



**Remedial Investigation/Feasibility Study Report for
North Ridge Estates Operable Unit 2
Kingsley Firing Range
EPA Identification No. ORN001002476**

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Prepared for:

U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101

Prepared by:

EA Engineering, Science, and Technology, Inc.
555 University Avenue, Suite 182
Sacramento, California 95825
(916) 604-4365

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
µg/dL	microgram(s) per deciliter
µg/L	microgram(s) per liter
%	percent
95UCLM	95 percent upper confidence limit of the mean
ABS	activity-based sampling
ACM	asbestos-containing material
ALM	Adult Lead Model
Apex	Apex Companies, LLC
ASR	Archive Search Report
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDC	Centers for Disease Control and Prevention
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
CSM	conceptual site model
DoD	Department of Defense
EA	EA Engineering, Science, and Technology, Inc.
EcoSSL	ecological soil screening level
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
FS	Feasibility Study
FUDS	Formerly Used Defense Site
HHRA	human health risk assessment
HQ	Hazard Quotient
ICP-MS	inductively coupled plasma – mass spectrometry
IEUBK	Integrated Exposure Uptake Biokinetic
ISM	Incremental Sampling Methodology
ITRC	Interstate Technology and Regulatory Council
IVBA	in vitro bioaccessibility assay samples
KFRA	Kingsley Firing Range Annex
kg ww/kg bw-day	kilogram(s) wet weight per kilogram body weight per day
LOAEL	lowest observed adverse effect level

MBK	Melvin Bercot Kenneth Partnership
mg/kg	milligram(s) per kilogram
mg/kg bw-d	milligram(s) per kilogram body weight per day
mm	millimeter(s)
NCES	Net Compliance Environmental Services, LLC
NOAEL	no observed adverse effect level
ODEQ	Oregon Department of Environmental Quality
OU	Operable Unit
PA	Preliminary Assessment
PACM	presumed asbestos-containing material
PAL	Project Action Limit
PbB	blood lead
PCM	phase contrast microscopy
PCMe f/cc	phase contrast microscope equivalent fibers per cubic centimeter
PRG	preliminary remediation goal
RBA	relative bioavailability
RI	Remedial Investigation
SI	Site Inspection
site	North Ridge Estates Superfund Site, Klamath Falls, Oregon
Shaw	Shaw Environmental, Inc.
SLERA	Screening Level Ecological Risk Assessment
TAL	Target Analyte List
TCRA	Time-Critical Removal Action
TRV	toxicity reference value
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USACHPPM	U.S. Army Center for Health Promotion and Preventative Medicine
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
Weston	Weston Solutions, Inc.

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EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) authorized EA Engineering, Science, and Technology, Inc., under Remedial Acquisition Framework, Design and Engineering Services Contract Number 68HE0318D005, Task Order 68HE0720F0121, to prepare a Remedial Investigation (RI)/Feasibility Study (FS) report for Operable Unit (OU) 2, also known as the former Kingsley Firing Range Annex, of the North Ridge Estates Superfund Site (site) in Klamath Falls, Klamath County, Oregon. The purpose of this RI/FS Report is to summarize OU2 information and data, discuss the nature, extent, fate, and transport of lead, arsenic, antimony, and asbestos contamination, present the human health and ecological risk assessments, and identify remedial alternatives to address the identified risks.

The site is located approximately 4 miles north of Klamath Falls, Oregon, in Klamath County, and has been divided into two geographically distinct and separate OUs. OU1 is a 144-acre residential subdivision that was built on top of asbestos-containing material (ACM) and debris improperly left on-site during the demolition of structures from a 1940s military facility. EPA completed a 3-year-long, fund-led cleanup of OU1 from 2016 to 2018. OU2 is a former firing area used by the Department of Defense (DoD), U.S. Air Force, and Oregon Air National Guard. OU2 is comprised of three overlapping areas: a small-arms firing range, a 3.5-inch rocket practice area, and a munitions disposal area. In later years, after OU2 was transferred to private ownership, the area has been used intermittently by private residents for small arms and non-explosive munitions practice. In addition, numerous buildings constructed in OU2 have been destroyed or demolished, resulting in presumed ACM (PACM) spread around OU2.

ES.1 REMEDIAL INVESTIGATION ACTIVITIES

Various agencies have completed historical investigations, site surveys, and removal actions within OU2 to identify and assess impacts from past use, the potential for contamination, and to characterize conditions. Investigations include archive searches, site assessments for ordnance use, and evaluations of the presence and extent of contaminants of potential concern (COPC). Sampling activities focused on collecting soil samples from areas where contamination would be expected, based on past use. Samples were submitted for laboratory analysis of select metals, explosive compounds, and asbestos. In 2021, the U.S. Army Corp of Engineers completed a separate, limited RI Report to assess munitions and explosives of concern and munitions constituents in some areas within OU2. The USACE limited RI was conducted with the DoD Formerly Used Defense Sites (FUDS) program. Due to limitations within the FUDS program, DOD was unable to evaluate munitions constituents contamination in some areas in which the DOD was not solely responsible. This included areas that were later used by private residents for small arms practice. These areas are evaluated within EPA's RI.

The focus of this RI is PACM. Additionally, EPA summarizes findings from the USACE limited RI (2021) and evaluates metals contamination from munitions constituents that the USACE was unable to complete under the FUDS program. To achieve this aim, four rounds of annual visual surveys of superficial PACM were completed between 2019 and 2022. The visual inspections included systematically identifying and marking PACM materials on the ground surface followed by the removal (pickup) of the previously marked PACM items for off-site disposal.

During the 2021 visual inspection and pickup activity, vegetation was cleared from high-density vegetation areas to aid visual inspections, and two test pits were excavated to assess for the potential presence or absence of PACM below ground surface. The amount of PACM material removed from OU2 decreased from 81 cubic feet during the initial 2019 pickup activity to 0.27 cubic feet during the last pickup activity performed in 2022.

In 2022, EPA completed a Time-Critical Removal Action (TCRA) assessment, followed by execution of the TCRA. The assessment included the evaluation of three decision units for the presence of ACM by collecting bulk samples for asbestos analysis. The TCRA included removing soil with PACM and confirmed ACM from two excavations and two dilapidated sheds with ACM and collecting confirmation soil samples from the bottom of the excavations. One hundred and eighty-two cubic yards of soil and seven tons of ACM and PACM building materials were removed from OU2 during the TCRA.

To evaluate the potential risk from asbestos fibers within OU2 soils, activity-based sampling (ABS) was conducted in areas with the highest occurrence of PACM observed during the annual site surveys.

To evaluate potential metals contamination from munitions constituents, historical sample results, specifically soil samples collected in 2004, 2007, and 2019, were used to assess the nature and extent of the metal COPCs within OU2 (lead, arsenic, and antimony).

The EPA RI dataset includes:

- Fiber count results from ABS air samples and soil samples collected in 2022.
- Lead, arsenic, and antimony results from discrete soil samples, sediment samples, and a groundwater sample collected in 2004; the antimony results were rejected by the analytical laboratory.
- Lead, arsenic, and antimony results from composite soil samples and a groundwater sample collected in 2007.
- Lead, arsenic, and antimony results from Incremental Sampling Methodology (ISM) and discrete soil samples collected in 2019.
- Lead, arsenic, and antimony results from ISM soil samples collected in 2022.

EPA is currently in the process of completing an additional removal action to address lead contamination at Decision unit OU-RR-BB2. The removal action is anticipated to be complete in 2024.

ES.2 REMEDIAL INVESTIGATION FINDINGS

ES.2.1 Asbestos

No fibers were reported in air samples collected from the personal air monitors during the ABS.

ES.2.2 Lead, Arsenic, and Antimony in Soil

The maximum concentration of lead measured within OU2 is 665 milligrams per kilogram (mg/kg) reported in sample OU-RR-BB2 collected from the former 300-yard firing line of the Rifle Range (decision unit OU-RR-BB2). Outside of decision unit OU2-RR-BB2, the maximum concentration of lead measured within OU2 is 220 mg/kg in sample KFR-RR-RF212 collected from the impact area of the Rifle Range, which is less than the OU2-specific preliminary remediation goal of 311 mg/kg.

The concentrations of arsenic in soil samples collected from OU2 were less than the regional background concentration of 12 mg/kg.

The maximum concentration of antimony measured within OU2 is 2.2 mg/kg reported in sample OU-RR-BB2. Outside of decision unit OU2-RR-BB2, antimony is not detected at concentrations greater than laboratory detection limits. The detection limits are 1.2 mg/kg for samples collected from the Disposal Range and range from 6.9 to 63 mg/kg for samples collected throughout the Rifle Range. Antimony is not detected above its residential screening level of 31 mg/kg.

ES.3 FATE AND TRANSPORT

The historical use of small arms within OU2 may have released lead, arsenic, and antimony to surface soil at the Rifle Range. Materials used to construct buildings within OU2 contained asbestos, and ACM was released to the surface soil due to disrepair and when the structures were demolished within or near OU2. These COPCs are not volatile and are relatively insoluble and immobile in soil. Thus, vertical migration of COPCs is unlikely. The primary pathway for migration of the COPCs within OU2 is the disturbance of the soil by anthropogenetic (e.g., excavation) or natural physical processes (e.g., wind, frost heaving for ACM).

ES.4 HUMAN HEALTH RISK ASSESSMENT

Asbestos was not detected in samples collected from personal air monitors during ABS activities and was not evaluated in the human health risk assessment. Arsenic was not detected above the regional background concentration and antimony was not detected above its residential screening level; therefore, neither metal was evaluated in the human health risk assessment. Lead was the only analyte evaluated in the human health risk assessment. Lead exceeded its Project Action Limit in one decision unit: OU2-RR-BB2. The Integrated Exposure Uptake Biokinetic Model for Lead in Children revealed potential concerns for child receptor's exposure to lead in soil within decision unit OU2-RR-BB2 for both current and future exposures. The Adult Lead Model did not reveal potential concerns for worker exposure to lead in soil. A site-specific bioavailability adjusted lead soil preliminary remediation goal of 311 mg/kg was determined to ensure that less

than 5 percent probability of attaining blood-lead level of 5 micrograms of lead per deciliter whole blood or higher for children younger than six years old.

ES.5 ECOLOGICAL RISK ASSESSMENT

Asbestos was not evaluated in the ecological risk assessment. The ecological risk assessment concluded lead in soil may pose risks to terrestrial plants, gallinaceous and omnivorous birds (a surrogate receptor for a threatened species), insectivorous mammals, reptiles, and amphibians. The risk is generally limited to decision unit OU2-RR-BB2. Arsenic was not detected above the regional background concentration of 12 mg/kg; therefore, arsenic was not evaluated in the ecological risk assessment. Antimony in soil is not expected to pose risk to any ecological receptors evaluated. However, suitable information on toxicity of antimony to avian wildlife is not available and risk from antimony to birds could not be evaluated.

ES.6 REMEDIAL INVESTIGATION SUMMARY AND CONCLUSIONS

The past use of OU2 for small arms shooting released lead to surface soil in portions of the Rifle Range. Lead was found in soil at concentrations posing a potential risk to children in decision unit OU2-RR-BB2. The ecological risk assessment concluded that lead in soil across OU2 may pose risks to terrestrial plants, gallinaceous and omnivorous birds (a surrogate receptor for a threatened species), insectivorous mammals, reptiles, and amphibians. Excluding results from decision unit OU2-RR-BB2, lead in soil outside of decision unit OU2-RR-BB2 may pose a risk to omnivorous birds, reptiles, and amphibians. Arsenic has not been reported in soil samples exceeding the regional background concentration of 12 mg/kg or exceeding ecological soil screening levels; therefore, arsenic is not a contaminant of concern for OU2. Antimony was not detected above its residential screening level of 31 mg/kg and is not expected to pose risk to any ecological receptors evaluated. ACM was released to the surface within OU2; however, previous pickup and removal activities, including the 2022 TCRA, reduced the amount of ACM in OU2. To confirm that soil containing ACM is not a potential risk to current and future receptors, ABS was completed and no fibers were reported in air samples collected from the raking area during the scenarios.

ES.7 FEASIBILITY STUDY

Risk to human and ecological receptors is generally limited to decision unit OU2-RR-BB2. Due to proximity to nearby residences, EPA has decided to address contamination at decision unit OU2-RR-BB2 through a time-critical removal action, with completion anticipated in 2024. The removal action will excavate contaminated soils for disposal off-site, after which further action should not be necessary to protect human health or the environment with OU2. An early action provides a timely and economically beneficial remediation option for the limited and discrete area of elevated contamination.

1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA) authorized EA Engineering, Science, and Technology, Inc. (EA), under Remedial Acquisition Framework, Design and Engineering Services Contract Number 68HE0318D005, Task Order 68HE0720F0121, to prepare a Remedial Investigation (RI)/Feasibility Study (FS) report for Operable Unit (OU) 2, also known as the former Kingsley Firing Range Annex (KFRA), of the North Ridge Estates Superfund Site (site) in Klamath Falls, Klamath County, Oregon (Figure 1-1). EA prepared this RI/FS Report in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) using the EPA *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final* (EPA 1988) and the National Oil and Hazardous Substances Pollution Contingency Plan (EPA 1990a).

1.1 PURPOSE

The EPA-led RI examined lead, arsenic, antimony, and asbestos contamination within OU2 that may have originated from Department of Defense (DoD) and non-DoD activities. The U.S. Army Corps of Engineers (USACE) previously performed a limited RI for OU2 through the DoD Formerly Used Defense Sites (FUDS) program to assess contamination related to former DoD activities. Under the FUDS program, USACE was only able to evaluate contamination for which DoD was solely responsible. Therefore, USACE's assessment excluded portions of the small-arms Rifle Range, which has been subsequently used by private residents for small arms practice. The USACE RI Report (USACE 2021) proposed no further action for areas and for contaminants of potential concern (COPCs) evaluated within the scope of the USACE investigation. Although it is possible that lead, arsenic, and antimony are present within OU2 due to former DoD activities, they are also constituents related to the non-DoD use of OU2, which includes civilian small arms practice. Therefore, lead, arsenic, and antimony are retained for assessment in this EPA-led RI. In addition to lead, arsenic, and antimony, asbestos is a COPC and is investigated as part of this EPA-led RI.

This RI/FS Report (1) summarizes the investigative activities performed by EA and others to document characteristics of OU2, (2) identifies and assesses COPCs, (3) defines the nature and extent of COPCs, (4) describes the fate and transport of COPCs, and (5) identifies potential receptor pathways. This RI/FS Report includes the OU2-specific human health risk assessment (HHRA) and ecological risk assessment (ERA) and discusses and considers EPA's planned removal of a discrete area with elevated concentrations of lead (decision unit OU2-RR-BB2) resulting in a no further action determination as part of the FS.

1.2 BACKGROUND

OU2 is a former military firing area used by the DoD, U.S. Air Force, and Oregon Air National Guard and includes areas used by the DoD for small arms firing, 3.5-inch rocket practice, and munitions disposal, and areas used by civilians for small arms practice. In addition, numerous small structures constructed with asbestos-containing material (ACM) in support of the munitions range (e.g., ammunition storage, latrines, etc.), were destroyed or demolished

spreading presumed ACM (PACM) and confirmed ACM across OU2. The site is described in more detail below and key features are presented on Figure 1-1 and Figure 1-2.

1.2.1 Site Description

The site is located approximately 4 miles north of Klamath Falls, in Klamath County, Oregon, at approximately 5,100 feet above mean sea level. The site has been divided into two geographically distinct and separate Ous. OU1 is a 144-acre residential subdivision built on top of ACM and debris improperly left during the demolition of structures from the 1940s military facility. EPA completed a 3-year-long, fund-led cleanup of OU1 that involved the removal of more than 360,000 cubic yards of contaminated material, which was replaced with clean fill (EPA 2021a). OU2 extends over 206 acres, of which the established firing ranges cover 87 acres. OU2 is currently contained within two privately owned parcels historically used as rangeland and for private shooting. No residential or commercial structures are currently present in OU2; however, residential homes are present to the west and northwest (Figure 1-1). Scott Valley Drive is located northeast of OU2, Thicket Court transects OU2 east to west and an unmaintained barbed wire fence exists north of Thicket Court and south of the Disposal Range (Figure 1-2) (EA 2022a).

Key features of OU2 include the former 200-, 300-, and 500-yard firing lines and an impact area, collectively referred to as the Rifle Range; the 3.5-inch practice rocket range, referred to as the Rocket Range; and the Horseshoe Disposal Pit and three burn areas, collectively referred to as the Disposal Range (Figure 1-2). The Horseshoe Disposal Pit and burn areas are believed to have been used in the disposal of munitions. Although they are referred to as pits, no excavations have occurred at their locations, and all disposal activities were above ground.

Building debris presumed to contain ACM has historically been dispersed on the ground surface and may still be present in historical structures. However, pickup and removal activities have occurred since 2019, reducing the amount of ACM, PACM, and soil containing ACM and PACM in OU2. Only limited sampling of the building debris has occurred; therefore, the materials are referred to as PACM throughout this report, unless the materials are confirmed ACM through laboratory analysis. Two buildings containing ACM were demolished as part of the 2022 Time-Critical Removal Action (TCRA) (Weston Solutions, Inc. [Weston] 2022), and two buildings and a concrete pad, presumably the foundation to the administration building, remain in OU2 near the entrance to the Rifle Range (Figure 1-2).

1.2.2 OU2 History

DoD originally purchased the property in 1944 to build an 82-building military recuperation facility (i.e., OU1) and firing range (i.e., OU2) for soldiers during World War II (EPA 2021a). A full history of site ownership and details of OU1 can be found in the Record of Decision for OU1 (EPA 2011). This RI/FS Report includes only the land use history of OU2.

OU2 remained under DoD control and was used as a firing range from 1944-1947, before temporarily transferring ownership of the entire site to the Oregon Technical institute. The property was operated by Oregon Technical institute and eventually the City of Klamath Falls until 1964, when the City could not manage the facility and it reverted back to the U.S.

Government in 1964. From 1965 to 1975, the U.S. Air Force and the Oregon Air National Guard used OU2 for small arms and 3.5-inch rocket target training. Since 1975, the range has been used intermittently for unauthorized small arms target practice by non-DoD shooters, comingling additional contamination with the DoD-generated contamination (USACE 2021). OU2 has remained largely undeveloped. Small removal actions were conducted at KFRA from 1994 to 2002 under an order from Oregon Department of Environmental Quality (ODEQ) and later EPA (Section 1.2.3).

During the 2004 Preliminary Assessment (PA) and Site Inspection (SI) performed by Weston, pieces of 3.5-inch practice rockets, rocket motors, and munitions debris were observed within the Rocket Range and Disposal Range areas (Weston 2004). USACE performed activities under the FUDS Program in 2007–2008 and 2019–2021 that further identified munitions, munitions debris, and munitions-related contamination. Subsequent visual surveys and material removals conducted between 2019 and 2022 identified and removed ACM and PACM debris.

EPA listed the North Ridge Estates Superfund Site on the National Priorities List in 2011. EPA completed a remedial action at OU1 for ACM, and USACE completed an RI for OU2 to evaluate COPCs (excluding asbestos) through the FUDS Program.

1.2.3 Previous Investigations and Removal Actions

Numerous entities have completed historical investigations and site surveys within the current OU2 boundaries to identify and assess past use and the potential for both DoD and non-DoD contamination and to characterize conditions. Activities and conclusions of historical investigations are incorporated into this RI/FS Report, summarized in chronological order below, and presented in Table 1-1. Field activities associated with sample collection are described in Section 2. Results for the COPCs are discussed in Section 4.

- **1992 – Site Survey.** USACE completed a site survey under the Defense Environmental Restoration Program for FUDS on 18 June 1992, and reported no presence of munitions or debris on site. However, one 7.62-millimeter (mm) and one 40-mm shell casing was observed during the site visit (USACE 1992 as referenced in Weston 2004).
- **1993 – Risk Assessment for Ordnance and Explosive Waste.** USACE’s Defense Environmental Restoration Program for FUDS completed a risk assessment for ordnance and explosive waste to prioritize remedial action of the KFRA. The maximum score of 10 was assigned to the likelihood of ordnance and explosive waste being present, while specific components of ordnance and explosive waste such as pyrotechnics, high explosive, propellants, and radiological/chemical agent/weapons were assigned a score of 0, indicating a low probability of these being present. USACE characterized the hazard severity for the KFRA as “critical.” Since the shell casings observed during the June 1992 site survey were identified on the soil surface, it was presumed the remaining ordnance and explosive waste would be identified at the surface. The nearest residences were estimated to be 0.5 to 1.0 mile away, with approximately six to ten single-family residences within a 2-mile radius. Access to the KFRA was limited by a maintained barbed wire fence with a locked gate; however, evidence of vandalism indicated the

possibility of exposure to on-site hazards. USACE determined the KFRA was a priority under FUDS and recommended further action (USACE 1993 as referenced in Weston 2004).

- **1995 and 1997 – Archive Searches.** To confirm eligibility of the KFRA under the FUDS Program, USACE prepared an Archive Search Report (ASR). Activities included performing a records search, interviewing nearby residents, and conducting a site inspection. The 1995 ASR noted practice 3.5-inch rockets and small arms (e.g., 0.30- and 0.45-caliber cartridges) munitions historically used on site and evaluated potential site hazards associated with those identified munitions. Munitions were confirmed to be present at the ordinance berm, detonation pits, and the 3.5-inch Rocket Impact Area, and potentially present at the small arms impact berm, rocket ricochet area, disposal kick out area, and the ricochet fan. The surrounding lands outside of the KFRA were determined to be free of munitions contamination (USACE 1995).

In 1997 under the FUDS Program, USACE confirmed five areas, covering a total of 50.97 acres, either having or potentially having munitions. An additional 155.03 acres of the former KFRA were determined to be uncontaminated and required no further action. USACE concluded that an engineering evaluation/cost analysis was needed for five areas (50.97 acres) where ordnance was confirmed present or potentially could be present. Prior to the engineering evaluation/cost analysis an expanded site investigation was recommended for several areas of the Rifle Range (USACE 1997).

- **2004 – Weston PA/SI.** The PA/SI summarized the four previous USACE investigations. The constituents associated with U.S. Army munitions included lead and antimony from small arms and lead azide and cyclotrimethylenetrinitramine (RDX) from practice 3.5-inch rockets. Thus, COPCs for the PA/SI included Target Analyte List (TAL) metals, nitrogen based explosive compounds, and perchlorate (Weston 2004). Seven discrete surface soil samples, one sediment sample, two discrete background samples (one soil and one sediment), and one groundwater sample were collected (Figure 1-3). An asbestos dump area was also located approximately 1,500 feet southwest of the 3.5-inch rocket area, outside of OU2. Samples collected from the asbestos dump area confirmed the presence of asbestos.

The PA/SI reported the identification and sampling of four potential source areas:

1) Horseshoe Berm Ordnance Burn/Disposal Area, 2) Flat Ordnance Burn/Disposal Area, 3) Small Arms Impact Berm, and 4) Rifle Range and 3.5-inch Rocket Impact Area (Figure 1-2). The Rifle Range is believed to have been used for small arms practice (i.e., 0.45-caliber and smaller) and includes the impact berm. The Rocket Range was used for training with 3.5-inch practice rockets. The main feature of the Horseshoe Ordnance Burn/Disposal Area is a former disposal area surrounded by a 6-foot-tall, horseshoe-shaped berm, known as the Horseshoe Disposal Pit, which may have been used for disposal of munitions during explosive ordnance disposal team training. Three potential, flat, surface burn areas (i.e., no pits or berms) were identified. Two burn areas are situated approximately 300 feet southeast from the Horseshoe Disposal Pit where

mixed munitions debris were observed and the third burn area was discovered approximately 250 feet south of the other burn areas, and had evidence of burnt mixed debris, including petroleum products and PACM (EA 2022b). The soil sampling results indicated:

- Horseshoe Berm Ordnance Burn/Disposal Area – Zinc was reported in the single sample (SS-BA001) collected from the area at a concentration (311 milligrams per kilogram [mg/kg]) significantly above the PA/SI background sample result (59 mg/kg). Nitrogen-based explosive compounds were not reported above detections limits.
 - Flat Ordnance Burn/Disposal Area – No metals were reported above their respective background levels in the single sample (SS-BA002) collected from the area. Nitrogen-based explosive compounds were not reported above detections limits.
 - Small Arms Impact Berm – Lead was reported above the PA/SI background concentration (6.8 mg/kg) at SS-SA001 (1,220 mg/kg) and SS-SA002 (73.6 mg/kg). These samples were not analyzed for nitrogen-based explosive compounds.
 - Rifle Range and 3.5-inch Rocket Impact Area – Arsenic was reported in sample SS-RA002 (2.8 mg/kg) above its PA/SI background result (non-detect at 0.96 mg/kg). Mercury was reported in sample SS-RA002 (0.11 mg/kg) and SS-RA003 (0.18 mg/kg) above its PA/SI background result (0.037 mg/kg estimated below quantitation limit). Lead was reported between 37.7 and 150 mg/kg in SS-RA001 through SS-RA003. Nitrogen-based explosive compounds were not reported above detections limits.
- **2004 – USACE ASR Supplement.** USACE expanded the FUDS to 206.34 acres to cover the entire KFRA and identified three sub-ranges (consistent with potential source areas identified in the PA/SI): the Rifle Range, the Rocket Range, and the Disposal Range (Figure 1-2). In addition, the ASR supplement states that the U.S. Air Force primarily used the area for small arms and rocket munitions until 1975 and provides a complete list of munitions used on site (USACE 2004).
 - **2008 – Final SI for the Kingsley Firing Range Annex.** Shaw Environmental, Inc. (Shaw) prepared the 2008 SI Report for USACE under the FUDS Program to determine presence or absence of munitions and explosives of concern or munitions constituents associated with former military range activities within OU2 (Shaw 2008). The same source areas (the Rocket Range, Rifle Range, and Disposal Range) identified in the 2004 ASR Supplement were identified as areas of concern, and the acreage of the KFRA FUDS was increased to 1,352 acres across 21 parcels to include the safety fans of the three ranges. The KFRA FUDS was designated as Range Complex Number 1. This SI included the collection of six discrete surface soil samples, ten background surface soil samples, and one groundwater sample in 2007. The discrete soil samples were submitted for analysis of explosives and select metals, and two of the samples were also submitted

for perchlorate. The background samples were submitted for analysis of select metals and three samples were submitted for perchlorate. Explosives were detected in the Disposal Range at concentrations below human health risk-based screening levels; explosives were not detected at the other two ranges. The SI Report recommended completing an RI/FS for munitions and explosives of concern, and munitions constituents (specifically lead) across the 1,352 acres. Arsenic in groundwater (3.4 micrograms per liter [$\mu\text{g/L}$]) exceeded the tap water screening level of 0.045 $\mu\text{g/L}$ and not the Maximum Contaminant Level (MCL) of 10 $\mu\text{g/L}$ in the single groundwater sample collected from a nearby private well. However, the presence of arsenic is likely naturally occurring in the area and the munitions did not contain arsenic.

- **2016 – Historical Data Summary and Conceptual Investigation Approach for Asbestos Contamination in Soil.** EPA and ODEQ established screening criteria for residential exposures to identify the following COPCs: nitroglycerin, aluminum, antimony, arsenic, chromium, cobalt, iron, lead, manganese, vanadium, and zinc. Lastly, sampling for asbestos following the *Framework for Investigating Asbestos Contaminated Sites* (EPA 2008) was recommended (CDM Smith 2016).
- **2019 – Asbestos Investigation and Abatement Report.** Apex Companies, LLC (Apex), under contract to ODEQ, performed a visual walk through of OU2 and identified three areas (approximately 2.9 acres total) where PACM was abundant on the ground surface. To assess PACM in the subsurface, three test pits were excavated with PACM being observed in one test pit located where the PACM density on the surface was observed in greater density than the surrounding areas. During the 2019 abatement activities, 3 cubic yards of PACM were removed from the surface of OU2 (APEX 2019). The 2019 investigation and abatement activities are discussed further in Section 2 and Section 4.
- **2021 – USACE RI.** USACE completed an RI to characterize contamination from DoD activities. Soil samples were collected between August and October 2019 to identify COPCs related to munitions and explosives of concern and munitions constituents and assess the presence or absence and nature and extent of contaminants. USACE's remediation goals were to remove or reduce human and ecological exposure pathways to munitions and explosives of concern and munitions constituents. Twenty-four incremental sampling methodology (ISM) soil samples were collected for analysis of metals, explosives, and/or nitroglycerin from the Rocket Range and Disposal Range, and 15 ISM samples were collected from the Rifle Range, which was a mixed DoD and civilian use area (Figure 1-3). The USACE RI Report (USACE 2021) concluded:
 - No munitions and explosives of concern were identified during RI activities or previous activities, no explosive safety hazard is present, and no complete pathways exist in soil or subsurface soil for explosive hazards.
 - No munitions constituents' source associated with military munitions was identified during RI activities or previous activities.

- There is evidence of small-arms use at the Rifle Range by non-DoD entities after DoD operations ceased.
 - Lead, antimony, and nitroglycerin are present in soil where small arms have been used. As this contamination is a result of both non-DoD activities and DoD activities, the KFRA is ineligible for remediation under the FUDS Program. Nitroglycerin was specifically reported in samples collected from the Rifle Range (KFR-RR-RF1).
 - No further action was recommended for munitions and explosives of concern across the KFRA and for munitions constituents in the Disposal and Rocket Ranges. Munitions constituents at the Rifle Range were recommended for further evaluation (USACE 2021).
- **2022 – TCRA Memorandum.** The TCRA memorandum documented the request and approval for a TCRA within OU2 and included details of the Removal Site Evaluation, which established three decision units:
 - Decision Unit 1: Located in the southern boundary of OU2 in the disposal area
 - Decision Unit 2: Located near the northern firing line
 - Decision Unit 3: Centrally located near the impact berm

Seven bulk samples were collected from Decision Unit 1, two bulk samples were collected from Decision Unit 2, and one bulk sample was collected from the eastern end of the Rifle Range as part of the Removal Site Evaluation to assess PACM. ACM was confirmed in each bulk sample between 4 and 25 percent and determined to be friable (Figure 1-4) (EPA 2022a).

- **2022 – TCRA Report.** A TCRA was performed by Weston under the guidance of the EPA Superfund Technical Assessment and Response Team, removing surface soil containing ACM debris to eliminate a potential threat to public health, welfare, and the environment. The removal action occurred between August and September 2022 and included areas in OU2 previously identified visually and by analytical results as having a high quantity of ACM. The TCRA decision units were refined to:
 - Decision Unit 1: Southern Disposal Area Excavation
 - Decision Unit 2: Northern Firing Line Excavation
 - Decision Unit 3: Northern and Southern Dilapidated Sheds (Figure 1-4)

The TCRA excavated an area 83 feet by 70 feet by 3 feet at Decision Unit 1 and 26 feet by 16 feet by 3 feet at Decision Unit 2 and removing two dilapidated sheds referred to collectively as Decision Unit 3. A qualified archeologist monitored the soil disturbing activities and identified and documented cultural artifacts. Approximately 269 tons (182 cubic yards) of soil with ACM were removed and two dilapidated sheds were demolished generating approximately 7 tons of material removed from OU2. To confirm ACM removal, six confirmation soil samples were collected from the excavations. Personal air

samples were collected for worker safety during ACM-disturbing activities. Asbestos fibers were not detected above the Occupational Safety and Health Administration's 8-hour time-weighted average worker exposure limit of 0.1 fibers per cubic centimeter. In addition, 12 perimeter air samples were collected during the 6-day work period with detections occurring in four samples below the time-weighted average (Weston 2022).

1.2.4 Nitroglycerin

The USACE RI Report (USACE 2021) identified surface soil results from the Rifle Range with elevated levels of lead, antimony, and nitroglycerin. FUDS funds are authorized for conducting response actions for DoD contamination only. Based on evidence that the Rifle Range had been used for small arms target practice by non-DoD entities, the elevated levels of lead, antimony, and nitroglycerin were not evaluated under the USACE RI. Lead and antimony are discussed and evaluated in detail throughout this RI/FS Report, including both the human health and ERAs.

However, concentrations of nitroglycerin in surface soil do not warrant a thorough evaluation in this RI/FS Report. The concentration of nitroglycerin in ISM soil samples collected at the Rifle Range varied between not detected at 0.4 mg/kg to a maximum estimated value of 6 mg/kg (Appendix A of USACE 2021). Exposure to nitroglycerin in soil is unlikely to cause adverse health effects under residential or less intense exposure scenarios since the maximum concentration is less than the residential regional screening level of 6.3 mg/kg (EPA 2022b). In addition, the maximum concentration is less than the EPA Region 4 ecological screening value of 13 mg/kg (EPA 2018). Therefore, no further assessment of nitroglycerin is justified under the scope of this RI.

1.3 REPORT ORGANIZATION

Section 1. Introduction. Includes a brief history of the site and OU2 and summarizes previous investigations.

Section 2. Operable Unit 2 Investigations. Describes RI activities conducted to support preparation of this EPA-led RI/FS.

Section 3. Site Characteristics. Describes the site and OU2 characteristics including physical setting, geology, hydrogeology, hydrology, land use, and ecological concerns.

Section 4. Nature and Extent of Contamination. Discusses the source(s) of contamination, and nature (e.g., presence/absence) and extent (e.g., location) of COPCs within OU2.

Section 5. Contaminant Fate and Transport. Reviews the properties of each COPC and migration pathways.

Section 6. Human Health Risk Assessment. Presents the HHRA.

Section 7. Ecological Risk Assessment. Presents the ERA.

Section 8. Remedial Investigation Summary and Conclusions. Summarizes the results of the activities and conclusions made during the RI.

Section 9. Feasibility Study. Discusses the recommendation for an additional EPA removal action to support a no further action determination.

Section 10. References. References documents and information used in preparing this report.

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2. OPERABLE UNIT 2 INVESTIGATIONS

Previous investigations conducted through the FUDS Program (Section 1.2.3) focused on DoD munitions and contamination from DoD munition-related constituents. However, as early as 2004, samples were collected for analysis of metals, including lead, arsenic, and antimony that may be related to non-DoD activities. In addition, EPA conducted investigations to assess PACM distribution within OU2 and to perform pickup activities under CERCLA. This section presents the collection of historical data related to lead, arsenic, antimony, and asbestos (i.e., COPCs) along with data collected by EA since 2019. Analytical results are discussed in Section 4. Historical data related to DoD munitions are summarized in Section 1 and discussed in the USACE RI Report (USACE 2021). DoD-related contamination is not discussed further in this RI/FS Report. Field activities and analysis methods used to generate the data evaluated in this RI/FS Report include:

- Collection and analysis of discrete, composite, and ISM soil samples.
- Collection and analysis of bulk ACM and subsequent removal of ACM and asbestos-contaminated soil.
- Visual surveys and pickup activities for PACM.
- Collection and analysis of air samples generated through activity-based sampling (ABS).
- Collection and analysis of personal air samples.
- Collection and analysis of sediment samples.
- Collection and analysis of groundwater samples.

EA conducted field activities in general accordance with the EPA-approved Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) and its subsequent revisions (EA 2022c). Field activities performed by others were completed as discussed in their respective reports and summarized herein. Table 1-1 provides a synopsis of the historical investigations detailed in this section, identifying the lead agency or company that executed the work and produced the referenced report and the year of the referenced report, and summarizing the findings of each investigation. A list of samples collected, including type (sample method), matrix, analytical methods, year collected, and referenced report, can be found in Table 2-1.

2.1 SOIL INVESTIGATIONS

Soil samples were collected using discrete, composite, and incremental sampling methods for source and background areas and to ascertain nature and extent of contamination. These samples were analyzed for COPCs to support the EPA-led RI. Historically, samples were collected in 2004 as part of the PA/SI (Weston 2004), in 2007 as part of the Final SI (Shaw 2008), and in 2019 as part of the USACE RI (USACE 2021). EA collected additional samples in August 2022

to address data gaps in metals analysis (EA 2022d), and Weston collected confirmation soil samples for asbestos analysis following the 2022 TCRA (Weston 2022).

2.1.1 Discrete and Composite Soil Samples

As described in the following bullets, 24 surface and 10 subsurface discrete or composite soil samples were collected from OU2 between 2004 and 2022.

- 2004: Eight discrete surface soil samples, including one background sample; analyzed for metals
- 2007: Sixteen composite surface soil samples, including ten background samples; analyzed for metals
- 2019: Four discrete subsurface soil samples (6-12 inches and 12-18 inches below ground surface [bgs]); analyzed for metals
- 2022: Six composite subsurface soil samples (3 feet bgs); analyzed for asbestos

Eight discrete surface soil samples were collected in 2004 for metals analysis from the Rifle Range, the impact berm, the Rocket Impact Area, and the Disposal Range, and one background sample was collected from southeast of OU2 (Figure 2-1 and Table 2-1). Prior to collecting the samples, randomly selected locations in the suspect source areas were scanned with a portable x-ray fluorescence analyzer to direct sample collection. Following x-ray fluorescence screening, soil samples were collected from 0 to 6 inches bgs with dedicated plastic or stainless-steel scoops and homogenized in the field using plastic bowls. The samples were classified using the Unified Soil Classification System, ASTM International Standard 2488, and this information was recorded on field sampling sheets. A representative sample of sandy and fine-grained material was then containerized, labeled, placed on ice, and shipped for laboratory analysis including TAL metals (Weston 2004).

Sixteen composite surface soil samples were collected in 2007 from 0 to 6 inches bgs using a disposable scoop and the 7-point, 2-foot radius, wheel composite method (Table 2-1). Samples were collected from each firing position of the Rifle Range, one from the Rocket Range, and one from the horseshoe-shaped open burn/open detonation pit (Figure 2-1). Specific sample locations within each area were selected based on visual observations. In addition, 10 background samples were collected in the vicinity of OU2 (Figure 2-1). Samples were submitted for laboratory analysis of TAL metals. Sampling procedures were performed consistent with the approved sampling and analysis plan (Shaw 2008).

Four discrete subsurface soil confirmation samples were collected in 2019 from the Horseshoe Disposal Pit following excavation and removal of debris (Figure 2-1). The four samples were collected from depths of 6-12 inches or 12-18 inches bgs and were analyzed for specific metals including lead and antimony; arsenic was not reported (USACE 2021).

Six composite confirmation subsurface soil samples were collected in 2022 as part of the TCRA. Five, 5-point composite samples were collected following excavation to 3 feet bgs of the Southern Disposal Area (Decision Unit 1 of the TCRA), and a single 5-point composite sample was collected from the Northern Firing Line Excavation (Decision Unit 2 of the TCRA) (Figure 1-4). The samples were submitted for laboratory analysis of bulk asbestos by polarized light microscopy. Samples were collected according to the sampling and analysis plan (Weston 2022).

