete floor will be completed, and concrete will be transported either to a non-hazardous waste landfill or hazardous waste landfill for disposal based on the results of disposal characterization.

- Demolish and transport other building components (e.g., dry wall/sheet rock, plywood, insulation, wood frame, asphalt floors, underground utilities, etc.) to hazardous waste landfill (i.e., Resource Conservation and Recovery Act [RCRA] Subtitle C landfill) for macroencapsulation and disposal.
- Transport and dispose of materials used for cleaning building components (e.g., rags, vacuum filters, etc.) to hazardous waste landfill (i.e., RCRA Subtitle C landfill). Collect water used in cleaning and either treat on Site and discharge to sanitary sewer or transport off Site for treatment and disposal. Perform chemical analytical testing of waste, as necessary, for disposal characterization purposes.
- Excavate contaminated soil from inside and outside the building. Determine final limits of excavation using results of field screening using hand-held X-ray Fluorescence (XRF) device and laboratory analytical results of soil samples collected from the excavation limits.
- Manage excavated soil using one or a combination of the following approaches based on actual site conditions and contractor bid prices:
    - Treat excavated soil on Site by mixing a reagent with soil to reduce TCLP lead concentrations below hazardous/dangerous waste levels, perform chemical analytical testing of treated soil for disposal characterization purposes and transport treated soil with TCLP lead contractions below hazardous/dangerous waste levels to a permitted solid waste landfill (e.g., RCRA Subtitle D landfill). Recovery of bullet/bullet fragments from soil comprising the north wall sloped soil berm may be performed before treatment if bullet recovery is identified to be feasible and cost effective.
    - Transport excavated soil to a hazardous waste landfill (i.e., RCRA Subtitle C landfill) for treatment and disposal.
- Perform compliance monitoring as described in Section 6.0.
- Grade the site to even grades to eliminate steep slopes, humps and depressions.
- Install post-cleanup erosion and sediment controls (e.g. straw wattles, etc.), as necessary, to minimize generation of sediment laden stormwater and dust until Site redevelopment occurs.
- Remove temporary site controls/facilities and garbage and leave the Site in clean and tidy condition.

5.0 MATERIALS MANAGEMENT PLAN

This section presents the approach to manage contaminated materials that will be removed and/or cleaned up as a result of building deconstruction/demolition and remedial excavation activities. As described in the RI/FS and CAP (GeoEngineers 2022), contaminated media at the Site include lead contaminated dust that is coated on the surfaces of the building components and lead, copper and antimony contaminated soil located inside and outside the building.

Based on the results of 2017 environmental investigations (GeoEngineers 2017), lead concentrations in the dust and soil are at hazardous/dangerous waste levels. Hazardous/dangerous waste will be managed in accordance with the requirements of applicable federal (40 Code of Federal Regulation [CFR] parts 260 through 273) and state (Washington Administrative Code [WAC] Chapter 173-303) regulations.

Building deconstruction/demolition activities and management of contaminated dust are described in Section 5.1. Remedial excavation and management of contaminated soil are described in Section 5.2. To support management of contaminated material generated because of building deconstruction/demolition and remedial excavation activities, a materials management area will be established on the Site. Requirements for materials management area and on-Site stockpiling of contaminated materials are described in Section 5.3.

5.1. Building Deconstruction/Demolition and Management of Lead Contaminated Dust

The building will be deconstructed/demolished as part of the cleanup action. Deconstructed/demolished building components will be reused, recycled or transported off Site for disposal at a permitted landfill as identified in Section 5.1.1.

Prior to and during building deconstruction/demolition, surfaces of building components will be cleaned to remove lead contaminated dust or sprayed with dust abatement spray, as necessary. An approach for cleaning/dust abatement is discussed in Section 5.1.2. Cleaning methods and the management of lead contaminated dust and other media resulting from the cleaning activities are described in Section 5.1.3. Off-site transportation of deconstructed building components and demolition debris are described in Section 5.1.4.

5.1.1. Building Components

The deconstructed/demolished building components that are planned to be reused, recycled or transported off Site for disposal at a permitted landfill are identified below. The actual list of building components that will be reused, recycled or transported and disposed of off Site during the cleanup action may vary based on actual Site conditions.

- Building components that are planned to be reused by the City include concrete ecology blocks used as retaining walls on the northwest and southeast sides of the building.
- Building components that are planned to be deconstructed and transported to a recycling facility include the following:
  - Metal frame of the building that includes beams and support posts.
  - Metal roof and walls of the building.
  - Ventilation system including air intake system on the south end of the building and ceiling fans/vents on the north end of the building.
  - Metal frame structures used as the bullet stops on the north end of the building in both firing ranges.
  - Metal frame and components of the tactical training rooms located in the northeast portion of the building.
  - Concrete floors (if cleaning is possible).
  - Concrete foundational elements including concrete columns supporting the roof.
- Building components that are planned to be demolished and transported off Site for disposal at a permitted landfill include the following:
  - Roof insulation on the firing range building.
  - Material including sheetrock, plywood, wood framing, door trim, ceiling and wall insulation, etc. associated with structures inside the building including meeting rooms, bathrooms, storage and tactical training rooms.
  - Wooden retaining wall on the west side of the building.

- Cinder block walls including the one in the center of the building that separates the two firing ranges.
- Asphalt floors.
- Concrete floors (if cleaning is not possible).
- Doors and windows.
- Bathroom fixtures including toilet, sink, etc.
- Furniture including lockers, tables, chairs, etc.
- Miscellaneous items including but not limited to garbage cans, fuel cans, heaters.

5.1.2. Building Components Cleaning/Dust Abatement Approach

The approach to clean or abate dust from the surfaces of building components will vary depending on whether the component is planned to be reused, recycled or disposed of in a landfill as described below:

- **Building Components Planned to be Reused:** The building components that are planned to be reused will be cleaned to minimize generation of airborne dust, protect worker health and safety during building deconstruction/demolition activities and to ensure that the reuse of the components does not pose unacceptable risk to human health and the environment. Following cleanup of these components, a post-cleanup wipe sample will be collected and analyzed for lead at an Ecology-accredited laboratory. It is assumed that one wipe sample will be collected per object. For example, if 50 concrete ecology blocks are cleaned up for reuse, 50 post-cleanup wipe samples will be collected (one sample from each ecology block). If the results of wipe samples are at or above the Occupational Safety and Health Administration (OSHA) and Labor & Industries (L&I) criteria of 200 μg/sf, then additional cleaning will be completed. The goal for cleanup of the building components planned for reuse is to ensure that the dust is removed from the surfaces of the components and the post-cleanup wipe sample results are below 200 μg/sf.
- **Building Components Planned to be Recycled or Disposed in a Landfill:** Cleaning or dust abatement from the surfaces of these building components may or may not be performed depending on their existing conditions. If the surfaces of these building components have visible dust, then such surfaces will either be cleaned or covered with a dust suppression spray, as necessary. If the surfaces of these building components do not have visible dust, then cleaning or dust abatement will not be performed. Cleaning or dust abatement of these building components, if performed, will be to minimize generation of airborne dust, protect worker health and safety during building deconstruction/demolition activities, prevent dispersion of dust during off Site transport and to meet the requirements of the receiving facility.

Cleaning methods are described in Section 5.1.3. Dust suppression sprays are polymer-based formulations that work by creating a uniform layer over the surface of the applied area and once dry, form a malleable membrane that stops dust from becoming airborne.

5.1.3. Cleaning Methods and Management of Dust and Cleaning Waste

Cleaning methods for building components will include vacuum cleaning using HEPA filters and/or wet wiping (or mopping) followed up by washing (if necessary). Dry sweeping methods will not be permitted to prevent dust generation. Wet wiping/mopping or washing may be employed without prior vacuum cleaning, if appropriate. In general, cleaning work will start from the cleanest areas and proceed to the dirtiest areas to minimize spreading of lead-contaminated dust to clean areas. Also cleaning work will start with the highest component (or highest surface of the component) and work down to the lowest component (or lowest surface of the component).

The following sections describe each cleaning method:

5.1.3.1. Vacuum Cleaning Using HEPA Filters

Vacuum cleaners with HEPA filters will be operated and maintained in accordance with manufacturer's recommendations. Filters will be changed in accordance with manufacturer's recommendations. Vacuum cleaner bins will be emptied when they are full, and the dust will be transferred into containers with lids (e.g. 55-gallon drums). Care will be taken while emptying vacuum cleaner bins into containers to minimize aerosolization of dust. For example, vacuum cleaner bins will be emptied closer to the bottom surface within the container to minimize the distance dust has to travel before it settles at the bottom and the container lid will be closed immediately following transfer to contain any aerosolized dust. Alternatively, a pressurized dust transfer mechanism maybe employed that allows transfer of dust from vacuum cleaner bins to containers without dust being exposed to air. Containers with lead-contaminated dust will be stored within designated material management and stockpiling area pending off Site transport and disposal at a permitted landfill.

5.1.3.2. Wet Wiping/Mopping

Wet wiping/mopping will be completed using two buckets; first bucket with clean rinse water and second bucket with a detergent solution. After wiping or mopping a small area, the disposable cloth or mop will be rinsed in the first bucket containing rinse water and then dipped in the second bucket containing the detergent solution. Disposable cloth or mop with detergent solution will be wringed to remove excess liquids prior to using it to wipe surface. Wet wiping/mopping will be completed in a manner such that liquids are not dripping and cross-contaminating other clean surfaces. Absorbent pads and/or a layer of underlying plastic will be placed to collect dripping water, if applicable, to prevent cross-contamination.

Rinse water and detergent solution will be changed, as necessary. Discarded rinse water and detergent solution will be collected in a storage tank and either transported off Site for permitted disposal or treated on Site prior to discharge into City sewer as described in Section 5.1.3.4. Disposable materials used for wet wiping/mopping (e.g. mops, cloth, absorbent pads, plastic) will be collected in containers with lids (e.g. 55-gallon drums). Containers will be stored within the material management and stockpiling area pending off Site transport and disposal at permitted landfill.

5.1.3.3. Washing

Washing will only be allowed within the on Site material management and stockpiling area where wash water can be channeled into wastewater collection system as described in Section 5.1.3.4. Requirements for on Site materials management area are described in Section 5.3. Washing will be completed by applying water to the surface of the building components. A pressure wash system or water jetting will be used where appropriate. Care will be taken to avoid spillage of water outside the limits of material management and stockpiling area and to ensure all wash water is channeled wastewater collection system.

Disposable materials (e.g. cloth), if used during washing, will be collected in containers with lids (e.g. 55-gallon drums) following their use. Containers will be stored within material management and stockpiling area pending off Site transport and disposal at permitted landfill.

5.1.3.4. Wastewater Collection, Storage, Treatment and Disposal/Discharge

The wastewater collection system will include a sump(s) located within the materials management area where water will be collected and a pump and pipes to transfer water from the sump(s) to temporary on-site storage tank(s).

The remediation contractor may elect to either directly transport collected wastewater to an off Site permitted disposal facility for treatment and disposal, or treat it on Site and discharge to the City's sanitary sewer.

If the contractor chooses to directly transport collected wastewater to an off Site permitted disposal facility, then they will be responsible for designing a wastewater collection and storage system sized appropriately for the project, providing containers (e.g. tanker trucks) necessary to perform wastewater transport, and transporting wastewater to the disposal facility. The contractor will also be responsible for collecting representative samples of the contaminated wastewater, performing required laboratory analyses, coordinating with the permitted disposal facility to obtain disposal authorization prior to transport of wastewater, and providing proof of disposal of the wastewater in accordance with disposal requirements. The disposal facility selected by the contractor will be required to be approved by the City.

If the contractor chooses to treat wastewater on Site and discharge to City's sanitary sewer, then they will be responsible for designing wastewater collection, storage, treatment and discharge system that is appropriately sized for the project, capable of treating site contaminants and meeting the discharge requirements of the City. The contractor will be responsible for obtaining a temporary sewer discharge permit from the City prior to discharge of any water into City sewer. The contractor will also be responsible for collecting representative samples of the treatment system effluent, performing required laboratory analyses, and coordinating with the City to ensure all City criteria are met for discharge of effluent into City sewer. Additionally, the contractor will be responsible for sampling and performing required laboratory analysis on sediment that gets collected at the bottom of storage tanks and spent treatment media for the purposes of disposal characterization. The contractor will coordinate with a permitted disposal facility approved by the City to obtain disposal authorization and transport of the material to the disposal facility.

5.1.4. Reuse of Building Components

Following cleaning, the building components that are planned to be reused will be stored on Site at a location away from the remediation and building demolition activities to prevent cross-contamination or the City may transport them off Site.

5.1.5. Off-Site Recycling/Disposal of Building Components and Demolition Debris

Following the cleaning or abatement of lead contaminated dust from the surfaces of the building components that are planned to be recycled (e.g. metal building components), the components will be transported off Site to a recycling facility.

In order to recycle the concrete floor on the west side of the building, the concrete floor will need to be demolished, the asphalt underlying the concrete floor will need to be removed, the bottom of the concrete floor will need to be cleaned and then the concrete will need to be tested to confirm that the concrete can go to a recycling facility. Prior to demolition, the top surface of the concrete floor will be cleaned of any dust, soil or debris that may be present as a result of other building demolition and remediation activities. A pilot cleaning test will be performed to confirm that the concrete cleaning process can be completed to remove lead from the surface of the concrete to levels that allow recycling. The results of the pilot study would be used to support disposal as solid waste or hazardous waste if the concrete was not adequately cleaned to support recycling. Cleaning will be performed using cleaning methods described in Section 5.1.3.

Following cleaning, the concrete will be broken/crushed, as necessary, for characterization for off-Site recycling or disposal. Characterization would include sampling and analysis of lead (total and TCLP, if necessary) and other analytes as requested by the receiving facility. The collection frequency of characterization samples will be determined during the project design phase and will be completed in accordance with the receiving facility's requirements. Concrete will be transported to a recycling facility if lead results are below the cleanup level and concrete conditions meet the recycling facility's requirements. Concrete will be transported to a landfill if the concrete floor cannot be successfully separated from underlying asphalt floor, cleaning is not possible or successful, or the characterization results for the concrete are above the cleanup level or criteria established by the recycling facility. Based on the results of disposal characterization, concrete will either be transported to a non-hazardous waste landfill or a hazardous waste landfill.

The other building components that are planned to be demolished and transported off Site for disposal will be managed as hazardous/dangerous waste because of the presence of hazardous/dangerous waste levels of lead dust on their surfaces. These components will be transported off-Site to a landfill permitted to accept hazardous/dangerous waste (i.e., RCRA Subtitle C landfill) for macroencapsulation and disposal. Macroencapsulation includes permanent isolation of waste from the surrounding environment, including rain water, leachates, and any other materials in the surrounding landfill. The RCRA Subtitle C landfill closest to the Site is Chemical Waste Management located in Arlington, Oregon that is operated by Waste Management.