2.1.2 Incremental Sampling Methodology Samples

ISM soil sampling was conducted in 2019 as part of the USACE RI (USACE 2021) and in August 2022 as part of the Supplemental Soil Sampling (EA 2022e). Thirty-nine ISM samples were collected from thirteen decision units¹ during the USACE RI investigation; however, six samples from two decision units were analyzed for only nitroglycerin. Nine ISM soil samples were collected from three decision units as part of the 2022 supplemental sampling event. The investigations used ISM in accordance with the updated Interstate Technology and Regulatory Council (ITRC) guidance (ITRC 2020).

2.1.2.1 2019 U.S. Army Corps of Engineers Remedial Investigation

The 39 soil samples collected in 2019 for the USACE RI were collected from 13 rectangular decision units identified on Figure 2-2. The size of each decision unit was based on an exposure unit equal to a residential property of approximately 0.25 acres. The four corners of each decision unit were marked with pin flags, and the decision units were divided into 60 individual equal increments using measuring tapes. The aliquot collection points were marked with pin flags (USACE 2021). Prior to sample collection, the aliquot collection points were cleared using a metal detector for unexploded ordinance avoidance. Three replicate samples were collected from each decision unit, with each replicate consisting of one aliquot from each of the 60 increments. All sample increments were collected from 0 to 2 inches bgs from the locations marked with pin flags.

Approximately 1 kilogram of soil was collected for each replicate sample using an incremental sampler. Once all the increments for a given replicate sample were placed in a plastic resealable bag, the bag was labeled, homogenized, sealed, placed on ice, and shipped to the laboratory for analysis. These surface soil samples were analyzed for metals (USACE 2021). Details of the soil samples collected in 2019 are provided in both the main text of the USACE RI and in Appendix A of the USACE RI Report as noted in Table 2-1 of this RI/FS Report.

2.1.2.2 2022 U.S. Environmental Protection Agency Supplemental Soil Sampling

In August 2022, EPA directed EA to collect nine samples from three separate decision units in accordance with Worksheet #17 of the EPA-approved UFP-QAPP, Revision 03 (EA 2022c). Each decision unit was approximately 0.25 acres and coincided with specific 2019 decision units (Figure 2-2). Decision unit OU2-RR-RF1 was collocated with 2019 decision unit KFR-RR-RF1

¹ The USACE referred to the ISM areas as “sample units.” For clarity and consistency in this RI/FS Report, EA will use the term “decision units” to describe an ISM sample area.

to assess the reproducibility of a historical lead result. Decision units OU2-RR-BB2 and OU2-RR-BB3 were collocated with decision units KFR-RR-BB2 and KFR-RR-BB3, respectively, since the 2019 samples were only analyzed for nitroglycerin. Each decision unit was divided into 60 increments of uniform size and shape using Visual Sample Plan software. An equal amount of soil volume (i.e., an aliquot) was collected from each increment using a decontaminated 2-inch-diameter coring device. Three replicates were collected from each decision unit.

A Global Positioning System unit was used to record where each sample aliquot was collected, and each location was marked with a pin flag. A soil aliquot from each increment was collected between 0 and 2 inches bgs using the coring device, and increments for an individual replicate sample were placed into a 5-gallon bucket lined with a plastic bag. Prior to homogenizing, organic matter and gravel were removed by hand. The mass of the homogenized soil sample was weighed to ensure at least 1 kilogram of soil was collected for laboratory analysis. Pre-prepared sample labels were affixed to each zip-sealed 1-gallon bag and secured with clear tape. Each sample bag was placed inside a second zip-sealed bag and put on ice for transportation to the EPA Region 10 Laboratory for analysis of select metals (EA 2022e).

Samples were prepared and analyzed by the laboratory in accordance with Worksheet #17 of the EPA-approved UFP-QAPP, Revision 03 (EA 2022c) and the Sample Plan Alteration Form (Appendix B) directing laboratory sieving prior to analysis. Laboratory preparation procedures included air-drying, sieving, and subsampling before a portion was extracted for analysis. Consistent with the Region 10 Laboratory's standard operating procedure for ISM samples, particles passing a 2 mm/#10 sieve would be milled prior to analysis. Because of the potential presence of asbestos in the samples, the laboratory did not mill these samples for safety concerns. Instead, the laboratory sieved the samples and individually analyzed each fraction, thereby ensuring each fraction was represented in the analytical result. This process produced analytical results comparable to a homogeneously milled sample. Each sample was air dried and weighed before processing through a 2 mm/#10 sieve. If suspected bullet fragments were observed during visual inspection of the greater than 2 mm material, the fragments were to be removed, retained, and weighed. The suspect bullet fragments were then to be viewed through a scanning electron microscope. The laboratory did not identify any suspect bullet fragments in the nine samples.

Sample material that passed through the 2 mm sieve was sieved with a 0.5 mm/#35 sieve, then again with 0.15 mm/#100 sieve. This method created four separation fractions of each sample that were analyzed as follows:

- For the greater than 2 mm material, metallic particles were counted, and metals were identified with the scanning electron microscope; this exercise mainly focused on lead identification.
- Between 2 and 0.5 mm, soils were weighed and quantified using inductively coupled plasma – mass spectrometry (ICP-MS).
- Between 0.5 and 0.15 mm, soils were weighed and quantified using ICP-MS.

- Less than 0.15 mm soils, were weighed and quantified using ICP-MS.

ICP-MS was used to obtain lower detection limits for site-specific ecological screening values. The laboratory used approximately 10 grams of digestion mass for analysis using EPA Method 6020B for TAL metals. One soil sample from each decision unit underwent in vitro bioaccessibility extraction using EPA Method 1340 to be analyzed for lead and arsenic by EPA Method 6020B. The in vitro bioaccessibility results were used to determine the lead bioaccessibility in OU2 soil for use in assessing the amount of lead that is available to enter the blood and body tissues as part of the HHRA.

2.2 ASBESTOS-CONTAINING MATERIAL SAMPLING, INSPECTIONS, AND PICKUP ACTIVITIES

2.2.1 Asbestos-Containing Material Sampling

Ten bulk ACM samples (NRE-DB01 through NRE-DB09 and NRE-DB95) were collected in 2022 from the Rifle Range and two decision units established during the Removal Site Evaluation prior to the TCRA (Figure 1-4). Building materials visually identified on site as PACM were hand tested for friability and sampled according to EPA Method 600/R-93/116 (EPA 2022a).

2.2.2 Presumed Asbestos-Containing Material Inspections and Pickup Activities

Four PACM inspections followed by pickup activities have occurred within OU2 between 2019 and 2022 in areas shown on Figure 2-3. During each inspection, PACM was marked for removal (e.g., pickup) and subsequently collected and disposed of off-site. Samples were not collected for analysis of asbestos during these activities. The four PACM inspection and pickup activities are summarized below.

2.2.2.1 2019 Inspections and Pickup Activities

In 2019, Apex conducted a visual inspection and oversaw the subsequent abatement of PACM across a total of approximately 2.9 acres within OU2 for ODEQ. The visual survey was conducted in August 2019 and identified three areas to excavate test pits for further subsurface investigation of PACM. The three test pit excavations were 10–13 feet long, 1.5 feet wide, and 2–3 feet deep. PACM was observed in one test pit. Samples were not collected for asbestos, except one bulk sample from a white chalky material present in one test pit that was indicative of potential asbestos-containing thermal system insulation wrapping. The sample was submitted for analysis by polarized light microscopy, and the laboratory reported no asbestos was present (Apex 2019).

Abatement crew members from Net Compliance Environmental Services, Inc. (NCES), a licensed asbestos abatement contractor, removed exposed PACM while wearing Level C personal protective equipment. NCES minimized surface disturbance and wetted materials prior to collection and disposed of materials in 6-mil plastic bags. A total of 3 cubic yards

(81 cubic feet) of PACM was collected from the surface in the areas shown on Figure 2-3; the material was removed to Hillsboro Landfill in Hillsboro, Oregon.

2.2.2.2 2020 Inspections and Pickup Activities

EA conducted a PACM visual survey in late September 2020 and completed a PACM pickup event with NCES in late October 2020 (Figure 2-3). The Fall 2020 field activities determined the extent of PACM within OU2 in areas previously cleared by USACE for unexploded ordnance non-intrusive work (USACE 2020). The visual survey transected 10 acres, and PACM was marked with pin flags and recorded with a handheld Global Positioning System unit. The identified PACM was removed by licensed abatement specialists in Level C personal protective equipment to prevent future releases and reduce ongoing potential risk within OU2. Two cubic yards (54 cubic feet) of material was wetted, picked up, and containerized in plastic bags for transportation as asbestos-contaminated waste to the Hillsboro Landfill in Hillsboro, Oregon. Details of the 2020 PACM related activities are presented in EA's technical memorandum dated December 2020 (EA 2020).

2.2.2.3 2021 Inspections and Pickup Activities

EA and NCES performed a visual survey, cleared vegetation, excavated test pits, and performed pickup activities for PACM between 19 and 21 October 2021. Vegetation was removed using hand tools from areas not previously investigated for PACM. The visual survey was conducted over the same 10 acres that were surveyed in 2020 and two test pits were excavated to assess presence or absence of PACM in the area cleared of vegetation. Each test pit was observed by an unexploded ordnance specialist for identification of ordnance materials and an archeologist for identification of historic objects. The test pits were excavated by a small excavator to 38 inches bgs in Test Pit 1 and 18 inches bgs in Test Pit 2. One cubic yard (27 cubic feet) of PACM was collected from areas marked during the visual survey and from Test Pit 1 (Figure 2-3). The material was wetted and sealed in plastic bags for off-site disposal. Details of the 2021 ACM related activities performed by EA are presented in a technical memorandum dated January 2022 (EA 2022a).

Concurrent and separate from EA's activities, Apex staked and subsequently removed PACM from a high-density PACM area within the Disposal Range (Figure 2-3). Additional details of these activities were not available to include in this RI/FS Report.

2.2.2.4 2022 Inspections and Pickup Activities

In August 2022, EA completed a PACM walk-through visual survey (Figure 2-3) and staked two areas for the TCRA. NCES collected a total of 0.01 cubic yards (0.27 cubic feet) of PACM and disposed of the materials off site. Details of the 2022 PACM walk-through visual survey and pickup activities are presented in EA's technical memorandum dated October 2022 (EA 2022b).

2.3 ACTIVITY-BASED SAMPLING

EA and Consolidated Safety Services, Inc. performed ten ABS raking scenario events in August 2022 to assess short-term exposure risk from PACM to humans during soil disturbing activities.

Five sample locations, each consisting of approximately 100 by 100-foot grids (10,000 square feet), were identified for two raking events each (Figure 2-4). Based on results from the annual surveys, each ABS sample location was selected by the project team as locations with the greatest potential for asbestos contamination in soil. Four personal air samples and three perimeter samples were collected at each location. Prior to raking, moisture content in each grid was measured to confirm that an average moisture content of 10 percent or less was present for optimal soil-disturbing (i.e., dust-generating) conditions. At each sample location, the raking individual wore two personal air sampling pumps attached to a backpack, each collecting one air sample. During each 2-hour raking session, medium-flow and low-flow personal air monitoring was sampled, and upwind, downwind, and crosswind perimeter air samples were collected for analysis. Two hours of raking was conducted at each location, in 30-minute rotations passing the air monitoring backpack to the individual performing the raking. Forty samples, including five duplicate samples, were collected and submitted for laboratory analysis of asbestos structures and fibers per ISO 10312. One sample (ABS1-02-L) was analyzed per ISO 13794 because of an overloaded filter.

Raking individuals wore Level C personal protective equipment consisting of polyethylene outer suits, boot covers, latex gloves, and a full-face respirator with P100 cartridges. Four cubic yards (108 cubic feet) of industrial-derived wastes consisting of personal protective equipment and sampling consumables were placed in contractor waste bags and disposed off site at the Klamath County Landfill by Rabe Consulting. Details of the 2022 ACM walk-through visual survey and pickup activities are presented in EA's technical memorandum dated October 2022 (EA 2022e).

2.4 AIR MONITORING

NCES conducted personal air monitoring sampling to ensure worker safety during four of the PACM inspection and pickup activities discussed in Section 2.2. Details are not available for the Apex activities conducted in 2021. In 2019, both ambient and personal air monitoring samples were collected during operations and analyzed using phase contrast microscopy (PCM) (Apex 2019). During the 2020, 2021, and 2022 inspection and pickup activities, personal air monitoring samples were collected for a minimum of 30 minutes to determine employee peak (30 minutes) and 8-hour time-weighted average exposures and analyzed using PCM (EA 2020, 2022a, 2022b).

During the TCRA, upwind and downwind stationary air monitoring stations were used to measure real-time air particulate concentrations. Personal air samples were collected daily within the operation zones. The pump flow rate was set between 1 and 4 liters per minute to achieve a daily air volume of 400 liters to calculate an 8-hour time-weighted average or it was set to a flow rate between 7 and 16 liters per minute for a daily volume of 400 liters for 30-minute short-term exposure limit sampling. Samples were analyzed for asbestos and other fibers by PCM. One sample exceeded the time-weighted average exposure limit; however, further analysis by transmission electron microscopy verified the asbestos concentration was below the time-weighted average (Weston 2022).

While air monitoring following activity-based disturbance cannot fully establish nature and extent characterization in OU2, it offers qualitative insight into the presence or absence of

asbestos in air following the soil disturbing activities performed during each of these events. No reported concentrations of asbestos exceeded worker exposure limits. Taken in tandem with discrete soil sampling efforts, this provides additional support for the presence or absence of asbestos contamination within soils that may pose risk to human receptors.

2.5 SEDIMENT SAMPLING

In 2004, two sediment samples were collected from an intermittent stream running parallel to OU2 (Figure 1-3). One sediment sample (SD-ST001) and one background sediment sample (SD-BK001) were collected from the surface of the dry streambed (0–6 inches bgs) following similar sampling methods used for the 2004 discrete soil sampling discussed in Section 2.1.1. Physical descriptions of the sediment with grain percentages (i.e., clay, silt, sand, and gravel), color, organic content, and odor were recorded for each sediment sample. The sediment samples were submitted for laboratory analysis of TAL metals (Weston 2004).

2.6 GROUNDWATER SAMPLING

In 2004, one groundwater sample (GW-DW001) was collected from a spigot of a private well 1,200 feet southwest of OU2. The single groundwater sample was submitted to the laboratory for analysis of TAL metals, perchlorate, and explosives (Weston 2004). The same private well was sampled in 2007 and a natural sample (NWO-069-3001) and a field duplicate (NWO-069-3002) were collected and submitted for laboratory analysis of select TAL metals and explosives, including nitroglycerin and perchlorate (Shaw 2008).

3. SITE CHARACTERISTICS

3.1 PHYSICAL SETTING

The city of Klamath Falls is located at an elevation of 4,100 feet and is surrounded by the Coastal and Cascade Mountain Ranges. OU2 is in the foothills of the Cascade Mountains at an elevation of approximately 5,100 feet. Topography is relatively flat with a low ground cover consisting of shrub-steppe landscape. Vegetation that is commonly encountered within OU2 includes: ponderosa pine, western juniper, Douglas fir, sagebrush, rabbitbrush, and bitterbrush (Weston 2022). The area surrounding OU2 consists of steep rocky terrain with rock outcroppings and the impact areas are surrounded by steep hills (USACE 2021).

3.2 GEOLOGY

3.2.1 Regional Geology

The Klamath Basin, located in south-central Oregon, is primarily composed of volcanic deposits with lowland fluviolacustrine deposits that have been described as consolidated volcanic rocks consisting largely of unconsolidated to semi-consolidated volcanic ejecta deposited around eruptive centers, and lowland fluviolacustrine deposits consisting of dolomite, water-lain volcanic sediment, tephra, and lava (U.S. Geological Survey 1999).

The Klamath Basin is in part a composite graben formed by north and northwest trending normal faults. Vertical displacements are generally less than 330 feet, and locally exceed 1,000 feet (U.S. Geological Survey 1999). The Klamath graben fault system confines the Klamath Lake Basin at the intersection of the northwestern Basin and Range and Cascade Mountains in southern Oregon. The slip rate along this fault system is between 0.2 and 1.0 mm per year. The Klamath graben fault system is divided into three sections: the West Klamath Lake section, the East Klamath Lake section, and the South Klamath Lake section. Faults in the South Klamath Lake section form composite grabens in the vicinity of Klamath Falls. To the north, large escarpments on Miocene and Pliocene bedrock define a graben that confines Upper Klamath Lake. Fault scarps are formed on more recent Holocene and Pleistocene talus deposits along these escarpments. The lack of extensive alluvial fans at the mouths of canyons that empty into Upper Klamath Lake may indicate late Quaternary subsidence along the margins of the Upper Klamath Basin. South of Klamath Falls, the graben system widens into a series of fault blocks and grabens (EA 2022c).

3.2.2 Site-Specific Geology

The site lies in the foothills of the Cascade Mountain Range east of Klamath Lake, in an area of transition between the Cascade Mountains and the Basin and Range provinces. Underlying the shallow soil horizon are volcanic rocks and layered sandstone and claystone with occasional clay layers. The volcanic rocks feature rhyolitic andesite and basalt. These rocks occur in outcroppings and in areas where topsoil is shallow, and rock has been from erosion (USACE 2021).

3.3 SOILS

The foothills of the Cascade Mountain Range, which includes OU2, are primarily underlain by three soil types: Lorella, Woodcock Association north, and Harriman-Lorella Complex. Lorella soils, which are shallow, well drained soils, weathered from residual material that originated as tuff and basalt. Lorella soils are underlain by unweathered bedrock at a depth of 20 inches, with some locations as shallow as 10 inches. The soil profile is predominately an H horizon with the top 0–5 inches consisting of very stony loam and a subsoil layer between 5–19 inches of very cobbly clay loam and very gravelly clay. Lorella soils lie on 2–35 percent grade slopes. Approximately 20 percent of the area is underlain by the Woodcock Association north soil type. This soil originates from colluvium and mudflows with andesitic rocks and ash. This well drained, shallow to deep soil covers slopes of 5–40 percent grade, and typically is associated with mountains, escarpments, and hillsides. The soil profile includes an O horizon of slightly decomposed plan material with an A horizon of stony medial loam grading to a very gravelly medial clay loam, which makes up most of the B horizon as well. The third most common soil type across OU2 is the Harriman-Lorella complex. This well drained, shallow to deep soil is also predominately an H horizon profiled from loam to a clay loam at 18 inches, then a sandy clay loam at 42 inches, and finally weathered bedrock. The source material for Harriman-Lorella soils are lacustrine deposits derived from diatomite, tuff, and basalt (U.S. Department of Agriculture 2022). Field observations made by USACE during an intrusive investigation within OU2 indicate the shallow soils consist of sandy silts with volcanic cobbles and boulders. The unconsolidated soils overlying the weathered volcanic bedrock boulders have been disturbed by previous ground leveling activities, probably occurring during the rifle range construction (USACE 2021).

3.4 HYDROGEOLOGY

3.4.1 Regional Hydrogeology

Groundwater occurs between 45 and 375 feet bgs (EA 2022c). There are numerous domestic groundwater wells within a 4-mile radius of OU2 used for irrigation, drinking water, and livestock watering. There is one identified private domestic well on land adjacent to the OU2 boundary, approximately at the edge of the range safety fans. This well was sampled in support of the 2004 PA/SI (Weston 2004) and the 2007 SI (Shaw 2008).

The city of Klamath Falls pumps water from municipal water wells located in downtown Klamath Falls, with the closest well located approximately 4 miles southwest of OU2. The depths of these wells vary from approximately 350 to 1,000 feet bgs, as reported by the Oregon Department of Water Resources. The City of Klamath Falls Water Division pumps water from a pumping station through a 12-inch-diameter pipeline located along Old Fort Road up the hill to a water storage tank located southwest of the old administration building at the site. This domestic water supply is provided to residences in the North Ridge area (Shaw 2008).

3.4.2 Site-Specific Hydrogeology

There is no site-specific information to suggest that the hydrogeology of OU2 differs significantly from regional hydrogeology. The information related to water quality and movement of groundwater on the site is inferred from two samples collected from the same domestic well.

Groundwater flow direction information has not been found for this area. However, OU2 sits atop a ridge, without many physical drainage features; therefore, groundwater direction is presumed to follow topography. The surface topography indicates that groundwater flow could be in two different directions away from the top of the ridgeline: south-southwest and/or north. Drainages south of OU2 appear to be flowing to the south or southwest along graben orientation toward the Klamath Valley and the Link River. The drainages in the center and north of OU2 appear to be flowing to the northwest into Upper Klamath Lake (USACE 2021).

3.5 SURFACE WATER

Streamflow data for an unnamed tributary adjacent to OU2 is not available; however, it is expected to be a minimal intermittent stream with flow less than 10 cubic feet per second when active (Weston 2004). The streamflow for Upper Klamath Lake is estimated to be 1,231 cubic feet per second (U.S. Geologic Survey 2022). This was based on the mean of monthly streamflow from 1961 through 2022 for the Link River, which is the tributary that drains Upper Klamath Lake.

No perennial water features exist within OU2 boundaries although drainage channels flow off site. Surface water runoff from OU2 flows to a drainage ditch that drains to an unnamed intermittent stream located less than 1,000 feet away, as shown on Figure 1-3. The unnamed intermittent stream flows in a north-northwesterly direction for approximately 8.5 miles where it drains into an unnamed canal. The unnamed canal flows west for 1 mile where it empties into Upper Klamath Lake. Surface water rights within a 15-mile radius of OU2 are used for irrigation only. The water bodies surrounding OU2 and Upper Klamath Lake are not tidally influenced. The Upper Klamath Lake is the largest lake in Oregon and is open for recreational fishing year-round (Weston 2004).

3.6 METEOROLOGY

OU2 is located near the city of Klamath Falls, which is bordered on the east by the Cascade Mountain Range and on the west by Coastal Mountain Range. The mountains block precipitation in a rain shadow effect before it reaches the valley. OU2 is within a semi-arid region with warm summers and cool winters (USACE 2021). The average annual maximum and minimum temperatures are 60.8- and 32.7-degrees Fahrenheit, respectively, for the years between 1981 and 2010. The mean annual precipitation for Klamath Falls, Oregon, is 13.10 inches for years between 1981 and 2010 according to the Western Regional Climate Center (2022).

3.7 LAND USE AND DEMOGRAPHY

OU2 is north of Klamath Falls, in Klamath County, south-central Oregon. The U.S. Census Bureau's 2021 estimated population for Klamath County is 70,164; a 1.1 percent increase from 2020. Approximately 31 percent of the county population lives in Klamath Falls. The population density of Klamath County is approximately 11.7 people per square mile. The predominant racial group in Klamath County is Caucasian (88.0 percent), followed by Hispanic (14.5 percent), people reporting two or more races (4.6 percent), American Indian and Alaska Native (5.0 percent), Asian (1.2 percent), and Native Hawaiian and other Pacific Islander (0.2 percent) (U.S. Census Bureau 2022).

OU2 is currently uninhabited; however, several residential homes are located immediately adjacent to OU2 on the western, northern, and northeastern sides of the site. The largest residential development near OU2 lies across Old Fort Road and is designated as OU1 of the site. Beyond OU1, Klamath Falls, Oregon, is the nearest community to the site. EPA's PA/SI indicated that the closest residential property is approximately 500 feet southwest of OU2 (Weston 2004). A barbed-wire fence surrounds a portion of the southern side of OU2. A locked gate on Thicket Court prevents vehicular access to a dirt road that leads to the firing range from the south. However, the area can be accessed by the public from Cougar Butte that intersects Scott Valley Drive (Figure 1-2). During USACE's SI activities conducted in November 2007, it was observed that portions of OU2 had been used by the public for skeet and target practice. Additionally, we observed residents hiking, hunting, and walking pets (Shaw 2008). There are no schools or day care centers located within 200 feet of OU2 (Weston 2004).

3.8 ECOLOGICAL ASSESSMENT

Table 3-1 lists of species of concern that may be present at OU2. There are several protected species listed, and before any potential removal action can begin, formal Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) is required². Table 3-1 presents information from the following three sources:

1. The USFWS Information for Planning and Consultation project planning tool to determine if any federally listed species, critical habitat, migratory birds, and other natural resources may be present within or near OU2 (USFWS 2022).
2. The Oregon Department of Fish and Wildlife Compass conservation mapping tool to determine if any state listed species may be present within or near OU2 (Oregon Department of Fish and Wildlife 2023).
3. Documented occurrences of rare, threatened, and endangered animal, plant, and fungi species near OU2 obtained through a data request submitted to the Oregon Biodiversity Information Center run by Portland State University's Institute for Natural Resources (Oregon Biodiversity Information Center 2023). The Oregon Biodiversity Information

² Section 7 of the Endangered Species Act requires Federal agencies to consult with the USFWS to ensure that actions they fund, authorize, permit, or otherwise carry out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats.

Center list ranking follows an international system for ranking rare, threatened and endangered species throughout the world, with 1 being critically imperiled and 5 being secure.

In addition to the Federal and State listed species, the following birds of conservation concern may also be present within or near OU2 and are protected under the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act (USFWS 2022):

- American White Pelican (*Pelecanus erythrorhynchos*)
- Bald Eagle (*Haliaeetus leucocephalus*)
- California Gull (*Larus californicus*)
- Cassin's Finch (*Carpodacus cassinii*)
- Clark's Grebe (*Aechmophorus clarkii*)
- Evening Grosbeak (*Coccothraustes vespertinus*)
- Franklin's Gull (*Leucophaeus pipixcan*)
- Lesser Yellowlegs (*Tringa flavipes*)
- Lewis's Woodpecker (*Melanerpes lewis*)
- Olive-sided Flycatcher (*Contopus cooperi*)
- Rufous Hummingbird (*Selasphorus rufus*)
- Sage Thrasher (*Oreoscoptes montanus*)
- Western Grebe (*Aechmophorus occidentalis*)
- Willet (*Tringa semipalmata*)

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4. NATURE AND EXTENT OF CONTAMINATION

This section describes the potential sources of contamination within OU2; presents the results of the investigation and removal activities described in Section 2; and discusses the extent of COPCs in soil, air, sediment, and groundwater. Contaminant results (other than COPCs) associated with past DoD activities within OU2 are not presented below as they are outside the scope of this RI. However, these data are discussed in the USACE RI Report (USACE 2021). Analytical results for COPCs evaluated in this RI/FS Report, including the HHRA and ERA, are presented in Tables 4-1 through 4-5. Discrete, composite, and ISM soil sample results for the metal COPCs are also presented on Figures 4-1 through 4-6.

4.1 SOURCES

Historical uses of OU2 include a firing range and munitions practice annex to the former Klamath Falls Military Recuperation Barracks. Activities at the firing range included 3.5-inch rocket training, small arms practice, and munitions disposal.

4.1.1 Historical Buildings

Buildings across OU2 were built as a military recuperation facility between 1944 and 1977, when asbestos was commonly used in building materials. These buildings were eventually abandoned and became dilapidated. As the buildings weathered, they slowly discharged ACM and PACM to the ground surface. Several of the structures on OU1 were removed by the property owner and EPA, including the former administrative building at the entrance of the site. ACM was prevalent across OU1; therefore, ACM may have been mobilized from OU1 to OU2 prior to completion of the OU1 remedial activities. Lastly, a potential source for ACM and PACM is an off-site disposal area documented west of OU2 on private property (Weston 2004) from which ACM or PACM may have been mobilized into OU2. No subsurface sources of ACM (e.g., burial areas) are known to exist within OU2. While the OU1 Military Recuperation Barracks included a wide-spread network of piping with asbestos-containing thermal systems insulation, no evidence of thermal systems insulation exists at OU2. This is an important consideration as thermal systems insulation typically contains greater percentages of asbestos by volume compared to other ACMs (EPA 1990b).

4.1.2 Firing Ranges

OU2 has been used by the DoD for 3.5-inch rocket and small arms training and, following DoD use, civilians used OU2 for small arms practice. The locations of the 3.5-inch rocket range (i.e., Rocket Range) and the small arms range (i.e., Rifle Range) are shown on Figure 1-2. The small arms range included 200-, 300-, and 500-yard firing points and an impact area. Constituents contained within DoD munitions and civilian small arms may have resulted in the release of metals and explosives (i.e., nitroglycerine) to the environment.

4.1.3 Munitions Disposal

A munitions Disposal Range has been documented south of the firing ranges. This area includes a horseshoe shaped berm and three potential surface burn areas (Figure 1-2). According to the

Supplemental ASR (USACE 2004) and the USACE RI Report (USACE 2021), the Disposal Range may have been used for the disposal of explosives from explosive ordnance disposal training, small arms, and rockets. No live ordnance has been observed within OU2 (USACE 2021). Similar to the firing ranges, constituents contained within the DoD munitions destroyed or disposed of at the Disposal Range may have resulted in the release of metals and explosives (i.e., nitroglycerine) to the environment.

4.1.4 Unknown Sources

Unknown activities within OU2 resulting in undocumented releases of contamination to the environment is unlikely. No evidence of undocumented disposal of hazardous material has been observed within OU2. Further, OU2 is located on the top of a ridge, outside the town of Klamath Falls, Oregon, and thus off-site industrial or commercial activities would not have impacted OU2.

4.2 CONTAMINANTS OF POTENTIAL CONCERN

Historically, COPCs related to the potential contaminant sources have included:

- Explosive constituents including nitroglycerin and perchlorate
- Metals including aluminum, antimony, arsenic, chromium, cobalt, iron, lead, manganese, vanadium, and zinc
- Asbestos

COPCs associated with past DoD activities were assessed as part of the USACE RI (USACE 2021) and USACE recommended no further action. Lead, arsenic, and antimony associated with civilian small arms use and asbestos from dilapidated or demolished buildings have been retained as COPCs for OU2 under the scope of this RI.

4.3 SOIL SAMPLE RESULTS

Soil samples were collected for use in this RI using discrete, composite, and ISM procedures for analysis of metals. Confirmation soil samples were collected for analysis of asbestos following excavation activities during the 2022 TCRA.

4.3.1 Discrete and Composite Soil Sample Results

4.3.1.1 Background Surface Soil Sample Results

Twelve discrete background soil samples were collected between 2004 and 2007 and are shown on Figure 2-1. The background samples were collected from surrounding areas anticipated to be free of contamination related to sources within OU2 and subsequently analyzed for metals. Nine of the background samples were collected outside of OU2. The single background sediment sample is discussed below in the sediment section.

Analytical results for lead in background samples range from 7.3 to 17.9 mg/kg. Analytical results for arsenic in background samples range from 1.4 to 3.6 mg/kg. Antimony was not detected in any background sample, except for sample SS-BK-001 for which the reported result of 5.7 mg/kg was rejected. Laboratory detection limits for antimony ranged from 0.086 to 0.090 mg/kg. These results are presented in Table 4-1. The background results were well below risk based screening levels and were not considered in either the human health or ERAs and are therefore not included in this RI dataset.

4.3.1.2 Surface Soil Sample Results

Lead was present in 13 discrete or composite surface soil samples collected from 2004 through 2019 with concentrations ranging from 10.1 to 1,220 mg/kg (Figure 4-1 and Table 4-1).

In 2004, EPA collected a discrete soil sample (SS-SA001; Figure 1-3) that contained a lead concentration of 1,220 mg/kg (Weston 2004). In 2019, USACE collected nine ISM samples from areas that encompassed the discrete sample location SS-SA-001 (i.e., KFR-RR-IA1, KFR-RR-IA2, and KFR-RR-IA3; Figure 2-2), from which average lead concentration is 162 mg/kg (USACE 2021). In 2007, USACE collected a discrete soil sample (NWO-069-0006; Figure 1-3) that contains a lead concentration of 828 mg/kg (Shaw 2008). In 2019, USACE sampled the Horseshoe Disposal Pit area and collected six ISM samples from two decision units (KFR-EOD-DP1 and KFR-EOD-DP2) and discrete sample (KFR-EOD-DP3) that encompassed the 2007 discrete sample location NWO-069-0006. The concentration of lead in the 2019 samples ranged from 2 to 140 mg/kg. The 2019 ISM and discrete sample results supersede the discrete results from 2004 and 2007. The superseded discrete results are excluded from the RI dataset and are not used in decision making including assessing risk or nature and extent of lead within OU2.

Lead concentrations for discrete surface samples, excluding the superseded concentrations, range from 10.1 to 150 mg/kg (Figure 4-1 and Table 4-1). These concentrations are below the lead Project Action Limit (PAL) of 240 mg/kg from the EPA-approved UFP-QAPP, Revision 03 (EA 2022c).

Arsenic is present in soil samples at concentrations ranging from 0.56 to 2.8 mg/kg (Figure 4-2 and Table 4-1). These concentrations are below the regional background concentration for arsenic of 12 mg/kg (ODEQ 2013a, 2013b), which is the established PAL for arsenic at OU2 (EA 2022c).

Antimony is present in soil samples at concentrations ranging from 0.22 to 7.9 mg/kg (Figure 4-3 and Table 4-1). The antimony concentration of 7.9 mg/kg was reported in sample NWO-069-0006, which has been superseded with ISM samples collected in 2019 from decision units KFR-RR-IA1, KFR-RR-IA2, and KFR-RR-IA3. The analytical results for antimony in the soil samples collected in 2004 were rejected (Weston 2004). Superseded and rejected results are excluded from the RI dataset and are not used in decision making including assessing risk or nature and extent of antimony within OU2. Excluding the sample result from NWO-069-0006 and the rejected data, the concentrations of antimony range from 0.22 to 0.27 mg/kg, which are below the residential regional screening level of 31 mg/kg (EPA 2022b).

4.3.1.3 Subsurface Soil Sample Results

In 2019, four discrete subsurface soil samples were collected from 6 to 12 inches or 12 to 18 inches bgs. Lead was reported in each of the four samples at concentrations ranging from 9.7 to 37 mg/kg, which are below the lead PAL of 240 mg/kg. Arsenic concentrations for the subsurface samples were not reported. Antimony was not detected in the subsurface samples at or above laboratory detection limits ranging from 1.4 to 1.7 mg/kg. The subsurface soil sample results are provided in Table 4-1.

Composite confirmation soil samples were collected from the bottom of the TCRA excavations at 3 feet bgs and analyzed for asbestos. These samples were reported to be 100 percent non-fibrous composition with zero percent asbestos (Table 4-3).

4.3.2 Incremental Sampling Methodology Soil Sample Results

Thirty ISM samples were collected from 10 decision units in 2019 and analyzed for metals. Nine ISM samples were collected in 2022 from 3 decision units and analyzed for TAL metals.

As detailed in Section 2.1.2, the laboratory initially processed each 2022 ISM sample through a 2 mm sieve; however, that fraction was not analyzed for TAL metals. Sample material that passed through the 2 mm sieve was further sieved with a 0.5 mm/#35 sieve, then again with a 0.15 mm/#100 sieve, creating four separation fractions and three corresponding metals results from each sample. Laboratory analytical and validation reports for the 2022 ISM samples are included in Appendix A.

A mass weighted concentration of lead, arsenic, and antimony was calculated for use in discussing nature and extent of metal COPCs within OU2 and for use in the HHRA and ERA. The total concentration for each metal COPC was calculated by using the concentration for each sieved soil fraction multiplied by the percent mass for that fraction of all material that passed the 2 mm sieve. The reported percent of each fraction of sample retained was based on the total sample weight, which included the mass remaining on the 2 mm sieve. The material retained on the 2 mm fraction was not analyzed for metals; therefore, each subsequent fraction's percentage was normalized so that 100 percent equaled only the material passing the 2 mm sieve. The adjusted concentrations of each sieved fraction were summed, resulting in a total metal COPC concentration analogous to a total metal COPC concentration had the milling of samples been possible. The representative equation is:

$$\begin{aligned} Cf_1 \times (\% f_1 / \% < 2mm) &= Cf_{1adj} \\ Cf_2 \times (\% f_2 / \% < 2mm) &= Cf_{2adj} \\ + \quad Cf_3 \times (\% f_3 / \% < 2mm) &= Cf_{3adj} \\ \hline &C_{total} \end{aligned}$$

Where:

Cf_1 = COPC concentration of fraction between 2 mm and 0.5 mm

Cf_2 = COPC concentration of fraction between 0.5 mm and 0.15 mm

Cf_3 = COPC concentration of fraction less than 0.15 mm

$\%f_1$ = percent of total sample mass of fraction between 2 mm and 0.5 mm

$\%f_2$ = percent of total sample mass of fraction between 0.5 mm and 0.15 mm

$\%f_3$ = percent of total sample mass of fraction less than 0.15 mm

$\%<2mm$ = percent of total sample mass for all sieved fractions less than 2 mm (i.e., $\%f_1 + \%f_2 + \%f_3$)

Cf_{1adj} = adjusted COPC concentration of fraction between 2 mm and 0.5 mm

Cf_{2adj} = adjusted COPC concentration of fraction between 0.5 mm and 0.15 mm

Cf_{3adj} = adjusted COPC concentration of fraction less than 0.15 mm

C_{total} = Total COPC concentration for sample

The calculations are included as Appendix A.

The concentrations of lead range from 7 to 1,900 mg/kg (Figure 4-4 and Table 4-2) in ISM samples collected within OU2. However, the lead concentration of 1,900 mg/kg in sample KFR-RR-RF112 was considered anomalous as the concentration of lead in the other two replicate samples collected from decision unit KFR-RR-RF1 were 73 mg/kg (sample KFR-RR-RF1) and 72 mg/kg (sample KFR-RR-RF111). In addition, the decision unit was resampled in 2022 (decision unit OU2-RR-RF1), and the concentrations of lead in the three replicate samples are 62.3, 65.3, and 46.7 mg/kg. The concentration of 1,900 mg/kg is superseded by the other results, excluded from the RI dataset, and not used in decision making including assessing risk or nature and extent of lead within OU2.

The three highest lead concentrations (316, 359, and 665 mg/kg) are from the three replicate samples collected from decision unit OU2-RR-BB2 located at the 300-yard small arms firing line (Table 4-2). Excluding the lead results from decision unit OU2-RR-BB2, the maximum concentration of lead is 220 mg/kg in sample KFR-RR-RF212 collected from the impact area of the Rifle Range.

The concentrations of arsenic range from 2.2 to 4.7 mg/kg (Figure 4-5 and Table 4-2) in ISM samples collected within OU2. These concentrations are below the regional background concentration for arsenic of 12 mg/kg.

The concentrations of antimony range from below laboratory detection limits to 16 mg/kg (Figure 4-6 and Table 4-2). The maximum antimony concentration of 16 mg/kg is from decision unit KFR-RR-RF1 (sample KFR-RR-RF112). Decision unit KFR-RR-RF1 was resampled in 2022 and the concentrations of antimony in the three replicate samples were below a laboratory detection limit of 0.50 mg/kg. The concentration of 16 mg/kg is superseded by the 2022 results, excluded from the RI dataset, and not used in decision making including assessing risk or nature and extent of antimony at OU2. Excluding the sample result from KFR-RR-RF112, the concentrations of detected antimony range from 1.5 to 2.2 mg/kg. The laboratory detection limits for the non-detect results ranged from 0.50 to 7.5 mg/kg, which are below the residential regional screening level of 31 mg/kg (EPA 2022b). There is one laboratory detection limit of 63 mg/kg, which is above the residential regional screening level of 31 mg/kg (EPA 2022b).

As part of the laboratory's quality program, a laboratory duplicate was analyzed for soils from the 0.5 to 2.0 mm size fraction of sample OU2-RR-RF1 (Appendix C). Unlike a field duplicate, this sample is used by the laboratory for assessing the analytical data's quality, similar to

laboratory control samples, matrix spike and matrix spike duplicate results, and thus is not included in the RI dataset.

4.3.3 Asbestos-Containing Material Sample Results

Initial identification of the potential for ACM to be on site was reported in 2004 during the PA/SI, when the presence of PACM was observed in a disposal area to the west of OU2. ACM and PACM related to building materials have moved to the surface in areas of former disposal or structures due to disturbance of the soil by anthropogenetic (e.g., excavation) or natural physical processes (e.g., frost heave).

Under direction of EPA or ODEQ, visual surveys, pickup, and TCRA activities were performed within OU2 between 2019 and 2022. Three test pits were excavated in 2019 and one test pit showed signs of PACM at 2 feet bgs. A bulk sample of white chalky material was collected from a different test pit and did not contain asbestos. No PACM was observed in the third test pit (Apex 2019). Another two test pits were excavated in the fall of 2021 in a high-density area of PACM to the northeast of the previous test pits in an area cleared of vegetation. Trace amounts of small, buried, PACM pieces, similar to the observed PACM pieces on the surface, were observed in TP-1 at approximately 6 inches bgs. PACM was not observed in TP-2 (EA 2022a). A total of 6 cubic yards (162 cubic feet) of PACM has been removed across OU2 during the visual surveys and pickup activities.

In addition to these visual surveys and pickups, a TCRA Action Memorandum was prepared, and a TCRA was performed in 2022. As part of the evaluation for the TCRA Action Memorandum, 10 bulk samples were collected for laboratory analysis of ACM. Each of the samples contained asbestos between 4 and 25 percent (EPA 2022a). During the TCRA, ACM and soil containing ACM was removed. In total, 645.5 cubic yards (17,430 cubic feet) from Decision Unit 1 and 46.2 cubic yards (1,248 cubic feet) from Decision Unit 2 were removed. In Decision Unit 3, approximately 9.95 cubic yards (268 cubic feet) of ACM was disposed of off-site from two dilapidated sheds. The total amount of ACM removed from OU2 during the TCRA was 707.65 cubic yards (19,106.55 cubic feet) (Weston 2022).

The analytical results for the bulk ACM samples are not detailed in this RI/FS Report as they only provide confirmation of the presence of ACM within OU2 to evaluate the areas subsequently abated during the TCRA and thus are not a thorough assessment of nature and extent or potential risk of exposure to asbestos.

4.4 AIR (ASBESTOS) SAMPLE RESULTS

4.4.1 Personal Air Monitoring Sample Results

Personal air monitoring was conducted each time PACM handling activities were performed. In 2019, the analytical results of personal and perimeter monitors did not exceed worker exposure limits (Apex 2019). In Fall 2021 and Summer 2022, results calculated for individuals wearing an air monitor were an order of magnitude below health and safety thresholds. The personal air monitoring results cannot be used quantitatively to assess nature and extent of ACM; however,

these data are useful in qualitatively assessing the possible risk of ACM in soil becoming airborne when soil is disturbed.

4.4.2 Activity-Based Sample Results

ABS was performed in 2022 in five pre-determined locations to quantify ACM in air from soil disturbing activities (Figure 2-4). During assessment of Grid 1 air samples, personal air filters were overloading with particulate matter; therefore, pumping rates were reduced from 8.0 to 2.0 liters per minute as directed by the Project Manager. Due to overloading of the air filter, high-flow samples were not analyzed except for sample COL5-01-H. Each of the low-flow samples were analyzed and asbestos fibers were not identified in the ABS samples, except for 1 fiber each in two upwind samples (PM3-UW and PM4-UW). The concentration of the fibers reported in the two upwind samples were 0.0003 phase contrast microscope equivalent fibers per cubic centimeter (PCMe f/cc), which is below the risk-based screening level of 0.03 PCMe f/cc. The analytical results are presented in Table 4-4 and the laboratory report is included in Appendix C.

4.5 SEDIMENT SAMPLE RESULTS

Results of the sediment sample (SD-ST001) and background sediment sample (SD-BK001) from the unnamed intermittent stream running north-south through the area to the east of KFRA indicate that metal COPCs were not detected above risk-based screening levels (Table 4-5).

Lead was detected at 5.5 mg/kg in the downstream sample and at 6.1 mg/kg in the background sample. These are the lowest concentrations of lead reported in samples collected for this RI and are similar to surface soil background concentrations.

Arsenic was detected at 1 mg/kg in the downstream sample and background samples, which is below the concentrations of arsenic reported in the soil background samples.

The antimony results reported at 6.1 mg/kg in the downstream sample SD-ST001 and at 5.9 mg/kg in the upstream sample SD-BK001 were reported as rejected by the laboratory. The 2004 surface soil background sample result was also rejected. Rejected results are excluded from the RI dataset and are not used in decision making including assessing risk or nature and extent of antimony within OU2.

4.6 GROUNDWATER SAMPLE RESULTS

Three groundwater samples were collected between 2004 and 2007, including one field duplicate (Figure 1-3 and Table 4-5). In 2004, the reported concentration of lead was below the laboratory detection limit of 10 µg/L. In 2007, the concentration of lead was reported for the parent sample at 0.56 µg/L and in the duplicate sample at 1.1 µg/L. In 2004, the reported concentration of arsenic was below the laboratory detection limit of 3.2 µg/L. In 2007, the concentration of arsenic was reported for the parent sample at 3.4 µg/L and in the duplicate sample at 3.3 µg/L. In 2004, the reported concentration of antimony was below the laboratory detection limit of 0.32 µg/L. In 2007, the reported concentration of antimony was below the laboratory detection limit of 0.28 µg/L in the parent and duplicate samples.

These groundwater results or laboratory detection limits are below Oregon Health Authority's and EPA's Maximum Contaminant Levels for drinking water, which are 15 µg/L for lead, 10 µg/L for arsenic, and 6 µg/L antimony (Oregon Health Authority 2023; EPA 2022b). Therefore, groundwater is not considered an exposure pathway for COPCs. The groundwater in the area is reported to be at depths between 45 and 375 feet bgs. No groundwater wells are within the OU2 boundary.

4.7 NATURE AND EXTENT OF CONTAMINANTS OF POTENTIAL CONCERN

4.7.1 Metals

Discrete and composite soil samples were collected along the centerline of the Rifle Range between the 500-yard firing line and the impact berm where heavy concentrations of munitions debris were identified. The discrete surface soil samples were collected in 2004 from worst-case locations based on x-ray fluorescence screening. Composite samples from 2007 and ISM samples from 2019 and 2022 were collected from areas where metals released to the environment would have been greatest based on past uses of the property, specifically to provide a more comprehensive evaluation of the firing lines, impact berm, and disposal areas.

Based on a judgmental, worst-case scenario sample design informed by site history, sufficient data has been collected to assess the nature and extent of metals contamination within OU2. Results of the investigation indicate:

- Soil
 - Lead was only detected above its PAL in surface soil at the 300-yard firing line
 - Arsenic was not detected above its regional background levels in soil
 - Antimony was not detected above its residential regional screening level in soil
- Sediment
 - Lead was detected at concentrations similar to soil background concentrations
 - Arsenic was detected at concentrations below soil background concentrations
 - Antimony results for sediment were rejected by the laboratory
- Groundwater
 - Lead was detected below drinking water Maximum Concentration Levels (MCL)
 - Arsenic was detected below MCL
 - Antimony was not detected above laboratory detection limits, which are below MCL

4.7.2 Asbestos

Systematic visual surveys for PACM have been performed across OU2 to identify PACM on the ground surface. Subsurface investigations have occurred in areas of high-density PACM. Between 2019 and 2022, a cycle of visual surveys followed by PACM pickup activities occurred, removing a total of approximately 162 cubic feet of PACM. In 2022 only 0.1 cubic feet of material remained in surface soil and was subsequently removed during the last pickup event. Excavation activities identified minimal vertical extent of PACM in soil, and a TCRA occurred in 2022 that removed soil containing ACM and two buildings with ACM. Lastly, the ABS results

confirmed there is not a potential risk of soil disturbing activities entrained asbestos fibers into the air above EPA's human health risk-based screening level.

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5. CONTAMINANT FATE AND TRANSPORT

This section identifies potential routes and relative rates of contaminant migration or degradation in site-specific environments. The factors influencing fate and transport of contaminants released into the environment include the contaminants' chemical and physical properties, contaminant persistence in the environmental media, soil and groundwater characteristics, contaminant release mechanisms, and other site-specific conditions.

5.1 CONTAMINANT PROPERTIES AND PERSISTENCE

Lead is a naturally occurring metal with a molecular weight of 207.2, melting point of 327.4 degrees Celsius (°C), boiling point of 1,740°C, a density of 11.34 grams per cubic centimeter at 20°C, and a vapor pressure of 1.77 mmHg at 1,000°C. Metals, other than elemental mercury, do not have partition coefficients or Henry's Law constants. The most important factor affecting lead's solubility and mobility in soil is pH (Agency for Toxic Substance and Disease Registry [ATSDR] 2020). Lead's greatest solubility occurs when pH is less than 4 or greater than 11 (ITRC 2003). In general, lead is relatively insoluble and immobile in soil (ITRC 2017). Based on its chemical and physical properties, lead is persistent in soil.

Arsenic is a naturally occurring solid compound classified as a metalloid having properties of both a metal and nonmetal. Arsenic compounds can be classified as an inorganic compound (no arsenic-carbon bond) or as an organic compound (having an arsenic-carbon bond). Elemental arsenic, also referred to as metallic arsenic, is a COPC for OU2. Elemental arsenic is an inorganic compound with a molecular weight of 74.9216, melting point of 817°C, boiling point of 614°C, a density of 5.778 grams per cubic centimeter at 25°C, a vapor pressure of 7.5×10^{-3} mmHg at 280°C, and is insoluble in water. As it is an inorganic compound, elemental arsenic has no partition coefficient or Henry's Law constant (ATSDR 2007). Based on its chemical and physical properties, arsenic is relatively persistent in the environment.

Antimony is a naturally occurring metalloid having properties of both a metal and nonmetal. Antimony displays four oxidation states with the most common being antimony(III) and antimony(V). Antimony has a molecular weight of 121.75, melting point of 630.5°C, a boiling point between 1,325 and 1,750°C, a density of 6.684 grams per cubic centimeter at 25°C, a vapor pressure of 1 mmHg at 886°C, and is insoluble in water. No partition coefficient or Henry's Law constant exists for antimony and its leachability is dependent on pH and oxidation state (ATSDR 2019). Based on its chemical and physical properties, antimony is relatively persistent in soil.

Asbestos is a generic term for six naturally occurring fibrous silicate minerals widely used in commercial products. The most common asbestos mineral (more than 95 percent of U.S. production) is chrysotile, a variety of serpentine, a metamorphic mineral. Serpentine asbestos possesses long and flexible crystalline fibers, which are capable of being woven and thus are used in fabrication including in building materials. Asbestos fibers are chemically inert. They do not evaporate, dissolve, or burn, and are not volatile (ATSDR 2001). Based on its chemical and physical properties, asbestos persists in the environment.

5.2 CONTAMINANT MIGRATION

COPCs are present in the surface and near surface soil within OU2. These COPCs are not known to have impacted sediment or groundwater at or near OU2. Because COPCs are not volatile nor are the soil conditions conducive to leaching to groundwater; therefore, absent mechanical disturbances, they will not migrate in air, soil gas, or soil, the potential routes of migration for the COPCs are limited to:

- Disturbing soil by anthropogenic (e.g., excavation) or natural influences (e.g., wind).
- Moving ACM from near surface soil to the surface by freeze/thaw processes.
- Weathering ACM in surface soil, possibly causing it to become more friable and more likely to migrate in air.
- Eroding soil and transporting by surface water.

Migration of the OU2 COPCs is limited to anthropogenic and natural disturbances of the soils. Anthropogenic disturbances could include digging, grading, and raking. During these activities, COPC-impacted soils could migrate through mechanical means or become airborne and be transported by wind. During the ABS activities, raking was performed in areas where ACM and PACM had historically been observed at the greatest density. The ABS results did not find that asbestos was mobilized into the air during the raking activities.

Naturally occurring disturbances of soil may include erosion, wind, and freeze-thaw processes. Erosion of soil leading to CPOC transport by overland flow of surface water has not been observed within OU2. Surface flow appears to be limited to an intermittent stream that transects OU2 southeast of the range areas, well removed from where the source of COPCs has been documented. Thus, the intermittent stream is not considered a migration pathway; this conclusion is further supported by the sediment sampling results for SD-ST001. Wind may mobilize COPCs in surface soil. However, its effect on ACM and PACM from OU2 will be minimal because surface ACM and PACM has been removed and asbestos in soil was not mobilized during raking, indicating asbestos is unlikely transported to air when surface soils are disturbed. Theoretically, the freezing and thawing of soil could result in the heaving (upward mobilization) of ACM and PACM from near-surface soil to the surface. The sources of ACM and PACM within OU2 are limited and at the ground surface (i.e., no ACM or PACM burial areas have been observed). This was confirmed during the 2021 excavations when only trace PACM material was observed on TP-1 to 6 inches bgs. While some scoured material was observed during annual surveys, PACM in this area was not abundantly identified in the most recent 2022 annual survey (EA 2022b). No evidence of additional scoured materials or appreciable volume exists.

6. HUMAN HEALTH RISK ASSESSMENT

6.1 HUMAN HEALTH RISK ASSESSMENT

The HHRA evaluated the nature and probability of adverse health effects in people who may be exposed to contaminants in environmental media at a site, now or in the future. The HHRA assesses the potential risks from site-related contaminants assuming that no steps are taken to remediate the environment or to reduce contact with contaminated environmental media.

An HHRA is an integral part of the RI process included in the National Oil and Hazardous Substances Contingency Plan (40 Code of Federal Regulations 300.430) pursuant to CERCLA (42 U.S. Code 9605). The results of the HHRA are used to support risk management decisions, such as exposure controls or remedial actions. The HHRA results are based upon potential exposure pathways that can currently occur or are reasonably likely to occur in the future. The HHRA evaluates the reasonable maximum exposure that has the potential to occur at the site. As a result, HHRA results are considered potential and should be used as a guideline in making risk management decisions.

In accordance with EPA (1989) guidance, the HHRA methodology involves a four-step process: data evaluation and hazard assessment, exposure assessment, toxicity assessment, and risk characterization. Sections 6.3 through 6.6 describe the [HHRA methodology](#).

6.2 CONCEPTUAL SITE MODEL

This section presents the preliminary conceptual site model (CSM) for human receptors and environmental media within OU2. The CSM identifies potentially complete exposure pathways by which receptors could contact OU2-related constituents. The CSM provides a framework for addressing potential risks and to evaluate health risks and the need for corrective measures. Figure 6-1 presents a graphic illustration of the HHRA CSM.

As defined in EPA's Risk Assessment Guidance for Superfund, Part A (EPA 1989), all of the following four elements are necessary to complete an exposure pathway:

- A source or release from a source
- A mechanism of release and transport
- A point of contact for potential receptors
- An exposure route

If any of these four elements are missing, then the exposure pathway is incomplete. In general, only potentially complete exposure pathways are evaluated in an HHRA. However, in some instances, exposure pathways that are not reasonably anticipated to be complete are quantitatively evaluated to provide support for risk management decisions. Conversely, in some instances, pathways that are deemed to be insignificant or highly uncertain are excluded from quantitative evaluation. The following subsections briefly discuss the elements of the HHRA CSM.

6.2.1 Sources and Release Mechanisms

As discussed in Section 4.1, OU2 was historically developed as a munitions practice range. It includes a 3.5-inch rocket training, small arms practice, and munitions disposal. Potential sources of asbestos include buildings across OU2 constructed when asbestos was commonly used in building materials and nearby disposal areas. ACM was also prevalent across OU1, and ACM may have been transported to or through OU2 prior to completion of the OU1 remedial activities. COPCs contained within DoD munitions and civilian small arms may have resulted in the release of metals and explosives to the environment, either through use or disposal.

Soil is the primary contaminated environmental media within OU2. The COPCs associated with OU2 have not impacted sediment or groundwater within or near OU2.

6.2.2 Potential Receptors and Exposure Routes

Most of the following information has been summarized from detailed discussions throughout Section 3. OU2 is uninhabited and consists of relatively flat, rocky terrain with low ground cover. OU2 is located within a zoning classification of low-density residential (Klamath County 2023). Properties adjacent to OU2 are also zoned as medium-density residential and low-density residential and several residences are located adjacent to OU2. The largest nearby residential population is located approximately 0.5–1 mile west of OU2 in the North Ridge Estates neighborhood, designated as OU1 of the site. The closest residential property is approximately 500 feet southwest of OU2. Historical investigations noted that portions of OU2 had been used by the public for skeet and target practice and residents use the property for activities such as hiking, hunting, and walking pets. The area also shows evidence of all-terrain vehicles.

No perennial water features exist in OU2. There are numerous domestic groundwater wells within a 4-mile radius of OU2 that are used for irrigation, drinking water, and livestock watering. Drinking water for most residential properties near OU2 is provided by 13 groundwater wells located throughout the City of Klamath Falls (City of Klamath Falls 2023a; City of Klamath Falls 2023b). The groundwater wells have depths ranging from 300 to 1,000 feet bgs, with the closest well located approximately 4 miles southwest of OU2.

Given current and future land use and zoning, the following receptors are expected for OU2:

- Current and future trespassers
- Current and future maintenance workers
- Future residents
- Future construction workers

Based on evidence of recreational activities, it is reasonable to expect that trespassers could include families with age ranges from children (less than 6 years of age) to adults. Maintenance workers and construction workers are adults. Future residents would also include age ranges similar to the trespassers; children to adults. The following exposure routes are identified for all receptors' exposure to OU2 soil:

- Ingestion
- Direct/dermal contact
- Inhalation of particulates

6.3 DATA EVALUATION AND HAZARD ASSESSMENT

Section 4 provides further details of samples evaluated in the HHRA. For this HHRA, sample results were compiled, reviewed, and compared to risk-based screening levels selected for impacted media (i.e., asbestos in air, metals in soil) throughout OU2. The comparison of OU2-specific concentrations of COPCs to risk-based screening levels allows the HHRA to focus on analytes that warrant further evaluation in the HHRA. When an analyte is detected at a concentration below its risk-based screening level, exposure is not expected to result in health effects or concerns, and the analyte is not considered further in the HHRA. However, analytes above risk-based screening levels do not necessarily represent a health concern. Instead, the results of the screening identify those analytes that warrant site-specific evaluation to determine whether health effects may occur.

6.3.1 Activity-Based Asbestos Samples

To determine the presence of asbestos in soil, ABS raking was performed to assess short-term exposure risk from ACM to humans during soil disturbing activities in OU2. Five sample locations, each consisting of approximately 100 by 100-foot grids (10,000 square feet), were identified for raking activities (Figure 2-4). Four personal air samples and three perimeter samples were collected at each location. Fibers were not reported in the ABS samples, except for 1 fiber in each of two upwind samples (PM3-UW and PM4-UW). Because these were upwind samples, the fibers reported in these samples are not related to OU2. Therefore, the ABS results confirmed there is not a potential risk of soil disturbing activities mobilizing asbestos fibers into the air, and there is no appreciable exposure risk to humans from asbestos during soil-disturbing activities. As a result, asbestos was not evaluated further in the HHRA.

6.3.2 Soil Metals Samples

As discussed in Section 4, soil samples have been collected within OU2 through various investigations. Soil sampling consisted of discrete, composite, and ISM samples for metal COPCs. Sample results for these COPCs are presented in Table 4-1 for discrete and composite samples and Table 4-2 for ISM samples.

6.3.2.1 Lead

Lead occurs in discrete and composite (i.e., non-ISM) surface soil samples with concentrations ranging from 10.1 to 150 mg/kg. Lead is also present in discrete subsurface soil samples with concentrations ranging from 9.7 to 37 mg/kg. Concentrations of lead in discrete and composite (i.e., non-ISM) surface and subsurface samples are below its OU2-specific PAL of 240 mg/kg.

ISM soil sampling was conducted in 2019 as part of the USACE RI (USACE 2021) and in August 2022 as part of the Supplemental Soil Sampling (EA 2022e). ISM samples collected as part of the USACE RI were sieved only through a 2 mm sieve and analyzed for metals. The August 2022 ISM samples were passed through additional sieves as discussed in Section 2.1.2.2. Only the material that passed through the 2 mm sieve, the 0.5 mm sieve, and 0.15 mm sieve were analyzed for metals and evaluated in the HHRA.

The evaluation of the ISM samples and the separate sample fractions was based upon EPA guidance (EPA 2000, 2016a). For current exposures, the lead results for the less than 0.15 mm sieve were used. Therefore, only the ISM samples collected during August 2022 were evaluated for current exposures. For future exposures, the full sample that passed through the 2 mm sieve was used. The use of the full sample accounts for potential future weathering and breakdown of soil. Therefore, all ISM samples were evaluated for future exposures. Material greater than 2 mm was evaluated through visual inspection and microscopy for potential lead fragments. No lead fragments were present.

To evaluate the ISM samples, the replicate samples were evaluated with the ITRC ISM calculator (ITRC 2020). For lead, exposure point concentrations (EPCs) were based on the arithmetic mean concentration of lead in soil. This is based on a method used by EPA to evaluate the potential risks associated with exposures to lead in environmental media which recommends the use of central tendency input parameters to develop probability distributions of blood lead (PbB) levels (EPA 1994, 2003a). The resulting mean lead concentrations were compared to its OU2-specific PAL of 240 mg/kg. The outputs from the ITRC calculator are provided in Appendix D.1.

The following table presents the mean lead concentrations for each 2022 ISM decision unit based upon all results <0.15 mm sieve:

Decision Unit	Replicate 1 (mg/kg)	Replicate 2 (mg/kg)	Replicate 3 (mg/kg)	Mean (mg/kg)	Evaluate Further ^(a) ?
OU2-RR-BB2	274	357	309	313	Yes
OU2-RR-BB3	33.7	22.7	18	24.6	No
OU2-RR-RF1	70.7	84.5	58.9	71.4	No

Notes:

Bold font indicates a lead result exceeding the OU2-specific PAL of 240 mg/kg.

(a) Decision units are evaluated further in the HHRA if the lead mean exceeds the OU2-specific PAL of 240 mg/kg.

The following table presents the mean lead concentrations for each ISM decision unit based upon all results <2 mm sieve:

Decision Unit	Replicate 1 (mg/kg)	Replicate 2 (mg/kg)	Replicate 3 (mg/kg)	Mean (mg/kg)	Evaluate Further ^(a) ?
KFR-RR-IA1	150	180	170	167	No
KFR-RR-IA2	200	120	220	180	No
KFR-RR-IA3	130	190	180	167	No
OU2-RR-BB2	665	359	316	447	Yes
OU2-RR-BB3	28.8	19.2	16.6	21.5	No
OU2-RR-RF1	62.3	65.3	46.7	58.1	No

Notes:

Bold font indicates a lead result exceeding the OU2-specific PAL of 240 mg/kg.

(a) Decision units are evaluated further in the HHRA if the lead mean exceeds the OU2-specific PAL of 240 mg/kg.

As shown in the preceding tables, only the mean lead concentrations within decision unit OU2-RR-BB2 exceed the OU2-specific PAL. Therefore, only lead within this decision unit was evaluated further in the HHRA for both current and future receptors.

6.3.2.2 Arsenic

Arsenic is present in discrete and composite surface soil samples collected from OU2 with concentrations ranging from 0.56 to 2.8 mg/kg. Arsenic is not detected in discrete subsurface soil samples with laboratory detection limits ranging from 0.96 to 3.6 mg/kg. Concentrations of arsenic were not reported for the 2019 ISM soil samples and range from 1.97 to 5.99 mg/kg in the individual sieve fractions 2022 ISM samples (Appendix A). Concentrations of arsenic in discrete, composite, and ISM surface samples and laboratory detection limits for discrete subsurface samples are below the regional background concentration for arsenic of 12 mg/kg, which is the established PAL for arsenic at OU2 (ODEQ 2013a, 2013b). Arsenic is not evaluated further in the HHRA.

6.3.2.3 Antimony

Results for antimony from the 2004 discrete surface soil samples were rejected by the laboratory (Weston 2004). Antimony is present in composite surface soil samples collected from OU2 with concentrations ranging from 0.22 to 0.27 mg/kg. Antimony is not detected in discrete subsurface soil samples with laboratory detection limits ranging from 1.4 to 1.7 mg/kg. Antimony is not detected in the 2019 ISM soil samples with laboratory detection limits ranging from 1.2 to 63 mg/kg. Concentrations of antimony range from 1.3 to 5.75 mg/kg in the individual sieve fractions 2022 ISM samples (Appendix A). Concentrations of antimony in composite and ISM surface samples and laboratory detection limits for discrete subsurface samples (with one exception) are below the residential regional screening level of 31 mg/kg (EPA 2022b). Antimony is not evaluated further in the HHRA.

6.3.3 In Vitro Bioaccessibility Assay Samples

One soil sample from each decision unit sampled in 2022 was collected for the in vitro bioaccessibility assay samples (IVBA). The IVBA was conducted on the less than 0.15 mm fraction. The IVBA assays measure the bioaccessibility of lead in soil from the measurements of *in vitro* solubility using a gastric-phase extraction medium. The IVBA results are used to estimate the relative bioavailability (RBA). The RBA represents the ratio of the absolute bioavailability of lead in soil to that of a water-soluble reference form (EPA 2021c). The RBA is dependent on the physical and chemical properties of the lead species and the characteristics of the soil. The RBA predicts of the amount of lead in soil that is available for uptake through the ingestion exposure pathway for children up to 72 months old (EPA 2021c).

The RBA is predicted from the IVBA results using a regression model. The regression model converts lead IVBA to lead RBA according to the following equation (EPA 2021c, 2021d):

$$\text{Lead RBA percent} = 0.878 \times \text{IVBA percent} - 2.8$$

Based on EPA guidance (EPA 2021c), the RBA estimate should be similar to the method used to determine the EPC. For lead, the arithmetic mean concentration is used as the EPC. Therefore, the arithmetic mean RBA is selected as the appropriate statistic. The following table presents the results of the lead IVBA sampling, the RBA, and the arithmetic mean of the results:

Sample Location	Calculated IVBA %	Calculated RBA %
OU2-RR-BB2	58.4	48.6
OU2-RR-BB3	40.4	32.7
OU2-RR-RF1	44.0	35.9
Arithmetic Mean		39

The OU2-specific RBA of 39 percent was used in the PbB models to adjust bioavailability parameters to account for OU2-specific differences between the bioavailability of soil lead within OU2 and the value assumed in the models (EPA 2021c). The application of the RBA in the Pb models is discussed further in Sections 6.4.1 and 6.4.2.

6.4 EXPOSURE ASSESSMENT

As identified in Section 6.3, lead is the only analyte in the HHRA. The risk evaluation of lead differs from other constituents because of its unique toxicological properties. EPA developed alternative methods to evaluate the potential risk associated with exposure to lead in soil that estimate blood lead levels (BLLs) based on exposure and then compare those BLLs to benchmark or reference levels.

EPA provides separate models for estimating risk associated with lead exposure for older receptors (adults) and children (age up to 72 months): the Adult Lead Model (ALM) and the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children, respectively (EPA 2017, 2021b). Current exposures to lead in soil use the arithmetic mean concentration of the less than 0.15 mm fraction for adult and children trespassers. As a result, current exposures

were evaluated using only the IEUBK model to evaluate potential risk concerns for children who may use the site. Future receptors include adult and children residents and workers (i.e., maintenance and construction). Therefore, both the ALM and the IEUBK model were used to evaluate potential future receptor's exposure to OU2 soil using the arithmetic mean concentration of the less than 2 mm fractions.

6.4.1 Adult Lead Model Equations

The ALM involves estimating fetal PbB levels in women of child-bearing age exposed to lead in soil. The following equations and inputs were used for calculating PbB levels in the developing fetus:

$$PbB_{fetal} = PbB_{mat} \times GSD_i^{1.645} \times R_{\frac{fetal}{mat}}$$

$$PbB_{mat} = PbB_0 + \frac{CS_{Pb} \times BKSF \times IRS_{Pb} \times AF_{Pb} \times EF}{AT_{Pb}}$$

Where:

- PbB_{fetal} = 95th percentile fetal PbB level (micrograms of lead per deciliter whole blood [µg/dL]), calculated
- PbB_{mat} = Mean maternal PbB level (µg/dL), calculated
- GSD_i = Geometric standard deviation of PbB levels in a homogenous population, where the exponent of 1.645 is the standard normal deviate used to calculate the 95th percentile from a lognormal distribution (default 1.8; unitless)
- R_{fetal/mat} = Ratio between fetal and maternal PbB levels (default 0.9; unitless)
- PbB₀ = Baseline geometric mean PbB level, U.S. women of child-bearing age (default 0.6 µg/dL)
- CS_{Pb} = EPC for lead in soil, arithmetic mean (site-specific, mg/kg)
- BKSF = Lead-specific biokinetic slope factor (default, 0.4 µg/dL per µg/day)
- IRS_{Pb} = Ingestion rate of soil (mg/day), 50 mg/day, default
- AF_{Pb} = Absolute gastrointestinal absorption fraction, site-specific input of 7.8 percent based upon the site-specific RBA of 39 percent of lead in soil/dust and 20 percent absorption of soluble lead (EPA 2021c)
- EF = Exposure frequency (219 days per year)
- AT_{Pb} = Averaging time for lead exposure (365 days)

6.4.2 Integrated Exposure Uptake Biokinetic Model

The IEUBK model, version 2, build 1.72 predicts a distribution or geometric mean of PbB levels for a hypothetical child or population of children (EPA 1994; 2021b). From this distribution, the model estimates the risk (i.e., probability) that the PbB level of an individual child or a population of children will exceed a specified target PbB level. Model equations are not presented due to the number and complexity. A detailed description of equations is provided in the IEUBK model Technical Support Document (EPA 1994). Key model inputs for calculating PbB levels in children are described below and are default IEUBK model values, unless noted (EPA 2021b).

PbB_{mat}	=	Baseline geometric mean PbB level in U.S. women of child-bearing age as is the IEUBK default input value of 0.6 $\mu\text{g}/\text{dL}$
GSD_i	=	Geometric standard deviation of PbB levels in U.S. children aged up to 72 months IEUBK default input value of 1.8 (unitless)
CS_{Pb}	=	EPC for lead in soil, arithmetic mean (mg/kg)
IRS_{Pb}	=	Soil ingestion rates are the IEUBK default central tendency values, which range from 55 to 94 mg/day, depending on the age
F_{soil}	=	The percentage of total ingested soil and dust derived from soil is 45 percent and 55 percent, respectively
AF_{Pb}	=	The absolute gastrointestinal absorption factor for lead from soil and dust For current exposures, the IEUBK default of 30 percent (default RBA of 60 percent of lead in soil/dust and 50 percent absorption of lead in drinking water) For future exposures, a site-specific value of 19.5 percent (site-specific RBA of 39 percent of lead in soil/dust and 50 percent absorption of lead in drinking water)
CA_{Pb}	=	The assumed concentration of lead in ambient air lead is the default IEUBK model input of 0.1 μg per cubic meter
CW_{Pb}	=	The concentration of lead in drinking water is the default IEUBK model input of 0.9 $\mu\text{g}/\text{L}$
IRW_{Pb}	=	Drinking water intake rates are the IEUBK default age-specific values, which range from 0.4 to 0.63 liters per day
AF_W	=	Absolute gastrointestinal absorption factor for lead from water is 50 percent
IRD_{Pb}	=	Dietary lead intake rates are the IEUBK default age-specific values, which range from 2.66 to 6.04 μg lead per day
AF_D	=	Absolute gastrointestinal absorption factor for lead from the diet is 50 percent

6.5 TOXICITY ASSESSMENT

Lead is classified as a B2-probable human carcinogen. However, EPA has not published a slope factor or inhalation unit risk for quantifying carcinogenic risks. Lead is not regulated as a carcinogen because it appears to be more potent as a toxicant to the hemopoietic system by inhibiting heme synthesis. Much of the toxicological data collected on the effects of lead in humans relates to exposure and effect in terms of the amount of lead in blood associated with an observed effect, expressed as μg lead/dL blood. EPA and the Centers for Disease Control and Prevention (CDC) have determined that there is no safe level of lead in children (CDC 2012). A target PbB level of 5 μg /dL was used in this HHRA.

6.6 RISK CHARACTERIZATION

For lead, results from the ALM and IEUBK models were compared to EPA policy. To achieve a specific level of protectiveness, EPA established a limit of exposure to soil lead levels such that a typical (or hypothetical) child would have no more than a 5 percent chance of attaining a PbB of 5 μg /dL (EPA 1994). Results from the ALM and IEUBK model were correlated to the 5 percent threshold and outputs are provided in Appendix D.2, Tables D.2.1 through D.2.3. The following table presents the results from the ALM and IEUBK models based upon current and future exposures:

Receptor	Percent > 5 μg /dL	Geometric Mean Blood Lead Level (μg /dL)
<i>Current Exposures</i>		
Child Trespasser	13.3	3.0
<i>Future Exposures</i>		
Child Resident	11.2	2.8
Adult Worker	0.2	2.4

As shown above, the current and future exposures for a child to lead in soil within decision unit OU2-RR-BB2 reveal a potential concern. Exposure to soil may result in greater than 5 percent of the child population exceeding a PbB of 5 μg /dL. It is noted that the current trespasser scenario does not account for the site-specific bioavailability and is therefore slightly higher than that of future residents. Additionally, both the child trespasser and the child resident were evaluated using the IEUBK model. The IEUBK model simulates PbB associated with continuous exposures of sufficient duration to result in a quasi-steady state (EPA 2016b). Therefore, the IEUBK model does not make a distinction between the trespasser or resident exposure scenarios, which were evaluated as full-time residential. The ALM evaluation of future workers did not reveal a potential health concern.

6.7 UNCERTAINTIES

There are numerous uncertainties inherent in the HHRA process. Risk assessment methods as specified by guidance (EPA 1989) are precautionary. As such, they are protective; however, may overestimate risks to assure protectiveness of public health. Where uncertainties exist,

conservative parameters were used in the HHRA process to ensure that the resulting risk characterization represents an “overestimate” of potential human health concerns. This ensures adequate protection of human health so that risks are not underestimated. In this assessment, evaluating risk as residential is a protective assumption. The site is not currently used as residential; however, residences are located adjacent to the site.

Of the potential uncertainties associated with environmental sampling, the sample design is likely to have the greatest impact on the evaluation of risks to receptors. The soil sampling design used in OU2 was developed based on the available historical information regarding the activities that occurred at OU2 and historical sample results. Focusing the study design to provide analyses for certain compounds specific to suspected source areas is a valid and accepted means of maintaining a practical and efficient limit on the field effort. However, there is always a possibility that the study design could miss sampling where these compounds are present or miss other types of compounds in a specific sample.

The ISM sampling design was used to prevent missing areas where OU2-related contaminants are present. The ISM decision units were identified in areas of suspected historical activities or elevated concentrations from previous investigations. The unsampled areas present an uncertainty in that, over time, as the soils may be reworked and spread across the property, these areas that were not sampled may contain contaminants. However, ISM sampling design outperforms discrete sampling designs.

To address the uncertainties just discussed, and in accordance with the conservative nature of HHRA, samples targeted areas of likely contamination based on where weapons were discharged and where targets were located. However, this bias may result in an overestimate of potential contaminant concentrations that a receptor may be exposed to over a long term.

6.8 HUMAN HEALTH RISK ASSESSMENT CONCLUSIONS

Sample results for asbestos, lead, arsenic, and antimony were evaluated in the HHRA. Asbestos was not detected in ABS samples from personal air monitors and was not evaluated in the HHRA. Arsenic was not detected above its OU2-specific PAL and antimony was not detected above its residential screening level; therefore, neither metal was evaluated in the HHRA.

Lead was the only COPC evaluated in the HHRA. Lead exceeded the OU2-specific PAL in only one decision unit, OU2-RR-BB2. The arithmetic mean lead concentration within decision unit OU2-RR-BB2 was evaluated in both the ALM and IEUBK models. Current exposures to lead in soil evaluated the arithmetic mean lead concentration in the less than 0.15 mm fraction (EPA 2000, 2016b). Future exposures to lead in soil evaluated the arithmetic mean lead concentration in the total less than 2 mm fraction (EPA 2000, 2016b). Future exposures also were assessed using a site-specific RBA of 39 percent. The IEUBK model revealed potential concerns for child receptor's exposure to lead in soil within decision unit OU2-RR-BB2 for both current and future exposures. The ALM did not reveal potential concerns for adult female workers.

As a result of potential risk concerns for a child receptor exposure to lead within decision unit OU2-RR-BB2, lead has been identified as a contaminant of concern within OU2. A preliminary remediation goal (PRG) for lead was determined. The IEUBK model was used to determine an acceptable soil lead concentration that would result in less than 5 percent of a child population having a PbB level of 5 µg/dL. Additionally, the OU2-specific RBA of 39 percent was used in the IEUBK model to modify the AF_{Pb} to determine the lead PRG. A copy of the IEUBK output for the PRG calculation is provided in Appendix D.2, Table D.2.4. The resulting lead soil PRG of 311 mg/kg was determined to ensure that less than 5 percent of a typical child population will have a PbB level of 5 µg/dL or higher.

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7. ECOLOGICAL RISK ASSESSMENT

7.1 INTRODUCTION

The purpose of this ERA is to characterize and quantify potential environmental impacts from contaminants in soil, specifically surface soil, within OU2. This ERA was conducted in accordance with the process outlined in the EPA document, *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final* (EPA 1997) and other relevant EPA guidance.

The process for an ERA outlined in EPA guidance includes eight steps (EPA 1997, 1998) and this document presents the first three steps of the ERA process (Figure 7-1). Steps 1 and 2 represent the Screening Level Ecological Risk Assessment (SLERA). The ecological CSM (Section 7.3) defines exposure pathways and identifies assessment and measurement endpoints. The SLERA (Section 7.4) builds on the ecological CSM and uses highly precautionary assumptions regarding exposure and toxicity to identify contaminants of potential ecological concern (COPECs). The screening level evaluation typically relies on laboratory analytical data.