Prior to transportation, building components and demolition debris will be reduced to a size that can be accommodated in commercially available trucks and trailers and meets the requirements of the receiving facility. The contractor engaged in transport of hazardous/dangerous waste will be required to have a valid United States Environmental Protection Agency (EPA)/State identification number and follow the requirements of WAC 173-303-190 (Preparing Dangerous Waste for Transportation) including but not limited to proper packaging, labeling, marking, and placarding. Transportation activities will be completed in a manner that prevents the release of contaminants during transport (for example, closed containers will be used for transportation, if necessary).

5.2. Remedial Excavation and Management of Contaminated Soil

Remedial excavation will be completed both inside and outside the building to remove lead contaminated soil. Based on existing data, contaminated soil is planned to be removed from the following areas:

- Inside the Building
  - East wall sloped soil berm;
  - West wall sloped soil berm;
  - North wall sloped soil berm; and
  - Footprint of French floor drain in the eastern portion of the building;

- Outside the Building
  - Northeastern corner of the building; and
  - Northwestern corner of the building.

During construction, if contamination is observed in areas other than the areas mentioned above, Ecology will be notified and a plan to address the contamination will be discussed with Ecology. Ecology's concurrence will be obtained prior to implementing a plan to address the contamination.

Within the east, west and north sloped soil berms, soil will be removed to the preliminary limits of remedial excavation shown on Figure 3. At the northeastern and northwestern corners of the building, soil will be removed to the preliminary limits of remedial excavation shown on Figure 4. These preliminary limits of remedial excavation are based on results of environmental investigations presented in the RI/FS and CAP (GeoEngineers 2022). At the preliminary limits of the remedial excavations field screening using XRF and verification soil sampling will be completed as described in Section 6.2 to determine the final limits of remedial excavation. The volume of contaminated soil to be removed from preliminary limits of remedial excavation within the east, west and north sloped soil berms and at the northeastern and northwestern corners of the building is estimated to be 500 cubic yards.

Prior to performing contaminated soil removal activities from the French floor drain location, existing asphalt and the underlying 6-inch thick layer of pea gravel within the entire footprint of the 2-foot-wide French floor drain will be removed to expose the soil underneath the pea gravel. Both asphalt and pea gravel will be managed as contaminated materials. Following the removal of pea gravel, remedial excavation will be performed to remove soil represented by sample location 11535-01 as identified on Figure 3. A 6-inch-thick layer of soil will be removed from a 10-foot-long and 2-foot-wide section centered on location 11535-01. Approximately 0.4 cubic yards of contaminated soil will be removed. Following the removal of soil, the entire footprint of French floor drain will be field screened using XRF to evaluate if there is a need for additional excavation at location of 11535-01 to meet the cleanup level and to identify if additional locations along the footprint of French floor drain require remedial excavation to remove soil with lead concentrations greater than cleanup levels. Field screening using XRF will be completed at a frequency identified in Section 6.2. Verification soil sampling will only be performed along the French floor drain where excavation activities are performed to remove contaminated soil which includes the location of 11535-01 and any other location identified to require excavation based on XRF field screening. At the limits of soil excavation, field screening using XRF and verification soil sampling will be completed as described in Section 6.2 to determine the final limits of remedial excavation.

Excavated contaminated soil will be managed in one of the following two ways following excavation:

- Off-Site Treatment and Disposal as Hazardous/Dangerous Waste; or
- On-Site Soil Sieving and Treatment, and Off-Site Disposal as Non-Hazardous/Non-Dangerous Waste.

These management options are described further in the following sections.

5.2.1. Off-Site Treatment and Disposal of Hazardous/Dangerous Waste Soil

Under this option, excavated contaminated soil will be transported off Site to a landfill permitted to accept hazardous/dangerous waste (i.e., RCRA Subtitle C landfill) for treatment and disposal. The RCRA Subtitle C landfill closest to the Site is Chemical Waste Management located in Arlington, Oregon that is operated by Waste Management.

The contractor engaged in transport of hazardous/dangerous waste will be required to have a valid EPA/State identification number and follow the requirements of WAC 173-303-190 (Preparing Dangerous Waste for Transportation) including but not limited to proper packaging, labeling, marking, and placarding. Transportation activities will be completed in a manner that prevents the release of contaminants during transport (for example, closed containers will be used for transportation, if necessary).

Disposal characterization of soil will be completed using existing chemical analytical data (Environmental Investigation Report; GeoEngineers 2017). Additional disposal characterization may be completed during construction if required by the receiving landfill. The soil may be stockpiled prior to transport in the on Site material management area described in Section 5.3 to allow for additional disposal characterization and support contractor's planned sequence of work. The existing chemical analytical data and additional disposal characterization data (if collected) along with the completed disposal facility waste profile forms will be submitted to RCRA Subtitle C landfill to obtain disposal authorizations.

5.2.2. On-Site Soil Sieving and Treatment, and Off-Site Disposal of Non-Hazardous/Non-Dangerous Waste Soil

Under this option, excavated contaminated soil will be stockpiled on Site and treated to reduce the lead concentration below hazardous/dangerous waste levels. Additionally, recoverable bullet/bullet fragments will be separated from the soil originating from the northern side slope of the building prior to treatment. Following treatment and confirmation of lead concentrations below hazardous/dangerous waste levels, soil will be transported off-site to a landfill permitted to accept non-hazardous/non-dangerous waste (for e.g., RCRA Subtitle D landfill). The following sections describe the individual components of this option.

5.2.2.1. Soil Sieving

The goal of soil sieving is to separate recoverable bullets/bullet fragments from the soil. The northern side slope inside the building was used as a backstop for the fired bullets and therefore, it contains bullets/bullet fragments that can be recovered. Soil from northern side slope will be stockpiled separately from rest of the contaminated material to allow for recovery of bullets/bullet fragments prior to treatment of this soil. The contractor will be responsible for developing a bullets/bullet fragments recovery plan, which will be subject to City's review and approval prior to implementation. Bullets/bullet fragments recovery process is expected to include a combination of soil sieving (passing soil through a series of appropriately sized screens) and other mechanical/gravity separation processes to separate heavier metal from soil. Once separated, bullets/bullet fragments will be collected in containers that can closed/sealed (e.g., 55-gallon drums), temporarily stored on Site, and transported off Site for recycling.

5.2.2.2. Soil Treatment

The goal of soil treatment is to reduce the Toxicity Characteristics Leaching Procedure (TCLP) lead concentration of the soil to a level below the hazardous/dangerous waste criteria of 5 milligrams per liter (mg/l) such that the soil can be designated as non-hazardous/non-dangerous waste. The designation of soil as non-hazardous/non-dangerous waste will eliminate the need for the more expensive disposal option at a RCRA Subtitle C landfill and allow for less expensive disposal at a permitted RCRA Subtitle D landfill. The contractor will be responsible for developing a soil treatment plan which will be subject to the City's review and approval prior to its implementation.

Soil treatment is expected to include mixing of soil with a reagent that is capable of binding lead and reducing lead leachability. The contractor's soil treatment plan will identify the reagent that the contractor plans to use to treat lead, studies (e.g., treatability study) documenting that the reagent is effective in treating lead concentrations observed at the Site, reagent dosage rate applicable to the Site-specific conditions and an approach for mixing reagent with soil. The contractor will be required to follow treatment by generator (TGB) requirements of State Dangerous Waste Regulations (WAC 173-303). The TGB requirements include but are not limited to treating waste only in containers [WAC 173-303-200(1)(b)(i)], tanks [WAC 173-303-200(1)(b)(ii)], or containment buildings [WAC 173-303-200(1)(b)(iv)] and meeting dangerous waste accumulation timeline and conditions [WAC 173-303-200, -201, -202]. Soil treatment will be completed until the results of subsequent sampling and analysis confirm that lead TCLP levels are below 5 mg/l. Sampling and analysis activities are presented in the following section.

5.2.2.3. Treated Soil Stockpile Sampling and Analysis

Following treatment, soil sampling and analysis will be completed to evaluate TCLP lead levels and determine waste designation of treated soil. The number of soil samples to be collected to characterize treated soil will be in accordance with Ecology's guidance on the typical number of samples needed to adequately characterize stockpiled soil as summarized in the table below.

Typical Number of Samples Needed to Adequately Characterize Stockpiled Soil[1]	
Cubic Yards of Soil	**Number of Samples for Chemical Analysis**
0-100	3
101-500	5
501-1000	7
1001-2000	10
>2000	10+1 for each additional 500 cubic yards

[1] Source: Ecology's Guidance for Remediation of Petroleum Contaminated Sites (Ecology 2016)

The locations of stockpile samples will be evenly distributed horizontally over the extent of the stockpile such that reasonable representation of the entire stockpile is achieved. The depth of sampling will be 0.5 feet below the surface of the stockpile, at a minimum. Each sample will be collected by field personnel using their hands covered with a clean pair of nitrile gloves. If the stockpile cannot be safely accessed by field personnel, then an excavator bucket will be used to retrieve the soil sample(s). If an excavator bucket is used, soil samples will be collected from soil that is not in direct contact with the surface of excavator bucket. Soil samples will be placed in laboratory provided containers and placed in a cooler with ice until the samples are delivered to the laboratory. Samples will be submitted to an Ecology-accredited laboratory for analysis of TCLP lead using a chain-of-custody form provided by laboratory. Chemical analysis will be performed on a 2-day turn-around time to support decision making concerning waste designation of treated soil. If TCLP lead concentration of one or more samples representing the stockpiled treated soil is greater than 5 mg/l then additional treatment will be completed on the soil until subsequent stockpile sampling and analysis confirms that TCLP lead concentrations are below 5 mg/l.

5.2.2.4. Disposal of Non-Hazardous/Non-Dangerous Waste Soil

Treated soil with TCLP lead concentrations below 5 mg/l will be transported off Site for disposal at a landfill permitted to accept non-hazardous/non-dangerous waste (for e.g., RCRA Subtitle D landfill) as identified above. RCRA Subtitle D facilities include Columbia Ridge Landfill located in Arlington, Oregon, Greater Wenatchee Landfill located in East Wenatchee, Washington and Roosevelt Regional Landfill located in Roosevelt, Washington. Columbia Ridge and Greater Wenatchee Landfills are operated by Waste Management and Roosevelt Regional Landfill is operated by Republic Services.

Transportation activities will be completed in accordance with applicable regulation and in a manner that prevents the release of contaminants during transport.

Disposal characterization of soil will be completed using existing chemical analytical data (Environmental Investigation Report; GeoEngineers 2017) and results of post-treatment sampling and analysis (Section 5.2.2.3). The chemical analytical data along with the completed disposal facility waste profile forms will be submitted to the permitted landfill selected by the contractor and approved by the City to obtain disposal authorization.

5.3. Materials Management Area and Stockpiling Best Management Practices

The materials management area will be established on Site to allow for proper stockpiling and management of deconstructed building components, demolition debris and excavated contaminated soil. The materials management area will be established on the existing concrete floor located within the western portion of the building. A perimeter barrier will be installed, as necessary, to contain stockpiled materials as well as liquids generated from stockpiled material or building components cleaning process within the area. The existing wooden retaining wall, concrete ecology block wall and cinder block wall surrounding the western, northern and eastern perimeter of the concrete floor may be used as the perimeter barrier, if appropriate. Any new perimeter barriers will be constructed of concrete ecology blocks or similar and will include BMPs to prevent water from coming in contact with stockpiled material as well as to contain liquids generated from stockpiled material or building components cleaning process within the stockpiled area. Best management practices (BMPs) will be used to contain liquids inside the materials management area. A sump(s) will be installed such that liquids generated from stockpiled material or building component cleaning process can be channeled towards the sump and collected.

Following removal of the roof of the building, stockpiled contaminated material will be covered with an impermeable cover. The intent of impermeable cover is to eliminate wind dispersion and direct contact of precipitation with stockpiled material. The complete extent of the stockpile will be covered during off-work hours and the portions of stockpile that is not in use during work hours will also be covered. The covers will extend over the berm surrounding the stockpiled materials to ensure that the precipitation is diverted outside the stockpile area and will be anchored using sandbags or similar to prevent them from being removed by wind. If the individual section of the cover is not big enough to cover the entire stockpile, then multiple sections will be used. Adjacent sections of the liner will be overlapped with overlying section located uphill. The cover will be constructed of impermeable high-density polyethylene (HDPE) sheeting (thickness of 6-mil or greater) or similar. Any torn covers will be repaired or replaced upon identification of the breach.

Hazardous/dangerous waste stockpiling requirements will include, but are not limited to, labeling each stockpile of hazardous/dangerous waste with the words “dangerous waste” or “hazardous waste”, waste accumulation date and RCRA Site Identification (ID) number for the Site in addition to BMPs identified above. RCRA Site ID will be requested and obtained from the EPA prior to Site construction.

6.0 COMPLIANCE MONITORING PLAN

Compliance monitoring will be implemented in accordance with WAC 173-340-410 that identifies Ecology compliance monitoring requirements. WAC 173-340-410 identifies three types of compliance monitoring applicable to a cleanup action including protection monitoring, performance monitoring, and confirmational monitoring.

- Protection monitoring is performed to confirm that human health and the environment are adequately protected during the construction phase of the cleanup action.
- Performance monitoring is performed to confirm that the cleanup action has attained cleanup standards.
- Confirmational monitoring is performed to confirm the long-term effectiveness of the cleanup action.

Protection and performance monitoring activities are described in the following sections. Confirmational monitoring typically involves groundwater monitoring. As described in Section 2.0, groundwater at the Site is not identified to be impacted by the firing range activities and is not considered a media of concern. Therefore, confirmational monitoring is not considered applicable to the cleanup action.

6.1. Protection Monitoring

Protection monitoring will be completed as described in the following sections to confirm that human health and the environment are adequately protected during cleanup action construction.

6.1.1. Worker Health and Safety

Cleanup action construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA; RCW 49.17) and the Federal Occupational Safety and Health Act (OSHA; 29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants and other hazards at a construction site. A site-specific Health and Safety Plan (HASP) will be prepared for the cleanup action that addresses protection monitoring requirement for GeoEngineers' personnel. The contractor will be required to prepare and submit a separate HASP for use by the contractor's personnel. The health and safety plans will address protection of workers from lead-contaminated dust including appropriate personal protective equipment (PPE) required at the site for protection from dust/airborne contamination.

6.1.2. Environmental Protection

Environmental protection measures consisting of Best Management Practices (BMPs) for stormwater, sediment, drainage, and erosion control; dust and noise control; spill prevention and pollution control; and other controls needed to protect environmental quality will be implemented. Environmental protection measures including installation, inspection and maintenance necessary for stormwater management, control of surface water runoff, and temporary erosion and sediment control measures will be described in contractor's submittals prior to commencing construction activities.

6.2. Performance Monitoring

Performance monitoring will be conducted to verify that the cleanup action achieves Site cleanup levels and will include field screening and verification soil sampling and analysis as described below.

At the preliminary limits of the remedial excavation as described in Section 5.2, a handheld XRF device will be used to obtain in situ measurements of lead in soil. The XRF devise will be calibrated in accordance with the manufacturer's recommendations. Sampling will be completed at a frequency of one sample per 20 linear feet of excavation sidewall and one per 400 square feet of the excavation base. Sidewall samples will be collected from the middle of the sidewall height from all excavation sidewalls. At all sidewall sampling locations on the exterior of the excavation areas located outside the building (not including the sidewall that abuts the building), an additional sidewall sample will be collected from 0- to 2-inch interval. At a minimum, one base and four sidewall samples will be obtained assuming a four-sided excavation. At the sampling locations, soil will be collected and placed in a fresh plastic zip-lock bag, thoroughly homogenized and the lead measurements will be obtained of the homogenized soil using an XRF devise.