Step 3 of the ERA process is the baseline risk assessment problem formulation, which draws from the risk evaluation performed in the SLERA to identify COPECs, exposure pathways, assessment endpoints, and risk questions requiring further consideration. The problem formulation includes refinement of the screening level risk calculations using more realistic or more relevant exposure and toxicity data (Section 7.5 and Section 7.6). The goal of the problem formulation is to provide a clear definition of the ecological risk within OU2. This problem formulation is the basis for either further assessment or, in cases where sufficient data are available, risk management if necessary. For OU2, a refinement of risk calculations was performed, and the results are presented in Section 7.7 and Section 7.8. Section 7.9 describes the uncertainties inherent to the ERA and Section 7.10 summarizes the results of the ERA.

For sites without clear risk conclusions and where further investigation is warranted, Steps 4 through 8 detail the study design and data quality objectives, verification of the field sampling design, site investigation and data analysis, risk characterization, and risk management. However, further investigation for risk assessment is not required and the ERA for OU2 concludes at Step 3.

7.2 SUMMARY OF DATA USED IN THE ERA

The previous sampling efforts discussed in detail in Section 4 resulted in a mix of discrete (Table 4-1), composite (Table 4-1), and ISM (Table 4-2) samples for the OU2 metal COPCs: lead, arsenic, and antimony. Only the metal COPCs (i.e., not asbestos) are considered COPECs for this ERA. Asbestos was not detected in ABS samples from personal air monitors and was not evaluated in the ERA.

The discrete and composite surface sample data were compared to the ISM surface sample data to ensure any risk was captured using the ISM samples only in the ERA.

COPEC	Discrete and/or Composite (mg/kg) (see Table 4-1)	ISM (mg/kg) (see Table 4-2)
Lead	10.1 to 150	7 to 665
Arsenic	0.56 to 2.8	2.3 to 4.7
Antimony	0.22 to 0.27	1.6 to 2.2

The maximum of the discrete and composite surface soil sample concentrations is less than those measured in the ISM samples for each COPEC. The maximum ISM sample concentrations are used in the SLERA as well as the refined risk characterization in addition to the 95 percent upper confidence limit of the mean (95UCLM); thus, use of only the ISM sample data is a conservative approach. Further, ISM provides more reliable and reproducible sampling results than traditional sampling approaches in heterogenous soils (ITRC 2020); therefore, only ISM sample data were used in the ERA.

As discussed in Section 2.1.2.2, ISM samples collected in 2022 were not milled because of safety concerns of asbestos materials in the soil. Each sample was air dried and weighed before processing through a series of sieves. The fractions that passed through the 2 mm sieve were analyzed for lead, arsenic, and antimony. Total concentrations were calculated for use in the ERA as described in Section 4.3.2 with the calculations provided in Appendix A.

Historical land use suggests lead shot may be present and could potentially pose risk to ecological receptors. The sieved fraction greater than 2 mm was visually inspected to identify any suspected bullet fragments (metallic-looking particles) and, if suspected bullet fragments were observed, the fragments were to be removed, retained, and weighed. The suspect bullet fragments were then to be viewed through a scanning electron microscope. The laboratory did not identify any suspect bullet fragments in the nine ISM samples collected in 2022 and lead shot density will not be further evaluated in this ERA. However, since samples were not collected for the purpose of evaluating lead shot density, there is some uncertainty with the conclusion that the soil does not contain lead shot. This uncertainty is explained in Section 7.9.

7.3 ECOLOGICAL CONCEPTUAL SITE MODEL

The ERA is based on a CSM for the OU2 investigation area. Supported by discussion in Section 4, the COPECs are lead, arsenic, and antimony in the soil. Lead shot could potentially pose risk to ecological receptors. The previous sections of this RI have defined the potential source areas (Section 4.1), described nature and extent of contamination (Section 4.7), discussed fate and transport of contaminants (Section 5), and identified threatened and endangered species that may be present (Section 3.8). This ecological CSM describes the ecological setting, determines complete ecological exposure pathways, and identifies representative ecological receptors to be used in the ERA. The CSM is presented on Figure 7-2.

7.3.1 Ecological Setting

OU2 is in the foothills of the Cascade Mountains at an elevation of approximately 5,100 feet. Topography is relatively flat with a low ground cover consisting of shrub-steppe, with occasional tree outcroppings consisting largely of coniferous species including ponderosa pine (*Pinus*

ponderosa) and Douglas fir (*Pseudotsuga menziesii*) (Weston 2022). OU2 has no perennial water features, however multiple drainage channels flow into an intermittent stream which flows approximately 8.5 miles into an unnamed canal that enters Klamath Lake (Weston 2004).

7.3.2 Exposure Pathway Analysis

Based on the ecological setting and exposure media (i.e., soil) discussed above, ecological receptors potentially present at OU2 include terrestrial plants, soil invertebrates, birds, mammals, reptiles, and amphibians. Exposure media and ecological receptors are evaluated to determine potential exposure pathways linking the two as shown in the ecological CSM on Figure 7-2. The ecological CSM differentiates between complete pathways (those that could reasonably occur) and incomplete pathways (those which are not relevant to the receptor). The ecological CSM also differentiates between significant complete exposure pathways and insignificant complete exposure pathways. The sections below discuss each ecological receptor group and identify the applicable exposure pathways. Uncertainties and data gaps are discussed in Section 7.9.

7.3.2.1 Terrestrial Plants and Soil Invertebrates

Terrestrial plants may absorb contaminants from surface and subsurface soil through their root system and from air or airborne particulates through their leaves. Foliar (leaf) uptake by plants is not well understood and will greatly vary based on plant species; however, the waxy surfaces of leaves limit this exposure (Shahid et al. 2016). Soil invertebrates may be exposed to contaminants in soil through direct contact, absorption, and ingestion, and in airborne particulates through direct contact. Terrestrial plant and soil invertebrate exposures are expected to occur primarily in surface soil, where most organic matter is found. Therefore, exposure pathways linking terrestrial plants and soil invertebrates to surface soil are complete and significant at OU2 and relevant for assessment.

7.3.2.2 Birds and Mammals

The most significant exposure route for birds and mammals is ingestion of contaminants found in contaminated media (EPA 2003b), including surface soil, surface water, and food items. Surface water is not considered a complete pathway in this ERA due to a lack of water sources on site. Birds and mammals may ingest contaminants in environmental media by incidentally ingesting soil while grooming or foraging (EPA 1993). Contaminants may bioaccumulate in animal tissues and birds and mammals may also ingest contaminants through the prey they consume. Ingestion of contaminants in soil and food are considered complete and significant exposure pathways for birds and mammals.

In addition, birds commonly consume grit to aid in digestion and lead shot is of the right size to be consumed as grit. Lead shot is expected to be a more significant exposure route for birds than ingestion of soil and prey (Massachusetts Department of Environmental Protection 2009). There is a high variability of lead shot toxicity to bird species as it is dependent upon retention time in the digestive system, stomach acidity, degree of physical abrasion experienced by lead shot in the digestive system, diet, and environmental factors (Kendall et al. 1996). Lead shot was not

observed in samples that were analyzed, although uncertainties do not entirely preclude the potential for this pathway, as discussed in Section 7.2.

Birds and mammals may be exposed to contaminants through direct contact during foraging or burrowing or from airborne particulates. Most birds and mammals have protective outer coverings such as fur, feathers, or scales that prevent or limit the dermal absorption of contaminants from environmental media (U.S. Army Center for Health Promotion and Preventative Medicine [USACHPPM] 2004). EPA guidance identifies that, in most cases, dermal exposures are likely to be less significant than exposures through ingestion, and their evaluation involves considerable uncertainty (EPA 2003b; USACHPPM 2004). This exposure route is considered complete although relatively insignificant for birds and mammals.

Inhalation is a potentially complete pathway for birds and mammals. Animals may inhale contaminants that have volatilized or that are adsorbed to airborne particulates. EPA guidance indicates that, in general, inhalation pathways are complete although likely to be insignificant compared to ingestion pathways (EPA 2003b).

In summary, ingestion of contaminants in surface soil and food are the routes of exposure that will contribute the greatest exposure potential and are therefore, considered complete and significant exposure pathways for assessment of risk to birds and mammals.

7.3.2.3 Reptiles and Amphibians

Reptiles and amphibians are exposed to contaminants through direct contact with and ingestion of surface water, airborne particulates, and soil as well as ingestion of food (prey tissue). All of these represent complete pathways. However, only the ingestion of food and the ingestion of and direct contact with soil are considered significant (Weir et al. 2014). Dermal contact with water may constitute an exposure pathway; however, because there are no water sources on site, this pathway is not considered complete and is not evaluated in this ERA. Exposure to airborne particulates is a complete pathway; however, it is not quantifiable as insufficient data exist to determine exposure estimates from particulates during inhalation.

7.3.3 Selection of Representative Receptors

Specific receptor groups and representative receptor species are selected to represent each of the ecological receptor groups identified above. Selection of representative receptor species is based primarily on several factors: (1) the likelihood of a species to use the site; (2) the potential for exposure to site-related contaminants based on the feeding habits and life history of the organisms/guild represented by the receptor species; (3) the availability of life history and exposure information for the selected receptor species; and (4) the availability of toxicity information for the representative receptor species. In cases where available toxicity data are of a general nature, communities or trophic levels were selected for evaluation. For threatened or endangered species (Section 3.8), surrogate receptors were selected to ensure that risks to these species are adequately assessed because the surrogates share common life history traits with the threatened or endangered species.

7.3.3.1 Terrestrial Plants

Based on the general nature of available plant toxicity data, no specific plant species are selected for evaluation. Instead, the assessments evaluate the potential for adverse effects to terrestrial plant communities and crops.

7.3.3.2 Soil Invertebrates

The earthworm (e.g., *Eisenia fetida*) is an ideal receptor species because they are in constant contact with the soil and do not have an exoskeleton; as such, they represent a precautionary estimate of exposure for soil invertebrates.

7.3.3.3 Herbivores

The California quail (*Callipepla californica*) is an appropriate receptor species because it is likely to occur within OU2, shares many life history traits with other birds, and is a Galliformes species, an order of birds which ingests grit to aid in digestion. Although inspection of the surface soil samples did not find lead shot, based on the land use history, lead shot may be present.

The deer mouse (*Peromyscus maniculatus*) is an appropriate receptor species because it is likely to occur within OU2, is a potential food source for other animals, and has a life history similar to that of many other small mammals.

7.3.3.4 Omnivores/Insectivores

The American robin (*Turdus migratorius*) was selected as the representative receptor species to evaluate the potential for adverse effects to omnivorous birds and as the surrogate receptor species for the yellow-billed cuckoo. The yellow-billed cuckoo is identified as a protected species that may be present within OU2 (Section 3.8). The American robin, similar to the yellow-billed cuckoo, occurs in a wide range of habitat types, may be present within OU2, feeds primarily on terrestrial invertebrates, and has a life history similar to that of many other passerine birds.

The vagrant shrew (*Sorex vagrans*) is an appropriate receptor species because it is a potential food source for other animals, may occur around OU2, and has a life history similar to that of other small insectivorous mammals.

7.3.3.5 Predators

The red-tailed hawk (*Buteo jamaicensis*) is a suitable representative for a predatory bird receptor because it feeds predominantly on small mammals (i.e., mice, shrews, voles, rabbits, and squirrels) and is likely to be present within OU2.

The coyote (*Canis latrans*) was selected as the representative receptor for predatory mammals and as the surrogate receptor for the protected species gray wolf, kit fox, and wolverine that may

be present within OU2 (Section 3.8). The coyote is an appropriate surrogate receptor as it falls in the middle of the size range, is a carnivore (as are the protected species), may be present at the site, feeds primarily on small mammals, and has a high potential for exposure due to bioaccumulation through the food chain. The coyote is also a valuable component to ecosystem structure by regulating the abundance, reproduction, distribution, and recruitment of lower trophic level prey (Crooks and Soulé 1999; Kilgo et al. 2012).

7.3.3.6 Reptiles and Amphibians

There is not sufficient data available to support quantitative evaluation of exposures to reptiles and amphibians; however, representative receptors are still selected for potential use in the future if sufficient data become available. The Pacific gophersnake (*Pituophis catenifer*) was selected as the representative receptor for reptiles because it may be present within OU2. The gophersnake primarily feeds on small mammals. The American bullfrog (*Rana catesbeiana*) was selected as the representative receptor for amphibians because it may be present within OU2. Bullfrogs are carnivorous and eat a wide variety of food items including small mammals, fish, snakes, birds, insects, and tadpoles.

7.4 STEPS 1 AND 2: SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

The SLERA is the first two steps of the eight-step ERA process (Figure 7-1) and include the screening-level problem formulation, toxicity evaluation, exposure estimate, and risk calculation.

7.4.1 Screening-Level Problem Formulation

The screening-level problem formulation includes development of an ecological CSM (Section 7.3), and identification of assessment and measurement endpoints for each representative receptor species evaluated within or near OU2. Assessment endpoints are specific ecological attributes to be protected and measurement endpoints are quantifiable ecological characteristics related to the assessment endpoints (EPA 1997).

7.4.1.1 Assessment And Measurement Endpoints

EPA guidance stresses the importance of ecologically significant endpoints. Failure to select appropriate assessment and measurement endpoints can result in the inability to answer the risk questions central to a SLERA. Several criteria are applicable for endpoint selection (Suter 1993; EPA 1998):

1. **Unambiguous Definition**—Assessment endpoints should indicate a subject (e.g., fish) and a characteristic of the subject (e.g., reproduction).
2. **Accessibility to Prediction and Measurement**—Assessment endpoints should be reliably predictable from measurements.

3. ***Susceptibility to the Hazardous Agent/Stressor***—Susceptibility of an organism (plant or animal) is a combination of potential for exposure and the sensitivity to the concentrations of contaminants or other stressors of concern.
4. ***Biological Relevance***—Biological relevance of impacts to an individual organism is determined by the importance of the impact to higher levels of biological organization (e.g., populations or communities).
5. ***Social Relevance and Policy Goals***—Assessment endpoints should be of value to decision makers and the public. The assessment endpoints should represent effects that would warrant consideration of site remediation or alteration of project plans. Assessment endpoint selection should also include legally mandated endpoints (e.g., protected species).

The ecological assessment endpoint applicable to OU2 is:

Protection of organisms exposed directly or indirectly to surface soil to ensure that COPECs in surface soil do not have unacceptable adverse effects on organism survival, growth, or reproduction, which may result in adverse effects to the community structure (e.g., diversity or biomass).

This assessment endpoint is general and is further refined and revised in the refinement assessment conducted in Step 3.

Because assessment endpoints are often defined in terms of ecological attributes that are difficult to measure, measurement endpoints are selected to provide a quantifiable method to characterize risks. The measurement endpoint selected for this ERA is:

Media Chemistry for Surface Soil—The measurement of maximum COPEC concentrations in surface soil compared to conservative (based on chronic or no effects levels) ecotoxicological-based screening concentrations, provides a quantifiable method to evaluate the protection of organisms exposed to surface soil. Surface soil screening levels are provided in Table 7-1.

7.4.2 Toxicity Evaluation And Exposure Estimate

The SLERA will use EPA-developed receptor-specific ecological soil screening levels (EcoSSLs) to compare to soil concentrations to determine if further evaluation of ecological risk is warranted (EPA 2003b). Maximum exposure estimates (concentrations) of lead, arsenic, and antimony in OU2 surface soil were compared to the most conservative corresponding EcoSSLs.

7.4.3 Risk Calculation

The results of this risk calculation used to identify COPECs are presented in Table 7-1. The SLERA risk calculation is performed by comparing the maximum exposure concentration to the screening level. When the screening level is greater than the maximum concentration, the

potential for adverse effects is considered unlikely. Because of the conservative nature of the SLERA, only contaminants with maximum concentrations less than the screening level may be removed from further examination. Identification of COPECs does not necessarily indicate they pose risks; it indicates that the contaminants cannot be definitively eliminated from further consideration. The results of the SLERA represent maximum estimates of risk and are not necessarily representative of population-wide risks. Uncertainties associated with the SLERA are discussed in Section 7.9.

The maximum concentrations of lead and antimony exceeded the soil screening level and associated risk will be evaluated further in this ERA. The maximum concentration of arsenic did not exceed the soil screening level; therefore, arsenic in soil is not expected to pose risks and is not evaluated further in this ERA.

7.5 ECOLOGICAL RISK ASSESSMENT REFINEMENT

Highly conservative assumptions were used in the SLERA to provide an upper bound estimate of risk to ecological resources. Such an approach meets with the objectives of the SLERA, which are to screen out contaminants that do not have the potential to adversely affect ecological resources and to maintain contaminants that have potential to cause risks.

These conservative assumptions are expected to overestimate actual levels of risk to most ecological receptors. Consequently, some contaminants that may not pose risk may be retained as COPECs at the outset of Step 3. The results of the ERA refinement build upon the risk results presented in the SLERA and are intended to support risk management decisions regarding the need for further investigation.

7.5.1 Assessment And Measurement Endpoints

Refined assessment endpoints were defined to reflect the potential impacts of the complete and significant exposure pathways discussed in Section 7.3.2. The selection of assessment endpoints is based on the fundamental knowledge of local ecology and corresponds to an adverse effect on a population or community. Survival of a specific species of insect is an example of a population-level assessment endpoint. Community-level assessment endpoints could include survival of benthic invertebrates or maintenance of multiple populations of birds.

Ecological receptors may be exposed to lead and antimony from food, airborne particulates, soil, and consumption of lead shot as grit (Figure 7-2). Based on the identified ecological receptors and habitats, the following ecological assessment endpoints are defined for this ERA:

Assessment Endpoint	Receptor
Protection of receptor exposed to lead and antimony in soil from adverse effects on survival, growth, or reproduction.	<ul style="list-style-type: none"> terrestrial plant communities soil invertebrate communities
Protection of receptor to ensure that ingestion of lead and antimony in soil and food do not have adverse effects on survival, growth, or reproduction.	<ul style="list-style-type: none"> herbivorous mammals herbivorous gallinaceous birds insectivorous mammals omnivorous birds predatory mammals predatory birds
Protection of receptor to ensure that ingestion of lead and antimony through contact with soil and food does not have adverse effects on survival, growth, or reproduction.	<ul style="list-style-type: none"> reptiles amphibians

The goal of the ERA is to protect receptor groups from population-level impacts. This ERA assesses impacts to individuals as a highly conservative estimator of potential impacts on populations, which is a source of uncertainty that may lead to the overestimation of risks.

The following refined measurement endpoints were defined to inform the evaluation of risk regarding the refined assessment endpoints:

1. ***Protection of Terrestrial Plant and Soil Invertebrate Communities***—The measurement of maximum lead and antimony concentrations in surface soil and subsequent calculation of the 95UCLM concentrations in surface soil provide the ability, when compared to relevant receptor-specific benchmarks, provides a quantifiable method to evaluate the protection of terrestrial plant and soil invertebrate communities.
2. ***Protection of Terrestrial Wildlife***—The measurement of maximum lead and antimony concentrations in surface soil and subsequent calculation of the 95UCLM concentrations in soil provide the ability to model wildlife doses, which can be compared to relevant receptor-specific benchmarks provides a quantifiable method to evaluate the protection of wildlife receptors.
3. ***Protection of Reptiles and Amphibians***—The assessment of risks to amphibians and reptiles is limited by the lack of sufficient literature-based exposure and toxicity information and assessment methods. Therefore, the receptor-specific assessment endpoints will be evaluated by assuming that risks from lead and antimony to other receptors may indicate there is risk to reptiles and amphibians.

7.5.1.1 Terrestrial Plants and Soil Invertebrates

The measurement endpoints for terrestrial plants and soil invertebrates include comparison of EPCs to benchmark toxicity reference values (TRVs) protective of exposures to soil. EPCs are described in Section 7.5.2.1. TRVs represent the threshold above which adverse effects to apical endpoints noted above are expected and below which no effect is expected. Potential risks to terrestrial plants and soil invertebrates were evaluated by comparing lead and antimony EPCs in soil to TRVs for these receptors. Conservative benchmarks have been selected to ensure receptors that may be at risk from lead and antimony in surface soil are accurately identified.

Comparisons were initially made using the maximum EPC as a precautionary initial screen and then refined using 95UCLM concentrations as EPCs.

7.5.1.2 Terrestrial Wildlife

For terrestrial wildlife, measurement endpoints are based on the results of food web models that predict the dose of lead and antimony ingestion. These doses will be compared to TRVs for terrestrial wildlife. The first measurement endpoint evaluated will be a comparison of doses based on the maximum EPC to no-effects TRVs. Refinement of the models will be conducted using the 95UCLM concentrations as EPCs.

7.5.1.3 Amphibians and Reptiles

Exposure estimates are not developed for amphibians or reptiles because a quantitative measurement endpoint for this ecological resource cannot be identified. Literature and database resources were examined for exposure and toxicity information that could be used to quantitatively evaluate risks to amphibians and reptiles. Despite searches of peer-reviewed literature, adequate data could not be found for a quantitative evaluation. Therefore, the potentials for risks to amphibians and reptiles will be maintained as an uncertainty throughout this ERA (Section 7.9). For reptile exposure to lead specifically, growth effects were seen at similar exposure doses to the lead EcoSSL TRV for avian ground insectivores (Salice et al. 2009), indicating the risk would occur at similar thresholds for birds and reptiles. Therefore, risks from lead to other receptors, especially birds, indicate risk to reptiles and amphibians as well.

7.5.2 Exposure Assessment

Many of the measurement endpoints identified rely on exposure estimation using analytical data. In some cases, contaminant concentrations are used as the exposure estimate, and the calculated 95UCLM concentrations are identified as EPCs for comparison to benchmarks. In other cases, contaminant concentrations are the EPC inputs for food web models that estimate exposures as ingested doses. The exposure assessment identifies the models and input parameters that were used in benchmark comparisons and food web dose modeling. These parameters include identification of EPCs, food web model assumptions, and literature-based uptake.

7.5.2.1 Exposure Point Concentrations

EPCs are COPEC concentrations that a receptor is assumed to be exposed to within a site. Two separate EPCs were used in this ERA. The initial measurement endpoint for each receptor consists of a screening-level comparison of the maximum case scenario exposure estimate to no-effects benchmarks. Therefore, the maximum concentrations detected in on-site media were used as the EPC in exposure estimation. The maximum EPC is a realistic estimate of exposures to organisms that may spend their entire lives in a small area. However, use of the maximum EPCs for assessment of some organisms is conservative and is likely to overestimate risks because it assumes that individual organisms spend 100 percent of their time inhabiting and feeding from the most contaminated sample location within OU2.

Additional measurement endpoints were evaluated based on 95UCLM concentrations found in on-site media. The 95UCLM is a more realistic, and yet still conservative, value for consideration of site-wide populations and exposures for mobile receptors because it assumes an upper-bound estimate of the average exposure across a site. The 95UCLM concentration of a contaminant within a given sample data grouping was calculated with the ITRC ISM 95% UCL Calculator (ITRC 2020).

Lead was detected in each of the 41 ISM samples from 13 decision units and antimony was detected in 3 of the 41 ISM samples, all from 1 decision unit. The ITRC ISM 95% UCL Calculator (ITRC 2020) does not differentiate between detects and non-detects and ITRC guidance advises using an alternative value such as the reporting limit or one-half of the reporting limit for non-detects (ITRC 2020). For the calculation of the antimony 95UCLM, one-half of the reporting limit was used for the non-detect samples. The reporting limits of non-detect samples ranged from 0.5 to 63 mg/kg. Generally, reporting limits were below 7.5 mg/kg, with the exception of one sample because of dilutions as a result of elevated lead in the same sample. The antimony 95UCLM was 5.0 mg/kg, which is higher than the maximum sample detection (2.2 mg/kg). The antimony 95UCLM is likely higher than the maximum sample detection because the reporting limits of many of the non-detect samples are higher than the maximum detection. Also, the ITRC guidance states that there is greater uncertainty in 95UCLM calculations for datasets that include non-detects (ITRC 2020). Given the high proportion of non-detects and that many of the reporting limits are higher than the maximum sample detection, the calculated 95UCLM concentration for antimony is uncertain and not defensible for use in the ERA. The uncertainty associated with the high reporting limits for non-detect samples is presented in Section 7.9.2.

Since there is uncertainty with the use of the 95UCLM concentration, the area weighted mean was calculated to determine a range of the sample mean by censoring the data and computing it where non-detects are equal to 0 and non-detects are equal to the reporting limit. Since the sample mean range [0.15 to 4.6] overlaps with the EcoSSL value of 0.27 mg/kg, we cannot make a statistical determination as to whether or not the screening level is exceeded by the sample mean. To be conservative, the upper bounds of the sample mean (4.6 mg/kg) are modeled in the ERA.

7.5.2.2 Evaluation of Lower Trophic Level Wildlife

The measurement endpoints for terrestrial plants and soil invertebrates (i.e., lower trophic level wildlife) include comparison of EPCs to available EcoSSLs for terrestrial plants and earthworms (EPA 2005a, 2005c) and to terrestrial plant TRVs for antimony (Efroymson et al. 1997) (Table-7-2).

Terrestrial Plants—Lead and antimony concentrations measured in soil within OU2 were used to evaluate the potential for adverse effects to terrestrial plants. The maximum detected concentration was used as the initial EPC in comparison to benchmarks protective of terrestrial plants. In addition, lead and antimony concentrations at each sample location were used as

sample-specific EPCs in comparison to benchmarks. If lead or antimony was not detected at concentrations exceeding available benchmarks, it was concluded that the contaminant is not likely to adversely affect terrestrial plants in that area as represented by the sample. Finally, a conservative estimate of the 95UCLM concentration was evaluated as an EPC in comparison to benchmarks to indicate the potential for population-wide impacts.

Soil Invertebrates—Lead and antimony concentrations measured in the soil were used to evaluate the potential for adverse effects to soil invertebrates. The maximum detected concentration was used as the initial EPC in comparison to benchmarks protective of soil invertebrates. In addition, lead and antimony concentrations at each sample location were used as sample-specific EPCs in comparison to benchmarks. If lead or antimony was not detected at concentrations exceeding available benchmarks, it was concluded that the contaminant is not likely to adversely affect soil invertebrates as represented by the sampling. Finally, a conservative estimate of the 95UCLM concentration was evaluated as an EPC in comparison to benchmarks to indicate the potential for population-wide impacts.

7.5.2.3 Exposure Modeling for Higher Trophic Level Wildlife

Food web modeling was used to derive dose-based exposure estimates for terrestrial wildlife (i.e., higher trophic level wildlife). The methods used to quantify the potential exposure of wildlife to contaminants through the ingestion of food and soil are based on equations presented in EPA (1993). The equations and exposure parameters discussed below are consistent with EPA guidance and standard risk assessment practice.

Table 7-3 provides a summary of exposure parameters for the avian and mammalian representative receptor species identified for evaluation. Food web model calculations, including uptake into food items, are presented in Table 7-4 and Table 7-5. It should be noted that, in general, conservative assumptions were used in the food web models. The objective of the models is to provide an upper bound risk estimate. Accordingly, in almost all cases, actual risks are likely to be overestimated by the models. Uncertainties associated with conservative assumptions and other exposure estimation factors are discussed in Section 7.9.

Two separate EPCs were used in food web dose modeling: the maximum and 95UCLM case scenario exposure estimates. The initial measurement endpoint for each bird and mammal receptor consists of comparing the maximum case scenario exposure estimate to no observed adverse effect level (NOAEL) benchmarks. The maximum concentration detected in OU2 soil was used as the EPC in exposure estimation for this endpoint. Use of the maximum is highly conservative and is likely to overestimate risks because it assumes that receptors spend 100 percent of their time inhabiting and feeding from the most contaminated sample location within OU2.

Food web modeling for the other wildlife measurement endpoints was based on the 95UCLM concentration in the exposure media. The 95UCLM is a more realistic value for consideration of the site-wide population because it assumes an average exposure across OU2.

Many wildlife species are highly mobile and may forage over a wide home range. The home range for each receptor species is included in Table 7-3. This ERA is conservative in that it assumes that receptors receive 100 percent of their exposure from the 206-acre OU2. This may overestimate the actual exposure for highly mobile species; however, this assumption is realistic for species with small home ranges such as the deer mouse as well as nesting birds.

7.5.2.3.1 Ingestion of Contaminants from Abiotic Media

Terrestrial wildlife may ingest soil while foraging or grooming, termed incidental soil ingestion, which is accounted for in food web models. The following equation was used to calculate the dose of lead and antimony that terrestrial wildlife may ingest from soil (EPA 1993):

$$Dose_{soil} = SI * C_{soil}$$

Where:

$Dose_{soil}$ = Amount of lead or antimony ingested per day from soil (milligram(s) per kilogram body weight per day [mg/kg bw-d])

SI = Soil ingestion rate (kilograms of soil per kilogram body weight per day)

C_{soil} = Lead or antimony concentration in surface soil (mg/kg)

Percent soil ingestion values taken from scientific literature for the terrestrial wildlife species of concern were multiplied by the food ingestion rates for these species to estimate soil ingestion rates. A summary of the percent soil ingestion rates and food ingestion rates taken from scientific literature is presented in Table 7-3.

7.5.2.3.2 Ingestion of Contaminants from Food

The following equation was used to calculate the dose of lead or antimony that a terrestrial wildlife species could obtain from the ingestion of food (EPA1993):

$$Dose_{\frac{food}{prey}} = FI * C_{\frac{food}{prey}}$$

Where:

$Dose_{\frac{food}{prey}}$ = Amount of lead or antimony ingested per day from food (mg/kg bw-d)

FI = Food ingestion rate (kilograms food per kilogram body weight per day)

$C_{\frac{food}{prey}}$ = Estimated maximum concentration of lead or antimony in food (mg/kg)

A summary of the food ingestion rate for each of the terrestrial wildlife species selected for evaluation is presented in Table 7-3. Food item concentrations were developed using regression equations from defensible, compilation- and consensus-based sources, or sources that include validation of the model instead of values from single studies. The selected equations include those presented in Table 4a from EPA EcoSSL guidance Attachment 4-1 (EPA 2003b), with the exception of uptake of antimony into worms. EcoSSL guidance suggests use of the default assumption that the concentration of antimony in earthworm tissue is equal to the concentration

of antimony in soil. However, this is a very conservative assumption used in the absence of data which likely overestimates worm tissue concentrations. Nannoni et al. (2014) sampled soil and earthworms from a mixture of urban, urban green space, and rural areas. The linear regression has a fit of $R^2=0.76$ for the antimony concentrations found in soil and earthworm tissue. R^2 is a measure of how well the data fit the model on a scale of 0 to 1. An R^2 value of 0.76 indicates that the model explains 76 percent of the data in the model. There is some uncertainty associated with the use of this regression to model uptake into earthworms, as discussed in Section 7.9.

The uptake equations selected are presented in Table 7-4, Table 7-5, Table 7-8, and Table 7-9. The maximum case scenario dry weight food tissue concentration was calculated by entering the dry weight soil concentration into the uptake equation. The 95UCLM case scenario tissue concentration was calculated using the 95UCLM dry weight soil concentration. Where conversion to wet weight values was required, food items (plants, soil invertebrates, and small mammals) were considered to contain 75 percent moisture as a default (USACHPPM 2004).

7.5.2.3.3 Total Contaminant Ingestion

The total dietary exposure doses of lead and antimony for wildlife were determined using the following equation (EPA 1993):

$$Dose_{total} = Dose_{food} + Dose_{soil}$$

Where:

$Dose_{total}$ = Amount of lead or antimony ingested per day from food and soil (mg/kg bw-d)

$Dose_{food}$ = Amount of lead or antimony ingested per day from food (mg/kg bw-d)

$Dose_{soil}$ = Amount of lead or antimony ingested per day from soil (mg/kg bw-d)

The total dietary intakes are compared to dietary toxicity values to determine if adverse effects are likely to occur to terrestrial wildlife from the ingestion of lead or antimony in food and soil (Table 7-6 and Table 7-10).

7.5.3 Refined Toxicity Assessment

This section derives toxicity values for use in evaluating exposure estimates for each representative receptor. The TRVs represent concentrations or doses of lead and antimony that are protective of the ecological receptors being evaluated. TRVs are compared to EPCs or estimated doses to evaluate the potential for adverse effects from lead or antimony on the receptor in question.

7.5.3.1 Terrestrial Plant Toxicity Reference Values for Exposure to Soil

To assess the potential for lead or antimony to adversely affect terrestrial plants, soil concentrations were compared to TRVs protective of terrestrial plants (Section 7.5.2.2; Table 7-2). As discussed in Section 7.5.2.2, the TRV selected for lead is the terrestrial plant EcoSSL (EPA 2005c). There was no terrestrial plant EcoSSL developed for antimony. The

terrestrial plant TRV from antimony is from Efroymson et al. (1997), and those TRVs were established at a level associated with a 20 percent reduction in growth or other measured toxicological endpoints. This level is consistent with other screening-level benchmarks for ERA.

7.5.3.2 Soil Invertebrate Toxicity Reference Values for Exposure to Soil

To assess the potential for lead or antimony to adversely affect soil invertebrates, soil concentrations were compared to TRVs protective of soil invertebrates (Table 7-2). As discussed above in Section 7.5.2.2, the TRVs selected for soil invertebrates were the soil invertebrate EcoSSLs for lead and antimony (EPA 2005a, 2005c).

7.5.3.3 Wildlife Toxicity Reference Values

Risk from lead and antimony was evaluated using dose-based toxicological benchmarks. Two types of benchmarks were used, each corresponding to a different level of ecological impacts for birds and mammals (Table 7-6). First, modeled doses were compared to dose-based NOAELs; doses that have been shown to cause no adverse impacts in test species following repeated exposures. The NOAELs used in this ERA were selected from the EcoSSL report for lead and antimony (EPA 2005a, 2005c). Avian and mammalian NOAELs are the highest bounded NOAEL lower than the lowest bounded lowest observed adverse effect level (LOAEL) for reproduction, growth, or survival considered in development of EcoSSLs (EPA 2005a, 2005c). Because NOAELs are conservative and protective, they were used as TRVs in this ERA.

The second set of benchmarks used were LOAELs; the lowest concentrations at which adverse effects are observed on individual test organisms following repeated exposures. The severity of effects considered “low level” varies based on the study from which LOAELs are derived. The accuracy of the NOAELs and LOAELs is dependent on the dose regime that the individual test organisms were exposed to in the study, with higher confidence given to studies that have more dose proximity. Because NOAELs are associated with no effects in a test study, it is uncertain whether they are close to or far below the threshold value at which effects would first be observed. And the reverse may be true of LOAELs since they are associated with low effects in a test study, it is uncertain whether they are close to or far above the threshold value at which effects would first be observed. LOAELs thus serve to bound the range of NOAELs, and the threshold of toxic effects is considered to lie between the NOAEL and the LOAEL. The LOAELs used in this ERA were also selected from the EcoSSL reports for antimony and lead (EPA 2005a, 2005c).

It should be noted that no avian TRVs are available for antimony, and thus risk to birds from antimony cannot be characterized. This is an uncertainty which is discussed in more detail in section 7.9.

7.5.4 Refined Risk Calculation

To calculate refined estimates of risk, refined estimates of exposure were compared to receptor-specific TRVs. A risk calculation was performed by dividing EPCs or doses by TRVs. The ratio of a contaminant’s concentration to its TRV is the Hazard Quotient (HQ). HQs greater

than or equal to 1.0 indicate a potential for unacceptable risk, while HQs less than 1.0 indicate no potential for unacceptable risk.

7.6 REFINED RISK CHARACTERIZATION

The purpose of the risk characterization is to draw conclusions regarding the potential for risks to each assessment endpoint and representative receptor by using a qualitative weight of evidence approach in which results for each measurement endpoint are considered as lines of evidence. In general, lines of evidence that provide results based on site-specific data applicable at the population level are given the greatest weight. The focus of the ERA is to protect the ecological values at the site-wide population or community level except where threatened or endangered species are concerned.

The maximum concentrations of lead and antimony exceeded TRVs protective of all receptors. It is important to note that comparison of the maximum EPC or dose to TRVs is a conservative comparison. Not all analytes with maximum concentrations in exceedance of TRVs are expected to pose risk to receptors. The weight-of-evidence approach takes additional lines of evidence into consideration to determine if lead or antimony pose and drive ecological risk within OU2.

An HQ of 1.0 indicates a potential for unacceptable risk, however, is not a risk determination. The following additional lines of evidence are considered in this ERA: 1) frequency of detection, 2) magnitudes of exceedance of the TRVs by EPCs or doses, and 3) frequency of exceedance. Based on an assessment of each of these lines of evidence, professional judgement is applied to determine if the potential unacceptable risk from lead or antimony in soil is probable and OU2-related, to aid future decisions by risk managers.

For example, if the maximum exposure has an HQ less than 3 and the mean exposure has an HQ that falls below 1.0, then that COPEC is unlikely to be driving site-wide risk for that receptor since the mean exposures fall below the TRV. In contrast, if the exceedance of the NOAEL-based TRV by the maximum exposure results in high HQs (greater than 10), even if the mean exposure falls below the LOAEL-based TRV, the individual samples responsible for the high HQs need to be investigated. When looking at the frequency of exceedance, it may be that there is only one or a handful of samples that are driving risk and those samples can be called out as the only areas with potential risk from COPECs. If the maximum exposure has an HQ that falls between 3 and 10, the risk characterization is not as clear and requires more consideration of the other lines of evidence.

7.7 ECOLOGICAL RISK CHARACTERIZATION RESULTS

7.7.1 Terrestrial Plants

The assessment endpoint for terrestrial plants is the protection of plant survival, growth, or reproduction from impacts of lead or antimony in soil. Measurement endpoints evaluated as indicators of risk to terrestrial plants include the comparison of lead and antimony concentrations to benchmarks protective of plants (i.e., maximum EPCs and 95UCLM EPCs).

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., discrete areas with elevated concentrations of contaminants). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this ERA. As discussed in Section 7.5.2.1, the 95UCLM concentration for antimony is greater than the maximum concentration most likely because of high laboratory reporting limits; therefore, the upper bound of the area weighted mean is used instead. HQs for both maximum and 95UCLM EPCs are provided in Table 7-2.

Antimony was detected in 3 of 41 surface soil samples. Both the maximum and upper bound of the area weighted mean EPCs fell below TRVs protective of terrestrial plants. Based on the low frequency of detection and the lack of exceedance of the terrestrial plant TRV, antimony is not expected to pose risk to terrestrial plants.

Lead was detected in each of the surface soil samples. The maximum and 95UCLM EPCs exceeded the terrestrial plant TRV with HQs of 5.5 and 1.1, respectively. Of the 41 ISM samples from 13 decision units, 12 samples from 5 decision units exceeded the plant TRV (120 mg/kg). Based on the exceedance of the terrestrial plant TRV by both EPCs, lead may pose risk to plants within OU2. Based on low magnitude of exceedance by the 95UCLM EPC (HQ=1.1), risk is expected to be limited to the decision unit with the maximum concentration (decision unit OU2-RR-BB2). Excluding decision unit OU2-RR-BB2, which is the subject of an ongoing removal action, lead is not believed to pose unacceptable risk to terrestrial plants.

7.7.2 Soil Invertebrates

The assessment endpoint for soil invertebrates is the protection of plant survival, growth, or reproduction from impacts of lead or antimony in soil. Measurement endpoints evaluated as indicators of risk to terrestrial plants include the comparison of lead and antimony concentrations to benchmarks protective of plants (i.e., maximum EPCs and 95UCLM EPCs).

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight-of-evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., discrete areas with elevated concentrations of contaminants). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this ERA. As discussed in Section 7.5.2.1, the 95UCLM concentration for antimony is greater than the maximum concentration most likely because of high laboratory reporting limits; therefore, the 95UCLM concentration is not used in the ERA and the upper bound of the area weighted mean is used instead. HQs for both maximum and 95UCLM EPCs are provided in Table 7-2.

Antimony was detected in 3 of 41 surface soil samples. Both the maximum and upper bound of the area weighted mean EPCs fell below TRVs protective of soil invertebrates. Based on the low frequency of detection and lack of exceedance of the soil invertebrate TRV, antimony is not expected to pose risk to soil invertebrates.

Lead was detected in each of the surface soil samples. Both the maximum and 95UCLM EPCs fell below TRVs protective of soil invertebrates. Based on the lack of exceedance of the TRV, lead is not expected to pose risk to soil invertebrates.

7.7.3 Avian Wildlife

The assessment endpoint for avian wildlife is the protection of the survival, growth, or reproduction of birds from impacts of lead or antimony in soil and food. Measurement endpoints evaluated as indicators of risk to birds include:

- Screening-level comparison of maximum case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks
- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks

There are no available TRVs for estimating risk from antimony to avian wildlife; as such, risk to birds from antimony cannot be characterized in this section. This is an uncertainty discussed in Section 7.9.

HQ calculations are based on the comparison of the dose from maximum and 95UCLM lead concentrations in soil and food to NOAELs and LOAELs protective of birds. Food web models are presented in Table 7-4 and Table 7-5. Comparison of the doses to the NOAEL- and LOAEL-based benchmarks are presented in Table 7-6.

Lead was detected in each of the surface soil samples. The maximum dose exceeded the NOAEL- and LOAEL-based TRVs for gallinaceous and omnivorous birds, and the 95UCLM dose exceeded the NOAEL- and LOAEL-based TRVs for omnivorous birds. Both doses fell below all TRVs for predatory birds, and the 95UCLM dose also fell below both TRVs for gallinaceous birds. HQs ranged from 0.17 to 59. Based on these results, lead in soil may pose a risk to omnivorous birds and lead at the decision unit with the maximum concentration (decision unit OU2-RR-BB2) may pose risks to gallinaceous birds.

The omnivorous bird receptor, the American robin, is a surrogate receptor for the yellow-billed cuckoo, a federally threatened species under the Endangered Species Act. There are no known observations of the yellow-billed cuckoo on-site. This species prefers wooded areas with gaps and clearings with water nearby. Though relatively common in the Eastern U.S., in the west this species is rare and generally only found in riparian forests dominated by cottonwood (Cornell Lab of Ornithology 2023). The site has no perennial water features and includes low shrub grassland with patches of coniferous trees (Weston 2004, 2022). The site does not have habitat to support the yellow-billed cuckoo. However, if present on site, lead in soil would also pose a risk to yellow-billed cuckoo.

7.7.4 Mammalian Wildlife

The assessment endpoint for mammalian wildlife is the protection of the survival, growth, or reproduction of mammals from impacts of lead or antimony in soil and food. Measurement endpoints evaluated as indicators of risk to birds include:

- Screening-level comparison of maximum case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks
- Comparison of 95UCLM (for lead)/ upper bound of the area weighted mean (antimony) case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks

HQ calculations are based on the comparison of the dose from maximum and 95UCLM concentrations in soil and food to NOAELs and LOAELs protective of mammals. Food web models are presented in Table 7-4 and Table 7-5. Comparison of the doses to the NOAEL- and LOAEL-based benchmarks are presented in Table 7-6.

Antimony was detected in 3 of 41 surface soil samples. The maximum dose for insectivorous mammals exceeded the NOAEL-based TRV with an HQ of 3.1 and fell below the LOAEL-based TRV. The dose based on the upper bound of the area weighted mean exceeded the NOAEL-based TRV with an HQ of 6.2 and fell below the LOAEL-based TRV. The maximum doses and doses based on the upper bound of the weighted mean for herbivorous and predatory mammals fell below both TRVs. Based on the low frequency of detection, low magnitude/lack of exceedance of the NOAEL-based TRV by the maximum dose, and lack of exceedance of the LOAEL-based TRV, antimony is not expected to pose risk to terrestrial mammals.

Lead was detected in each of the surface soil samples. The maximum and 95UCLM doses exceeded the NOAEL- and LOAEL-based TRVs for insectivorous mammals; however, both doses fell below both TRVs for the other mammal receptors. HQs ranged from 0.08 to 14.6. Lead at the decision unit with the maximum concentration (decision unit OU2-RR-BB2) may pose risks to insectivorous mammals.

7.7.5 Reptiles And Amphibians

The assessment endpoint for reptiles and amphibians is the protection of the survival, growth, or reproduction of reptiles and amphibians from impacts of lead or antimony in soil and food. As discussed above, the assessment of risks to amphibians and reptiles is limited by the lack of sufficient exposure and toxicity information. Therefore, reptiles and amphibians are evaluated by assuming that risks from lead and antimony to other receptors may indicate there is risk to reptiles and amphibians.

The risk assessment found that lead in soil may pose risks to terrestrial plants, gallinaceous and omnivorous birds (a surrogate receptor for a threatened species), and insectivorous mammals. Therefore, lead in soil may pose risks to reptiles and amphibians; however, risk from lead in soil is generally limited to the decision unit with the maximum lead concentration (decision unit

OU2-RR-BB2). Antimony in soil is not expected to pose risk to plants, soil invertebrates, or mammals. Suitable information on the toxicity of antimony to avian wildlife is not available, so risk from antimony to birds could not be evaluated. Based on the available information, antimony in soil is not expected to pose risk to reptiles and amphibians.

7.8 MODIFIED ECOLOGICAL RISK CHARACTERIZATION RESULTS

The results of the risk characterization detailed in Section 7.7 found that antimony in soil was not expected to pose risk to ecological receptors. Lead may pose risks to terrestrial plants, gallinaceous and omnivorous birds, and insectivorous mammals in soil limited to the decision unit with the maximum concentration of lead (decision unit OU2-RR-BB2). Since decision unit OU2-RR-BB2 is currently in the process of remediation through a time-critical-removal action, EPCs were recalculated and the risk assessment was rerun excluding concentrations from decision unit OU2-RR-BB2. Outside of decision unit OU2-RR-BB2, antimony was not detected in any sample. However, the reporting limit of some of the non-detect samples is higher than the EcoSSL for antimony, which is an uncertainty further discussed in Section 7.9. Due to the lack of reported detections in decision units outside decision unit OU2-RR-BB2, antimony will not be considered further in this modified ERA characterization. The results of the modified ecological risk characterization are included to support future risk management decisions once the removal action at decision unit OU2-RR-BB2 is complete (anticipated in spring of 2024).

7.8.1 Terrestrial Plants

The assessment endpoint for terrestrial plants is the protection of plant survival, growth, or reproduction from impacts of lead in soil. Measurement endpoints evaluated as indicators of risk to terrestrial plants include the comparison of lead concentrations to benchmarks protective of plants (i.e., maximum EPCs and 95UCLM EPCs).

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight of evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., discrete areas with elevated concentrations of contaminants). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this ERA. HQs for both EPCs are provided in Table 7-7.

Excluding results from decision unit OU2-RR-BB2, the maximum and 95UCLM EPCs exceeded TRVs protective of plants with HQs of 1.8 and 0.6, respectively. Based on the low magnitude of exceedance, lead is not expected to pose risk to terrestrial plants outside of decision unit OU2-RR-BB2.

7.8.2 Soil Invertebrates

The assessment endpoint for soil invertebrates is the protection of plant survival, growth, or reproduction from impacts of lead in soil. Measurement endpoints evaluated as indicators of risk to terrestrial plants include the comparison of lead concentrations to benchmarks protective of plants (i.e., maximum EPCs and 95UCLM EPCs).

Comparison of maximum concentrations to benchmarks is typically given the most weight in the weight-of-evidence approach because it is the most precautionary indicator of risks at specific locations (i.e., discrete areas with elevated concentrations of contaminants). Comparison of the 95UCLM concentrations to benchmarks had the strongest weight of evidence as an indicator of population-wide risks in this ERA. HQs for both EPCs are provided in Table 7-2.

Excluding results from decision unit OU2-RR-BB2, the maximum and 95UCLM EPCs fell below the TRVs protective of soil invertebrates. Based on this lack of exceedance, lead is not expected to pose risk to soil invertebrates outside of decision unit OU2-RR-BB2.

7.8.3 Avian Wildlife

The assessment endpoint for avian wildlife is the protection of the survival, growth, or reproduction of birds from impacts of lead in soil and food. Measurement endpoints evaluated as indicators of risk to birds include:

- Screening-level comparison of maximum case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks
- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks

HQ calculations are based on the comparison of the dose from maximum and 95UCLM lead concentrations in soil and food to NOAELs and LOAELs protective of birds. Food web models are presented in Table 7-8 and Table 7-9. Comparison of the doses to the NOAEL- and LOAEL-based benchmarks are presented in Table 7-10.

Excluding results from decision unit OU2-RR-BB2, the maximum and 95UCLM doses exceeded the NOAEL- and LOAEL-based TRV for omnivorous birds. The maximum dose to gallinaceous birds also exceeded the NOAEL-based TRV. Both doses fell below TRVs for predatory birds, and the 95UCLM dose also fell below TRVs for gallinaceous birds. HQs ranged from 0.13 to 21. Based on these results, lead in soil is not expected to pose risk to gallinaceous or predatory birds. However, lead in soil outside of decision unit OU2-RR-BB2 may pose a risk to omnivorous birds given the exceedances of NOAEL- and LOAEL-based TRVs by the maximum and 95UCLM doses. As noted previously, the omnivorous bird receptor, the American robin, is a surrogate receptor for the yellow-billed cuckoo, a threatened species. OU2 is not expected to support the habitat requirements of the yellow-billed cuckoo, so the species is not likely to be present within OU2.

The avian NOAEL-based TRV (1.63 mg/kg bw-day) for lead used in the ERA is the same value used in the development of the EcoSSL. The LOAEL-based TRV (3.26 mg/kg bw-day) is derived from the same study (EPA 2005c). It is worth noting that the avian EcoSSL for lead (11 mg/kg) falls below the default lead background value of 29 mg/kg for the Basin and Range region in Oregon (where OU2 is located) (Johnson 2018) as well as soil background concentrations for more than 90 percent of the US (Sample et al. 2019). Excluding decision unit OU2-RR-BB2, data from 12 decision units is included in the ‘modified’ ERA. The maximum

replicate concentrations in 6 of the decision units fall below the default soil background concentration. The maximum replicate concentrations in the remaining 6 decision units range from 73 to 220 mg/kg, approximately 2.5 to 8 times the default background concentration.

The NOAEL used in the development of the EcoSSL is driven by a LOAEL based on reduced egg production in Japanese quail (*Coturnix japonica*), an endpoint which has been shown to have highly variable sensitivity to lead and other contaminants (Sample et al. 2019). Thus, there is some uncertainty with the reliability of this endpoint (Sample et al. 2019). Consequently, Sample et al. (2019) developed dose-response relationships using EPA Benchmark Dose Software for dietary concentrations and doses for egg production in Japanese quail and chickens with data from 10 studies. Effect levels were extracted from the dose-response analyses and new no effects and low effects doses (4.4 and 9.8 mg/kg bw-day) were proposed for the revision of the avian EcoSSL for lead (Sample et al. 2019). When the maximum and 95UCLM doses to omnivorous birds are compared to the proposed revised low effects dose of 9.8 mg/kg, the HQs fall to 4 and 1, respectively.

Since the 95UCLM concentration yields a dose that is similar to the proposed revised low effects dose (HQ=1), there may be localized risk to receptors at the decision units with concentrations greater than the 95UCLM concentration (72.3 mg/kg). Of the 6 decision units with maximum concentrations greater than the default background soil concentration, the maximum replicate concentration at one decision unit is about equal to the 95UCLM concentration and the maximum concentrations at 5 of the decision units exceed the 95UCLM. The five decision units with maximum concentrations that exceed the 95UCLM range from 110 to 220 mg/kg, which would yield HQs of 2 to 4 based on comparison to the revised low effect levels. Therefore, localized risk may be present at those 5 decision units (KFR-RR-FP1, KFR-EOD-DP1, KFR-RR-IA1, KFR-RR-IA2, and KFR-RR-IA3); however, site-wide risks to omnivorous bird receptors are not expected since the 95UCLM dose compared to the proposed revised low effects dose yields an HQ of 1.

It is also worth noting risks to receptors are likely overestimated to some extent in the ERA as it is assumed that lead is 100 percent bioavailable. The bioavailability of lead in contaminated soils is highly variable and is dependent on the chemical and physical properties of the soil as well as the form of lead present (Sample et al. 2019). The bioavailability of lead at OU2 is not known and site-specific bioavailability is not likely to be 100 percent. More data on the site-specific soil properties, such as pH and clay content, could be used to quantitatively estimate site-specific bioavailability of metals, including lead (EPA 2020).

7.8.4 Mammalian Wildlife

The assessment endpoint for mammalian wildlife is the protection of the survival, growth, or reproduction of mammals from impacts of lead in soil and food. Measurement endpoints evaluated as indicators of risk to birds include:

- Screening-level comparison of maximum case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks

- Comparison of 95UCLM case scenario doses ingested through the food web to NOAEL- and LOAEL-based benchmarks

HQ calculations are based on the comparison of the dose from maximum and 95UCLM lead concentrations in soil and food to NOAELs and LOAELs protective of mammals. Food web models are presented in Table 7-8 and Table 7-9. Comparison of the doses to the NOAEL- and LOAEL-based benchmarks are presented in Table 7-10.

Excluding results from decision unit OU2-RR-BB2, the maximum dose exceeded the NOAEL and LOAEL-based TRVs for insectivorous mammals. The 95UCLM dose exceeded the NOAEL-based TRV for insectivorous mammals and was equal to the LOAEL-based TRV. Both doses fell below TRVs for herbivorous and predatory mammals. HQs ranged from 0.05 to 5.2. Based on these results, lead in soil is not expected to pose risk to herbivorous or predatory mammals. Since the maximum dose to insectivorous mammals exceeds both of the TRVs, there may be risk to insectivorous mammals. However, given the low magnitude of exceedance of the NOAEL-based TRV by the 95UCLM dose to insectivorous mammals, and lack of exceedance of the 95UCLM dose of the LOAEL-based TRV, lead is not expected to pose risk to mammals outside of decision unit OU2-RR-BB2.

7.8.5 Reptiles And Amphibians

The assessment endpoint for reptiles and amphibians is the protection of the survival, growth, or reproduction of reptiles and amphibians from impacts of lead or antimony in soil and food. As discussed above, the assessment of risks to amphibians and reptiles is limited by the lack of sufficient exposure and toxicity information. Therefore, reptiles and amphibians are evaluated by assuming that risks from lead to other receptors may indicate there is risk to reptiles and amphibians. Excluding results from decision unit OU2-RR-BB2, lead may pose localized risk to omnivorous birds; however, site-wide risks to omnivorous bird receptors are not expected. Consequently, lead may also pose localized risk to reptiles and amphibians; however, site-wide risks to reptiles and amphibians are not expected.

7.9 UNCERTAINTIES

This ERA protectively addresses several uncertainties to ensure that contaminants eliminated from consideration do not pose risks to ecological receptors. Accordingly, the risks are likely to be overestimated. The main areas of uncertainty associated with the ERA are:

- Environmental Sampling and Analysis
- Analysis of Contaminant Data
- Analysis of Estimated Exposure and Toxicity Data
- Assessment of Risks
- Data Gaps

7.9.1 Environmental Sampling and Analysis

The sample design is likely to have the greatest impact on the evaluation of risks to ecological resources. The sample design was developed based on the available historical information regarding the activities that took place within OU2. Focusing the study design to provide analyses for COPECs for specific suspected source areas is a valid and accepted means of maintaining a practical and efficient limit on the field effort. However, there is always a possibility that the study design could miss samples where COPECs are present or miss other types of contaminants in a specific sample.

To address the uncertainties associated with environmental sampling, and in accordance with the conservative nature of ERAs, samples were biased to areas of likely contamination to characterize areas most impacted by historical activities. For example, the food web models assume that mammals and birds obtain all their food from within a grouping; this can be a highly conservative assumption for mobile receptors. While it is possible that some nesting birds and small mammals do spend all their time in the areas most impacted, the affected population size would be small compared to the population of the species at the site. Except for fixed or limited mobility receptors (e.g., benthic organisms), ecological receptors are unlikely to use only those areas of highest contamination and are more likely to forage over a larger area that includes areas of contamination as well as less contaminated or even uncontaminated outlying areas.

7.9.2 Analysis Of Contaminant Data

The ERA found no unacceptable antimony risk based on detected concentrations although uncertainty may be associated with elevated non-detect results because the reporting limits of the 38 non-detect samples exceeded the minimum antimony soil screening level (0.27 mg/kg based on protection of mammals) (EPA 2005a). OU2 is on the western side of the Basin and Range region in Oregon, which has a default antimony background value of 0.86 mg/kg (Johnson 2018); therefore, the 6 non-detect samples with reporting limits below 0.86 mg/kg are expected to fall below background. The 32 ISM samples collected by USACE in 2019 have reporting limits greater than 0.86 mg/kg and the limits ranged from 1.2 to 63 mg/kg (Table 4-2). Data collected by USACE in 2019 was not collected for ecological risk assessment purposes, so it's not surprising that it does not meet ecological DQOs.

There were 15 non-detect ISM samples from five decision units in the Horseshoe Disposal Pit area (Figure 4-6) collected in 2019 and each had a reporting limit of 1.2 mg/kg, which is in exceedance of the screening level and the regional background concentration. However, since the reporting limits of the non-detect samples were only 1.4 times the regional background concentration, the sample concentrations are expected to be within background.

There were 17 non-detect ISM samples from six decision units in the Rifle Range (Figure 4-6) collected in 2019. The reporting limits of five of the samples ranged from 6.9 to 7.5 mg/kg and one reporting limit was 63 mg/kg because of dilutions due to a high lead concentration in the same sample. For each of the non-detect samples, there was a nearby discrete or ISM sample (Figure 4-3 and Figure 4-6) that was either detected at or below the screening level or was non-detect with reporting limits less than 0.86 mg/kg. The nearby samples are included in this

uncertainty discussion to get a clearer understanding of antimony concentrations throughout OU2.

- ISM samples from decision units KFR-RR-BB1 and KFR-RR-FP1 were collected on the northwest border of the Rifle Range with non-detect results and reporting limits above the screening level and the regional background concentration. Composite sample NWO-069-0001 was collected in the vicinity of decision units KFR-RR-BB1 and KFR-RR-FP1 with a detection of 0.22 mg/kg.
- ISM samples from decision unit OU2-RR-RF1 were collected in 2022 from the same sampling area as decision unit KFR-RR-RF1 (sampled in 2019) and were non-detect with reporting limits less than 0.86 mg/kg. Composite sample NWO-069-0005 was collected in the vicinity of OU2-RR-RF1 with a detection of 0.27 mg/kg.
- ISM decision units KFR-RR-IA1, KFR-RR-IA2, and KFR-RR-IA3 are adjacent to each other near the southeast border of the Rifle Range and the single replicate with the reporting limit of 63 mg/kg was from KFR-RR-IA2. Composite sample NWO-069-0004 was collected in the vicinity of KFR-RR-IA2 with a detection of 0.27 mg/kg.

Although there is some uncertainty in this evaluation as the nearby samples do not represent the exact sample area captured by the 2019 ISM samples, the nearby samples indicate that antimony concentrations are likely within background throughout OU2. Therefore, risk to ecological receptors from antimony in the non-detect samples is not likely.

7.9.3 Analysis Of Estimated Exposure and Toxicity Data

A major source of uncertainty in the ERA is associated with the estimation of receptor exposure to COPECs. Generally, the models used to estimate exposures from abiotic media and prey were created to represent a worst-case scenario of possible risks to the receptor groups, and thus, many conservative assumptions were incorporated into the models.

EcoSSL guidance (EPA 2003b) suggests use of the default assumption that the concentration of antimony in earthworm tissue is equal to the concentration of antimony in soil. However, this is a very conservative assumption used in the absence of data which overestimates worm tissue concentrations. Nannoni et al. (2014) sampled soil and earthworms from a mixture of urban, urban green space, peri-urban, and rural areas. The regression has a fit of $R^2=0.76$ for the antimony concentrations found in soil and earthworm tissue and the maximum antimony soil concentration falls within the range of soil concentrations from the study. This regression was used to model antimony uptake into earthworms in the ERA; however, there is some uncertainty associated with its use because the regression is based on a single study in a single municipality that targeted a single species of earthworm (*Nicodrilus caliginosus*) and the model has not been validated with additional data. Also, the study took place in central Italy, and though there are soil properties provided in the study, the soil types within OU2 are not known for comparison.

However, even with the above uncertainties, the Nannoni et al. (2014) study is likely more realistic of antimony in soil and the uptake into earthworms than the default assumption. The

earthworm concentration impacts the doses to the omnivorous bird and insectivorous mammal as they ingest earthworms as well as the doses to predatory birds and mammals since the food web models base the uptake into small mammals consumed by predators on the concentration in earthworms. The maximum antimony soil concentration (2.2 mg/kg) was used with the two invertebrate uptake methods (Nannoni et al. regression and the default uptake) to calculate food items concentrations, doses from food, total doses, and HQs. The values are presented below for comparison. The food web models in Tables 7-3 through 7-5 provide the parameters and sources required for the calculations.

Invertebrate Uptake Method	Food Item Concentration (mg/kg dry weight)	Dose From Food (mg/kg bw-day)	Total Dose (mg/kg bw-day)	HQ Compared to NOAEL	HQ Compared to LOAEL
<i>Omnivorous Birds (American Robin)</i>					
Nannoni et al.	0.2	0.044	0.25	--	--
Default Uptake	2.2	0.48	0.69	--	--
<i>Predatory Birds (Red-Tailed Hawk)</i>					
Nannoni et al.	0.01	0.0006	0.0006	--	--
Default Uptake	0.11	0.006	0.006	--	--
<i>Insectivorous Mammals (Vagrant Shrew)</i>					
Nannoni et al.	0.2	0.03	0.18	3.1	<1
Default Uptake	2.2	0.3	0.46	7.8	<1
<i>Predatory Mammals (Coyote)</i>					
Nannoni et al.	0.01	0.0003	0.007	<1	<1
Default Uptake	0.11	0.003	0.01	<1	<1

Note:

-- HQs could not be calculated because there are no available avian NOAEL or LOAEL TRVs.

In general, the regression from Nannoni et al. (2014) results in food item concentrations and doses from food that are approximately 10 times less than the default assumption that earthworm tissue concentration is equal to the soil concentration. This does not necessarily have the same impact on the total dose or HQs because the dose from the incidental ingestion of soil does not change. Except for the insectivorous mammal dose comparison to the NOAEL, the change in uptake does not change the HQs. Given the majority non-detect samples for antimony and that the dose falls below the LOAEL, using the default uptake instead of the Nannoni et al. (2014) regression would not have changed the conclusions of the ERA.

7.9.4 Assessment Of Risks

There are uncertainties associated with the assessment of risks in the ERA for OU2. One apparent uncertainty is from the extrapolation of assumptions about the potential for adverse effects from individual organisms to populations. The intent of this ERA, as set forth in the assessment endpoints, is to ultimately evaluate risks to populations. Few methods are available to extrapolate the potential for adverse effects from the individual level to the population level. It is generally assumed that if there is no potential for direct adverse effects to individual organisms, then adverse population effects are also unlikely. Similarly, it is assumed that if there is potential for adverse effects to individual organisms, then there is also potential adverse population effects. However, it is conservative to assume that potential damage at the individual level will impact the populations in the surrounding ecosystem.

This uncertainty is an acknowledged limitation associated with the use of HQs to determine the potential for risk to ecological receptors. Use of the HQ is a standard tool set forth in EPA guidance (EPA 1997) to achieve protective remedies in the absence of the extensive long-term field studies that would be necessary to determine actual harm at contaminated sites. Such studies would not be practicable for the universe of contaminated sites addressed under CERCLA. HQ values are not scalable, nor do they allow for extrapolation between individual and population level effects (Tannenbaum et al. 2003).

In addition, the assessment of risks was primarily based on the comparison of estimated doses to toxicity values from the EcoSSL reports (EPA 2005a, 2005b, 2005c). There are uncertainties associated with these evaluation tools and thus, with the assessment of risks based upon them. For example, omnivorous birds and insectivorous mammals may face risk driven by the uptake of lead into earthworms. In the absence of site-specific earthworm tissue, the earthworm tissue concentrations are modeled based on an uptake equation specific to lead and earthworms and the soil concentration of lead. However, the uptake equation developed by Sample et al. (1998a) and suggested for use in EcoSSL guidance (EPA 2003b) is generalized, as it represents multiple earthworm species, seasons, and soil types and characteristics, which have all been shown to affect uptake (Sample et al. 1998a). Therefore, the uncertainty with the earthworm tissue estimate for any specific location may be high (Sample et al. 1998a), and thus the exposure estimate to the wildlife receptors that eat earthworms is also uncertain.

There is uncertainty associated with the mammal EcoSSL for antimony (0.27 mg/kg) which is lower than background concentrations of antimony in most places (EPA 2005a). The EcoSSL is based on the highest bounded NOAEL lower than the lowest bounded LOAEL which is equal to 0.059 mg antimony per kilogram of body weight per day. The LOAEL used in this ERA is the corresponding LOAEL to that study (0.59 mg antimony per kilogram of body weight per day). The selected NOAEL as well as the lowest LOAELs are from studies evaluating drinking water exposure (EPA 2005a). It has been documented that some metals have lower absorption when ingested in the presence of food and a higher absorption when ingested via drinking water in the absence of food (Schrenk et al. 2020). Thus, the NOAEL and LOAELs based on drinking water may be more conservative and potential risk indicated from comparison of doses based on ingestion of prey and incidental ingestion of soil to drinking water based TRVs are uncertain. For comparison, when NOAELs are not bounded, EcoSSLs are developed based on the geometric mean of NOAELs for reproduction and growth and for antimony this value is 13.3 mg antimony per kilogram of body weight per day. This alternative value is over 200 times the NOAEL value selected (EPA 2005a) and using this value in the ERA would show no exceedances of the NOAEL-based TRV even when doses are calculated with the maximum reporting limit of the non-detect sample (63 mg/kg). Therefore, risks to mammals based on the selected EcoSSL NOAEL and LOAELs may be overestimated.

There is also uncertainty associated with the lack of formal literature-based avian TRVs for antimony. Given the absence of methods for estimating risks from exposure to contaminants without appropriate TRVs, it is not possible to estimate the uncertainty associated with the limitation. It is not possible to indicate if the impacts result in an underestimate or overestimate

of potential ecological risks. Presumably, either scenario is possible. Consequently, risks to avian wildlife resulting from exposure to antimony cannot be quantitatively assessed.

There is also uncertainty regarding the assessment and characterization of risks to amphibians and reptiles. Except for bioassays, there is a lack of adequate methods for assessing risks to amphibians and reptiles; thus, these receptors were not evaluated quantitatively in the risk assessment. The greatest uncertainty with respect to the characterization of risks to amphibians and reptiles is the lack of receptor-specific contaminants benchmarks, uptake data, and bioconcentration rates. Approved TRVs and other comparative values to measure adverse effects to amphibians and reptiles from contaminants in soil have not yet been developed from literature. Available toxicity literature and databases provide some usable information; however, they are still under development, and are not yet comprehensive or consistent enough to allow development of reliable TRVs. Thus, uncertainties associated with toxic effects of COPECs at concentrations on adults, juveniles, larvae, or eggs, or the specific effects of contaminant exposure on development, reproductive capacity, or survival remain unresolved. However, it has been demonstrated that for reptile exposure to lead specifically, growth effects were seen at similar exposure doses to the lead EcoSSL TRV for avian ground insectivores (Salice et al. 2009), indicating the risk could occur at similar thresholds for birds and reptiles. Therefore, risks from lead to other receptors, especially birds, may indicate risk to reptiles and amphibians as well.

7.9.5 Data Gaps

Based on the land-use history of OU2, lead shot may be present and, if present, could pose risk to ecological receptors that consume lead shot as grit. A lead shot density analysis, collection of surface soil over a known surface area and counting any lead particles per square foot, was not completed. However, to determine if a lead shot density analysis was required (determine if lead shot was present), the sample fraction greater than 2 mm of the 2022 ISM surface soil samples were visually inspected and any metallic-looking particles were further evaluated to determine if they were lead. The results yielded no lead fragments in soil samples examined. However, since samples were not collected for the purpose of evaluating lead shot density, there is some uncertainty with the conclusion that the OU2 soil does not contain lead shot.

In addition, what counts as “grit-sized” is species-dependent and Bennet et al. (2011) presents particle sizes for various species of birds that are likely to be ingested as grit. According to Duggan and Dhawan (2007), lead shot sizes used for trap and skeet are greater than 2 mm and they would have been captured in the inspection of the greater than 2 mm fraction of surface soil samples. Over time the lead fragments can degrade, so particles of lead found in the soil can be much smaller. Based on the data presented in Bennet et al. (2011), a relatively high proportion of grit particles found in birds were smaller than 0.25 mm (Luttik and de Snoo 2004; Gionfriddo and Best 1999), though approximately 75 percent of bird species evaluated elsewhere had a mean grit size of 0.5 mm or larger (Gionfriddo and Best 1996). Therefore, there is additional uncertainty with the conclusion that OU2 soil does not contain lead shot that may be consumed as grit because only the greater than 2 mm fraction was evaluated and there may be “grit-sized” particles of lead between 0.25 and 2 mm present within OU2.

7.10 ECOLOGICAL RISK ASSESSMENT SUMMARY

The ERA was initiated with the development of an ecological CSM and performance of media-specific screening as part of a SLERA. The SLERA concluded that lead and antimony in surface soil required further evaluation. The results of the SLERA represent maximum estimates of risk and are not necessarily representative of population-wide risks; therefore, the ERA includes data evaluation and risk characterization, which rely on receptor-specific risk estimates using more site-specific assumptions and information. This provides a more site-specific and realistic risk characterization for OU2 used for risk management decisions.

Several uncertainties are inherent in the assessment of risks and should be considered in interpretation of results. One of the greatest uncertainties inherent to the risk assessment is the assumption that effects on individuals, as indicated by benchmark exceedances, are indicative of population-level effects. Also, assumptions made in the screening-level risk assessment are highly precautionary and may overestimate risk, while assumptions made throughout the assessment require generalizations that may result in overestimated or underestimated risks. Since OU2-specific prey tissue concentrations have not been collected, exposure estimates to wildlife rely upon uptake models that are uncertain as the data used to develop the models was general in nature.

The results of the ERA found that antimony in soil is not expected to pose risk to any ecological receptors evaluated. However, suitable information on toxicity of antimony to avian wildlife is not available, so risk from antimony to birds could not be evaluated. The risk assessment found that lead in soil may pose risks to terrestrial plants, gallinaceous and omnivorous birds (a surrogate receptor for a threatened species), insectivorous mammals, reptiles, and amphibians. Risk from lead in soil is generally limited to the decision unit with the maximum lead concentration (decision unit OU2-RR-BB2). To support future risk management decisions, EPCs were recalculated, and the risk assessment was rerun excluding concentrations from decision unit OU2-RR-BB2.

Outside of decision unit OU2-RR-BB2, antimony was not detected in any sample. Excluding decision unit OU2-RR-BB2, site-wide risks to ecological receptors are not expected from lead in the soil. The modified risk assessment did determine potential for localized risk from lead in the soil outside of decision unit OU2-RR-BB2 to omnivorous birds, reptiles, and amphibians given the exceedances of an alternative avian low effect levels at five decisions units. The omnivorous bird receptor, the American robin, is a surrogate receptor for the yellow-billed cuckoo, a threatened species. OU2 is not expected to support the habitat requirements of the yellow-billed cuckoo, so the species is not likely to be present within OU2. However, it is worth noting that if the species is present, lead in soil may pose localized risk to the yellow-billed cuckoo.

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8. REMEDIAL INVESTIGATION SUMMARY AND CONCLUSIONS

EPA and others have been investigating and performing removal actions within the KFRA since 1992. Initial investigations focused on surveying the property and performing archive searches to assessing and evaluating risk from past munition use. More recent activities have focused on collecting characterization data. Removal actions included ACM pickups and a TCRA. In 2019, USACE completed a limited RI to assess munitions and explosives of concern and munitions constituents at the KFRA; the USACE RI Report (USACE 2021) recommended no further action for the Rocket Range and the Disposal Range. The purpose of this RI/FS is to evaluate risk from asbestos, as well as risk from lead, arsenic, and antimony related to civilian small arms use and ACM.

8.1 SUMMARY

Between 2019 and 2022, four visual inspections for PACM were performed within OU2. The visual inspections included systematically identifying and marking PACM materials on the ground surface followed by the removal of previously marked PACM items for off-site disposal. During the 2021 visual inspection and pickup activity, vegetation was cleared from high-density vegetation areas to aid visual inspections, and two test pits were excavated to assess for the presence or absence of PACM bgs. The amount of PACM material removed from OU2 decreased from 81 cubic feet during the initial 2019 pickup activity to 0.27 cubic feet in 2022.

In 2022, EPA completed an assessment and performed a TCRA. The assessment evaluated three decision units for ACM by collecting bulk samples for analysis. The TCRA removed soil with PACM and confirmed ACM from two excavations and two dilapidated sheds and collecting confirmation soil samples from the bottom of the excavations. The TCRA removed 182 cubic yards of soil and 7 tons of ACM and PACM building material.

Historical sample results, specifically soil samples collected in 2004, 2007, and 2019, were combined with soil and ABS air samples collected in 2022 to assess the nature and extent of COPCs within OU2 (lead, arsenic, antimony, and asbestos). The RI dataset includes:

- Lead, arsenic, and antimony results from discrete soil samples, sediment samples, and a groundwater sample collected in 2004; the antimony results were rejected by the analytical laboratory.
- Lead, arsenic, and antimony results from composite soil samples and a groundwater sample collected in 2007.
- Lead, arsenic, and antimony results from ISM and discrete soil samples collected in 2019.
- Lead, arsenic, and antimony results from ISM soil samples collected in 2022.
- Fiber count results from ABS performed in 2022.

8.1.1 Nature and Extent

8.1.1.1 Lead, Arsenic, and Antimony in Soil

The maximum concentration of lead measured within OU2 is 665 mg/kg reported in sample OU-RR-BB2 collected from the former 300-yard firing line of the Rifle Range (decision unit OU-RR-BB2). Outside of decision unit OU-RR-BB2, the maximum concentration of lead measured within OU2 is 220 mg/kg in sample KFR-RR-RF212 collected from the impact area of the Rifle Range, which is less than the OU2-specific PRG of 311 mg/kg.

The concentrations of arsenic in soil samples collected from OU2 were below the regional background concentration of 12 mg/kg.

The maximum concentration of antimony measured within OU2 is 2.2 mg/kg reported in sample OU-RR-BB2. Outside of decision unit OU2-RR-BB2, antimony is not detected at concentrations greater than laboratory detection limits. The detection limits are 1.2 mg/kg for samples collected from the Disposal Range and firing range from 6.9 to 63 mg/kg for samples collected throughout the Rifle Range. Antimony is not detected above its residential screening level of 31 mg/kg.

Lead, arsenic, and antimony were not present in sediment or groundwater above their respective PALs, which is expected based on the lack of mobility of these metals.

8.1.1.2 Asbestos

No fibers were reported in air samples collected from the personal monitors during the ABS.

8.1.2 Fate and Transport

The historical use of small arms within OU2 may have released lead, arsenic, and antimony to surface soil at the Rifle Range. Materials used to construct buildings within OU2 contained asbestos, and ACM was released to the surface soil due to disrepair and when the structures were demolished within or near OU2. These COPCs are not volatile and are relatively insoluble and immobile in soil; therefore, vertical migration of COPCs is unlikely. The primary pathway for migration of COPCs within OU2 is the disturbance of the soil by anthropogenetic (e.g., excavation) or natural physical processes (e.g., wind, frost heaving for ACM).

8.1.3 Human Health Risk Assessment

Sample results for asbestos, lead, arsenic, and antimony were evaluated in the HHRA. Asbestos was not detected in samples collected from personal air monitors during ABS activities and was not evaluated in the HHRA. Arsenic was not detected above the regional background concentration and antimony was not detected above its residential screening level; therefore, neither metal was evaluated in the HHRA.

Lead was the only analyte evaluated in the HHRA. Lead exceeded its PAL in only one decision unit, OU2-RR-BB2. The IEUBK model revealed potential concerns for child receptor's exposure to lead in soil within decision unit OU2-RR-BB2 for both current and future exposures. The

ALM did not reveal potential concerns for worker exposure to lead in soil. A lead soil PRG of 311 mg/kg was determined to ensure that less than 5 percent of the child population will have a PbB level of 5 µg/dL or higher.

8.1.4 Ecological Risk Assessment

The ERA concluded lead in soil may pose risks to terrestrial plants, gallinaceous and omnivorous birds (a surrogate receptor for a threatened species), insectivorous mammals, reptiles, and amphibians. However, risk is generally limited to decision unit OU2-RR-BB2. Arsenic was not detected above the regional background and was not evaluated in the ERA. Antimony in soil is not expected to pose risk to any ecological receptors evaluated. However, suitable information on toxicity of antimony to avian wildlife is not available, so risk from antimony to birds could not be evaluated. Asbestos was not evaluated in the ERA.