If XRF lead measurements are greater than the Site cleanup level, then the homogenized soil will be returned to the sampling location and additional excavation will be completed to remove the portion of sidewall or base represented by the elevated measurement. Additional excavation will be performed horizontally or vertically (as applicable) in 3- to 6-inch increments until subsequent XRF lead measurements are below Site cleanup levels.

If the XRF measurements are less than the Site cleanup levels, then a portion of the homogenized soil will be placed in a laboratory-provided jars for chemical analysis of lead and the remaining portion will be returned to the measurement/sampling location. The soil sampling frequency is the same as the XRF lead measurement frequency described above. Chemical analysis will be performed by an Ecology-accredited laboratory on an expedited turnaround time (two days) to support decision making concerning any additional excavation that may be required to achieve the cleanup levels. If the results of chemical analysis identify lead at concentrations greater than Site cleanup levels, then additional excavation will be completed to remove the portion of sidewall or base represented by the soil verification sample with the lead exceedance. Additional excavation will be performed horizontally or vertically (as applicable) in a 6-inch increment until subsequent XRF measurement and results of soil verification samples are below Site cleanup levels. One duplicate soil sample for laboratory analysis will be collected per every 20 parent soil samples collected from excavation limits for QA/QC purposes.

Soil samples will be collected by GeoEngineers' field personnel using a clean pair of nitrile gloves. Reusable sampling equipment (if used) will be decontaminated prior to sample collection at each location. Each sample container will be securely capped, labeled, and placed in a cooler with ice immediately upon collection and until the samples are delivered to the laboratory. Chain-of-custody forms will be used to document the transfer of samples during transport and submittal of samples to the laboratory. The field representative will visually classify the soil in accordance with ASTM International (ASTM) Method D 2488 (Standard Practice for Description and Identification of Soils [Visual Manual Procedure]) and record soil descriptions, XRF measurements and other relevant field screening details (e.g., staining, debris, odors, etc.) in the field log. Field screening, the type of sample container, sample labeling, and handling procedures are described in the Quality Assurance Project Plan (QAPP, Appendix B). Chemical analytical data validation will be completed as described in the QAPP. The results of verification soil samples representing the final limits of remedial excavation will be submitted to Ecology's Environmental Information Management (EIM) database following data validation.

7.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This section describes general QA/QC procedures to be implemented during the cleanup action including contractor quality control, construction monitoring and field documentation, and analytical QA/QC.

7.1. Contractor Quality Control

The contractor will be required to prepare plans and submittals describing their means and methods for completing the construction of the cleanup action. The contractor plans and submittals will include quality control procedures that will be utilized and the project management structure. The contractor's plans and submittals will be subject to review and approval by the City to ensure that the contractor's plan is in accordance with contract documents (plans and specifications).

The contractor will maintain QC records for the duration of the construction. These records will include contractor prepared daily reports to document work completed on a daily basis and documentation of any design change implemented during construction. Any design change will require approval from the City prior to its implementation by the contractor.

In addition to the contractor's QC activities, City and/or City's representatives will perform independent oversight of the contractor's activities to confirm that the construction activities are completed in accordance with the contract documents.

7.2. Construction Monitoring and Field Documentation

Construction monitoring will be performed by the City and its representatives. A comprehensive record of field activities will be maintained. Field documentation for this project will include field notes and measurements, field forms, field reports, and chain-of-custody forms for samples submitted for analytical testing. The field documentation will record construction and sampling activities, as well as decisions, corrective actions, and/or any changes/deviations to the contract documents. Field documentation procedures are described in the QAPP (Appendix A).

7.3. Analytical QA/QC

Analytical QA/QC is described in the QAPP (Appendix A). The QAPP describes sampling, analysis, and QC procedures that will be implemented to produce chemical and field data that are representative, valid, and accurate for use in evaluating the effectiveness of the cleanup action.

8.0 SCHEDULE

Cleanup action construction work is scheduled to begin in the summer/fall of 2022. The construction duration is estimated to occur over a period of two to three months. A detailed project schedule will be established at the time of contractor selection.

9.0 REPORTING

Upon completion of cleanup-related construction activities, a construction completion report summarizing the cleanup activities and results of sampling and analysis will be prepared in accordance with WAC 173-340-400. The construction completion report will present detailed excavation maps with excavation depths and sampling locations and excavation cross-sections including the excavation completed along the French floor drain. The figures will document the sampling locations and the lead results. Lead results will also be documented in a table. Representative photographs of construction activities will be included as an appendix to the construction completion report. Waste manifests and contaminated soil disposal receipts will also be included in the construction completion report. A draft version of the construction completion report will be submitted to Ecology for review and comment prior to finalization.

10.0 LIMITATIONS

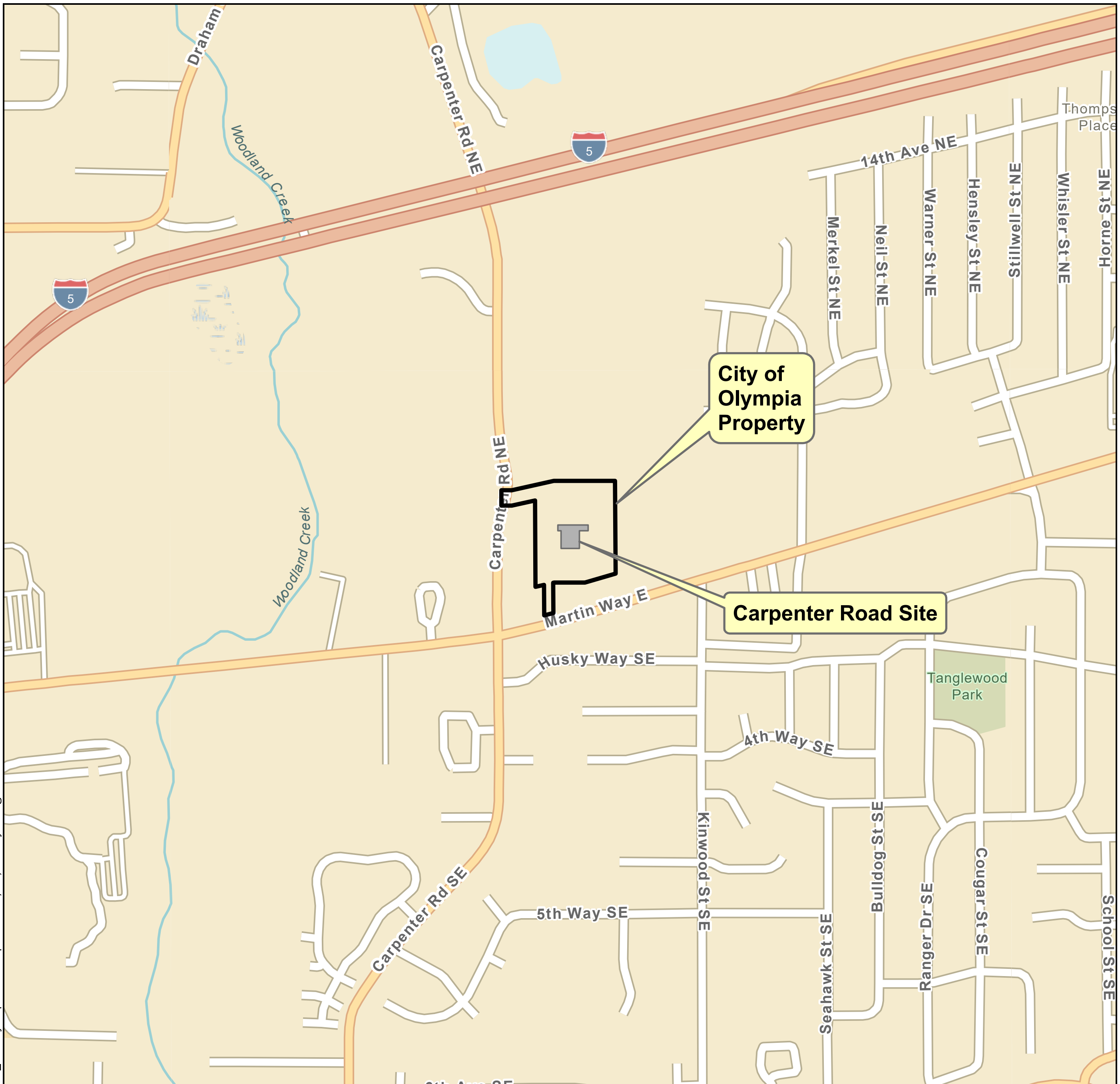
We have prepared this plan for use by the City of Olympia during the remedial action at the Carpenter Road Site. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

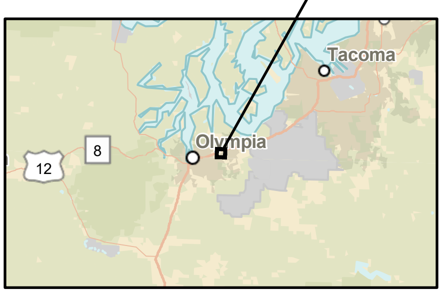
Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

11.0 REFERENCES

GeoEngineers, 2017. Environmental Investigation, Carpenter Road Site, Lacey, Washington; Prepared for City of Olympia and dated July 3, 2017.

GeoEngineers, 2022. Remedial Investigation/Feasibility Study (RI/FS) and Cleanup Action Plan (CAP), Carpenter Road Site, Lacey, Washington; Prepared for Washington State Department of Ecology and dated March 22, 2022.





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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: ESRI

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Carpenter Road Waste Operations Facility
Lacey, Washington

GeoEngineers

Figure 1

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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: Base map provided by Opsis Architecture

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Legend

- Piezometer Name and Approximate Location
- Property Boundary
- Site Boundary

Property and Site Layout

Carpenter Road Site
Lacey, Washington

GEOENGINEERS

Figure 2

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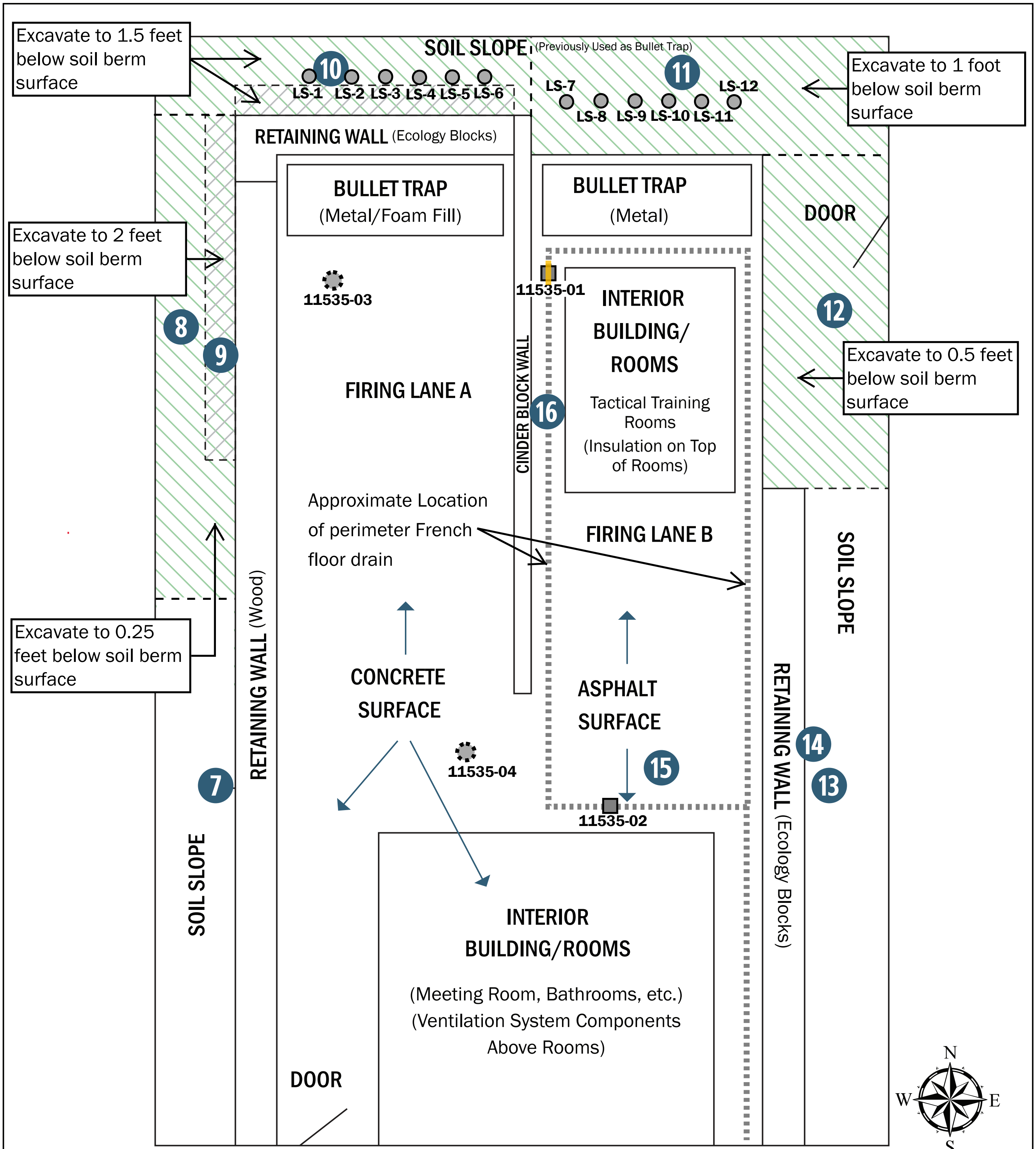

Legend

- 8 Approximate location of Hand Auger Boring HA-8
- Concrete Core and Wipe Sample Location
- Asphalt Saw-cut and Soil Sample Location
- Horizontal Soil Core Locations
- Approximate Extent of Contamination Preliminary Surface Soil Removal/ Remediation Area
- Approximate Extent of Contamination Preliminary Slough Soil Removal/ Remediation Area
- Approximate Extent of Contamination Preliminary Soil Removal/Remediation Area along French Floor drain

Notes:

1. The location 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.

Extent of Contamination - Inside Building

Cartpenter Road Site,
Lacey, Washington

GeoEngineers

Figure 3

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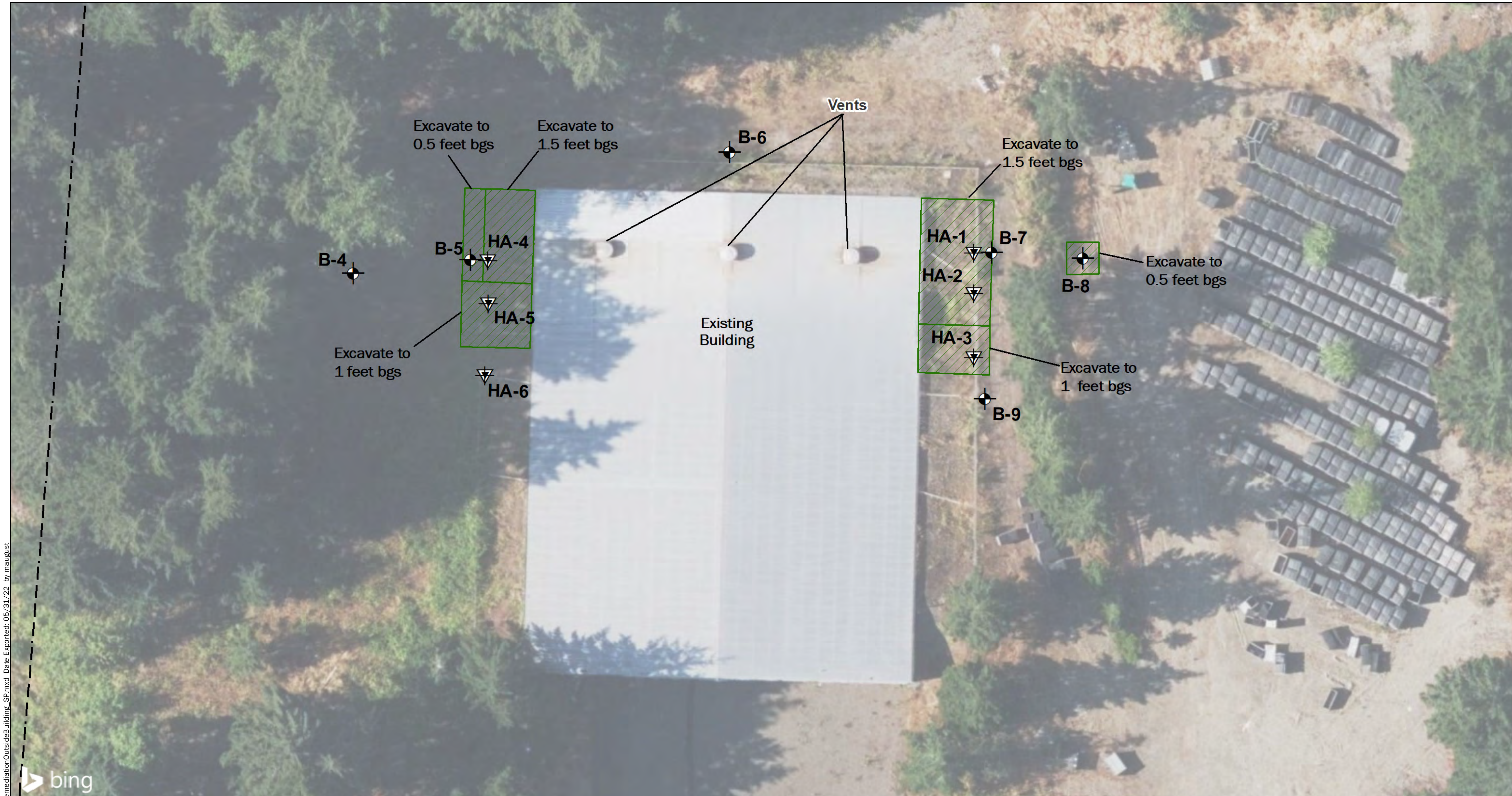

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers,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

Data Source: Base map provided by the City of Olympia.

Projection: NAD 1983 StatePlane Washington South FIPS 4602 Feet

Legend

Extent of Contamination

Preliminary Soil Removal/Remediation

B-1 Approximate Location of Direct Push Boring

HA-1 Approximate Location of Hand Auger

bgs = below ground surface

N E S W

30 0 30

Feet

Extent of Contamination – Outside Building

Carpenter Road Site
Lacey, Washington

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Figure 4

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APPENDIX A
Technical Memorandum - Additional Site Investigations at Carpenter Road Site

Technical Memorandum

To:	Jeff Johnstone and Gary Franks, City of Olympia Public Works
From:	Iain Wingard and Abhijit Joshi, GeoEngineers, Inc.
Date:	April 29, 2022
File:	Carpenter Road Site, GEI File Number 0415-068-04
Subject:	Additional Site Investigation at Carpenter Road Site

This memorandum presents a summary of field activities and results from additional investigation performed at the Carpenter Road Site (Site). The Site address is 6530 Martin Way East, Lacey, Washington, 98516. The investigation activities were performed to collect additional data to support material management for the planned cleanup action construction at the Site. Details of the field activities and results are provided below.

ADDITIONAL SITE INVESTIGATION

The scope of work included the following tasks:

- Evaluation of the Concrete Floor
- Evaluation of the Presence/Absence of a French Drain
- Estimation of Recoverable Bullets/Bullet Fragments from North Side Slope

Each of these tasks are further described in the following sections.

Evaluation of the Concrete Floor

EHS-International, Inc. (EHSI) personnel completed two 4-inch diameter cores in the floor located on the western half of the firing range building (Firing Lane A) to determine the presence or absence of asphalt below the concrete floor and, if present, to collect wipe samples for lead analysis from the surface area where the concrete and asphalt pavements are in contact. One core was completed in the northwest corner and one in southeast corner of the Firing Lane A. Approximate locations of the concrete cores are shown on Attachment 1. Both the core samples revealed the presence of an asphalt layer underneath the concrete floor. The thickness of concrete layer ranged from approximately 6 to 12 inches. The thickness of asphalt layer was approximately 4 inches. EHSI separated the concrete from the asphalt layer and two wipe samples were collected from each core location - one from each of the separated surfaces. A total of four wipe samples were submitted to NVL Laboratories (NVL) located in Seattle, Washington for lead analysis by United States Environmental Protection Agency (EPA) Method 3051/7000B. A summary report from EHSI with information including field activities, photographs, analytical results and laboratory reports is included in Attachment 2. Lead concentrations for the four wipe samples are summarized in the table below:

TABLE 1. LEAD RESULTS IN WIPE SAMPLES

Sample ID	Core/Sample Location	Lead Results (µg/wipe)	Lead Results (µg/sf)
11535-3 Top	NW corner of Firing Lane A/ Separated Concrete Surface	1,800	59,000
11535-3 Bottom	NW corner of Firing Lane A/Separated Asphalt Surface	1,800	59,000
11535-4 Top	SE corner of Firing Lane A/ Separated Concrete Surface	120	4,100
11535-4 Bottom	SE corner of Firing Lane A/Separated Asphalt Surface	160	5,400

Notes:

µg = micrograms

sf = square feet

Upon completion of coring activities, the cores were placed back into the holes after the samples were collected. Water and slurry generated during core drilling was placed in a 55-gallon drum and left inside the building in the southeast corner pending transport and disposal, which will be completed during cleanup action construction. The drum was almost full of water and slurry.

Evaluation of the Presence/Absence of a French Drain

EHSI personnel completed saw cuts at two locations in the eastern half of the firing range building (Firing Lane B) to determine the presence or absence of a French drain in the subsurface and if present, evaluate lead concentrations in the soil underneath the French drain. One saw cut was completed in the northwest corner and one in south end of the Firing Lane B. Saw cuts measured 2 feet long by 2 feet wide. The approximate saw cut locations are shown on Attachment 1. A French drain system consisting of pea gravel was identified below asphalt at both saw cut locations. Asphalt and pea gravel layers were observed to be 2 inches and 6 inches thick, respectively, at both locations. EHSI collected soil samples (one sample from each location) from the soil under the French drain pea gravel at the depth of 8 inches below ground surface and submitted the samples to NVL for lead analysis by EPA Method 3051/7000B. A summary report from EHSI with information including field activities, photographs, analytical results and laboratory reports is included in Attachment 2. Lead concentrations for the soil samples are summarized in the table below:

TABLE 2. LEAD RESULTS IN SOIL SAMPLES

Sample ID	Core/Sample Location	Lead Results (mg/kg)
11535-01	NW corner of Firing Lane B/Soil below French drain pea gravel	28,000
11535-02	S end of Firing Lane B/Soil below French drain pea gravel	< 33

Notes:
mg = milligrams
kg = kilogram

Following completion of soil sampling activities, the sawcut asphalt was placed back into the holes.

Estimation of Recoverable Bullets/Bullet Fragments From North Side Slope

GeoEngineers personnel collected soil samples from the northern soil side slope of the firing range building to estimate the quantity of recoverable bullets/bullet fragments in the soil. A total of twelve horizontal soil cores were completed to a depth of approximately 2-feet along the northern soil berm utilizing a 4-inch diameter, 30-inch long hand coring device. Six soil cores (LS-1 through LS-6) were completed north of Firing Lane A and six soil cores (LS-6 through LS-12) were completed north of Firing Lane B. The cores in Firing Lane A were positioned approximately 10 feet up the slope (above the surface of the firing lane) due to the presence of the 6-foot tall ecology-block retaining wall at the base of the soil slope. The cores in Firing Lane B were positioned approximately 4 feet up the slope. The approximate horizontal soil core locations are shown on Attachment 1.

After collection of each core, the core was laid out onto plastic sheeting to visually evaluate the vertical distribution of the bullets/bullet fragments in the soil core. Then the soil from the core was placed into a 5-gallon bucket to obtain an initial weight of the soil. Following this step, the soil was passed through a series of four sieves (1 inch, 0.5 inch, #4 and #10) to remove the bullets/bullet fragments. Upon removing the bullets/bullet fragments, the soil was placed back into the 5-gallon bucket and weighed to provide a weight of the soil without the bullets/bullet fragments. Rocks and gravel that collected on the sieves were also placed into the soil bucket. The difference between the initial and final weights correspond to the approximate weight of metal recovered at each soil core location. The results are presented in the table provided below. As noted in the table, bullet/bullet fragments were recovered from nine of the twelve soil sampling locations. Based on visual observations of the core, the bullets/bullet fragments were present in the top 6-to-12-inch interval. Bullets/bullet fragments were not observed in the soil cores below 12-inches in depth as identified in the following table.

TABLE 3. QUANTITY OF BULLETS/BULLET FRAGMENTS IN THE NORTHERN SOIL SLOPE

Sample ID	Core Depth (ft bgs)	Core Interval with Visual Evidence of Metal (ft bgs)	Initial Weight of Soil Sample (lb)	Weight of Soil Sample After Removal of Metal (lb)	Weight of Recovered Metal (lb)	Percentage of Metal in Soil Sample (by weight)
Firing Lane A						
LS-1	2	0 to 1	17.0	14.6	2.4	14.1%
LS-2	2	0 to 1	15.2	13.0	2.2	14.5%
LS-3	2	0 to 0.5	17.8	13.4	4.4	24.7%
LS-4	2	0 to 1	18.0	14.0	4.0	22.2%
LS-5	2	0 to 1	17.0	15.2	2.2	12.9%
LS-6	2	0 to 0.5	17.0	14.6	3.6	21.2%
Firing Lane B						
LS-7	2	0 to 0.5	15.0	14.6	0.4	2.7%
LS-8	2	0 to 0.5	16.4	15.0	1.4	8.5%
LS-9	2	0 to 0.5	16.0	12.6	3.4	21.2%
LS-10	2	NO	15.8	15.8	0	0%
LS-11	2	NO	15.6	15.6	0	0%
LS-12	2	NO	16.4	16.4	0	0%

Notes:

ft = feet
bgs = below ground surface
NO = not observed

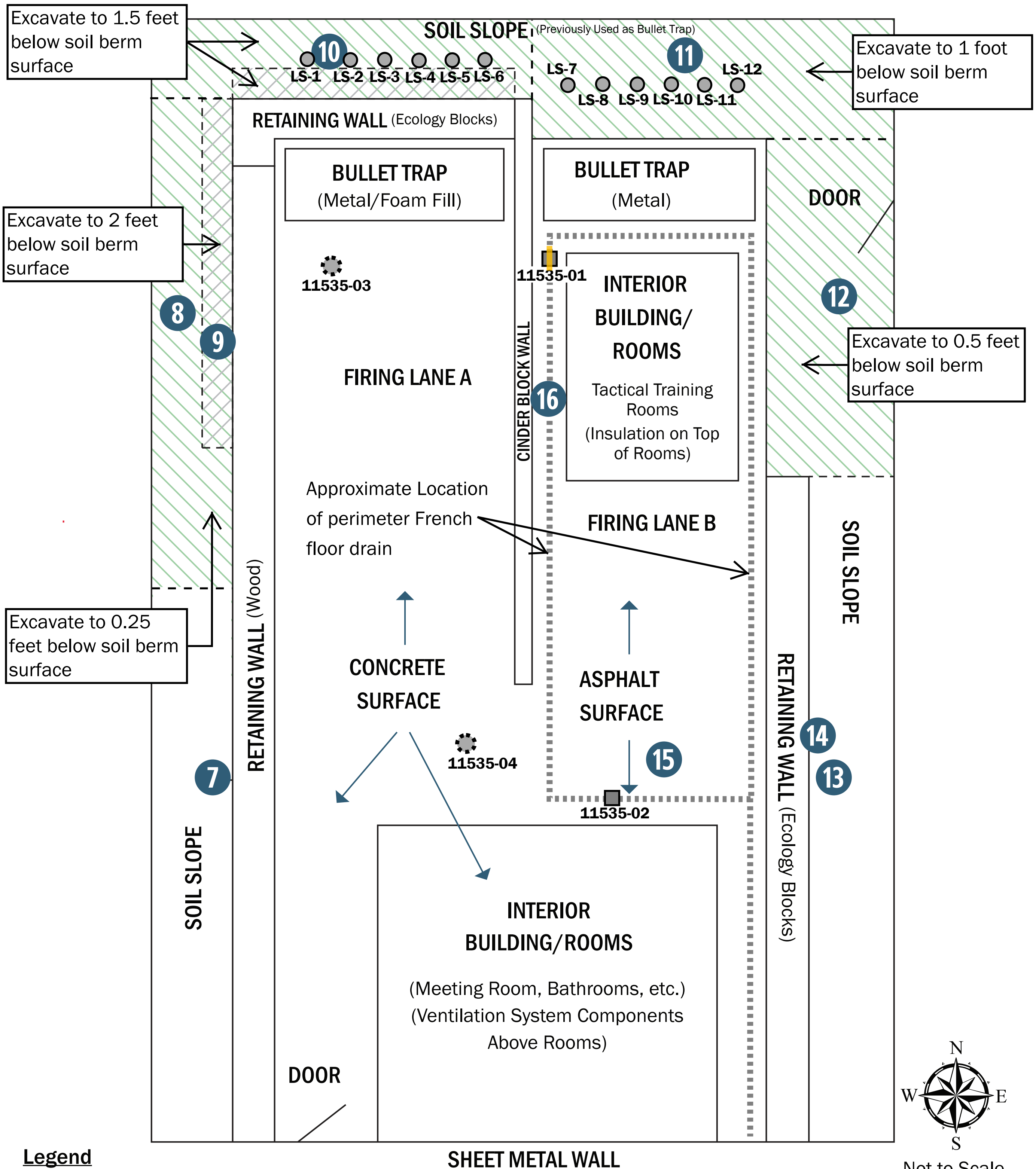
As presented in the table above, the percent of recovered bullet/bullet fragments by weight in soil samples located north of Firing Lane A ranged from 12.9% to 24.7%. The percent of recovered bullet/bullet fragment by weight in soil samples located north of Firing Lane B ranged from 2.7% to 21.2%. The soil and bullet/bullet fragments collected from each core were returned to the core location after completing evaluation of the core.