8.2 CONCLUSIONS

The past use of OU2 for small arms practice has resulted in elevated concentrations of lead being present within portions of the Rifle Range. Lead was found at concentrations in soil posing a potential risk to children only within just one decision unit, OU2-RR-BB2. The ERA concluded that lead in soil across OU2 may pose risks to terrestrial plants, gallinaceous and omnivorous birds (a surrogate receptor for a threatened species), insectivorous mammals, reptiles, and amphibians. Excluding results from decision unit OU2-RR-BB2, lead in soil outside of decision unit OU2-RR-BB2 may pose a localized risk to omnivorous birds, reptiles, and amphibians. However, site-wide risks to ecological receptors are not expected.

EPA is currently planning a removal action for the OU2-RR-BB2 decision unit anticipated for completion in 2024 and will obviate the need for further actions to address lead risk at OU2. Arsenic has not been reported in soil samples exceeding the regional background concentration of 12 mg/kg or exceeding EcoSSLs; therefore, arsenic is not a contaminant of concern for OU2. Antimony was not detected above its residential screening level of 31 mg/kg and is not expected to pose risk to any ecological receptors evaluated. ACM was released to the surface within OU2; however, previous pickup and removal activities, including the 2022 TCRA, reduced the amount of ACM in OU2. To confirm that soil containing ACM is not a potential risk to current and future receptors, ABS was completed and no fibers were reported in air samples collected from the raking area during the scenarios.

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9. FEASIBILITY STUDY

This section presents the FS conducted for OU2 of the North Ridge Estates Superfund Site in Klamath Falls, Klamath County, Oregon. The RI portion of this RI/FS Report (Sections 1 through 8), including the HHRA (Section 6) and ERA (Section 7), provide the basis for this FS. Regulatory and guidance documents utilized in this evaluation included the following:

- National Oil and Hazardous Substance Pollution Contingency Plan, 40 Code of Federal Regulations Part 300
- Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (Office of Solid Waste and Emergency Response [OSWER] Directive 9355.3-01) (EPA 1988)

9.1 BASIS FOR REMOVAL ACTION

Sample results from RI activities identified one DU with elevated concentrations of lead where the 300-yard firing line of the Rifle Range had been historically (Figure 9-1). This discrete area corresponds to decision unit OU2-RR-BB2 from the 2022 ISM sampling and contains lead at concentrations in surface soils (0 to 6 inches bgs) that may pose risk to human health and ecological receptors. Excluding the contamination within decision unit OU2-RR-BB2, COPCs and COPECs are not known to be present within OU2 at concentrations that pose unacceptable risk to human health or the environment, except for risk to a lesser extent from lead to omnivorous birds, reptiles, and amphibians.

The conclusions presented in Section 8.2 of this RI/FS Report provide a strong basis for the performance of an action to remove the discrete area with elevated concentrations of lead (decision unit OU2-RR-BB2) (Figure 9-1), following which further action should not be necessary to protect human health or the environment within OU2. A removal action provides a timely and economically beneficial remediation option for the limited and discrete area of elevated contamination present at OU2.

This FS is focused on a removal action to support a no further action determination in the forthcoming Record of Decision. Given the lack of contamination being present above risk-based screening levels outside of the discrete area with elevated concentrations of lead, no other remedial alternatives are evaluated as part of this FS.

9.2 REMEDIAL ACTION OBJECTIVE

Remedial action objectives consist of medium-specific or operable unit-specific goals for protecting human health and the environment (EPA 1988). According to the National Oil and Hazardous Substances Contingency Plan, 40 Code of Federal Regulations §300.430(a)(1)(i), the “national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste.”

The proposed remedial action objective for the lead-contaminated soil within OU2 is:

Prevent human ingestion and direct contact with soil having lead in excess of 311 mg/kg.

The remedial action objective is protective of human health (i.e., children's PbB level) as 311 mg/kg lead is the PRG to ensure that no more than 5 percent of a typical child population will have a PbB level of 5 µg/dL or higher.

9.3 GENERAL RESPONSE ACTIONS

The presumptive general response actions for lead-contaminated soil are:

- Excavation and Disposal at either on-site or off-site repository
- Capping and Institutional Controls

9.4 CONCLUSION

Remediation of decision unit OU2-RR-BB2 (Figure 9-1) through a removal action followed by a no further action determination in the forthcoming Record of Decision allows for an effective solution to protect human health and the environment by reducing the volume of contaminated media to achieve the remedial action objective in an expedited timeline.

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Tables

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Table 1-1. Previous Investigations

Investigation	Agency/Company	Year	Findings/Summary
Property Survey	USACE	1992	A survey was conducted under DERP; two shell casings were observed and the property was deemed free of munitions or on-site debris.
Risk Assessment for Ordnance and Explosive Waste	USACE	1993	A Risk Assessment for Ordnance and Explosive Waste was completed to prioritize remedial actions of the KFRA. The risk assessment gave a score to determine the threat level based on present ordnance and explosive wastes. KFRA was characterized as critical hazard severity and determined a priority under FUDS. Further action was recommended based on the shell casings found during the 1992 property survey and proximity of residential properties.
Archive Search	USACE	1995	The 1995 archive search was done to confirm the eligibility of the KFRA site under the FUDS program. The effort included a search of records, interviews of site-related personnel, and a property inspection. The ASR determined that munitions were historically used on-site and munitions (3.5-inch rockets to small arms) were found within KFRA. The lands surrounding KFRA were determined to be free of munitions contamination.
Archive Search	USACE	1997	The 1997 archive search confirmed that five areas covering 50.97 acres have or potentially have munitions. Another 155.03 acres of the former KFRA were determined to be uncontaminated and required no further action. USACE recommended a engineering evaluation/cost analysis for the five areas and source areas to determine extent of potential contamination.
PA/SI	Weston Solutions, Inc.	2004	During this PA/SI, previous investigations were summarized and reviewed for EPA. In addition, seven discrete surface soil samples, one sediment sample, two discrete background samples, and one groundwater sample were collected. These samples were analyzed for COPCs including TAL metals, NBECs, and perchlorate. The sampling occurred in the four potential source areas. The investigation found that the Horseshoe Berm Ordnance Burn/Disposal area, Small Arms Impact Berm, Rifle Range, and 3.5-inch Rocket Impact Area had soil with metal concentrations above background levels. At the Flat Ordnance Burn/Disposal Area explosive constituents were not reported above detection limits. An asbestos dump area was located and confirmed asbestos was present.
ASR Supplement	USACE	2004	The USACE resized the FUDS to 206.34 acres to cover the entire KFRA and the three identified sub-ranges. This document also provides information on U.S. Air Force use of the area up to 1975, including a complete list of munitions used on-site.
Final SI for KFRA	Shaw Environmental, Inc.	2008	The Final SI determined the presence or absence of MEC or MC associated with the KFRA's former use as a military range. Arsenic concentrations in groundwater did not exceed the maximum contaminant level and did exceed the EPA topwater screening level. Arsenic presence was not attributed to DoD activities. Acreage of the KFRA FUDS was increased to 1,352 acres across 21 parcels.
Historical Data Summary and Conceptual Investigation Approach for Asbestos Contamination in Soil	CDM Smith	2016	EPA and ODEQ evaluated existing data to develop screening criteria for residential exposures. Based on these values, the following were identified as COPCs: nitroglycerin, aluminum, antimony, arsenic, chromium, cobalt, iron, lead, manganese, vanadium, and zinc. In addition, within this investigation, a framework and approach for sampling asbestos was recommended.

Table 1-1. Previous Investigations

Investigation	Agency/Company	Year	Findings/Summary
Asbestos Investigation and Abatement Report North Ridge Estates - OU2	Apex Companies, LLC	2019	On behalf of ODEQ, Apex Companies, LLC conducted the first inspection and subsequent abatement of PACM across 2.9 acres at OU2. The inspection consisted of a visual survey and three test pit excavations that were 10-13 feet long, 1.5 feet wide, and 2-3 feet deep. One bulk sample from TP-3 was submitted for asbestos testing, and asbestos was not detected. PACM materials were not found in the other two test pits.
FUDS RI	USACE	2021	The USACE completed a RI concurrent with this RI/FS to characterize impacts from former DoD activities at the site. Soil collection during the USACE RI aimed to identify the concentration, presence, and extent COPCs related to MEC and MC. After 24 ISM samples were analyzed for metals, explosives, and/or nitroglycerin, no COPCs related to MEC, explosive hazards, or MC sources were found. Lead, antimony, and nitroglycerin are present in soil, indicating use of small arms occurred at the Rifle Range post-DoD occupancy. The small arms contamination was not eligible for FUDS remediation because it was the result of non-DoD activity. No further action was recommended for MEC across the site and for MC in the Disposal Range and Rocket Range.
TCRA Memorandum	EPA	2022	The memorandum documented the request and approval for a TCRA at OU2. It also detailed the removal site evaluation by establishing three DUs (DU1, DU2, and DU3). Of the nine total bulk soil samples collected from all three DUs (seven from DU1, two from DU2, and one from DU3) 4 to 25 percent were friable and confirmed to have ACM.
TCRA Report	Weston Solutions, Inc.	2022	A TCRA was completed to remove ACM and PACM from three DUs (DU1, DU2, and DU3) at OU2. Soil containing ACM and PACM was removed from a 83 x 70 x 3-foot excavation at DU1 and a 26 x 16 x 3-foot excavation at DU2. Two sheds containing ACM and PACM were removed at DU3. In total 269 tons of ACM or PACM were removed from OU2.

Notes:

ACM = asbestos-containing materials

ASR = archive search report

COPC = contaminant of potential concern

DERP = Defense Environmental Restoration Program

DoD = Department of Defense

DU = decision unit

EPA = U.S. Environmental Protection Agency

FS = Feasibility Study

FUDS = Formerly Used Defense Site

ISM = incremental sampling methodology

KFRA = Kingsley Firing Range Annex

MC = munition constituent

Sources:

Apex Companies, LLC. 2019. Asbestos Inspection and Abatement Report, North Ridge Estates - Operable Unit 2, Klamath Falls, Oregon. 19 November.

CDM Smith. 2016. North Ridge Estates, Operable Unit 2 - Klamath County, Oregon, Historic Data Summary and Conceptual Investigation Approach for Asbestos Contamination in Soil Memorandum. Prepared for U.S. Environmental Protection Agency. 24 October.

Sources continued:

MEC = munitions and explosives of concern

NBEC = nitrogen-based explosive compound

ODEQ = Oregon Department of Environmental Quality

OU = operable unit

PA = Preliminary Assessment

PACM = presumed asbestos-containing materials

RI = Remedial Investigation

SI = Site Inspection

TAL = Target Analyte List

TCRA = Time-Critical Removal Action

USACE = U.S. Army Corps of Engineers

Table 1-1. Previous Investigations

Investigation	Agency/Company	Year	Findings/Summary
Shaw Environmental, Inc. 2008. Final Site Inspection Report, Kingsley Firing Range Annex, Klamath County, Oregon, FUDS Property No. F10OR0569. September.			
USACE. 1992. Site Survey Summary Sheet for DEPR-FUDS Site No. F10OR056900, Kingsley Firing Range Annex, OR. 9 October.			
USACE 1993. Risk Assessment Procedures for Ordnance and Explosive Sites, Kingsley Firing Range Annex, Klamath Falls, Oregon, Site No. F10OR056901. 7 June.			
USACE 1995. Archive Search Report Findings for the Former Kingsley Firing Range Annex. September.			
USACE 1997. Final Archive Search Report Findings for the Former Kingsley Firing Range Annex, Klamath Falls, Oregon with Conclusions and Recommendations. 27 February.			
USACE 2004. ASR Supplement, Kingsley Firing Range Annex. November.			
USACE 2021. Final Remedial Investigation Report, Rocket, and Disposal Range MRS, Kingsley Firing Range Annex, FUDS Property Klamath County, Oregon, Formerly Used Defense Site Property No. F10OR0569, Contract No. W9128F-17-D-0030. November.			
EPA 2022. Memorandum: Request for Approval and Funding for a Time-Critical Removal Action at North Ridge Estates, Klamath Falls, Klamath County, Oregon. 27 June.			
Weston Solutions, Inc. 2004. Kingsley Firing Range Annex, Formerly Used Defense Site, Preliminary Assessment/Site Inspection Report, TDD: 01-08-0006. December.			
Weston Solutions, Inc. Draft Time-Critical Removal Action Report, North Ridge Estates 2022 Removal, Klamath Falls, Klamath County, Oregon, Contract No. 68HE720D0005. Task Order No. 68HE0722F0107. November.			

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Table 2-1. Sample Summary

Sample Identification	Sample Type	Matrix	Explosives by EPA Method 8330 (Modified)	Select Metals by EPA Method 6020 ^(a)	Select Metals by EPA Method 6020 ^(b)	Select Metals by EPA Method 6020 ^(c)	Mercury by EPA Methods 7470A / 7471A	TAL Metals by CLP SOW ILM05.3 ^(d)	Select Metals by EPA Method 6010C ^(e)	Select Metals by EPA Method 6010D ^(f)	IVBA by EPA Method 1340	Asbestos by ISO Method 10312	Asbestos by ISO Method 13794	Asbestos by PLM CARB 435 ^(h)	Perchlorate by EPA Method 314.0	Perchlorate by EPA Method 6850	Nitroglycerin by EPA Method 8330	Year Collected	Report Reference
GW-DW001	Discrete	Groundwater	X					X							X			2004	Weston 2004
SD-ST001	Discrete	Sediment	X					X										2004	Weston 2004
SD-BK001	Discrete	Sediment (background)	X					X										2004	Weston 2004
SS-BK001	Discrete	Sediment (background)	X					X										2004	Weston 2004
SS-BA001	Discrete	Surface Soil	X					X										2004	Weston 2004
SS-BA002	Discrete	Surface Soil	X					X										2004	Weston 2004
SS-RA001	Discrete	Surface Soil	X					X										2004	Weston 2004
SS-RA002	Discrete	Surface Soil	X					X										2004	Weston 2004
SS-RA003	Discrete	Surface Soil	X					X										2004	Weston 2004
SS-SA001	Discrete	Surface Soil						X										2004	Weston 2004
SS-SA002	Discrete	Surface Soil						X										2004	Weston 2004
NWO-069-3001	Discrete	Groundwater	X		X		X									X		2007	Shaw 2008
NWO-069-0001	Composite	Surface Soil	X	X			X											2007	Shaw 2008
NWO-069-0002	Composite	Surface Soil	X	X			X											2007	Shaw 2008
NWO-069-0003	Composite	Surface Soil	X	X			X											2007	Shaw 2008
NWO-069-0004	Composite	Surface Soil	X	X			X											2007	Shaw 2008
NWO-069-0005	Composite	Surface Soil	X	X			X											2007	Shaw 2008
NWO-069-0006	Composite	Surface Soil	X	X			X									X		2007	Shaw 2008
NWO-069-5001	Composite	Surface Soil (background)				X	X									X		2007	Shaw 2008
NWO-069-5002	Composite	Surface Soil (background)				X	X									X		2007	Shaw 2008
NWO-069-5003	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
NWO-069-5004	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
NWO-069-5005	Composite	Surface Soil (background)				X	X									X		2007	Shaw 2008
NWO-069-5006	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
NWO-069-5007	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
NWO-069-5008	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
NWO-069-5009	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
NWO-069-5010	Composite	Surface Soil (background)				X	X											2007	Shaw 2008
KFR-EOD-DP3 ^(g)	Discrete	Subsurface Soil	X						X									2019	USACE 2021
KFR-EOD-DP4 ^(g)	Discrete	Subsurface Soil	X						X									2019	USACE 2021
KFR-EOD-DP5 ^(g)	Discrete	Subsurface Soil	X						X									2019	USACE 2021
KFR-EOD-DP6 ^(g)	Discrete	Subsurface Soil	X						X									2019	USACE 2021

Table 2-1. Sample Summary

Sample Identification	Sample Type	Matrix	Explosives by EPA Method 8330 (Modified)	Select Metals by EPA Method 6020 ^(a)	Select Metals by EPA Method 6020 ^(b)	Select Metals by EPA Method 6020 ^(c)	Mercury by EPA Methods 7470A / 7471A	TAL Metals by CLP SOW ILM05.3 ^(d)	Select Metals by EPA Method 6010C ^(e)	Select Metals by EPA Method 6010D ^(f)	IVBA by EPA Method 1340	Asbestos by ISO Method 10312	Asbestos by ISO Method 13794	Asbestos by PLM CARB 435 ^(h)	Perchlorate by EPA Method 314.0	Perchlorate by EPA Method 6850	Nitroglycerin by EPA Method 8330	Year Collected	Report Reference
KFR-EOD-BA1	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA111	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA112	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA2	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA211	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA212	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA3	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA311	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-BA312	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-DP1	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-DP111	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-DP112	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-DP2	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-DP211	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-EOD-DP212	ISM	Surface Soil	X						X									2019	USACE 2021
KFR-RR-BB1	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB111	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB1112	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB2	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB211	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB212	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB3	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB311	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-BB312	ISM	Surface Soil															X	2019	USACE 2021
KFR-RR-FP1	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-FP111	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-FP112	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA1	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA111	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA112	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA2	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA211	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA212	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA3	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA311	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-IA312	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A

Table 2-1. Sample Summary

Sample Identification	Sample Type	Matrix	Explosives by EPA Method 8330 (Modified)	Select Metals by EPA Method 6020 ^(a)	Select Metals by EPA Method 6020 ^(b)	Select Metals by EPA Method 6020 ^(c)	Mercury by EPA Methods 7470A / 7471A	TAL Metals by CLP SOW ILM05.3 ^(d)	Select Metals by EPA Method 6010C ^(e)	Select Metals by EPA Method 6010D ^(f)	IVBA by EPA Method 1340	Asbestos by ISO Method 10312	Asbestos by ISO Method 13794	Asbestos by PLM CARB 435 ^(h)	Perchlorate by EPA Method 314.0	Perchlorate by EPA Method 6850	Nitroglycerin by EPA Method 8330	Year Collected	Report Reference
KFR-RR-RF1	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-RF111	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
KFR-RR-RF112	ISM	Surface Soil							X								X	2019	USACE 2021, Appendix A
ABS1-01-H	ABS	Air										X						2022	EA 2022e
ABS1-01-L	ABS	Air										X						2022	EA 2022e
ABS1-02-H	ABS	Air										X						2022	EA 2022e
ABS1-02-L	ABS	Air											X					2022	EA 2022e
ABS2-01-H	ABS	Air										X						2022	EA 2022e
ABS2-01-L	ABS	Air										X						2022	EA 2022e
ABS2-02-H	ABS	Air										X						2022	EA 2022e
ABS2-02-L	ABS	Air										X						2022	EA 2022e
ABS3-01-H	ABS	Air										X						2022	EA 2022e
ABS3-01-L	ABS	Air										X						2022	EA 2022e
ABS3-02-H	ABS	Air										X						2022	EA 2022e
ABS3-02-L	ABS	Air										X						2022	EA 2022e
ABS4-01-H	ABS	Air										X						2022	EA 2022e
ABS4-01-L	ABS	Air										X						2022	EA 2022e
ABS4-02-H	ABS	Air										X						2022	EA 2022e
ABS4-02-L	ABS	Air										X						2022	EA 2022e
ABS5-01-H	ABS	Air										X						2022	EA 2022e
ABS5-01-L	ABS	Air										X						2022	EA 2022e
ABS5-02-H	ABS	Air										X						2022	EA 2022e
ABS5-02-L	ABS	Air										X						2022	EA 2022e
PM1-CW	ABS	Air										X						2022	EA 2022e
PM1-DW	ABS	Air										X						2022	EA 2022e
PM1-UW	ABS	Air										X						2022	EA 2022e
PM2-CW	ABS	Air										X						2022	EA 2022e
PM2-DW	ABS	Air										X						2022	EA 2022e
PM2-UW	ABS	Air										X						2022	EA 2022e
PM3-CW	ABS	Air										X						2022	EA 2022e
PM3-DW	ABS	Air										X						2022	EA 2022e
PM3-UW	ABS	Air										X						2022	EA 2022e
PM4-CW	ABS	Air										X						2022	EA 2022e
PM4-DW	ABS	Air										X						2022	EA 2022e
PM4-UW	ABS	Air										X						2022	EA 2022e
PM5-CW	ABS	Air										X						2022	EA 2022e
PM5-DW	ABS	Air										X						2022	EA 2022e
PM5-UW	ABS	Air										X						2022	EA 2022e
NRE-0830-CS01	Composite	Subsurface Soil												X				2022	Weston 2022
NRE-0830-CS02	Composite	Subsurface Soil												X				2022	Weston 2022
NRE-0830-CS03	Composite	Subsurface Soil												X				2022	Weston 2022

Table 2-1. Sample Summary

Sample Identification	Sample Type	Matrix	Explosives by EPA Method 8330 (Modified)	Select Metals by EPA Method 6020 ^(a)	Select Metals by EPA Method 6020 ^(b)	Select Metals by EPA Method 6020 ^(c)	Mercury by EPA Methods 7470A / 7471A	TAL Metals by CLP SOW ILM05.3 ^(d)	Select Metals by EPA Method 6010C ^(e)	Select Metals by EPA Method 6010D ^(f)	IVBA by EPA Method 1340	Asbestos by ISO Method 10312	Asbestos by ISO Method 13794	Asbestos by PLM CARB 435 ^(h)	Perchlorate by EPA Method 314.0	Perchlorate by EPA Method 6850	Nitroglycerin by EPA Method 8330	Year Collected	Report Reference
NRE-0830-CS04	Composite	Subsurface Soil												X				2022	Weston 2022
NRE-0831-CS01	Composite	Subsurface Soil												X				2022	Weston 2022
NRE-0831-CS02	Composite	Subsurface Soil												X				2022	Weston 2022
OU2-RR-BB2	ISM	Surface Soil								X	X							2022	EA 2022d
OU2-RR-BB211	ISM	Surface Soil								X								2022	EA 2022d
OU2-RR-BB212	ISM	Surface Soil								X								2022	EA 2022d
OU2-RR-BB3	ISM	Surface Soil								X	X							2022	EA 2022d
OU2-RR-BB311	ISM	Surface Soil								X								2022	EA 2022d
OU2-RR-BB312	ISM	Surface Soil								X								2022	EA 2022d
OU2-RR-RF1	ISM	Surface Soil								X	X							2022	EA 2022d
OU2-RR-RF111	ISM	Surface Soil								X								2022	EA 2022d
OU2-RR-RF112	ISM	Surface Soil								X								2022	EA 2022d

Notes:

This table identifies natural field samples only. Samples collected for quality assurance and quality control are not included.

(a) Select metals include aluminum, antimony, arsenic, barium, chromium, copper, iron, lead, manganese, molybdenum, nickel, and zinc.

(b) Select metals include aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc.

(c) Select metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, selenium, silver, vanadium, and zinc.

(d) TAL Metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

(e) Select metals include antimony, copper, lead, and zinc.

(f) Region 9 Laboratory reported lead and arsenic results. Antimony results were calculated from laboratory documentation and reported later.

(g) Table 4-10 of USACE 2021 erroneously identifies all of these samples as EOD-DP-3. The laboratory report (Appendix F of USACE 2021) identifies them as EOD-DP3, EOD-DP4, EOD-DP5, and EOD-DP6.

(h) Analysis of bulk asbestos via EPA 600R-93/116 Method with CARB 435 Prep (milling). Level B for 0.1 percent Target Analytical Sensitivity.

ABS = activity-based sampling
CARB = California Air Resources Board
CLP = Contract Laboratory Program
EPA = U.S. Environmental Protection Agency
ISM = incremental sampling methodology
ISO = International Organization for Standardization
IVBA = in-vitro bioaccessibility
PLM = polarized light microscopy
SOW = Statement of Work
TAL = Target Analyte List

Sources:

EA Engineering, Science, and Technology, Inc. (EA). 2022d. Summer 2022 Supplemental Soil Sampling Technical Memorandum. North Ridge Estates Operable Unit 2 Kingsley Firing Range, Klamath County, Oregon. October.

EA Engineering, Science, and Technology, Inc. (EA). 2022e. Summer 2022 Activity -Based Sampling Technical Memorandum. North Ridge Estates Operable Unit 2 Kingsley Firing Range, Klamath County, Oregon. October.

Shaw Environmental, Inc. (Shaw). 2008. Final Site Inspection Report, Kingsley Firing Range Annex, Klamath County, Oregon, FUDS Property No. F10OR0569. September.

U.S. Army Corps of Engineers (USACE). 2021. Final Remedial Investigation Report, Rocket, and Disposal Range MRS, Kingsley Firing Range Annex, FUDS Property Klamath County, Oregon, Formerly Used Defense Site Property No. F10OR0569, Contract No. W9128F-17-D-0030. November.

Weston Solutions, Inc. (Weston). 2004. Kingsley Firing Range Annex, Formerly Used Defense Site, Preliminary Assessment/Site Inspection Report, TDD: 01-08-0006. December.

Weston Solutions, Inc. (Weston). 2022. Draft Time- Critical Removal Action Report, North Ridge Estates 2022 Removal, Klamath Falls, Klamath County, Oregon, Contract No. 68HE720D0005. Task Order No. 68HE0722F0107. November.

Table 4-1. Discrete and Composite Soil Sample Results

Sample	Lead (mg/kg)	Lead Result Qualifiers	Arsenic (mg/kg)	Arsenic Result Qualifiers	Antimony (mg/kg)	Antimony Result Qualifiers	Year Collected	Comments	Reference Report
PAL	240		12		31 ^(a)				
Surface Soil									
SS-BA001	16.8		0.92	UJK	5.5	R	2004		Weston 2004
SS-BA002	10.1		0.56	BJK	5.7	R	2004		Weston 2004
SS-SA001	1220		0.96	UJK	5.8	R	2004	Superseded by ISM decision units KFR-RR-IA1, KFR-RR-IA2 and KFR-RR-IA3	Weston 2004
SS-SA002	73.6		0.94	UJK	5.6	R	2004		Weston 2004
SS-RA001	74.8		0.98	UJK	5.9	R	2004		Weston 2004
SS-RA002	150		2.8	JL	5.8	R	2004		Weston 2004
SS-RA003	37.7		0.87	BJK	5.8	R	2004		Weston 2004
NWO-069-0001	15.8		2.2	U	0.22	J	2007		Shaw 2008
NWO-069-0002	11.4		2	U	0.089	U	2007		Shaw 2008
NWO-069-0003	29.7		1.9	U	0.087	U	2007		Shaw 2008
NWO-069-0004	75.5		1.5	U	0.27	J	2007		Shaw 2008
NWO-069-0005	60.5		1.3	U	0.27	J	2007		Shaw 2008
NWO-069-0006	828		2.5	U	7.9		2007	Superseded by ISM decision units KFR-EOD-DP1 and KFR-EOD-DP2 and sample KFR-EOD-DP3	Shaw 2008
Subsurface Soil									
KFR-EOD-DP3	10		NR		1.4	U	2019		USACE 2021
KFR-EOD-DP4	37		NR		1.7	U	2019		USACE 2021
KFR-EOD-DP5	9.7		NR		1.6	U	2019		USACE 2021
KFR-EOD-DP6	18		NR		1.6	U	2019		USACE 2021
Background Surface Soil									
SS-BK001	6.8		0.96	UJK	5.7	R	2004		Weston 2004
NWO-069-5001	12.3		1.6	U	0.087	U	2007		Shaw 2008
NWO-069-5002	10.8		1.3	U	0.089	U	2007		Shaw 2008
NWO-069-5003	7.3		2.4	U	0.088	U	2007		Shaw 2008
NWO-069-5004	14.6		3.6	U	0.086	U	2007		Shaw 2008
NWO-069-5005	9.8		2.4	U	0.088	U	2007		Shaw 2008
NWO-069-5006	8.9		2.2	U	0.087	U	2007		Shaw 2008
NWO-069-5007	9.2		2.4	U	0.090	U	2007		Shaw 2008
NWO-069-5008	8.4		2.1	U	0.087	U	2007		Shaw 2008
NWO-069-5009	17.9		1.7	U	0.090	U	2007		Shaw 2008
NWO-069-5010	12.6		1.4	U	0.089	U	2007		Shaw 2008

Notes:

Green highlight indicates that the sample is anomalous and has been superseded by more recent results.

(a) The PAL for antimony is identified in this Remedial Investigation Report as the EPA residential soil regional screening level (EPA 2022).

B = Detected constituent is below the sample quantitation limit and above the method detection limit.

DU = decision unit

ISM = Incremental Sampling Methodology

J = The analyte was analyzed for and the result is estimated.

K = The associated numerical value is an unknown bias estimate.

L = The associated numerical value is a low-bias estimate.

mg/kg = milligrams per kilogram

NR = not reported

PAL = project action limit (EA 2022)

R = The datum was rejected.

U = The analyte was analyzed for and not detected at or above the reported value.

Sources:

EA Engineering, Science and Technology, Inc. (EA). 2022. Uniform Federal Policy Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, North Ridge Estates Operable Unit 2, Kingsley Firing Range, Klamath County, Revision 03, Oregon. July.

Shaw Environmental, Inc. (Shaw). 2008. Final Site Inspection Report, Kingsley Firing Range Annex, Klamath County, Oregon, FUDS Property No. F10OR0569. September.

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U.S. Army Corps of Engineers (USACE). 2021. Final Remedial Investigation Report, Rocket, and Disposal Range MRS, Kingsley Firing Range Annex, FUDS Property Klamath County, Oregon, Formerly Used Defense Site Property No. F10OR0569, Contract No. W9128F-17-D-0030. November.

U.S. Environmental Protection Agency (EPA). 2022. *Regional Screening Levels (RSLs) – Generic Tables, RSL tables 10-6, HQ 1.0*. Last modified November 2022. Available at: <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>. Accessed March 2023.

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Table 4-2. Incremental Sampling Methodology Soil Sample Results

Sample	Lead (mg/kg)	Lead Qualifiers	Arsenic (mg/kg)	Arsenic Qualifiers	Antimony (mg/kg)	Antimony Result Qualifiers	Year Collected	Comments	Reference Report
PAL	240		12		31 ^(a)				
KFR-EOD-BA1	8.2	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA111	7.8	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA112	8	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA2	24	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA211	25	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA212	28	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA3	16	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-BA311	17		NR		1.2	U	2019		USACE 2021
KFR-EOD-BA312	18	J	NR		1.2	U	2019		USACE 2021
KFR-EOD-DP1	23		NR		1.2	U	2019		USACE 2021
KFR-EOD-DP111	140		NR		1.2	U	2019		USACE 2021
KFR-EOD-DP112	17		NR		1.2	U	2019		USACE 2021
KFR-EOD-DP2	7.5		NR		1.2	U	2019		USACE 2021
KFR-EOD-DP211	7		NR		1.2	U	2019		USACE 2021
KFR-EOD-DP212	8.8		NR		1.2	U	2019		USACE 2021
KFR-RR-BB1	21		NR		7.4	U	2019		USACE 2021
KFR-RR-BB111	16		NR		6.9	U	2019		USACE 2021
KFR-RR-BB112	20		NR		7.3	U	2019		USACE 2021
KFR-RR-BB2	NA		NA		NA		2019		USACE 2021
KFR-RR-BB211	NA		NA		NA		2019		USACE 2021
KFR-RR-BB212	NA		NA		NA		2019		USACE 2021
KFR-RR-BB3	NA		NA		NA		2019		USACE 2021
KFR-RR-BB311	NA		NA		NA		2019		USACE 2021
KFR-RR-BB312	NA		NA		NA		2019		USACE 2021
KFR-RR-FP1	110	J	NR		7.1	U	2019		USACE 2021
KFR-RR-FP111	24	J	NR		7.5	U	2019		USACE 2021
KFR-RR-FP112	31	J	NR		7.3	U	2019		USACE 2021
KFR-RR-IA1	150	J	NR		7.0	U	2019		USACE 2021
KFR-RR-IA111	180	J	NR		7.3	U	2019		USACE 2021
KFR-RR-IA112	170	J	NR		7.2	U	2019		USACE 2021
KFR-RR-IA2	200	J	NR		7.3	U	2019		USACE 2021
KFR-RR-IA211	120	J	NR		7.5	U	2019		USACE 2021
KFR-RR-IA212	220		NR		63	U	2019		USACE 2021
KFR-RR-IA3	130	J	NR		7.3	U	2019		USACE 2021
KFR-RR-IA311	190		NR		7.4	U	2019		USACE 2021
KFR-RR-IA312	180		NR		7.1	U	2019		USACE 2021
KFR-RR-RF1	73	J	NR		7.1	U	2019		USACE 2021
KFR-RR-RF111	72	J	NR		6.9	U	2019		USACE 2021
KFR-RR-RF112	1900	J	NR		16		2019	Result superseded by ISM decision unit OU2-RR-RF1	
OU2-RR-BB2	665	J*	4.2	J*	2.2	J**	2022		
OU2-RR-BB211	359	J*	4.7	J*	1.5	J**	2022		
OU2-RR-BB212	316	J*	4.7	J*	1.6	J**	2022		
OU2-RR-BB3	28.8	J*	2.9	J*	0.51	UJ	2022		
OU2-RR-BB311	19.2	J*	2.8	J*	0.50	UJ	2022		
OU2-RR-BB312	16.6	J*	2.9	J*	0.50	UJ	2022		
OU2-RR-RF1	62.3	J*	2.6	J*	0.50	UJ	2022		
OU2-RR-RF111	65.3	J*	2.2	J*	0.50	UJ	2022		
OU2-RR-RF112	46.7	J*	2.2	J*	0.50	UJ	2022		

Notes:

Green highlight indicates that the sample is anomalous and has been superseded by more recent results.

Yellow highlight indicates the results exceeds the PRG.

(a) The PAL for antimony is identified in this Remedial Investigation Report as the EPA residential soil regional screening level (EPA 2022).

ISM = Incremental Sampling Methodology

J = The analyte was analyzed for and the result is estimated.

J* = The concentration of at least one sieved fraction included in the calculated analyte value had an acceptable identification of the analyte and the reported value was an estimate.

J** = The analyte in at least one sieved fraction included in calculating the total concentration was analyzed for and not detected at or above the reported value; the calculated result is estimated.

mg/kg = milligram(s) per kilogram

NA = not analyzed

NR = not reported

PAL = project action limit (EA 2022)

U = The analyte was analyzed for and not detected at or above the reported value.

Sources:

EA Engineering, Science and Technology, Inc. (EA). 2022. Uniform Federal Policy Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, North Ridge Estates Operable Unit

Kingsley Firing Range, Klamath County, Revision 03, Oregon. July.

U.S. Army Corps of Engineers (USACE). 2021. Final Remedial Investigation Report, Rocket, and Disposal Range MRS, Kingsley Firing Range Annex, FUDS Property Klamath County, Oregon.

Formerly Used Defense Site Property No. F10OR0569, Contract No. W9128F-17-D-0030. November.

Table 4-3. Time-Critical Removal Action Confirmation Soil Sample Results

Location	Sample	Date	Matrix	Limit (%) ^(b)	PLM CARB 435 ^(a)	
					Asbestos (% type)	% Non-Fibrous
Northern Excavation	NRE-0831-CS02	31-Aug-22	Soil	1	0	100
Southern Excavation (Central Grid)	NRE-0830-CS01	30-Aug-22	Soil	1	0	100
Southern Excavation (Northern Grid)	NRE-0830-CS02	30-Aug-22	Soil	1	0	100
Southern Excavation (Southern Grid)	NRE-0830-CS03	30-Aug-22	Soil	1	0	100
Southern Excavation (Eastern Grid)	NRE-0830-CS04	30-Aug-22	Soil	1	0	100
Southern Excavation (Western Grid)	NRE-0891-CS01	31-Aug-22	Soil	1	0	100

Notes:

(a) Analysis of bulk asbestos by EPA 600R-93/116 Method with CARB 435 Prep (milling). Level B for 0.1 percent Target Analytical Sensitivity.

(b) Limit source: Environmental Protection Agency 1986. Asbestos Hazard Emergency Response Act of 1986.

% = percent

CARB = California Air Resources Board

PLM = polarized light microscopy

TCRA = Time-Critical Removal Action

Reference report: Weston Solutions, Inc. (Weston). 2022. Draft Time-Critical Removal Action Report, North Ridge Estates 2022 Removal, Klamath Falls, Klamath County, Oregon, Contract No. 68HE720D0005. Task Order No. 68HE0722F0107. November.

Table 4-4. Activity-Based Sample Results

Field Sample ID	Laboratory Sample ID	Sample Type	Sample Location	Parent Sample ID	Date Collected	Analytical Method	Results (PCMe f/cc)
ABS1-01-H	220805-S1	ABS high flow	Grid 1 Event 1	---	15-Aug-2022	not analyzed	Overloaded, not prepared
ABS1-01-L	220805-S2	ABS low flow	Grid 1 Event 1	---	15-Aug-2022	ISO 10312	<0.008
ABS1-02-H	220805-S3	ABS high flow	Grid 1 Event 2	---	15-Aug-2022	not analyzed	Overloaded, not prepared
COL1-02-H	220805-S37	Field Replicate	Collocated Grid 1 Event 2	ABS1-02-H	15-Aug-2022	not analyzed	Overloaded, not prepared
ABS1-02-L	220805-S4	ABS low flow	Grid 1 Event 2	---	15-Aug-2022	ISO 13794 ^(a)	<0.0287
ABS2-01-H	220805-S5	ABS high flow	Grid 2 Event 1	---	16-Aug-2022	not analyzed	Overloaded, not prepared
ABS2-01-L	220805-S6	ABS low flow	Grid 2 Event 1	---	16-Aug-2022	ISO 10312	<0.0136
ABS2-02-H	220805-S7	ABS high flow	Grid 2 Event 2	---	16-Aug-2022	not analyzed	Overloaded, not prepared
ABS2-02-L	220805-S8	ABS low flow	Grid 2 Event 2	---	16-Aug-2022	ISO 10312	<0.0142
ABS3-01-H	220805-S9	ABS high flow	Grid 3 Event 1	---	17-Aug-2022	not analyzed	Overloaded, not prepared
COL3-01-H	220805-S39	Field Replicate	Collocated Grid 3 Event 1	ABS3-01-H	17-Aug-2022	not analyzed	Overloaded, not prepared
ABS3-01-L	220805-S10	ABS low flow	Grid 3 Event 1	---	17-Aug-2022	ISO 10312	<0.0131
ABS3-02-H	220805-S11	ABS high flow	Grid 3 Event 2	---	17-Aug-2022	not analyzed	Overloaded, not prepared
ABS3-02-L	220805-S12	ABS low flow	Grid 3 Event 2	---	17-Aug-2022	ISO 10312	<0.0134
ABS4-01-H	220805-S13	ABS high flow	Grid 4 Event 1	---	19-Aug-2022	not analyzed	Overloaded, not prepared
ABS4-01-L	220805-S14	ABS low flow	Grid 4 Event 1	---	19-Aug-2022	ISO 10312	< 0.0132
ABS4-02-H	220805-S15	ABS high flow	Grid 4 Event 2	---	19-Aug-2022	not analyzed	Overloaded, not prepared
ABS4-02-L	220805-S16	ABS low flow	Grid 4 Event 2	---	19-Aug-2022	ISO 10312	<0.0131
ABS5-01-H	220805-S17	ABS high flow	Grid 5 Event 1	---	18-Aug-2022	not analyzed	Overloaded, not prepared
ABS5-01-L	220805-S18	ABS low flow	Grid 5 Event 1	---	18-Aug-2022	ISO 10312	<0.0134
COL5-01-H	220805-S41	Field Replicate	Collocated Grid 5 Event 1	ABS5-01-H	18-Aug-2022	ISO 10312	<0.0034
ABS5-02-H	220805-S19	ABS high flow	Grid 5 Event 2	---	18-Aug-2022	not analyzed	Overloaded, not prepared
ABS5-02-L	220805-S20	ABS low flow	Grid 5 Event 2	---	18-Aug-2022	ISO 10312	<0.0134
PM1-UW	220805-S21	Perimeter	Grid 1 Upwind Perimeter	---	15-Aug-2022	ISO 10312	<0.0003
PM1-DW	220805-S22	Perimeter	Grid 1 Downwind Perimeter	---	15-Aug-2022	ISO 10312	<0.0003
PM1-CW	220805-S23	Perimeter	Grid 1 Crosswind Perimeter	---	15-Aug-2022	ISO 10312	<0.0003
PM2-UW	220805-S24	Perimeter	Grid 2 Upwind Perimeter	---	16-Aug-2022	ISO 10312	<0.0003
PM2-DW	220805-S25	Perimeter	Grid 2 Downwind Perimeter	---	16-Aug-2022	ISO 10312	<0.0003
COL2-DW	220805-S38	Field Replicate	Collocated Grid 2 Downwind Perimeter	PM2-DW	16-Aug-2022	ISO 10312	<0.0003
PM2-CW	220805-S26	Perimeter	Grid 2 Crosswind Perimeter	---	16-Aug-2022	ISO 10312	<0.0003
PM3-UW	220805-S27	Perimeter	Grid 3 Upwind Perimeter	---	17-Aug-2022	ISO 10312	0.0003

Table 4-4. Activity-Based Sample Results

Field Sample ID	Laboratory Sample ID	Sample Type	Sample Location	Parent Sample ID	Date Collected	Analytical Method	Results (PCMe f/cc)
PM3-DW	220805-S28	Perimeter	Grid 3 Downwind Perimeter	---	17-Aug-2022	ISO 10312	<0.0003
PM3-CW	220805-S29	Perimeter	Grid 3 Crosswind Perimeter	---	17-Aug-2022	ISO 10312	<0.0003
PM4-UW	220805-S30	Perimeter	Grid 4 Upwind Perimeter	---	19-Aug-2022	ISO 10312	0.0003
COL4-UW	220805-S40	Field Replicate	Collocated Grid 4 Upwind Perimeter	PM4-UW	19-Aug-2022	ISO 10312	<0.0003
PM4-DW	220805-S31	Perimeter	Grid 4 Downwind Perimeter	---	19-Aug-2022	ISO 10312	<0.0003
PM4-CW	220805-S32	Perimeter	Grid 4 Crosswind Perimeter	---	19-Aug-2022	ISO 10312	<0.0003
PM5-UW	220805-S33	Perimeter	Grid 5 Upwind Perimeter	---	18-Aug-2022	ISO 10312	<0.0003
PM5-DW	220805-S34	Perimeter	Grid 5 Downwind Perimeter	---	18-Aug-2022	ISO 10312	<0.0003
PM5-CW	220805-S35	Perimeter	Grid 5 Crosswind Perimeter	---	18-Aug-2022	ISO 10312	<0.0003
LB-15082022	220805-S36	Lot Blank	Filter Lot Blank	---	15-Aug-2022	ISO 10312	none detected
FB-15082022	220805-S42	Field Blank	Field Blank	---	15-Aug-2022	ISO 10312	none detected
FB-16082022	220805-S43	Field Blank	Field Blank	---	16-Aug-2022	ISO 10312	none detected
FB-17082022	220805-S44	Field Blank	Field Blank	---	17-Aug-2022	ISO 10312	none detected
FB-18082022	220805-S45	Field Blank	Field Blank	---	18-Aug-2022	ISO 10312	none detected
FB-19082022	220805-S46	Field Blank	Field Blank	---	19-Aug-2022	ISO 10312	none detected

Notes:

(a) Sample filter was overloaded, analyzed by indirect method

Bold = Fibers detected above reporting limit

ABS = activity-based sampling

ID = identification

ISO = International Standard for the Determination of Asbestos Fibers

PCMe f/cc = phased contrast microscopy equivalent fibers per cubic centimeter 0.25-3.0, >5 & 3:1

Table 4-5. Groundwater and Sediment Sample Results

Sample	Sample Type	Matrix	Lead	Lead Qualifiers	Units	Arsenic	Arsenic Qualifiers	Units	Antimony	Antimony Qualifiers	Units	Year Collected	Reference Report
Groundwater													
PAL		Groundwater	15		µg/L	10		µg/L	6.0		µg/L		
GW-DW001	Discrete	Groundwater	10	U	µg/L	3.2	U	µg/L	0.32	U	µg/L	2004	Weston 2004
NWO-069-3001	Discrete	Groundwater	0.56		µg/L	3.4	J	µg/L	0.28	U	µg/L	2007	Shaw 2008
NWO-069-3002 (field duplicate)	Discrete	Groundwater	1.1		µg/L	3.3	J	µg/L	0.28	U	µg/L	2007	Shaw 2008
Sediment													
PAL		Sediment	240		mg/kg	12		mg/kg	31		mg/kg		
SD-BK001	Background Discrete	Sediment	6.1		mg/kg	0.99	UJK	mg/kg	5.9	R	mg/kg	2004	Weston 2004
SD-ST001	Discrete	Sediment	5.5		mg/kg	1	UJK	mg/kg	6.1	R	mg/kg	2004	Weston 2004

Notes:

µg/L = micrograms per liter

J = The analyte was analyzed for and the result is estimated.

K = The associated numerical value has an unknown bias estimate.

mg/kg = milligrams per kilogram

PAL = project action limit (Groundwater = Oregon Health Authority [2023] and EPA Maximum Contaminant Level [2022]; Sediment = residential soil [EPA 2022])

R = The datum was rejected.

U = The analyte was analyzed for and not detected at or above the reported value.

Sources:Oregon Health Authority. 2023. Maximum Contaminant Levels and Action Levels. Available: <https://www.oregon.gov/oha/ph/healthyenvironments/drinkingwater/rules/Documents/pwsrules.pdf#page=20>. February.

Shaw Environmental, Inc. (Shaw). 2008. Final Site Inspection Report, Kingsley Firing Range Annex, Klamath County, Oregon, FUDS Property No. F10OR0569. September.

Weston Solutions, Inc. (Weston). 2004. Kingsley Firing Range Annex, Formerly Used Defense Site, Preliminary Assessment/Site Inspection Report, TDD: 01-08-0006. December.

U.S. Environmental Protection Agency (EPA). 2022. Regional Screening Levels (RSLs) – Generic Tables, RSL tables 10-6, HQ 1.0. Last modified November 2022.

<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>.

Table 7-1
Screening Level Ecological Risk Assessment Results

Chemical	Maximum Concentration (mg/kg)	Minimum EcoSSL (mg/kg) ^{(a),(b),(c)}	EcoSSL Receptor	COPEC?
Antimony	2.2	0.27	mammals	Yes
Arsenic	4.73	18	plants	No
Lead	665	11	birds	Yes

Notes:

(a) Antimony EcoSSL from EPA. 2005a. Ecological Soil Screening Levels for Antimony. EPA Office of Solid Waste and Emergency Response Directive 9285.7-61.

(b) Arsenic EcoSSL from EPA. 2005b. Ecological Soil Screening Levels for Arsenic. EPA Office of Solid Waste and Emergency Response Directive 9285.7-62.

(c) Lead EcoSSL from EPA. 2005c. Ecological Soil Screening Levels for Lead. EPA Office of Solid Waste and Emergency Response Directive 9285.7-70.

COPEC = contaminant of potential ecological concern

EcoSSL = ecological soil screening level

EPA = U.S. Environmental Protection Agency

mg/kg = milligrams per kilogram

Table 7-2
Comparison of Lead Exposure Point Concentrations in Soil to
Lower Trophic Level Toxicity Reference Values—All Samples

Receptor	EcoSSL ^{(a),(b)} (mg/kg dry weight)	Maximum EPC (mg/kg dry weight)	HQ for Maximum EPC	95UCLM EPC (mg/kg dry weight)	HQ for 95UCLM EPC
<i>Antimony</i>					
Plants	5	2.2	0.4	5.0	1.0
Invertebrates (Earthworm)	78	2.2	0.03	5.0	0.06
<i>Lead</i>					
Plants	120	665	5.5	135	1.1
Invertebrates (Earthworm)	1,700	665	0.4	135	0.1

Notes:

Bold values indicate HQ greater than 1.0.

(a) Antimony EcoSSLs from EPA 2005a. Ecological Soil Screening Levels for Antimony. EPA Office of Solid Waste and Emergency Response Directive 9285.7-61.

(b) Lead EcoSSLs from EPA 2005c. Ecological Soil Screening Levels for Lead. EPA Office of Solid Waste and Emergency Response Directive 9285.7-70.

95UCLM = 95 percent upper confidence limit of the mean

EcoSSL = ecological soil screening level

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

HQ = hazard quotient

mg/kg = milligrams per kilogram

Table 7-3
Wildlife Exposure Factors for Ecological Risk Assessment

Exposure Parameter	Value	Units	Notes
CALIFORNIA QUAIL			
Body Weight	0.16	kg	EPA Wildlife Exposure Factors Handbook (1993), average of adult male and female weights for northern bobwhite given throughout year for west Rio Grande, Texas
Food Ingestion Rate	0.07	kg dry wt/kg-day	Converted assuming 10 percent moisture of commercial game food (EPA 1993)
Food Ingestion Rate	0.08	kg wet wt/kg-day	EPA Wildlife Exposure Factors Handbook (1993), average adult rates for northern bobwhite given throughout year from southern Texas, diet consisted of commercial game food with 5–10 percent moisture
Incidental Soil Ingestion Rate	9.3%	% of total mass of diet	Beyer et al. 1994 value for turkey, a receptor with similar feeding habits
Home Range	26.00	acres	California Department of Fish and Wildlife 1990
DEER MOUSE			
Body Weight	0.021	kg	EPA Wildlife Exposure Factors Handbook (1993), mean of all adult values
Food Ingestion Rate	0.065	kg dry wt/kg-day	Converted assuming 75 percent prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.26	kg wet wt/kg-day	EPA Wildlife Exposure Factors Handbook (1993), mean of all adult values
Incidental Soil Ingestion Rate	2%	% of total mass of diet	Beyer et al. 1994, based on value for white-footed mouse
Home Range	0.15	acres	EPA Wildlife Exposure Factors Handbook (1993), mean of all adult values
AMERICAN ROBIN			
Body Weight	0.077	kg	EPA Wildlife Exposure Factors Handbook (1993)
Food Ingestion Rate	0.22	kg dry wt/kg-day	Converted assuming 75 percent prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.89	kg wet wt/kg-day	EPA Wildlife Exposure Factors Handbook (1993)
Incidental Soil Ingestion Rate	10.5%	% of total mass of diet	Value base on woodcock (Sample and Suter 1994)
Home Range	0.30	acres	USDA Forest Service 1980, citing Young 1951
VAGRANT SHREW			
Body Weight	0.007	kg	EPA Wildlife Exposure Factors Handbook (1993)
Food Ingestion Rate	0.14	kg dry wt/kg-day	Converted assuming 75 percent prey moisture (USACHPPM 2004)
Food Ingestion Rate	0.55	kg wet wt/kg-day	EPA Wildlife Exposure Factors Handbook (1993), mean of all adult values for short-tailed shrew
Incidental Soil Ingestion Rate	13%	% of total mass of diet	Talmage and Walton 1993 as cited in Sample and Suter 1994, value for short-tailed shrew
Home Range	1.46	acres	EPA Wildlife Exposure Factors Handbook (1993), mean of all adult values for short-tailed shrew
RED-TAILED HAWK			
Body Weight	1.2	kg	USACHPPM 2004
Food Ingestion Rate	0.059	kg dry wt/kg-day	Calculated using allometric equation for carnivorous birds from Nagy 2001
Food Ingestion Rate	0.23	kg wet wt/kg-day	Converted assuming 75 percent prey moisture (USACHPPM 2004)
Incidental Soil Ingestion Rate	0%	% of total mass of diet	Sample and Suter 1994
Home Range	1,408	acres	Palmer 1988
COYOTE			
Body Weight	13	kg	Average of lowest and highest weights reported for males and females in western states (Oregon Department of Fish and Wildlife 1994)
Food Ingestion Rate	0.028	kg dry wt/kg-day	Calculated using allometric equation for carnivora from Nagy 2001
Food Ingestion Rate	0.11	kg wet wt/kg-day	Converted assuming 75 percent prey moisture (USACHPPM 2004)
Incidental Soil Ingestion Rate	2.8%	% of total mass of diet	Value from Beyer et al. (1994), value for red fox
Home Range	3,336	acres	Ward et al. 2018

Table 7-3
Wildlife Exposure Factors for Ecological Risk Assessment

Exposure Parameter	Value	Units	Notes
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Notes:

EPA = U.S. Environmental Protection Agency

kg = kilogram

kg dry wt/kg-day = kilogram(s) dry weight per kilogram day

kg wet wt/kg-day = kilogram(s) wet weight per kilogram per day

USDA = U.S. Department of Agriculture

Sources:

Beyer, W.N., E. Conner, and S. Gerould. 1994. Estimates of soil ingestion by wildlife. *Journal of Wildlife Management*. 58:75-82.

California Department of Fish and Wildlife. 1990. "Life history account for California quail". California Wildlife Habitat Relationships System, California Interagency Wildlife Task Group.

Nagy, K.A. 2001. Food requirements of wild animals: predictive equations for free-living mammals, reptiles, and birds. *Nutrition Abstracts and Reviews*, Series B 71, 21R-31RPalmer, R.S., editor. 1988. *Handbook of North American birds*. Vol. 4. Yale University Press, New Haven, Connecticut, USA.

Sample, B.E. and G.W. Suter, II. 1994. Estimating Exposure of Terrestrial Wildlife to Contaminants. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM 125.

Talmage, S.S. and B.T. Walton. 1993. Food chain transfer and potential renal toxicity of mercury to small mammals at a contaminated terrestrial field site. *Ecotoxicology* 2: 243-256.

U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM). 2004. Development of Terrestrial Exposure and Bioaccumulation Information for the Army Risk Assessment Modeling System. U.S. Army Center for Health Promotion and Preventive Medicine Contract Number DAAD050-00-P-8365, Aberdeen Proving Ground, Maryland.

U.S. Department of Agriculture: Forest Service. 1980. "American robin, B1137, *Turdus migratorius*." Accessed at: [b137.pdf \(usda.gov\)](#)U.S. Environmental Protection Agency. 1993. *Wildlife Exposure Factors Handbook*. 2 Volumes, EPA/630/R-93/187a. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.Ward, J. et al. 2018. Home range size, vegetation density, and season influences prey use by coyotes (*Canis latrans*). *PLoS ONE*. 13(10): e0203703. Accessed at:<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0203703>

Young 1951

Table 7-4
Wildlife Dose Modeling for Maximum Exposure Scenario—All Samples

Receptor	Maximum Soil Concentration (mg/kg dry wt)	Food Item Uptake			Exposure Parameters		Maximum Case Scenario Doses		
		Food Item	Uptake Equation ^(a)	Maximum Food Item Concentration (mg/kg dry wt)	Soil Ingestion Rate (kg/kg bw-day)	Food Ingestion Rate (kg dw/kg bw-day)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Antimony									
Gallinaceous Birds (California Quail)	2.2	Plants	ln(dry plant conc, mg/kg) = (-3.233 + 0.938 * ln(soil conc))	0.083	0.007	0.07	0.02	0.01	0.02
Omnivorous Birds (American Robin)	2.2	Invertebrates	ln(dry worm conc, mg/kg) = (-1.99 + 0.48 * ln(soil conc))	0.2	0.093	0.22	0.206	0.0439	0.25
Predatory Birds (Red-Tailed Hawk)	2.2	Small mammals	dry mammal conc, mg/kg = 0.001 * 50 * dry worm conc	0.00998	0	0.059	0.00	0.0006	0.0006
Mammals (Deer Mouse)	2.2	Plants	ln(dry plant conc, mg/kg) = (-3.233 + 0.938 * ln(soil conc))	0.083	0.01	0.065	0.01	0.01	0.02
Mammals (Vagrant Shrew)	2.2	Invertebrates	ln(dry worm conc, mg/kg) = (-1.99 + 0.48 * ln(soil conc))	0.2	0.07	0.138	0.16	0.02744	0.18
Predatory Mammals (Coyote)	2.2	Small mammals	dry mammal conc, mg/kg = 0.001 * 50 * dry worm conc	0.00998	0.003	0.028	0.007	0.00028	0.007
Lead									
Gallinaceous Birds (California Quail)	665	Plants	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	10.2	0.007	0.07	4.95	0.71	5.66
Omnivorous Birds (American Robin)	665	Invertebrates	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	153	0.093	0.22	62.14	33.56	95.70
Predatory Birds (Red-Tailed Hawk)	665	Small mammals	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	19.1	0	0.059	0.00	1.12	1.12
Mammals (Deer Mouse)	665	Plants	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	10.2	0.01	0.065	3.46	0.66	4.12
Mammals (Vagrant Shrew)	665	Invertebrates	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	153	0.07	0.138	47.55	20.97	68.52
Predatory Mammals (Coyote)	665	Small mammals	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	19.1	0.003	0.028	2.09	0.54	2.63

Notes:

Soil Ingestion Rate = Incidental Soil Ingestion as Proportion of Diet * food ingestion rate (kg ww/kg bw-day)

(a) Uptake equation sources:

Plants - Bechtel Jacobs Company, LLC. 1998a. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Tennessee.**Invertebrates, Antimony** - Nannoni, F., Rossi, R., and Protano, G. 2014. Soil Properties and Metal Accumulation by Earthworms in the Siena Urban Area (Italy). Applied Soil Ecology. 77: 9-17.**Invertebrates, Lead** - Sample, B.E., J.J. Beauchamp, R.A. Efraymson, G.W. Suter, II, and T.L. Ashwood. 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-220.**Small Mammals, Antimony** - U.S. Environmental Protection Agency. 2007. EcoSSL Attachment. https://www.epa.gov/sites/default/files/2015-09/documents/ecoss_l_attachment_4-1.pdf**Small Mammals, Lead** - Sample, B.E., J.J. Beauchamp, R.A. Efraymson, G W. Suter II, and T.L. Ashwood. 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-219.

EcoSSL = ecological soil screening level

kg/kg bw-day = kilogram(s) per kilogram body weight per day

kg dw/kg bw-day = kilogram(s) dry weight per kilogram body weight per day

mg/kg = milligram(s) per kilogram

mg/kg dry wt = milligram(s) per kilogram dry weight

Table 7-5
Wildlife Dose Modeling for 95UCLM Exposure Scenario—All Samples

Receptor	95UCLM Soil Concentration (mg/kg dry wt)	Food Item Uptake			Exposure Parameters		95UCLM Case Scenario Doses		
		Food Item	Uptake Equation ^(a)	95UCLM Food Item Concentration (mg/kg dry wt)	Soil Ingestion Rate (kg/kg bw-day)	Food Ingestion Rate (kg dw/kg bw-day)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Antimony									
Gallinaceous Birds (California Quail)	5.0	Plants	$\ln(\text{dry plant conc, mg/kg}) = (-3.233 + 0.938 * \ln(\text{soil conc}))$	0.178	0.007	0.07	0.037	0.012	0.05
Omnivorous Birds (American Robin)	5.0	Invertebrates	$\ln(\text{dry worm conc, mg/kg}) = (-1.99 + 0.48 * \ln(\text{soil conc}))$	0.3	0.093	0.22	0.47	0.065	0.53
Predatory Birds (Red-Tailed Hawk)	5.0	Small mammals	dry mammal conc, mg/kg = 0.001 * 50 * dry worm conc	0.01480	0	0.059	0.00	0.00087	0.00087
Herbivorous Mammals (Deer Mouse)	5.0	Plants	$\ln(\text{dry plant conc, mg/kg}) = (-3.233 + 0.938 * \ln(\text{soil conc}))$	0.178	0.005	0.065	0.03	0.012	0.038
Insectivorous Mammals (Vagrant Shrew)	5.0	Invertebrates	$\ln(\text{dry worm conc, mg/kg}) = (-1.99 + 0.48 * \ln(\text{soil conc}))$	0.3	0.07	0.138	0.36	0.041	0.40
Predatory Mammals (Coyote)	5.0	Small mammals	dry mammal conc, mg/kg = 0.001 * 50 * dry worm conc	0.01480	0.003	0.028	0.016	0.00042	0.016
Lead									
Gallinaceous Birds (California Quail)	135	Plants	$\ln(\text{dry plant conc, mg/kg}) = (-1.328+0.561*\ln(\text{soil conc}))$	4.2	0.007	0.07	1.01	0.29	1.30
Omnivorous Birds (American Robin)	135	Invertebrates	$\ln(\text{dry worm conc, mg/kg}) = (-0.218+0.807*\ln(\text{soil conc}))$	42	0.093	0.22	12.63	9.27	21.90
Predatory Birds (Red-Tailed Hawk)	135	Small mammals	$\ln(\text{dry mammal conc, mg/kg}) = (0.0761+0.4422*\ln(\text{soil conc}))$	9.4	0	0.059	0.00	0.55	0.55
Herbivorous Mammals (Deer Mouse)	135	Plants	$\ln(\text{dry plant conc, mg/kg}) = (-1.328+0.561*\ln(\text{soil conc}))$	4.2	0.01	0.065	0.70	0.27	0.97
Insectivorous Mammals (Vagrant Shrew)	135	Invertebrates	$\ln(\text{dry worm conc, mg/kg}) = (-0.218+0.807*\ln(\text{soil conc}))$	42	0.07	0.138	9.66	5.80	15.45
Predatory Mammals (Coyote)	135	Small mammals	$\ln(\text{dry mammal conc, mg/kg}) = (0.0761+0.4422*\ln(\text{soil conc}))$	9.4	0.003	0.028	0.43	0.27	0.69

Notes:

(a) Uptake equation sources:

Plants - Bechtel Jacobs Company, LLC. 1998a. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Tennessee.**Invertebrates, Antimony** - Nannoni, F., Rossi, R., and Protano, G. 2014. Soil Properties and Metal Accumulation by Earthworms in the Siena Urban Area (Italy). Applied Soil Ecology. 77: 9-17.**Invertebrates, Lead** - Sample, B.E., J.J. Beauchamp, R.A. Efraymson, G.W. Suter, II, and T.L. Ashwood. 1998a. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-220.**Small Mammals, Antimony** - U.S. Environmental Protection Agency. 2007. EcoSSL Attachment. https://www.epa.gov/sites/default/files/2015-09/documents/ecoss_attachment_4-1.pdf**Small Mammals, Lead** - Sample, B.E., J.J. Beauchamp, R.A. Efraymson, G W. Suter II, and T.L. Ashwood. 1998b. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-219.

95UCML = 95 percent upper confidence limit of the mean

EcoSSI = ecological soil screening level

kg/kg bw-day = kilogram(s) per kilogram body weight per day

kg dw/kg bw-day = kilogram(s) dry weight per kilogram body weight per day

mg/kg = milligram(s) per kilogram

mg/kg bw-day = milligram(s) per kilogram body weight per day

mg/kg dry wt = milligram(s) per kilogram dry weight

Table 7-6
Comparison of Modeled Wildlife Doses to Wildlife Toxicity Reference Values—All Samples

Receptor	TRVs (mg/kg bw-day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs	Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs	95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs	95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs
	NOAEL	LOAEL				
<i>Antimony</i>						
Gallinaceous Birds (California Quail)	NA	NA	--	--	--	--
Omnivorous Birds (American Robin)	NA	NA	--	--	--	--
Predatory Birds (Red-Tailed Hawk)	NA	NA	--	--	--	--
Herbivorous Mammals (Deer Mouse)	0.059	0.59	0.28	0.03	0.64	0.06
Insectivorous Mammals (Vagrant Shrew)	0.059	0.59	3.1	0.31	6.7	0.67
Predatory Mammals (Coyote)	0.059	0.59	0.12	0.01	0.27	0.03
<i>Lead</i>						
Gallinaceous Birds (California Quail)	1.63	3.26	3.5	1.7	0.80	0.40
Omnivorous Birds (American Robin)	1.63	3.26	59	29	13.4	6.7
Predatory Birds (Red-Tailed Hawk)	1.63	3.26	0.69	0.34	0.34	0.17
Herbivorous Mammals (Deer Mouse)	4.7	8.9	0.88	0.46	0.21	0.11
Insectivorous Mammals (Vagrant Shrew)	4.7	8.9	14.6	7.7	3.3	1.74
Predatory Mammals (Coyote)	4.7	8.9	0.56	0.30	0.15	0.08

Notes:

Bold values indicate HQ greater than 1.0.

95UCML = 95 percent upper confidence limit of the mean

HQ = hazard quotient

mg/kg bw-day = milligram(s) per kilogram body weight per day

NA = value is not available

NOAEL = no observed adverse effect level

LOAEL = lowest observed adverse effect level

TRV = toxicity reference value

Avian and mammalian NOAELs are the highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth, or survival considered in development of the EcoSSLs (U.S. Environmental Protection Agency 2005a, 2005c). Avian and mammalian LOAELs are the corresponding LOAEL to the presented NOAEL.

Sources:

U.S. Environmental Protection Agency. 2005a. Ecological Soil Screening Levels for Antimony. EPA Office of Solid Waste and Emergency Response. Directive 9285.7-61

U.S. Environmental Protection Agency. 2005c. Ecological Soil Screening Levels for Lead. EPA Office of Solid Waste and Emergency Response. Directive 9285.7-70.

Table 7-7
Comparison of Lead Exposure Point Concentrations in Soil to Lower Trophic Level
Toxicity Reference Values—Excluding OU2-RR-BB2

Receptor	Toxicity Reference Values ^(a) (mg/kg dry weight)	Maximum EPC (mg/kg dry weight)	Hazard Quotient for Maximum EPC	95UCLM EPC (mg/kg dry weight)	Hazard Quotient for 95UCLM EPC
Lead					
Plants	120	220	1.8	72.3	0.6
Invertebrates (Earthworm)	1700	220	0.1	72.3	0.04

Notes:

(a) U.S. Environmental Protection Agency. 2005. Ecological Soil Screening Levels for Lead. EPA Office of Solid Waste and Emergency Response. Directive 9285.7-70.

Bold values indicate hazard quotient greater than 1.0.

95UCLM = 95 percent upper confidence limit of the mean

EPC = exposure point concentration

mg/kg = milligrams per kilogram

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Table 7-8
Wildlife Dose Modeling for Maximum Exposure Scenario—Excluding OU2-RR-BB2

Receptor	Maximum Soil Concentration (mg/kg dry wt)	Food Item Uptake			Exposure Parameters		Maximum Case Scenario Doses		
		Food Item	Uptake Equation ^(a)	Maximum Food Item Concentration (mg/kg dry wt)	Soil Ingestion Rate (kg/kg bw-day)	Food Ingestion Rate (kg dw/kg bw-day)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Lead									
Gallinaceous Birds (California Quail)	220	Plants	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	5.5	0.0074	0.070	1.64	0.38	2.02
Omnivorous Birds (American Robin)	220	Invertebrates	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	62	0.093	0.22	20.56	13.74	34.30
Predatory Birds (Red-Tailed Hawk)	220	Small mammals	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	12	0	0.059	0.00	0.69	0.69
Mammals (Deer Mouse)	220	Plants	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	5.5	0.0052	0.065	1.14	0.36	1.50
Insectivorous Mammals (Vagrant Shrew)	220	Invertebrates	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	62	0.072	0.138	15.73	8.59	24.32
Predatory Mammals (Coyote)	220	Small mammals	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	12	0.0032	0.028	0.69	0.33	1.02

Notes:

(a) Uptake equation sources:

Plants - Bechtel Jacobs Company, LLC. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Tennessee.

Invertebrates - Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-220.

Small Mammals - Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G W. Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-219.

kg/kg bw-day = kilogram(s) per kilogram body weight per day

kg dw/kg bw-day = kilogram(s) dry weight per kilogram body weight per day

mg/kg = milligram(s) per kilogram

mg/kg bw-day = milligram(s) per kilogram body weight per day

mg/kg dry wt = milligram(s) per kilogram dry weight

Table 7-9
Wildlife Dose Modeling for 95UCLM Exposure Scenario—Excluding OU2-RR-BB2

Receptor	95UCLM Soil Concentration (mg/kg dry wt)	Food Item Uptake			Exposure Parameters		95UCLM Case Scenario Doses		
		Food Item	Uptake Equation ^(a)	95UCLM Food Item Concentration (mg/kg dry wt)	Soil Ingestion Rate (kg/kg bw-day)	Food Ingestion Rate (kg dw/kg bw-day)	Dose from Soil (mg/kg bw-day)	Dose from Food (mg/kg bw-day)	Total Dose (mg/kg bw-day)
Lead									
(California Quail)	72.3	Plants	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.9	0.0074	0.070	0.54	0.20	0.74
Omnivorous Birds (American Robin)	72.3	Invertebrates	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	25	0.093	0.22	6.76	5.60	12.35
Predatory Birds (Red-Tailed Hawk)	72.3	Small mammals	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	7.2	0	0.059	0.00	0.42	0.42
Herbivorous Mammals (Deer Mouse)	72.3	Plants	ln(dry plant conc, mg/kg) = (-1.328+0.561*ln(soil conc))	2.9	0.0052	0.065	0.38	0.19	0.57
Insectivorous Mammals (Vagrant Shrew)	72.3	Invertebrates	ln(dry worm conc, mg/kg) = (-0.218+0.807*ln(soil conc))	25	0.072	0.138	5.17	3.50	8.67
Predatory Mammals (Coyote)	72.3	Small mammals	ln(dry mammal conc, mg/kg) = (0.0761+0.4422*ln(soil conc))	7.2	0.0032	0.028	0.23	0.20	0.43

Notes:

(a) Uptake Equation sources:

Plants - Bechtel Jacobs Company, LLC. 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Tennessee.

Invertebrates - Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W. Suter, II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-220.

Small Mammals - Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G W. Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-219.

95UCLM = 95 percent upper confidence limit of the mean

kg dw/kg bw-day = kilogram(s) dry weight per kilogram body weight per day

mg/kg = milligram(s) per kilogram

mg/kg dry wt = milligram(s) per kilogram dry weight

mg/kg bw-day = milligram(s) per kilogram body weight per day

Table 7-10
Comparison of Modeled Wildlife Doses to Wildlife Toxicity Reference Values—Excluding OU2-RR-BB2

Receptor	TRVs (mg/kg bw-day)		Maximum Case Scenario HQs Based on Comparison of Doses to NOAELs	Maximum Case Scenario HQs Based on Comparison of Doses to LOAELs	95UCLM Case Scenario HQs Based on Comparison of Doses to NOAELs	95UCLM Case Scenario HQs Based on Comparison of Doses to LOAELs
	NOAEL	LOAEL				
Lead						
Gallinaceous Birds (California Quail)	1.63	3.26	1.2	0.62	0.46	0.23
Omnivorous Birds (American Robin)	1.63	3.26	21	11	7.6	3.8
Predatory Birds (Red-Tailed Hawk)	1.63	3.26	0.42	0.21	0.26	0.13
Herbivorous Mammals (Deer Mouse)	4.7	8.9	0.32	0.17	0.12	0.06
Insectivorous Mammals (Vagrant Shrew)	4.7	8.9	5.2	2.7	1.8	1.0
Predatory Mammals (Coyote)	4.7	8.9	0.22	0.11	0.09	0.05

Notes:

Bold values indicate a hazard quotient greater than 1.0.

95UCLM = 95 percent upper confidence limit of the mean

HQ = hazard quotient

mg/kg bw-day = milligram(s) per kilogram body weight per day

NOAEL = no observed adverse effects level

LOAEL = lowest observed adverse effects level

TRV = toxicity reference value

Avian and mammalian NOAELs are the highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth, or survival considered in development of the EcoSSLs for lead (U.S. Environmental Protection Agency 2005). Avian and mammalian LOAELs are the corresponding LOAEL to the presented

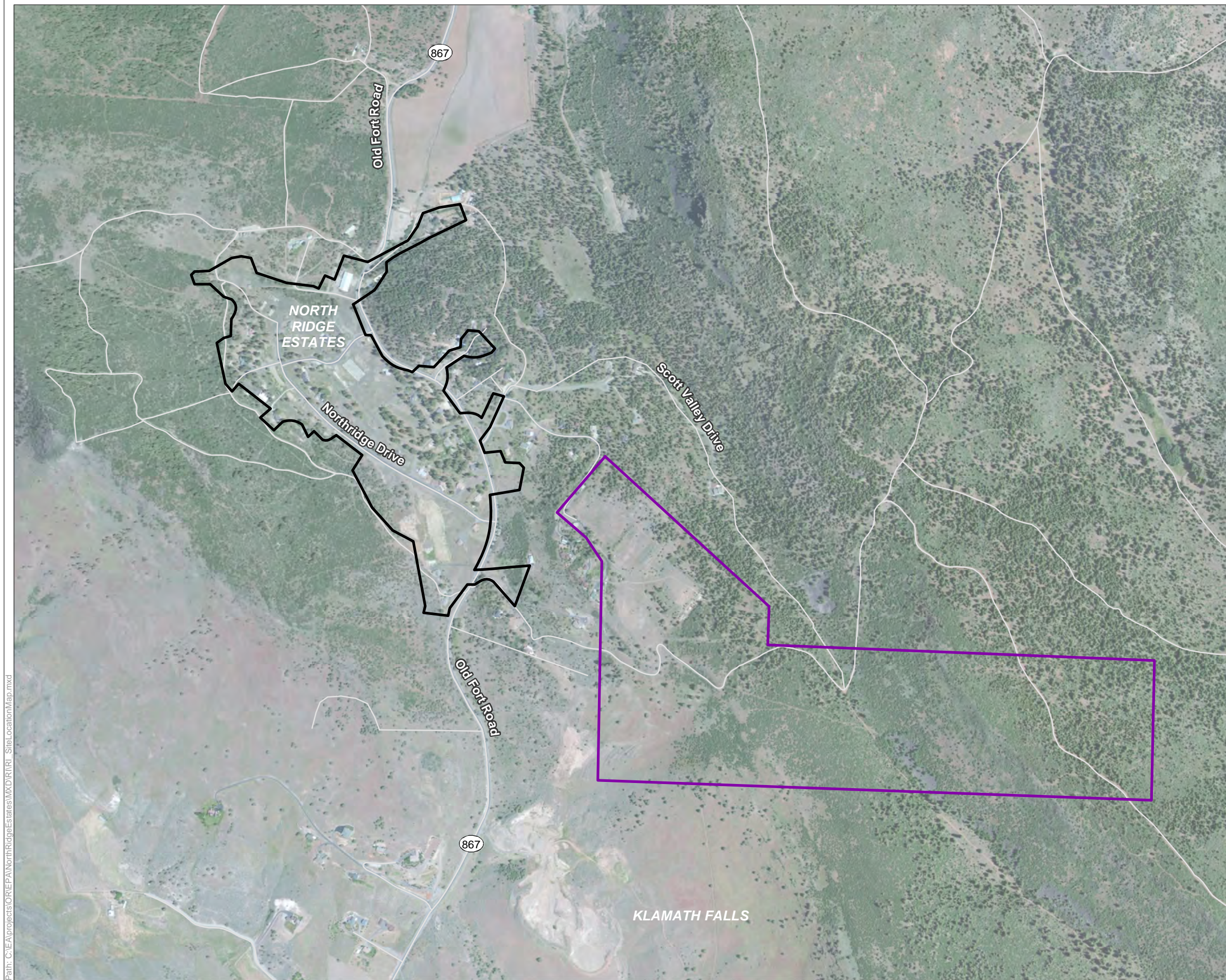
Source: U.S. Environmental Protection Agency. 2005. Ecological Soil Screening Levels for Lead. EPA Office of Solid Waste and Emergency Response. Directive 8230-F-50



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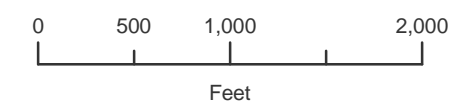
Figures

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-  Operable Unit 1
-  Operable Unit 2