Attachments:

Attachment 1. Extent of Contamination – Inside Building

Attachment 2. EHSI Sampling Report

ATTACHMENT 1
Extent of Contamination – Inside Building



Legend

- 8 — Approximate location of Hand Auger Boring HA-8
- Concrete Core and Wipe Sample Location
- Asphalt Saw-cut and Soil Sample Location
- Horizontal Soil Core Locations
- Approximate Extent of Contamination Preliminary Surface Soil Removal/ Remediation Area
- Approximate Extent of Contamination Preliminary Slough Soil Removal/ Remediation Area
- Approximate Extent of Contamination Preliminary Soil Removal/Remediation Area along French Floor drain

Notes:

1. The location 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.

Extent of Contamination - Inside Building

Cartpenter Road Site,
Lacey, Washington

GeoEngineers

Attachment 1

P:\0\0415068\Graphics_Misc\041506801_F07_SoilRemediation_InsideBuilding.ai Exported 1/13/22 by spride

ATTACHMENT 2
EHSI Sampling Report

1011 Southwest Klickitat Way, Suite 104
Seattle, WA 98134
Phone 206-381-1128
Toll Free: 800-666-2959
Fax 206-254-4279

April 22, 2022

Mr. Abhijit R. Joshi, PE
Senior Environmental Engineer
GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite

Re: Sampling Report in Advance of Lead Abatement Design
Carpenter Road Site – City of Olympia
6530 Martin Way, Lacey, Washington

Dear Mr. Joshi:

GeoEngineers, Inc. has contracted EHS-International, Inc. (EHSI), an industrial hygiene and hazardous materials consulting firm, to provide consultation services related to the lead abatement design services for the Carpenter Road Site, located at 6530 Martin Way in Lacey, Washington (Site). The Site was formerly used by the City of Olympia Police Department as a training facility. In addition to sampling potentially lead-containing materials, EHSI is creating as-built drawings to support the lead abatement and demolition design and providing an inventory of building contents for potential salvage.

EHSI inspected interior and exterior areas while creating as-built drawings for the lead abatement and demolition design. EHSI supervised saw cuts of the asphalt flooring located in the eastern portion of the building (B firing line side), to determine presence or absence of a French drain. NCES, LLC, a licensed concrete cutting and core drilling company, served as EHSI's subcontractor to perform the saw cuts and core samples discussed below.

A French drain system was located on the B firing line side, and EHSI collected two (2) bulk samples of the soil underneath for lead analysis:

- Sample #11535-01: B firing line side, NW corner
- Sample #11535-02: B firing line side, SE corner

Samples were collected at soil level approximately 8" below grade, underneath asphalt 2" thick and approximately 6" of pea gravel.

EHSI also supervised core drilling of the raised concrete flooring located in the western portion of the building (A firing line side), to determine the presence or absence of asphalt below the concrete. One core was in the NW corner of the, and one in the SE corner. An asphalt layer approximately 4" thick was found beneath the concrete layer in both core samples. The concrete/asphalt juncture ranged from approximately 6-12" below the concrete floor surface.

EHSI manually separated the concrete from the asphalt layer in each core and collected four (4) lead wipe (area) samples from the exposed surfaces:

- #11535-3 Top: A line firing side, NW corner, bottom of concrete
- #11535-3 Bottom: A line firing side, NW corner, top of asphalt
- #11535-4 Top: A line firing side, SE corner, bottom of concrete
- #11535-4 Bottom: A line firing side, SE corner, top of asphalt

Lead (Pb) Sample Results:

- **28000 ppm - Lead was detected in the soil below the French drain (B line firing side, NW corner)**

- **4100-59000 µg/sq. ft - Lead was detected on both surfaces of the concrete/asphalt juncture below (A line firing side, NW+SE corners).**


EHSI staff wore a personal air sampling pump for the duration of activities. Tables with lead soil/wipe/air sample results, laboratory analytical reports, and an inventory of salvageable items are provided as attachments to this correspondence.

The OSHA Lead in Construction Standard applies to construction-related tasks that impact any detectable level of lead. During renovation or demolition activities, we recommend that the contractor use precautions and follow health and safety guidelines, since sampling has demonstrated that the soil, concrete, and asphalt materials in the building have lead contamination. Based on the historic use of the building it is also believed that the shooting backstops inside the building contain lead contamination and that settled dust in the building contains lead as well. EHSI recommends that the provided lead sample results be used in conjunction with other applicable (e.g., air monitoring) data to evaluate the potential for elevated airborne lead exposures during demolition activities.

EHSI appreciates the opportunity to provide environmental and industrial hygiene services to GeoEngineers. If you have any questions or comments regarding the information in this report, please feel free to contact me at any time.

Sincerely,

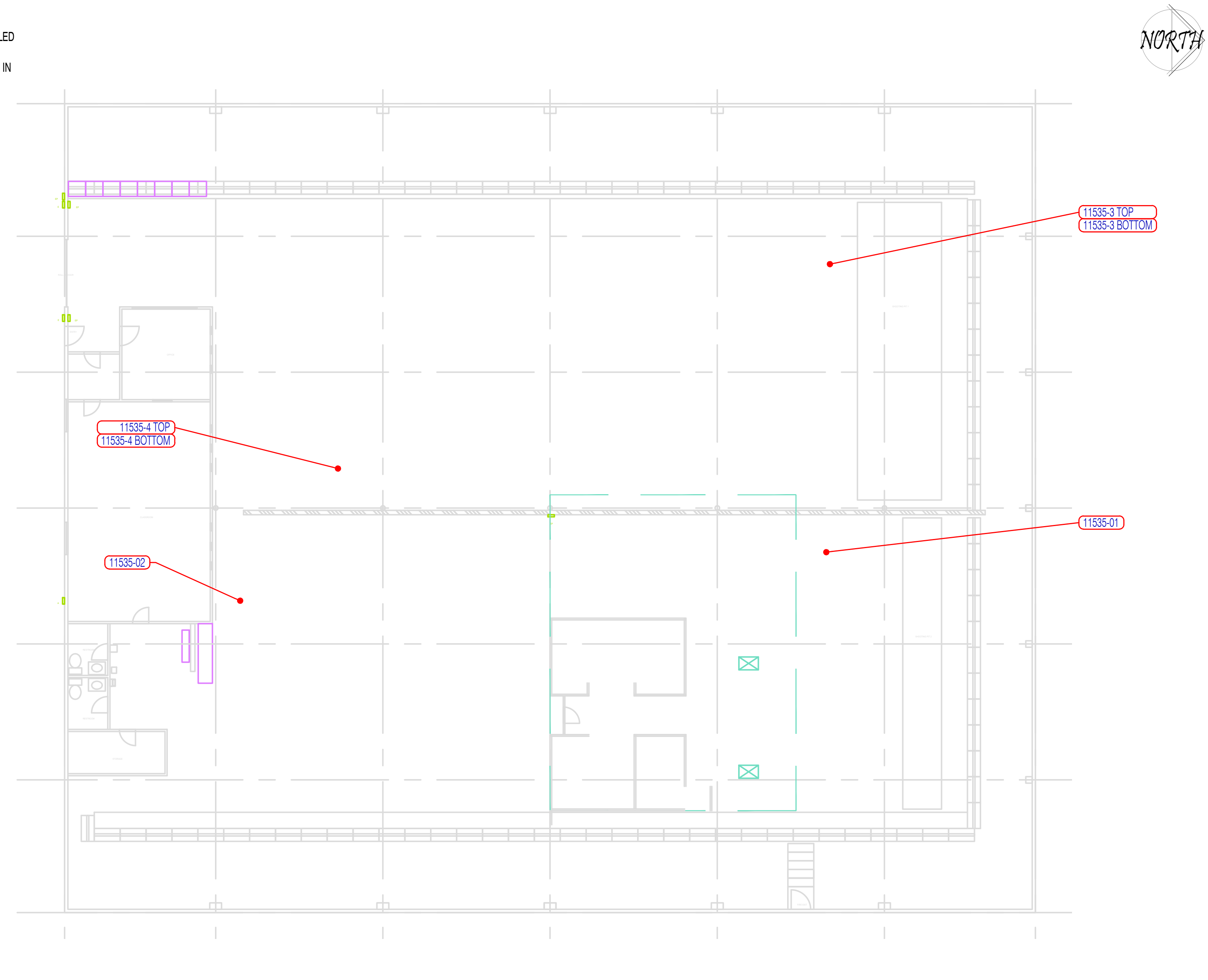
EHS-International, Inc.

Mike Harris, CIH
Senior Industrial Hygienist

Marcus Gladden
Senior Industrial Hygienist

Attachments: Drawing: Sample Locations
Table: Summary of Lead Soil and Wipe Sample Results
NVL Analytical Reports and Chain of Custody Forms
Salvageable Items Inventory

1. DRAWING IS SCHEMATIC AND SAMPLE LOCATIONS ARE APPROXIMATE.
2. REFER TO REPORT FOR MORE INFORMATION ABOUT THE SAMPLED MATERIALS.
3. BACKGROUND DRAWING WAS PREPARED BASED ON SKETCHES IN THE FIELD.



ehsi A Subsidiary of SoundEarth Strategies 1011 SW Klickitat Way, Suite 104 Seattle, Washington 98134 Ph: 206.381.1128 Fax: 206.254.4279	PROJECT INFO: LEAD ABATEMENT DESIGN SERVICES CARPENTER ROAD SITE - CITY OF OLYMPIA 6530 MARTIN WAY EAST LACEY, WA GEOENGINEERS, INC TACOMA, WA	SURVEY DATES: 03/14/22	PROJECT MANAGER: S. JOSHI DRAWN BY: F. DIMALANTA	INSPECTORS: M. MACFARLANE R. MYERS	LEGEND: 11535-XX BULK LEAD SAMPLE LOCATIONS; 11535-XX TOP LEAD WIPE SAMPLE LOCATIONS; 11535-XX BOTTOM LEAD WIPE SAMPLE LOCATIONS	DRAWING TITLE: FLOOR PLAN	ISSUE DATE: 04/21/2022 SCALE: NTS	EHSI PROJECT #: 11535-01 SHEET: SL-1

NVL
INDUSTRIAL HYGIENE SERVICES
LABORATORY + MANAGEMENT + TRAINING

March 18, 2022

Mike Harris
EHS International
1011 SW Klickitat Way. Suite 104
Seattle, WA 98134

NVL Batch # 2205003.00

RE: Total Metal Analysis
Method: NIOSH 7082 Lead by FAA <air>
Item Code: FAA-01

Client Project: 11535-01
Location: City of Olympia Gun Range Lead Abatement

Dear Mr. Harris,

NVL Labs received 1 sample(s) for the said project on 3/15/2022. Preparation of these samples was conducted following protocol outlined in NIOSH 7082, unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with NIOSH 7082 Lead by FAA <air>. The results are usually expressed in ug/filter and ug/m^3. Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

Shalini Patel, Manager Metals Lab

Enc.: Sample results

ilac-MRA

ENVIRONMENTAL LEAD Accredited Laboratory ISO/IEC 17025:2017 Pb Lead AIHA LAP, LLC AIHAACCREDITEDLABS.ORG Lab ID # 101861

Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516

Analysis Report

Total Lead (Pb)

Client: EHS International
Address: 1011 SW Klickitat Way. Suite 104
Seattle, WA 98134

Attention: Mr. Mike Harris
Project Location: City of Olympia Gun Range Lead Abatement

Batch #: 2205003.00
Matrix: Air
Method: NIOSH 7082
Client Project #: 11535-01
Date Received: 3/15/2022
Samples Received: 1
Samples Analyzed: 1

Lab ID	Client Sample #	Vol (L)	RL ug/m^3	Results in ug/filter	Results in ug/m^3
22330428	11535-05	200	25	< 5.0	< 25

Sampled by: Client
Analyzed by: Yasuyuki Hida — Date Analyzed: 03/18/2022
Reviewed by: Shalini Patel — Date Issued: 03/18/2022

Shalini Patel, Manager Metals Lab

ug/m^3 = Micrograms per cubicmeter
RL = Reporting Limit
ug/filter = Micrograms per filter
'<' = Below the reporting Limit

Note : Method QC results are acceptable unless stated otherwise. Concentration (ug/m^3) not reported if sample volume is zero.
Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.
Preparation of above samples was conducted using microwave digestion in accordance with EPA Method 3051.

Bench Run No: 2022-0318-02

LEAD LABORATORY SERVICES

Company	EHS International	**NVL Batch Number**	**2205003.00**
Address	1011 SW Klickitat Way. Suite 104 Seattle, WA 98134	**TAT**	5 Days **AH** No
		Rush TAT	
Project Manager	Mr. Mike Harris	**Due Date**	3/22/2022 **Time** 1:10 PM
Phone	(206) 381-1128	**Email**	mikeh@ehsintl.com
Cell	(360) 442-6790	**Fax**	(206) 254-4279

Project Name/Number: 11535-01 **Project Location:** City of Olympia Gun Range Lead Abatement

Subcategory Flame AA (FAA)

Item Code FAA-01 NIOSH 7082 Lead by FAA <air>

Total Number of Samples 1 Rush Samples

	Lab ID	Sample ID	Description	A/R
1	22330428	11535-05		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	3/15/22	1310
Analyzed by	Yasuyuki Hida		NVL	3/18/22	
Results Called by					
☐ **Faxed** ☐ **Emailed**					

Special Instructions:

Date: 3/15/2022
Time: 2:21 PM
Entered By: Fatima Khan

NVL Laboratories, Inc.
4708 Aurora Ave N, Seattle, WA 98103
Tel: 206.547.0100 Emerg.Pager: 206.344.1878
Fax: 206.634.1936 1.888.NVL.LABS (685.5227)

CHAIN of CUSTODY SAMPLE LOG

2205003

Client EHS International, Inc.
Street 1011 SW Klickitat Way
Suite 104
Seattle, WA 98134
Project Manager Mike Harris
Project Location City of Olympia Gun Range
Lead Abatement
Phone: (206) 381-1128 **Fax:** (206) 254-4279

NVL Batch Number
Client Job Number 11535-01
Total Samples 1
Turn Around Time ☐ 1-Hr ☐ 24-Hrs ☐ 4 Days ☐ 2-Hrs ☐ 2 Days ☑ 5 Days ☐ 4-Hrs ☐ 3 Days ☐ 6 to 10 Days
Please call for TAT less than 24 Hrs
Email address mikeh@ehsintl.com

☐ **Asbestos Air**	☐ PCM (NIOSH 7400) ☐ TEM (NIOSH 7402) ☐ TEM (AHERA) ☐ TEM (EPA Level II) ☐ Other
☐ **Asbestos Bulk**	☐ PLM (EPA/600/R-93/116) ☐ PLM (EPA Point Count) ☐ PLM (EPA Gravimetry) ☐ TEM Bulk
☐ **Mold/Fungus**	☐ Mold Air ☐ Mold Bulk ☐ **Rotometer Calibration**

METALS	Inst./Det Limit	Matrix		RCRA Metals	☐ All 8	Other Metals
☑ Total Metals ☐ TCLP	☑ FAA (ppm) ☐ ICP (ppm) ☐ GFAA (ppb)	☑ Air Filter ☐ Drinking water ☐ Dust/wipe (Area) ☐ Soil ☐ Paint Chips in %	☐ Paint Chips in cm ☐ Waste Water ☐ Other	☐ Arsenic (As) ☐ Barium (Ba) ☐ Cadmium (Cd) ☐ Chromium (Cr) ☑ Lead (Pb)	☐ Mercury (Hg) ☐ Selenium (Se) ☐ Silver (Ag)	☐ All 3 ☐ Copper (Cu) ☐ Nickel (Ni) ☐ Zinc (Zn)

☐ **Other Types of Analysis** ☐ Fiberglass ☐ Nuisance Dust ☐ Other (Specify) ☐ Silica ☐ Respirable Dust

Condition of Package: ☐ Good ☐ Damaged (no spillage) ☐ Severe damage (spillage)

Seq. #	Lab ID	Client Sample Number	Comments (e.g Sample area, Sample Volume, etc)	A/R
1		11535-05		
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

	Print Below	Sign Below	Company	Date	Time
Sampled by	Matt M.	[signature]	EHSI	3·14·22	~~1100~~ 1200
Relinquished by	Reese M	[signature]	EHSI	3-15-22	1305
Received by	Kumpfer	[signature]		3/15/22	1310
Analyzed by					
Results Called by					
Results Faxed by					

Special Instructions: Unless requested in writing, all samples will be disposed of two (2) weeks after analysis.

Please e-mail results. cc: mattm@ehsintl.com, reesem@ehsintl.com

2205003

ehsi
EHS–International, Inc.
13228 NE 20th Street, Suite #100
Bellevue, Washington 98005
(425) 455-2959 (800) 666-2959
FAX: (425) 646-7247

Date: 3/14/22
EHSI Customer/ PO #: 11535-01
Project Name: City of Olympia Gun Range
Technician: Matt Macfarlane
Contractor:

LEAD AND ARSENIC AIR MONITORING DATA SHEET

Sample #	Sample Code	Time On / Off	LPM On / Off	Total Minutes	Total Liter	Pump No.	Location/Activity of Person and Social Security No.	Conc. f/cc
11535-05	PERS	1015 / 1155	2 / 2	100	~~1200~~ 200	0769	Matt Macfarlane personal	

SAMPLE CODES	
PRE = Pre-Abatement	PERS = Personal
CLR = Clearance	HEPA = Neg-Air Exhaust
AMB = Ambient	IA = Inside Area
BLK = Blank	OA = Outside Area

TURNAROUND TIME

- ☐ RUSH
- ☐ 24 HRS
- ☐ 48 HRS
- ☐ OTHER: ____________

TECHNICIAN CERTIFICATION: I certify that the above samples were taken in compliance with applicable standards and regulations as well as the project specifications.

[signature]
Technician Signature

3/14/22
Date Signed

March 22, 2022

Mike Harris
EHS International
1011 SW Klickitat Way. Suite 104
Seattle, WA 98134

NVL Batch # 2205002.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <soil>
Item Code: FAA-03

Client Project: 11535-01
Location: City of Olympia Gun Range Lead Abatement

Dear Mr. Harris,

NVL Labs received 2 sample(s) for the said project on 3/15/2022. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <soil>. The results are usually expressed in mg/Kg and ppm. Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

Shalini Patel, Manager Metals Lab

Enc.: Sample results

Phone: 206 547.0100 | Fax: 206 634.1936 | Toll Free: 1.888.NVL.LABS (685.5227)
4708 Aurora Avenue North | Seattle, WA 98103-6516

Analysis Report

Total Lead (Pb)

Client: EHS International
Address: 1011 SW Klickitat Way. Suite 104
Seattle, WA 98134

Attention: Mr. Mike Harris
Project Location: City of Olympia Gun Range Lead Abatement

Batch #: 2205002.00
Matrix: Soil
Method: EPA 3051/7000B
Client Project #: 11535-01
Date Received: 3/15/2022
Samples Received: 2
Samples Analyzed: 2

Lab ID	Client Sample #	Sample Wt (g)	RL mg/ kg	Results in mg/Kg	Results in ppm
22330426	11535-01	0.2850	35	28000	28000
22330427	11535-02	0.3019	33	< 33	< 33

Sampled by: Client
Analyzed by: Yasuyuki Hida — Date Analyzed: 03/22/2022
Reviewed by: Shalini Patel — Date Issued: 03/22/2022

Shalini Patel, Manager Metals Lab

mg/ kg = Milligrams per kilogram
ppm = Parts per million
RL = Reporting Limit
'<' = Below the reporting Limit

Note : Method QC results are acceptable unless stated otherwise.
Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

Bench Run No: 2022-0322-01

LEAD LABORATORY SERVICES

Company	EHS International	**NVL Batch Number**	**2205002.00**
Address	1011 SW Klickitat Way. Suite 104 Seattle, WA 98134	**TAT**	5 Days **AH** No
		Rush TAT	
Project Manager	Mr. Mike Harris	**Due Date**	3/22/2022 **Time** 1:10 PM
Phone	(206) 381-1128	**Email**	mikeh@ehsintl.com
Cell	(360) 442-6790	**Fax**	(206) 254-4279

Project Name/Number: 11535-01 **Project Location:** City of Olympia Gun Range Lead Abatement

Subcategory Flame AA (FAA)

Item Code FAA-03 EPA 7000B Lead by FAA <soil>

Total Number of Samples 2

Rush Samples

	Lab ID	Sample ID	Description	A/R
1	22330426	11535-01		A
2	22330427	11535-02		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	3/15/22	1310
Analyzed by	Yasuyuki Hida		NVL	3/22/22	
Results Called by					
☐ **Faxed** ☐ **Emailed**					

Special Instructions:

Date: 3/15/2022
Time: 2:18 PM
Entered By: Fatima Khan

2205002

NVL Laboratories, Inc.

4708 Aurora Ave N, Seattle, WA 98103
Tel: 206.547.0100 Emerg.Pager: 206.344.1878
Fax: 206.634.1936 1.888.NVL.LABS (685.5227)

CHAIN of CUSTODY SAMPLE LOG

NVL LABS

Client	EHS International, Inc.	NVL Batch Number	
Street	1011 SW Klickitat Way, Suite 104, Seattle, WA 98134	Client Job Number	11535-01
Project Manager	Mike Harris	Total Samples	2
Project Location	City of Olympia Gun Range Lead Abatement	Turn Around Time	☐ 1-Hr ☐ 24-Hrs ☐ 4 Days ☐ 2-Hrs ☐ 2 Days ☒ 5 Days ☐ 4-Hrs ☐ 3 Days ☐ 6 to 10 Days
			Please call for TAT less than 24 Hrs
Phone: (206) 381-1128	Fax: (206) 254-4279	Email address	mikeh @ehsintl.com, MattM@ehsintl.com, ReeseM@ehsintl.com

☐ Asbestos Air: ☐ PCM (NIOSH 7400) ☐ TEM (NIOSH 7402) ☐ TEM (AHERA) ☐ TEM (EPA Level II) ☐ Other

☐ Asbestos Bulk: ☐ PLM (EPA/600/R-93/116) ☐ PLM (EPA Point Count) ☐ PLM (EPA Gravimetry) ☐ TEM Bulk

☐ Mold/Fungus: ☐ Mold Air ☐ Mold Bulk ☐ Rotometer Calibration

METALS	Inst./Det Limit	Matrix		RCRA Metals ☐ All 8		Other Metals ☐ All 3
☒ Total Metals	☒ FAA (ppm)	☐ Air Filter	☐ Paint Chips in cm	☐ Arsenic (As)	☐ Mercury (Hg)	☐ Copper (Cu)
☐ TCLP	☐ ICP (ppm)	☐ Drinking water	☐ Waste Water	☐ Barium (Ba)	☐ Selenium (Se)	☐ Nickel (Ni)
	☐ GFAA (ppb)	☐ Dust/wipe (Area)	☐ Other	☐ Cadmium (Cd)	☐ Silver (Ag)	☐ Zinc (Zn)
		☒ Soil		☐ Chromium (Cr)		
		☐ Paint Chips in %		☒ Lead (Pb)		

☐ Other Types of Analysis: ☐ Fiberglass ☐ Silica ☐ Nuisance Dust ☐ Respirable Dust ☐ Other (Specify)

Condition of Package: ☐ Good ☐ Damaged (no spillage) ☐ Severe damage (spillage)

Seq. #	Lab ID	Client Sample Number	Comments (e.g Sample area, Sample Volume, etc)	A/R
1		11535-01	Sawcut NE side	
2		11535-02	Sawcut SE side	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

	Print Below	Sign Below	Company	Date	Time
Sampled by	Reese Myers	[signature]	EHSI	3-14-22	1026
Relinquished by	Reese Myers	[signature]	EHSI	3-15-22	1305
Received by	[illegible]	[signature]	NVL	3/15/22	1310
Analyzed by					
Results Called by					
Results Faxed by					

Special Instructions: Unless requested in writing, all samples will be disposed of two (2) weeks after analysis.

Please e-mail results.

March 18, 2022

Mike Harris
EHS International
1011 SW Klickitat Way. Suite 104
Seattle, WA 98134

NVL Batch # 2205006.00

RE: Total Metal Analysis
Method: EPA 7000B Lead by FAA <wipe>
Item Code: FAA-04

Client Project: 11535
Location: City of Olympia Gun Range Lead Abatement

Dear Mr. Harris,

NVL Labs received 4 sample(s) for the said project on 3/15/2022. Preparation of these samples was conducted following protocol outlined in EPA 3051/7000B , unless stated otherwise. Analysis of these samples was performed using analytical instruments in accordance with EPA 7000B Lead by FAA <wipe>. The results are usually expressed in ug/wipe and ug/sq. ft. Test results are not blank corrected.

For recent regulation updates pertaining to current regulatory levels or permissible exposure levels, please call your local regulatory agencies for more detail.

At NVL Labs all analyses are performed under strict guidelines of the Quality Assurance Program. This report is considered highly confidential and will not be released without your approval. Samples are archived after two weeks from the analysis date. Please feel free to contact us at 206-547-0100, in case you have any questions or concerns.

Sincerely,

Shalini Patel, Manager Metals Lab

Enc.: Sample results

Analysis Report

Total Lead (Pb)

Client: EHS International
Address: 1011 SW Klickitat Way. Suite 104
Seattle, WA 98134

Attention: Mr. Mike Harris
Project Location: City of Olympia Gun Range Lead Abatement

Batch #: 2205006.00
Matrix: Wipe
Method: EPA 3051/7000B
Client Project #: 11535
Date Received: 3/15/2022
Samples Received: 4
Samples Analyzed: 4

Lab ID	Client Sample #	Element	Sample sq ft	RL ug/ sq ft	Results in ug/wipe	Results in ug/sq. ft
22330435	11535-3 Top	Lead (Pb)	0.03	170	1800	59000
22330436	11535-3 Bottom	Lead (Pb)	0.03	170	1800	59000
22330437	11535-4 Top	Lead (Pb)	0.03	170	120	4100
22330438	11535-4 Bottom	Lead (Pb)	0.03	170	160	5400

Sampled by: Client
Analyzed by: Yasuyuki Hida — Date Analyzed: 03/18/2022
Reviewed by: Shalini Patel — Date Issued: 03/18/2022

Shalini Patel, Manager Metals Lab

ug/ sq. ft. =Micrograms per square foot
ug / wipe = Micrograms per wipe

RL = Reporting Limit
'<' = Below the reporting Limit

Note : Method QC results are acceptable unless stated otherwise. Concentration (ug/ft^2) not reported if sample area is zero. Unless otherwise indicated, the condition of all samples was acceptable at time of receipt.

Bench Run No: 2022-0318-03
FAA-04

LEAD LABORATORY SERVICES

Company EHS International
Address 1011 SW Klickitat Way. Suite 104
Seattle, WA 98134
Project Manager Mr. Mike Harris
Phone (206) 381-1128
Cell (360) 442-6790

NVL Batch Number 2205006.00
TAT 5 Days **AH** No
Rush TAT
Due Date 3/22/2022 **Time** 1:10 PM
Email mikeh@ehsintl.com
Fax (206) 254-4279

Project Name/Number: 11535 **Project Location:** City of Olympia Gun Range Lead Abatement

Subcategory Flame AA (FAA)
Item Code FAA-04 EPA 7000B Lead by FAA <wipe>

Total Number of Samples 4 Rush Samples

	Lab ID	Sample ID	Description	A/R
1	22330435	11535-3 Top		A
2	22330436	11535-3 Bottom		A
3	22330437	11535-4 Top		A
4	22330438	11535-4 Bottom		A

	Print Name	Signature	Company	Date	Time
Sampled by	Client				
Relinquished by	Client				

Office Use Only	Print Name	Signature	Company	Date	Time
Received by	Kelly AuVu		NVL	3/15/22	1310
Analyzed by	Yasuyuki Hida		NVL	3/18/22	
Results Called by					
☐ **Faxed** ☐ **Emailed**					

Special Instructions:

Date: 3/15/2022
Time: 3:00 PM
Entered By: Kelly AuVu

NVL Laboratories, Inc.
4708 Aurora Ave N, Seattle, WA 98103
Tel: 206.547.0100 Emerg.Pager: 206.344.1878
Fax: 206.634.1936 1.888.NVL.LABS (685.5227)

CHAIN of CUSTODY SAMPLE LOG

2205006

HAZARDOUS MATERIALS SERVICES

Client EHS International, Inc.
Street 1011 SW Klickitat Way
Suite 104
Seattle, WA 98134
Project Manager Mike Harris
Project Location City of Olympia Gun Range Lead Abatement
Phone: (206) 381-1128 **Fax:** (206) 254-4279

NVL Batch Number
Client Job Number 11535
Total Samples 4
Turn Around Time ☐ 1-Hr ☐ 24-Hrs ☐ 4 Days ☐ 2-Hrs ☐ 2 Days ☑ 5 Days ☐ 4-Hrs ☐ 3 Days ☐ 6 to 10 Days
Please call for TAT less than 24 Hrs
Email address Mike h @ehsintl.com
MattM@ehsintl.com
ReeseM@ehsintl.com

☐ **Asbestos Air** ☐ PCM (NIOSH 7400) ☐ TEM (NIOSH 7402) ☐ TEM (AHERA) ☐ TEM (EPA Level II) ☐ Other ______

☐ **Asbestos Bulk** ☐ PLM (EPA/600/R-93/116) ☐ PLM (EPA Point Count) ☐ PLM (EPA Gravimetry) ☐ TEM Bulk

☐ **Mold/Fungus** ☐ Mold Air ☐ Mold Bulk ☐ **Rotometer Calibration**

METALS	Inst./Det Limit	Matrix		RCRA Metals ☐ All 8		Other Metals
☑ Total Metals	☑ FAA (ppm)	☐ Air Filter	☐ Paint Chips in cm	☐ Arsenic (As)	☐ Mercury (Hg)	☐ All 3
☐ TCLP	☐ ICP (ppm)	☐ Drinking water	☐ Waste Water	☐ Barium (Ba)	☐ Selenium (Se)	☐ Copper (Cu)
	☐ GFAA (ppb)	☑ Dust/wipe (Area) 4" square	☐ Other	☐ Cadmium (Cd)	☐ Silver (Ag)	☐ Nickel (Ni)
		☐ Soil		☐ Chromium (Cr)		☐ Zinc (Zn)
		☐ Paint Chips in %		☑ Lead (Pb)		

☐ **Other Types of Analysis** ☐ Fiberglass ☐ Nuisance Dust ☐ Other (Specify) ______ ☐ Silica ☐ Respirable Dust

Condition of Package: ☐ Good ☐ Damaged (no spillage) ☐ Severe damage (spillage)

Seq. #	Lab ID	Client Sample Number	Comments (e.g Sample area, Sample Volume, etc)	A/R
1		11535-3 TOP	Area: 4" square	
2		11535-3 Bottom	↓	
3		11535-4 Top	↓	
4		11535-4 Bottom	↓	
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

	Print Below	Sign Below	Company	Date	Time
Sampled by	Reese Myers	Reese Myers	EHSI	3-14-22	1052
Relinquished by	Reese Myers	Reese Myers	EHSI	3-15-22	1305
Received by	Kelly Allen	[signature]	NVL	3/15/22	1310
Analyzed by					
Results Called by					
Results Faxed by					

Special Instructions: Unless requested in writing, all samples will be disposed of two (2) weeks after analysis.

Please e-mail results.

Table 1
Summary of Lead Soil Sampling Analytical Results
Sampling Report in Advance of Lead Abatement Design
City of Olympia Gun Range Lead Abatement Design
6530 Martin Way, Lacey, Washington
EHSI Project Number: 11535

Sample Number	Floor	Location	Component / Substrate	Color	Results (mg/kg)
6530 Martin Way, Lacey, Washington					
11535-01	**1**	**Sawcut NE Side**	**Soil (under french drain)**	**Black**	**28000.00**
11535-02	1	Sawcut SE Side	Soil (under french drain)	Black	<33.00

NOTES:

Bold text indicates sample contains detectable levels of Lead.

< = less than

Pb = lead

Table 2
Summary of Lead Wipe Sampling and Analytical Results
Sampling Report in Advance of Lead Abatement Design
City of Olympia Gun Range Lead Abatement
6530 Martin Way, Lacey, Washington
EHSI Project Number: 11535

Sample Number	Floor	Location	Component / Substrate	Color	Results (in µg/sq. ft)
6530 Martin Way, Lacey, Washington					
11535-03 Top	**1**	**Core (NW Side)**	**Concrete / Asphalt**	**Gray**	**59000.00**
11535-03 Bottom	**1**	**Core (NW Side)**	**Asphalt / Soil**	**Black**	**59000.00**
11535-04 Top	**1**	**Core (SW Side)**	**Concrete / Asphalt**	**Gray**	**4100.00**
11535-04 Bottom	**1**	**Core (SW Side)**	**Asphalt / Soil**	**Black**	**5400.00**

NOTES:

Bold text indicates sample contains detectable levels of Lead.

< = less than

Pb = lead

Salvage:

- Air compressors x 2: Need Names/Brands if possible
- metal rolling cart: 5' x 7'
- Shooting pit #1: 13' x 46'
- X2 table mounted magazine loaders
- x10: 1' x 19" overhead heaters
- x 3" (unopened): ~~[illegible]~~ 2" x 6" Flip top training tables
- x1: CFM 137 stand up vaccum cleaner made by Nilfisk Advance
- x4 Boxes (3 unopened): Project child safe gun locks (100 per box)

APPENDIX B
Quality Assurance Project Plan (QAPP)

Quality Assurance Project Plan (QAPP)

Carpenter Road Site
Olympia, Washington

for
City of Olympia

April 29, 2022

GeoEngineers
Earth Science + Technology

Quality Assurance Project Plan (QAPP)

Carpenter Road Site
Olympia, Washington

for
City of Olympia

April 29, 2022

GeoEngineers

1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Quality Assurance Project Plan (QAPP)

Carpenter Road Site
Olympia, Washington

File No. 0415-068-04

April 29, 2022

Prepared for:

City of Olympia
900 Plum Street SE
Olympia, Washington 98507

Attention: Jeff Johnstone and Gary Franks

Prepared by:

GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Abhijit R. Joshi, PE
Senior Environmental Engineer

Iain H. Wingard
Associate Environmental Scientist

ARJ:IHW:ch

GeoEngineers

Table of Contents

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Description
ARI	Analytical Resources, Inc.
COC	chain-of-custody
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management system
EPA	United States Environmental Protection Agency
GeoEngineers	GeoEngineers, Inc.
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
OSHA	Occupational Safety and Health Administration
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PPE	personal protective equipment
%D	percent difference
%R	percent recovery
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
RIFS	remedial investigation and feasibility study
RL	reporting limit
RPD	relative percent difference
Site	Carpenter Road Site
SOP	standard operating procedure
TRL	target reporting limit
XRF	X-ray fluorescence

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is prepared as an appendix to the Materials Management and Compliance Monitoring Plan (MMCMP) for the Carpenter Road Site (Site). This plan presents quality assurance (QA) and quality control (QC) requirements applicable to cleanup action activities. Environmental measurements will be taken to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that the precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data generated meet the specified data quality objectives (DQOs) to the maximum extent possible.

The QAPP was prepared following the Washington State Department of Ecology's Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology 2004), United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA 2001), Guidance for Quality Assurance Project Plans (EPA 2002), and EPAs National Functional Guidelines for Inorganic and Organic Superfund Methods Data Review (EPA 2017a and 2017b).

2.0 PROJECT MANAGEMENT AND ORGANIZATION

The project management and organization elements for the cleanup action including the key personnel, roles and responsibilities of the participants and special training/certification are presented in the following sections.

2.1. Project Organization and Responsibilities

Key individuals and positions providing QA and QC are summarized in the following table. A description of the responsibilities, lines of authority and communication for the key individuals and positions providing QA and QC is presented below.

Project Role	**Name and Organization**	**Contact Information**
Project Manager	Jeff Johnstone, PE City of Olympia	360.753.8290 jjohnsto@ci.olympia.wa.us 601 4th Avenue East Olympia, Washington 98507
Project Manager	Iain Wingard GeoEngineers	253.722.2417 iwingard@geoengineers.com 1101 Fawcett Avenue, Suite 200 Tacoma, Washington 98402
Task Manager	Abhijit Joshi, PE GeoEngineers	206.239.3256 ajoshi@geoengineers.com 2101 4th Avenue, Suite 950 Seattle, Washington 98121
Field Coordinator/Field Personnel	Roger Chang GeoEngineers	253.722.2430 rchang@geoengineers.com 2101 4th Avenue, Suite 950 Seattle, Washington 98121

Project Role	Name and Organization	Contact Information
Health and Safety Manger	Connor Jordan GeoEngineers	253.722.2426 cjordan@geoengineers.com 1101 Fawcett Avenue, Suite 200 Tacoma, Washington 98402
Data Quality Assurance Leader	Denell Warren GeoEngineers	253.722.2792 dwarren@geoengineers.com 1101 Fawcett Avenue, Suite 200 Tacoma, Washington 98402
Laboratory Project Manager	Shelly Fishel Analytical Resources, LLC	210.845.0183 shelly.fishel@arilabs.com 4611 South 134th Place, Suite 100 Tukwila, Washington 98168

2.1.1. City of Olympia's Project Manager

City's project manager duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

2.1.2. GeoEngineers' Project Manager

GeoEngineers' project manager is responsible for fulfilling contractual and administrative control of the project. GeoEngineers' project manager's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules.

GeoEngineers' project manager's duties also include implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the City project manager, providing technical oversight, and providing overall production and review of project deliverables.

2.1.3. Task Manager

The task manager is responsible for the daily management of project tasks including providing technical direction to the field staff, produces task specific documents and supporting documents, develops schedules and allocates resources for field tasks, coordinates data collection activities to be consistent with information requirements, supervises the compilation of field data and laboratory analytical results, assures that data are correctly and completely reported, implements and oversees field sampling in accordance with project plan and supervises field personnel. Additionally, the task manger coordinates work with on-site subcontractors, verifies that appropriate sampling, testing, and measurement procedures are followed, coordinates the transfer of field data, sample tracking forms, and log books to the project manager for data reduction and validation, and participates in QA corrective actions as required.

2.1.4. Field Coordinator

The field coordinator will lead the field sampling effort for the project, serving as the direct point of contact between the task manager, analytical laboratory and subcontractors; and ensures that the appropriate sampling containers, chain-of-custody (COC) forms and field sampling gear including personal protective equipment (PPE) are available. The field coordinator ensures that data collection activities are consistent with information requirements and to assure that field information is correctly and completely reported for the entire duration of the project. The field coordinator will also coordinate appropriate sampling, testing, and measurement procedures and schedule sample delivery/shipment with the analytical laboratory. The field coordinator will transfer field data and sample tracking forms to the project file and perform data reduction and validation and participate in QA corrective actions as required.

2.1.5. Field Personnel

Field personnel have the primary responsibility for duties involving field data collection and documentation. Technical/field staff are responsible for:

- Understanding and following the requirements of project plans.
- Checking all equipment and supplies in advance of field operations.
- Ensuring that samples are properly collected, preserved, labeled, packaged, and shipped.
- Ensuring that all field data are carefully recorded in accordance with the compliance monitoring plan and supporting documents.

2.1.6. Health and Safety Manager

The health and safety manager will oversee implementation of health and safety programs and verify that work on the project proceeds in accordance with the site-specific Health and Safety Plan (HASP).

2.1.7. Data Quality Assurance Leader

The quality assurance leader will provide oversight required for the completion of sample analyses for the project and verify, in conjunction with the laboratory manager, that the analytical work is proceeding in accordance with internal laboratory standard practices and the QA/QC guidelines for the project. This person will also oversee completion of data validation activities completed for this project.

2.1.8. Laboratory Project Manager

The laboratory project manager will fulfill the analytical requirements of this project including being responsible for sample analyses using appropriate analytical laboratory methods. The specific procedures to be used for COC transfer, internal calibrations, laboratory analyses, reporting, preventive instrument maintenance, and corrective action will follow standard protocols.

2.2. 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 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.

3.0 DATA QUALITY OBJECTIVES

The primary DQO for this cleanup action is to collect environmental sampling data of known, acceptable, and documentable quality. The specific 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 to ensure consistency and thoroughness of data generated.
- Achieve the level of QA/QC required to produce scientifically valid analytical data of known and documented quality. This will be accomplished by establishing criteria for data precision, accuracy, representativeness, completeness, and comparability, and by evaluating project data against these criteria.

3.1. Chemical Quality Objectives

The sampling design, field procedures, useable laboratory procedures, and QC procedures established for this project were developed to provide defensible data. Specific factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors such as representativeness and comparability. The specific DQOs associated with these data quality factors are discussed below. Method-specific DQOs for chemical laboratory analyses are presented in Table 3.

3.1.1. Analytical Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight for contaminant conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL), which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL.

The PQLs provided by the Ecology-certified laboratory (Analytical Resources, LLC of Tukwila, Washington) are presented in Table 1 for soil. The PQLs presented in Table 1 are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions of samples affect detection limits. Second, analytical procedures may require sample dilutions or other practices to quantify a particular analyte at concentrations above the range of the instrument. The effect is that other analytes could be reported as undetected but at a value higher than a specified TRL. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries and careful interpretation is required to correctly characterize subsurface conditions.

3.1.2. Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicates (i.e., 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 and field duplicate comparisons of various matrices. The RPD is calculated as:

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

Where:

D_1 = Concentration of analyte in primary 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 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. Project RPD goals for all analyses are presented in Table 3, unless the primary and duplicate sample results are less than 5 times the method reporting limit (MRL), in which case RPD goals will not apply for data quality assessment purposes.

3.1.3. Accuracy

Accuracy is a measure of bias in the analytical process. The closer the measurement value is to the true value, the greater the accuracy. Accuracy is typically evaluated by adding a known spike concentration of a target or surrogate compound to a sample prior to analysis. The detected concentration or percent recovery (%R) of the spiked compound reported in the sample provides a quantitative measure of analytical accuracy. Since most environmental data collected represent single points spatially and temporally rather than an average of values, accuracy is generally more important than precision in assessing the data. In general, if %R values are low, non-detect results may be reported for compounds of interest when in fact these compounds are present (i.e., false negative results), and results for detected compounds may be biased low. The reverse is true when %R values are high. In this case, non-detect values are considered accurate, whereas detected values may be higher than true values.

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

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

Accuracy (%R) criteria for surrogate spikes, matrix spikes, and laboratory control samples (blank spikes) are presented in Table 3.

3.1.4. Representativeness, Completeness, and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. Representativeness of the data will be evaluated by:

- Comparing actual sampling procedures to those specified in this document.
- Reviewing analytical results for field duplicates to determine the variability in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative in nature. Only representative data will be used in subsequent data reduction, validation, and reporting activities.

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. The completeness goal is 90 percent useable data for the samples/analyses planned. If the completeness goal is not achieved, an evaluation will be performed to determine if the data are adequate to meet study objectives.

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 assess overall usefulness of data sets generated during the project, following the evaluation of precision and accuracy.

3.1.5. Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Recommended holding times are presented in Table 2. If the analysis of an archived sample is required but the sample exceeds the respective holding time, either discard the sample and collect a new representative sample for analysis and/or consult with Ecology to determine if the sample may still be used.

3.1.6. Quality Control Blank Samples

According to the National Functional Guidelines for Inorganic Data Review (EPA 2017a), "The purpose of laboratory blank analysis is to assess the existence and magnitude of contamination resulting from laboratory activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks)." Method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for laboratory blanks will be interpreted in general accordance with EPA's National Functional Guidelines for Inorganic Data (EPA 2017a) Review and professional judgment. Laboratory blank samples are discussed further in Section 4.0.

4.0 DATA GENERATION AND ACQUISITION

The data generation and acquisition elements for the QAPP (as detailed below) address aspects of the project design and implementation including the appropriate methods for measurement and analysis, data collection or generation, data handling, and how QC activities are employed and properly documented. Sampling methods including field documentation, sampling, and decontamination procedures are also discussed below.

4.1. Sample Location Documentation

Sample locations inside and outside the firing range building will be documented in reference to the building.

4.2. Field Screening Procedures

The potential presence of lead contamination in soil will be evaluated using a handheld X-ray fluorescence (XRF). The use and calibration of the instrument will be in accordance with EPA SW-846 Method 6200 and the manufacturer's instructions. Field screening using the XRF will be conducted at the preliminary limits of the remedial excavation areas to obtain in situ measurements of lead. XRF field measurements will be obtained at a frequency of one measurement per 15 linear feet of excavation sidewall and one measurement per 225 square feet of the excavation base, at a minimum. Field screening results will be recorded on the field logs.

If XRF lead measurements are greater than the Site cleanup levels, then additional excavation will be completed to remove the portion of sidewall or base represented by the elevated measurement. Additional excavation will be performed horizontally or vertically (as applicable) in a 6-inch increment until subsequent XRF lead measurements are below Site cleanup levels. At the limits where XRF lead measurements are below Site cleanup levels, soil verification soil samples will be collected for the chemical analysis of lead, as described in the MMCMP.

4.3. Decontamination Procedures

Soil samples will be collected using excavation equipment (i.e., backhoe or excavator), hand tools including stainless steel spoons and/or directly from the excavation limits using clean pair of nitrile gloves.

Reusable sampling equipment that comes in contact with soil will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
2. Rinsing with distilled water; and
3. Wrapping or covering the decontaminated equipment with aluminum foil. Field personnel will limit cross-contamination by changing gloves between sampling locations.

Wash water used to decontaminate equipment will be collected and stored on-site in 55-gallon drums.

4.4. Sample Containers, Labeling, Handling and Custody

4.4.1. Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling and documentation. Soil samples will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table 2.

Sample containers will be labeled with the following information at the time of sample collection:

- Project name and number
- Sample name, which will include a reference to date and sampling depth
- Date and time of collection

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between sample containers/labels, field log books and COC forms.

4.4.2. Sample Storage

Samples will be placed in a cooler with ice after they are collected. The objective of the cold storage will be to attain a sample temperature of 2 to 6 degrees Celsius. Holding times (Table 2) will be observed during sample storage.

4.4.3. Sample Shipment

Samples will be transported and delivered to the analytical laboratory in the sample coolers. The samples will either be transported by field personnel, laboratory personnel or by courier service. The Field Coordinator will ensure that the cooler has been properly secured using clear plastic tape and custody seals.

4.4.4. Chain-of-Custody Records

Field personnel are responsible for the security of samples from the time the samples are collected until the samples have been received by the courier service or laboratory personnel. A COC form will be completed for each group of samples being shipped to the laboratory. Information to be included on the COC form includes:

- Project name and number;
- Sample identification numbers;
- Date and time of sampling;
- Sample matrix (soil) and number of containers for each sample;
- Analyses to be performed;
- Names of sampling personnel;
- Project manager name and contact information including phone number; and
- Shipping information including shipping container number, if applicable.

The original COC form will be signed by a member of the field team. Field personnel will retain copies and place the original and remaining copies in a plastic bag. The plastic bag containing the COC form will be placed in the cooler before sealing the cooler for transport to the laboratory.

4.4.5. 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 analyst's name or initials, time and date.

4.5. Disposal of Incidental Waste

Incidental waste generated during sampling activities during the cleanup action includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or disposal facility.

4.6. Field Documentation

The field staff will be responsible for documenting field activities including sampling in an all-weather (e.g. "Rite-in-the-Rain") field notebook and/or on field logs, and by producing a draft technical field report at the end of each day of sampling. The field staff will also be responsible for implementing field QA/QC procedures in accordance with the methods outlined in this document and general good practice sampling protocols. These procedures include recording and documenting relevant and appropriate information regarding project activities, sampling methods and data collected during performance of field activities at each sample location.

The following general guidelines should be followed in documenting fieldwork:

- Documentation will be maintained in a dedicated field notebook and on field forms, as applicable.
- Notebook documentation will be completed in waterproof ink or permanent marker and written errors will be crossed out with a single line.

Field notebooks will include records of pertinent activities completed on site including sampling. Field notebooks will be bound books with sequentially numbered pages. The books will remain in the custody of the Field Coordinator/Personnel until project completion, after which, the books will be kept in the project files. The field notebook and forms will be maintained on a real-time basis and will include, where applicable and appropriate, the following information:

- Date, time of specific activities and weather conditions.
- Names of all personnel on the site, including visitors.
- Specific details regarding sampling activities, including sampling locations, type of sampling, depth, and sample numbers.
- Specific problems and resolutions.
- Identification numbers of monitoring instruments used that day.
- Chain-of-custody details, including sample identification numbers.

A draft field report will be prepared upon completion of field activities each day. Field data that was recorded in the notebooks and field forms will be used to complete the field report. The field report will be used to document construction, sampling, and monitoring activities, sampling and Site personnel, and weather conditions, as well as decisions, corrective actions, and/or modifications to the project plans and procedures discussed in this report. The draft field report will be finalized following review by the Task Manager and/or Technical Project Manager and kept in the project files.

4.7. Analytical Methods

Samples and QC samples shall be analyzed following the analytical methods listed in Table 2 using laboratory instruments prescribed in the methods. The analytical methods must meet the technical acceptance criteria specified by the method prior to the analysis of environmental samples. Samples that are not analyzed initially (i.e., placed on "hold") will be stored at the laboratory for at least 6 months, and will be disposed of by the laboratory following this period. Samples to be analyzed initially will be analyzed within proper holding times, which are listed in Table 2.

The laboratory is required to comply with their current written standard operating procedures. 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, re-extraction) will be submitted with the data package.

4.8. Quality Control

Quality control activities that will be implemented for each sampling, analysis or measurement technique are summarized in Table 3. Formulas for calculating QC statistics are provided in Section 3.1.

The laboratory will maintain and implement documented QA/QC procedures. The laboratory QA/QC program will provide the following:

- Procedures that must be followed for certifying the precision and accuracy of the analytical data generated by the laboratory.
- Documentation of each phase of sample handling, data acquisition, data transfer, report preparation, and report review.
- Accurate and secure storage and retrieval of samples and data.
- Detailed instructions for performing analyses and other activities affecting the quality of analytical data generated by the laboratory.
- Appropriate management-level review and approval of procedures, revisions to procedures, and control of procedures in such a way so that laboratory personnel that require specific procedures have access to them.

4.8.1. Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the potential influence of off-Site factors on project samples.

4.8.1.1. Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. 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. Under ideal field conditions, field duplicates 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. One duplicate soil sample will be collected per every 20 parent soil samples collected from excavation limits for QA/QC purposes.

4.8.2. Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data quality assessment process. The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks
- Internal standards
- Instrument calibrations
- Matrix spike/matrix spike duplicates (MS/MSD)
- Laboratory control samples/laboratory control sample duplicates (LCS/LCSD)
- Laboratory replicates or duplicates

- Surrogate spikes

4.8.2.1. Laboratory Blanks

Laboratory procedures utilize several types of blanks, but the most commonly used blanks for QC monitoring 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 detected in a method blank, then one (or more) of the following occurred:

- Sample containers, measurement equipment, and/or analytical instruments were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.

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. If target analytes are detected in method blanks, data validation guidelines assist in determining which substances in project 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".

4.8.2.2. Calibrations

Several types of instrument calibrations are used, depending on the analytical method, to assess the linearity of the calibration curve and assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

4.8.2.3. Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a project sample with a known amount of one or more of the target analytes, ideally at a concentration that is 5 to 10 times higher than the sample result. A percent recovery is then calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the known concentration of the spike, and multiplying by 100.

MS/MSD samples will be analyzed at a frequency of one MS/MSD per sample set or batch. The samples for the MS/MSD analyses should be collected from a boring or sampling location that is believed to have only 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 the MS/MSD analyses as required by the laboratory.

4.8.2.4. Laboratory Control Sample/ Laboratory Control Sample Duplicates (LCS/LCSD)

Also known as blank spikes, LCSs are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared sample medium, and a percent recovery of the spiked substances is calculated. The primary difference between LCS and MS samples is that the LCS uses a contaminant-free sample medium. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance.

4.8.2.5. Laboratory Replicates/Duplicates

Laboratories 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; they most commonly consist of a second analysis on the extracted media.

4.8.2.6. Surrogate Spikes

Surrogate spikes are used to verify proper extraction procedures and the accuracy of the analytical instrument. Surrogates are substances with characteristics similar to the target analytes. A known concentration of surrogate is added to the project sample and passed through the instrument, and percent recovery is calculated. Each surrogate used has acceptance limits (i.e., an acceptable range) for percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified acceptance limits, a possibility of false positives exist, although non-detect results are considered accurate.

4.9. Instrument/Equipment Testing, Inspection, and Maintenance

4.9.1. Field Instrumentation

If field instruments are used, calibration and calibration checks will be performed to facilitate accurate and reliable field measurements. The calibration of the instruments will be checked and adjusted as necessary in general accordance with manufacturers' recommendations. Methods and frequency of calibration checks and instrument maintenance will be based on the type of instrument, stability characteristics, required accuracy, intended use, and environmental conditions.

4.9.2. Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's Standard Operating Procedures (SOPs). Calibration documentation will be retained at the laboratory for a period of 6 months.

4.10. Laboratory Data Reporting and Deliverables

Laboratories will report data in electronic form to the GeoEngineers project manager, task manager and data QA leader. Upon completion of analyses, the laboratory will prepare electronic deliverables for data packages in accordance with the specifications in the agreed-upon *Special Conditions for Lab Analysis* document. The laboratory will provide electronic data deliverables (EDDs) with the electronic laboratory report, including the appropriate QC documentation. GeoEngineers will establish EDD requirements with the contract laboratory.

Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the client/field sample identification, the laboratory sample identification, reporting units, analytical methods, analytes tested, analytical results, extraction and analysis dates, quantitation limits, and data qualifiers. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues.

5.0 DATA REDUCTION AND ASSESSMENT PROCEDURES

The process for generating and checking data, as well as the process for producing reports for field and analytical laboratory data, are summarized in the following sections.

5.1. Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the data QA leader, task manager and project manager. This will involve both electronic-copy forms and EDDs. Both forms of data will be compared with each other to verify that the data are reliable and error-free.

5.2. 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 document. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrix, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation (if applicable), 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.

5.3. Data Verification/Validation

Project decisions, conclusions, and recommendations will be based upon verified (validated) data. The purpose of data verification is to ensure that data used for subsequent evaluations and calculations are scientifically valid, of known and documented quality, and legally defensible. Field data verification will be used to eliminate data not collected or documented in accordance with the protocols specified in the MMCMP and this document. Laboratory data verification will be used to eliminate data not obtained using prescribed laboratory procedures.

The data QA leader will validate data collected during the cleanup action to ensure that the data are valid and usable. At a minimum, a Stage 2B validation will be performed on the cleanup action data in general conformance with EPA functional guidelines for data validation (EPA 2004; and EPA 2008). At a minimum, the following items will be reviewed to verify the data as applicable:

- Documentation that a final review of the data was completed by the laboratory QA coordinator;
- Documentation of analytical and QC methodology;
- Documentation of sample preservation and transport;
- Sample receipt forms and case narratives; and
- The following QC parameters:
  - Holding times and sample preservation (if applicable)
  - Method blanks
  - MS/MSDs
  - LCS/LCSDs
  - Surrogate spikes
  - Duplicates/replicates

When sample analytical data are received from the analytical laboratory, they will undergo a QC review by the QA leader. The accuracy and precision achieved will be compared to the laboratory's analytical control limits. Example control limits are presented in Table 3. Calculations of RPDs will follow standard statistical conventions and formulas as presented in this document. Additional specifications and professional judgment by the data QA leader may be incorporated when appropriate data from specific matrices and field samples are available.

A data quality assessment will be prepared to document the overall quality of the data relative to the DQOs. The major components of the data quality assessment are as follows:

- **Data Validation Summary:** Summarizes the data validation results for all sample delivery groups by analytical method. The summary identifies any systematic problems, data generation trends, general conditions of the data, and reasons for any data qualification.
- **QC Sample Evaluation:** Evaluates the results of QC sample analyses, and presents conclusions based on these results regarding the validity of the project data.
- **Assessment of DQOs:** An assessment of the quality of data measured and generated in terms of accuracy, precision, and completeness relative to objectives established for the project.
- **Summary of Data Usability:** Summarizes the usability of data, based on the assessment performed in the three preceding steps.

The data quality assessment will help to achieve an acceptable level of confidence in the decisions that are to be made based upon the project data. The project analytical data will be submitted to Ecology's Environmental Information Management (EIM) system within 60 days after the data quality assessment is completed.

6.0 LIMITATIONS

We have prepared this Quality Assurance Project Plan (QAPP) for use by the City of Olympia during the cleanup action at the Carpenter Road Site located at 6530 Martin Way East in Lacey, Washington. 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.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

7.0 REFERENCES

GeoEngineers, 2022. Remedial Investigation/Feasibility Study (RI/FS) and Cleanup Action Plan (CAP), Carpenter Road Site, Lacey, Washington; Prepared for Washington State Department of Ecology and dated March 22, 2022.

United States Environmental Protection Agency (EPA) 2001, "EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5" EPA-240/B-01/003, Office of Environmental Information, Washington, DC, dated March 2001.

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United States EPA 2017a, "National Functional Guidelines for Inorganic Superfund Methods Data Review." OLEM 9355.0-135, EPA 540-R-2017-001, Office of Superfund Remediation and Technology Innovation (OSRTI), Washington, DC, dated January 2017.

United States EPA 2017b "National Functional Guidelines for Organic Superfund Methods Data Review." OLEM 9355.0-136, EPA 540-R-2017-002, Office of Superfund Remediation and Technology Innovation (OSRTI), Washington, DC, dated January 2017.

Washington State Department of Ecology (Ecology), 2004, "Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies," dated July 2004 and revised December 2016.

Table 1

Soil Practical Quantitation Limits (PQLs)

Compliance Monitoring Plan (CMP) and Quality Assurance Project Plan (QAPP)

Carpenter Road Site

Lacey, Washington

Analyte	CAS Number	PQL	Units	Analytic Method
Lead	7439-92-1	2.0	mg/kg	6010/200.7

Notes:

CAS = Chemical Abstract Services

mg/kg = milligrams/kilogram

Table 2

Soil Analytical Methods, Sample Size, Containers, Preservation and Holding Times

Compliance Monitoring Plan (CMP) and Quality Assurance Project Plan (QAPP)

Carpenter Road Site

Lacey, Washington

Analyte	Method	Internal Minimum Sample Size (dry weight)	Container Size and Type	Sample Preservation Technique	Holding Time[1]
Metals (Lead)	SW6010/SW6020	100 g	4 oz. CWM jar	≤ 6°C	6 months to analysis

Notes:

[1]Holding times are based on elapsed time from date of sample collection unless otherwise noted.

CWM = Clear Wide-Mouth

°C = degrees centigrade

g = gram

Table 3

Soil Field and Laboratory Quality Assurance/Quality Control Requirements

Compliance Monitoring Plan (CMP) and Quality Assurance Project Plan (QAPP)
Carpenter Road Site
Lacey, Washington

Analyte	Field Duplicates	Laboratory Control Sample (LCS) %R Limits (%)	Matrix Spike (MS) %R Limits (%)	MS Duplicate Samples or Lab Duplicate RPD Limits[1] (%)	Surrogate Standard (SS) or Labeled Compounds %R Limits (%)
Metals (Lead)	1 per every 20 samples	80 - 120	75 - 125	≤20	NA

Notes:

[1]Relative Percent Difference (RPD) control limits are only applicable if the primary and duplicate sample concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the primary and duplicate samples must be less than 2X the MRL for soil.

%R = Percent Recovery

NA = Not applicable

RPD = Relative percent difference