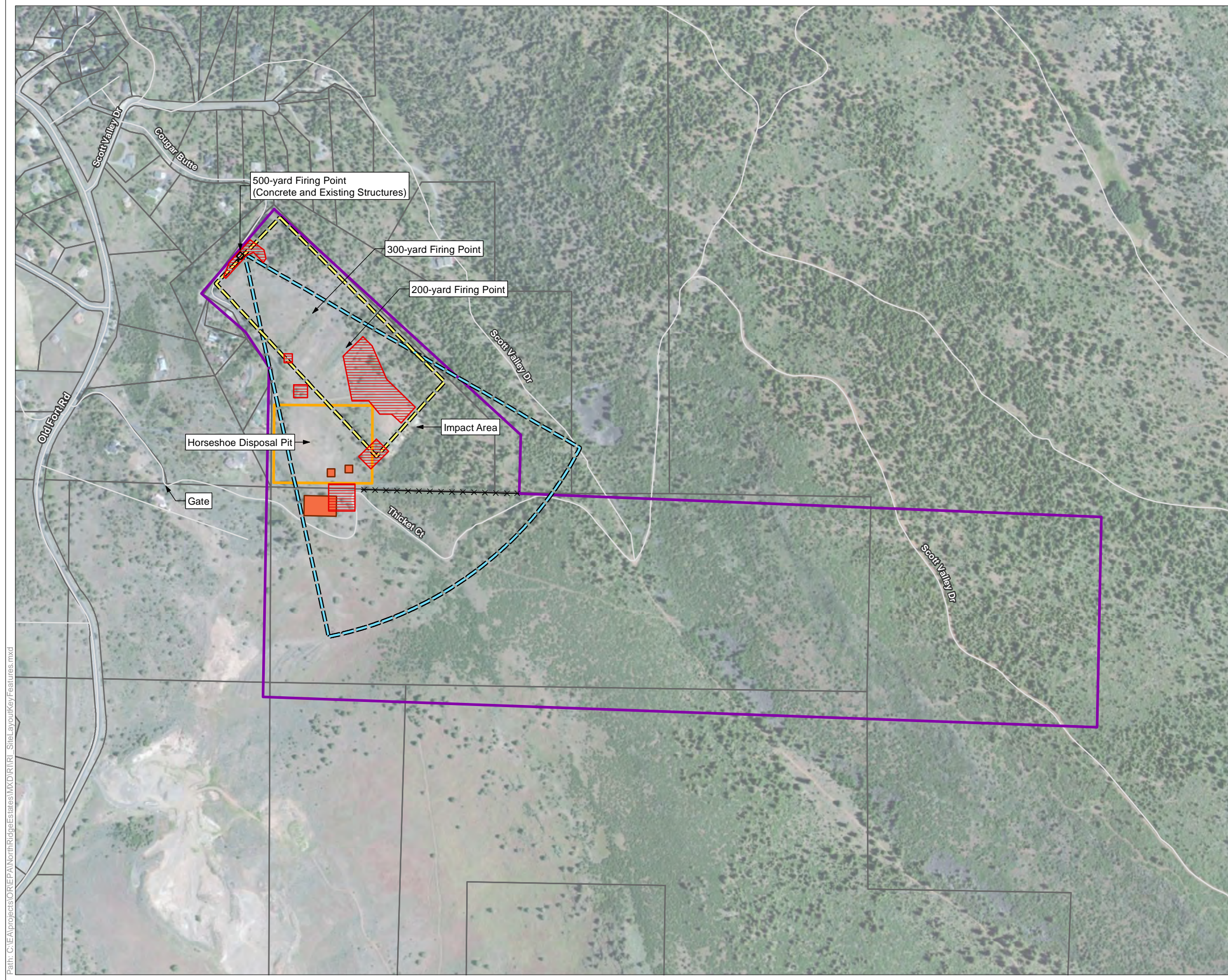


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North Ridge Estates Operable Unit 2
Klamath County, Oregon

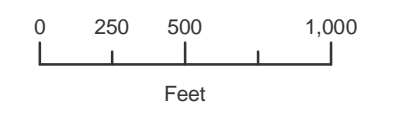
Figure 1-1
Site Location





- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Disposal Range
- Rifle Range (without safety fan)
- Rocket Range (without safety fan)
- Burn Area
- Parcel Boundary
- Area of High Density PACM (approximate)
- Barbed Wire Fence (approximate)

PACM = presumed asbestos-containing material



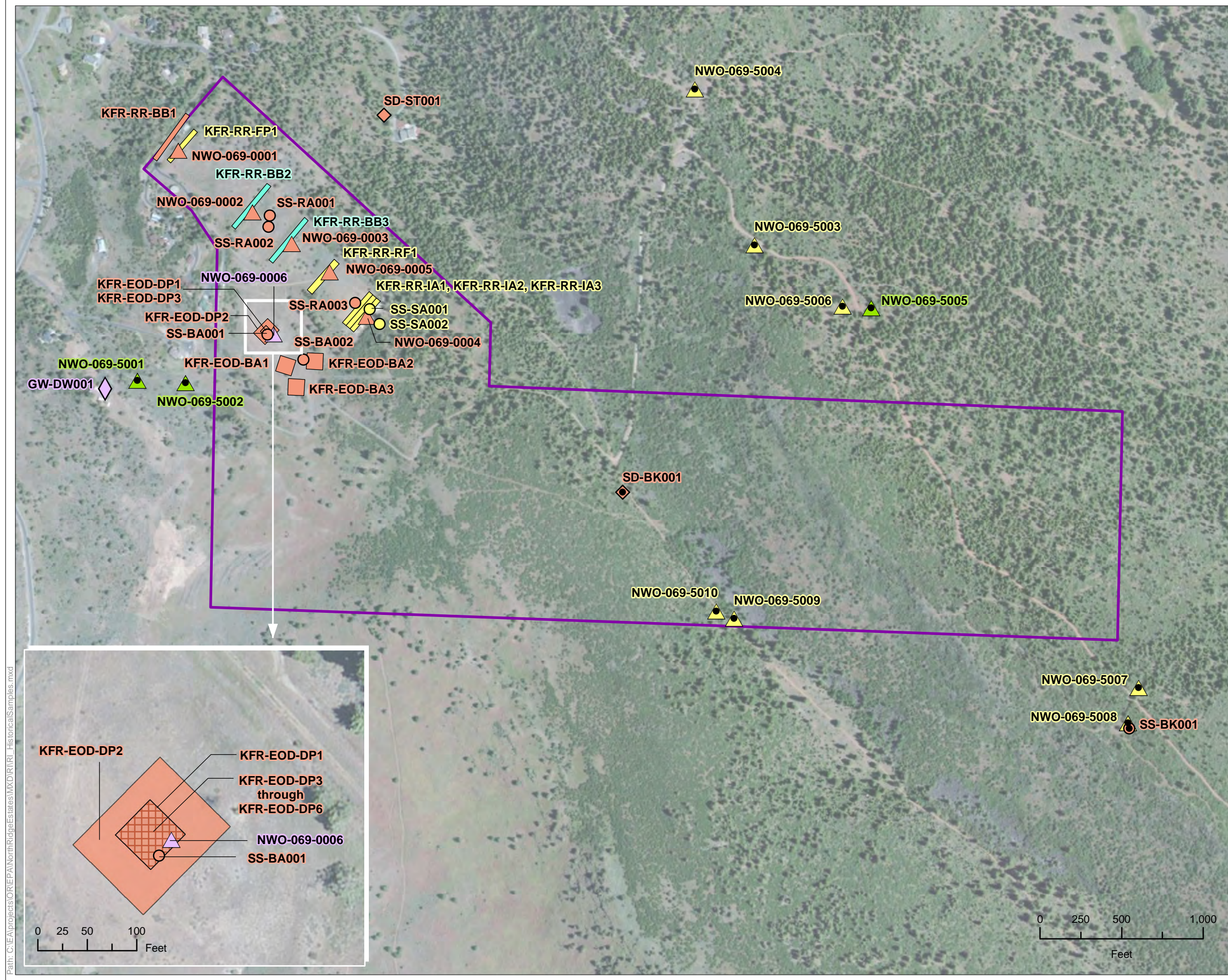
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North Ridge Estates Operable Unit 2 Klamath County, Oregon

Figure 1-2
Site Layout and Key Features



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- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Background Sample
- 2004 Sample Location
- Metals (Surface Soil)
 - Metals and Explosives (Surface Soil)
 - Metals and Explosives (Sediment)
 - Metals, Explosives, and Perchlorate (Groundwater)
- 2007 Sample Location
- Metals (Surface Soil)
 - Metals and Explosives (Surface Soil)
 - Metals and Perchlorate (Surface Soil)
 - Metals, Explosives, and Perchlorate (Surface Soil)
 - Metals, Explosives, and Perchlorate (Groundwater)
- 2019 Sample Area
- Metals and Explosives (Subsurface Soil)
- 2019 ISM Decision Unit
- Metals (Surface Soil)
 - Metals and Explosives (Surface Soil)
 - Nitroglycerin (Surface Soil)

ISM = Incremental Sampling Methodology

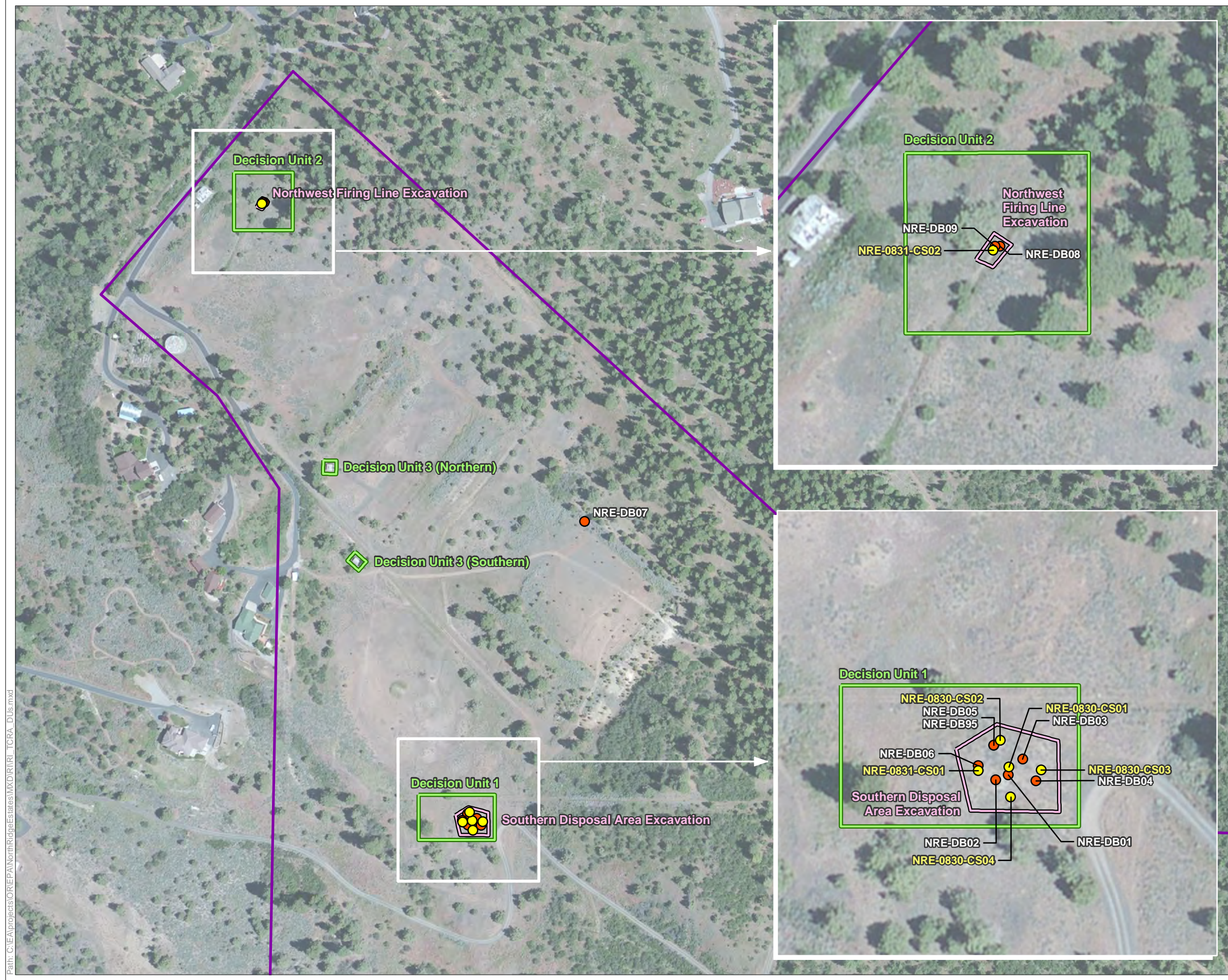
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North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 1-3
Historical Sample Locations

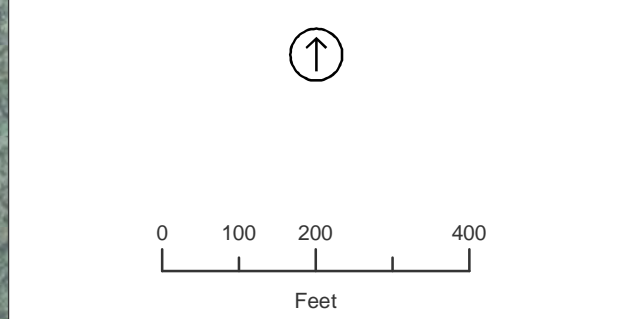


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- Kingsley Firing Range Annex
- Formerly Used Defense Site Property (Operable Unit 2)
- TCRA Decision Unit
- Removal Area
- ACM Bulk Sample
- Confirmation Sample

ACM = asbestos-containing materials
TCRA = Time-Critical Removal Action

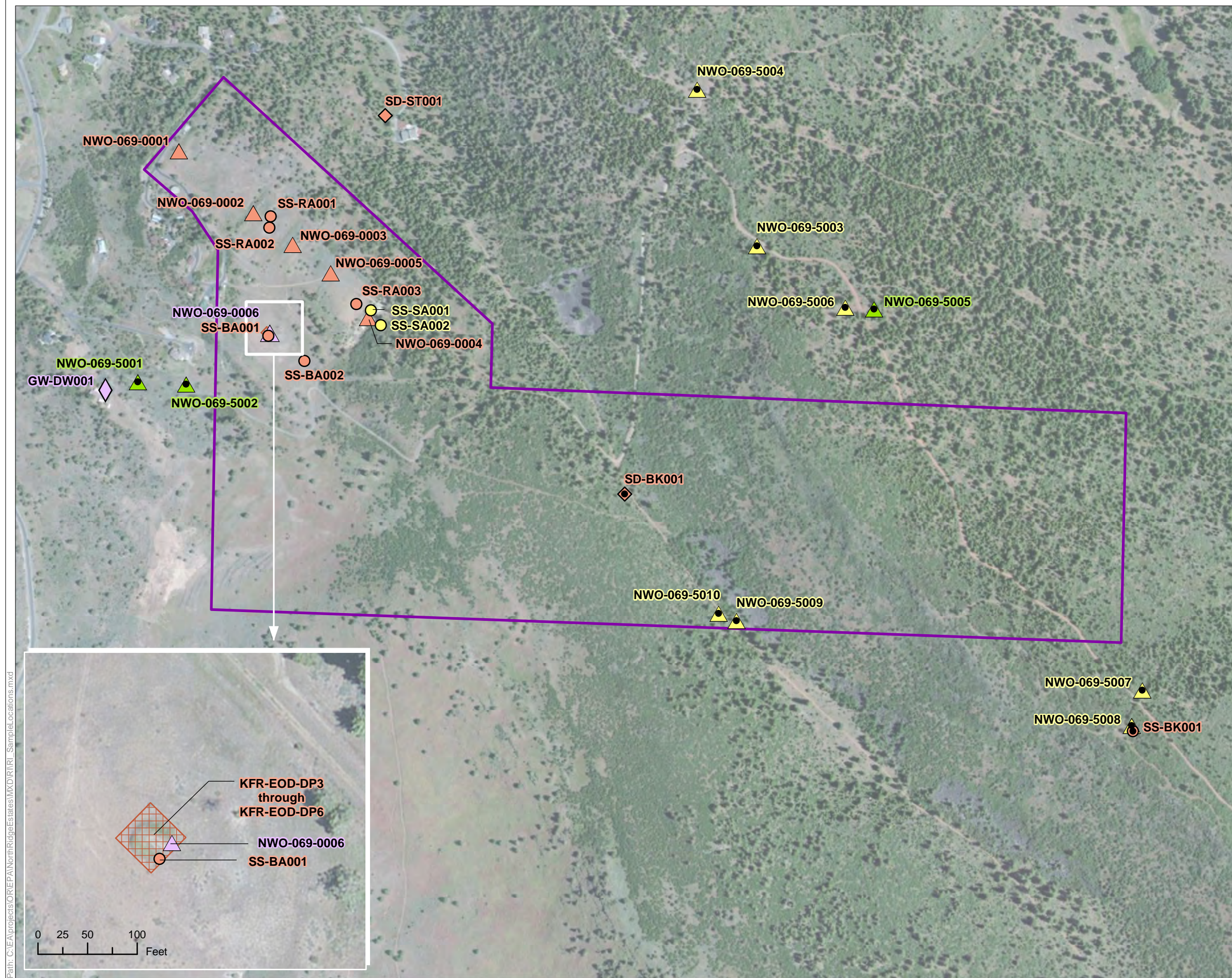


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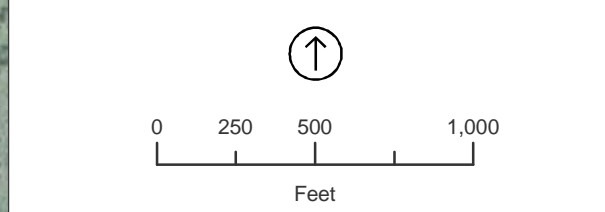
North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 1-4
Time-Critical Removal Action -
Decision Units and Confirmation
Sample Locations

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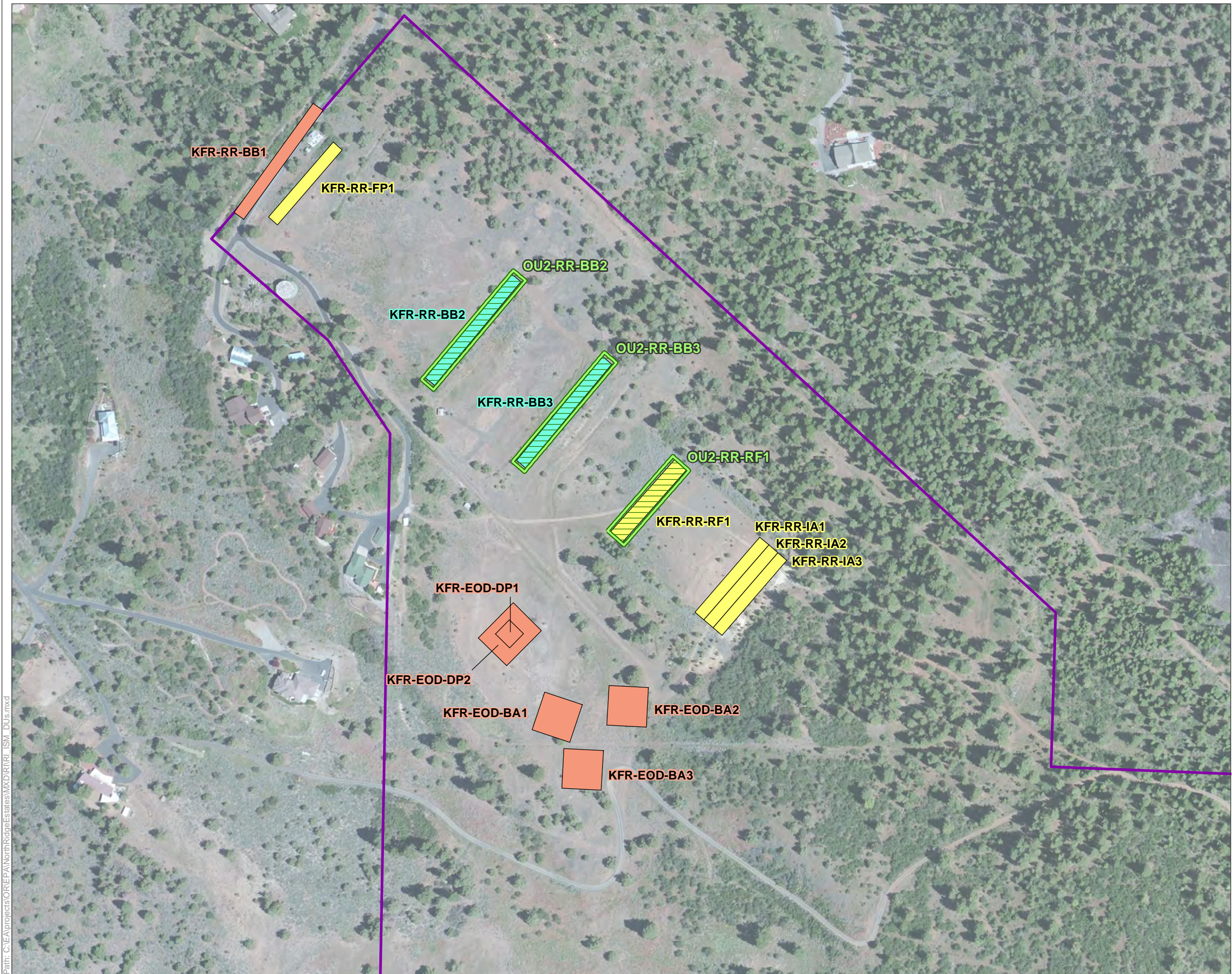
- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Background Sample
- 2004 Discrete Sample Location
 - Metals (Surface Soil)
 - Metals and Explosives (Surface Soil)
 - Metals and Exposives (Sediment)
 - Metals, Explosives, and Perchlorate (Groundwater)
- 2007 Composite Sample Location
 - Metals (Surface Soil)
 - Metals and Explosives (Surface Soil)
 - Metals and Perchlorate (Surface Soil)
 - Metals, Explosives, and Perchlorate (Surface Soil)
- 2007 Discrete Sample Location
 - Metals, Explosives, and Perchlorate (Groundwater)
- 2019 Discrete Sample Area
 - Metals and Explosives (Subsurface Soil)




Date: 4/25/2023




North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 2-1
Discrete and Composite Sample Locations



 Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)

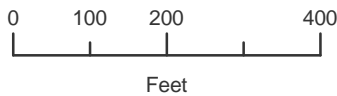
2019 ISM Decision Unit

-  Metals
-  Metals and Explosives
-  Nitroglycerin

2022 ISM Decision Unit

-  Metals

ISM = Incremental Sampling Methodology



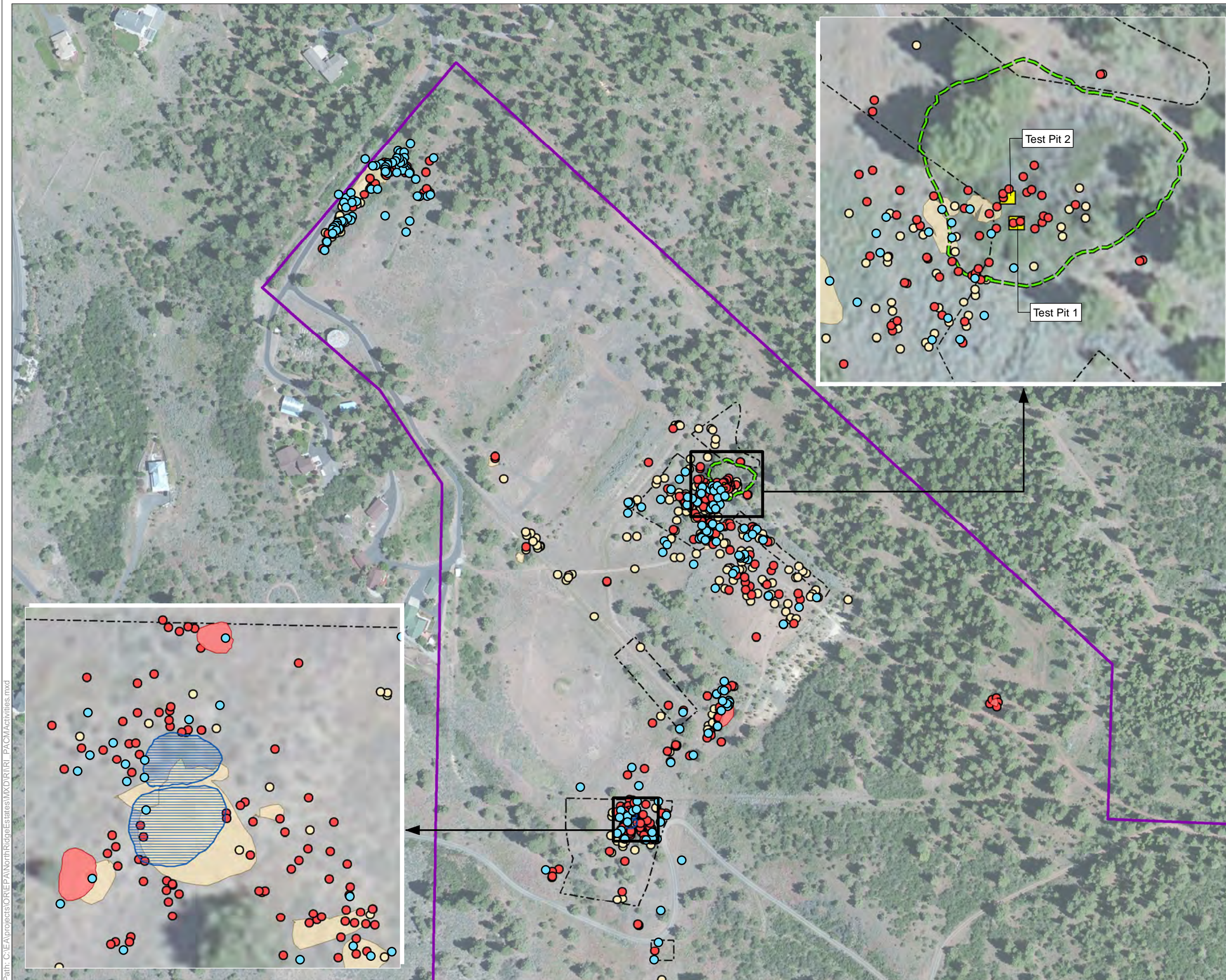
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North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 2-2
Incremental Sampling
Methodology - Decision Units



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Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)

2019 Data

Abated PACM Area

2020 Data

PACM

Area of High Density PACM (approximate)

2021 Data

PACM

Area of High Density PACM (approximate)

Test Pit

Vegetation Clearing Area

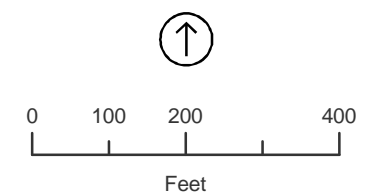
Apex Removal Area

2022 Data

PACM

Apex = Apex Companies, LLC

PACM = presumed asbestos-containing materials

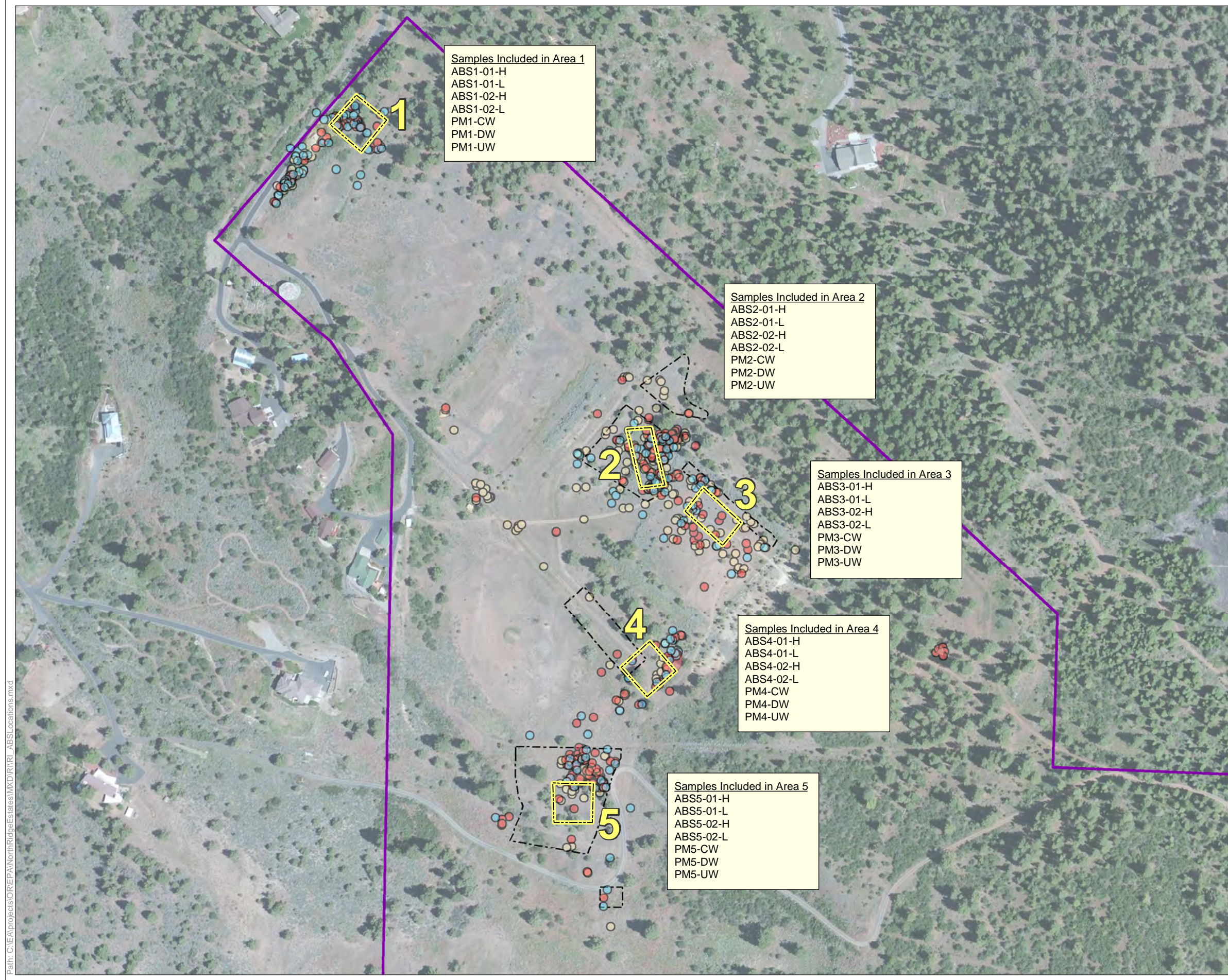


Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

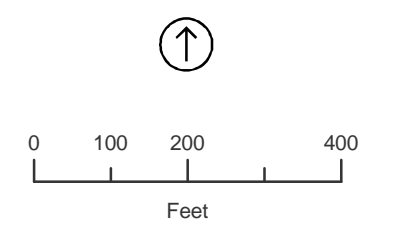
Figure 2-3
Presumed Asbestos-Containing
Materials Activities, 2019 - 2022





- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Activity-Based Sampling Grid
- 2019 Data
 - PACM
- 2020 Data
 - PACM
 - Area of High Density PACM (approximate)
- 2021 Data
 - PACM
 - Area of High Density PACM (approximate)
- 2022 Data
 - PACM

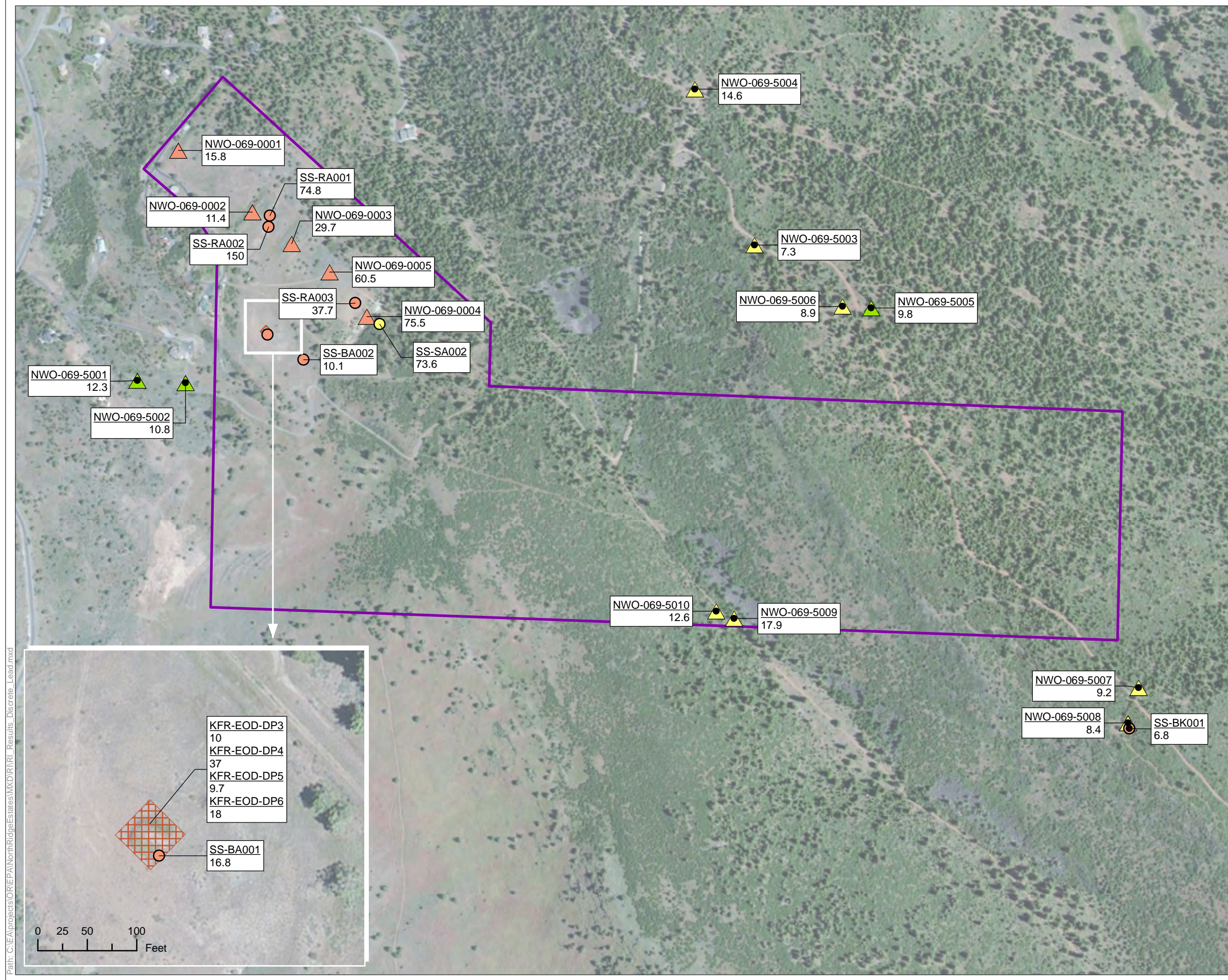
PACM = presumed asbestos-containing materials



Date: 4/27/2023

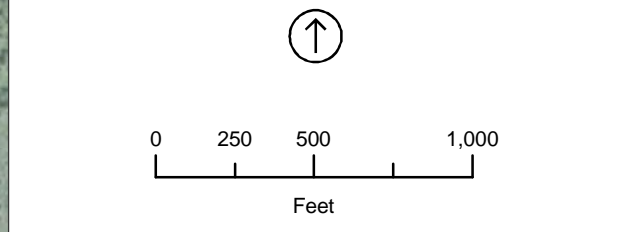
North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 2-4
Activity-Based Sample Locations



- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Background Sample
- 2004 Discrete Sample Location (Surface Soil)
 - Metals
 - Metals and Explosives
- 2007 Composite Sample Location (Surface Soil)
 - Metals
 - Metals and Explosives
 - Metals and Perchlorate
- 2019 Discrete Sample Area (Subsurface Soil)
 - Metals and Explosives

Notes:
Results are shown in mg/kg.
mg/kg = milligram(s) per kilogram

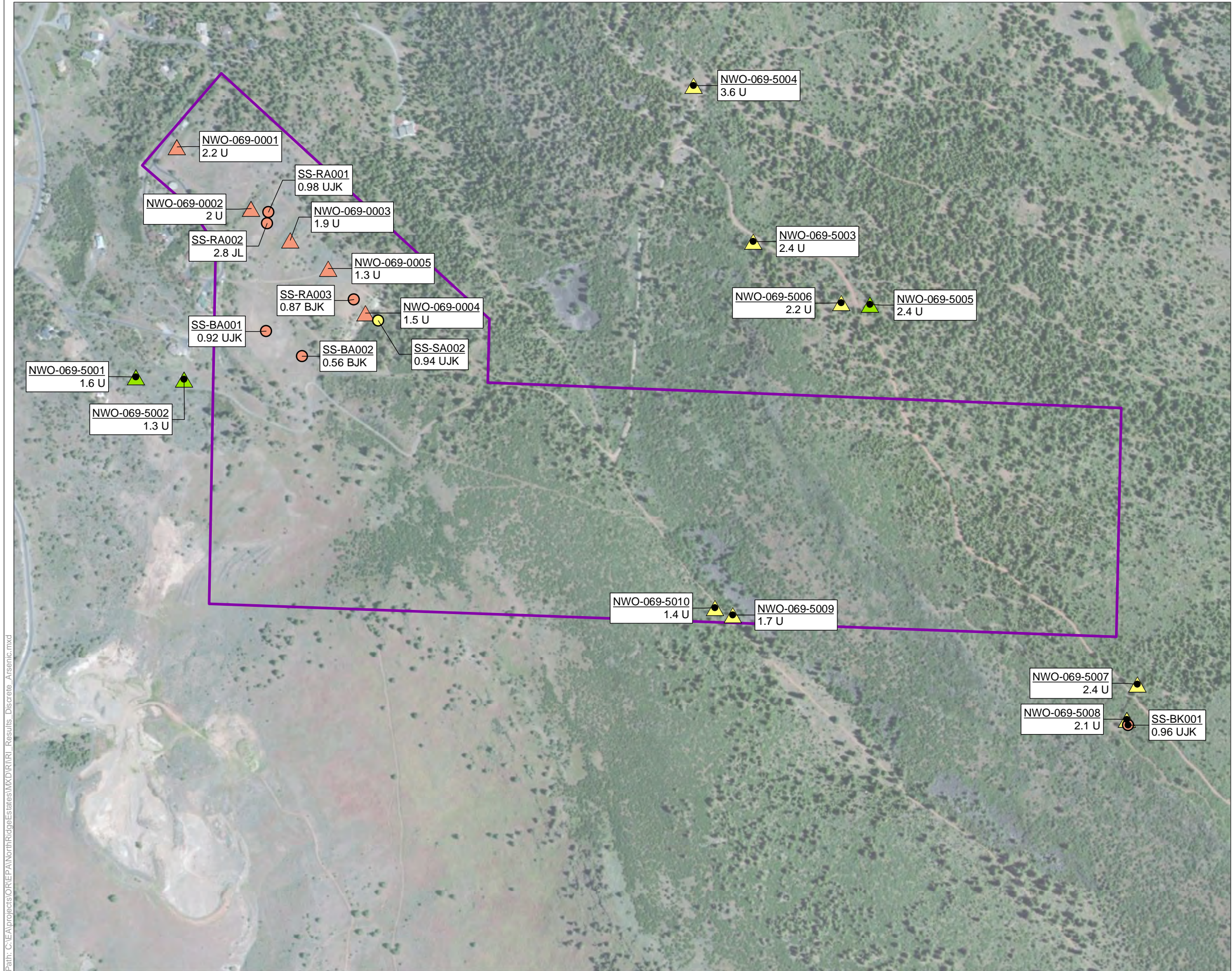


Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 4-1
Discrete and Composite Soil Sample Results - Lead

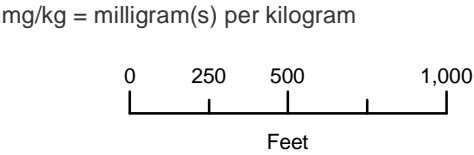
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- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Background Sample
- 2004 Discrete Sample Location (Surface Soil)
- Metals
 - Metals and Explosives
- 2007 Composite Sample Location (Surface Soil)
- Metals
 - Metals and Explosives
 - Metals and Perchlorate

Notes:
Results are shown in mg/kg.

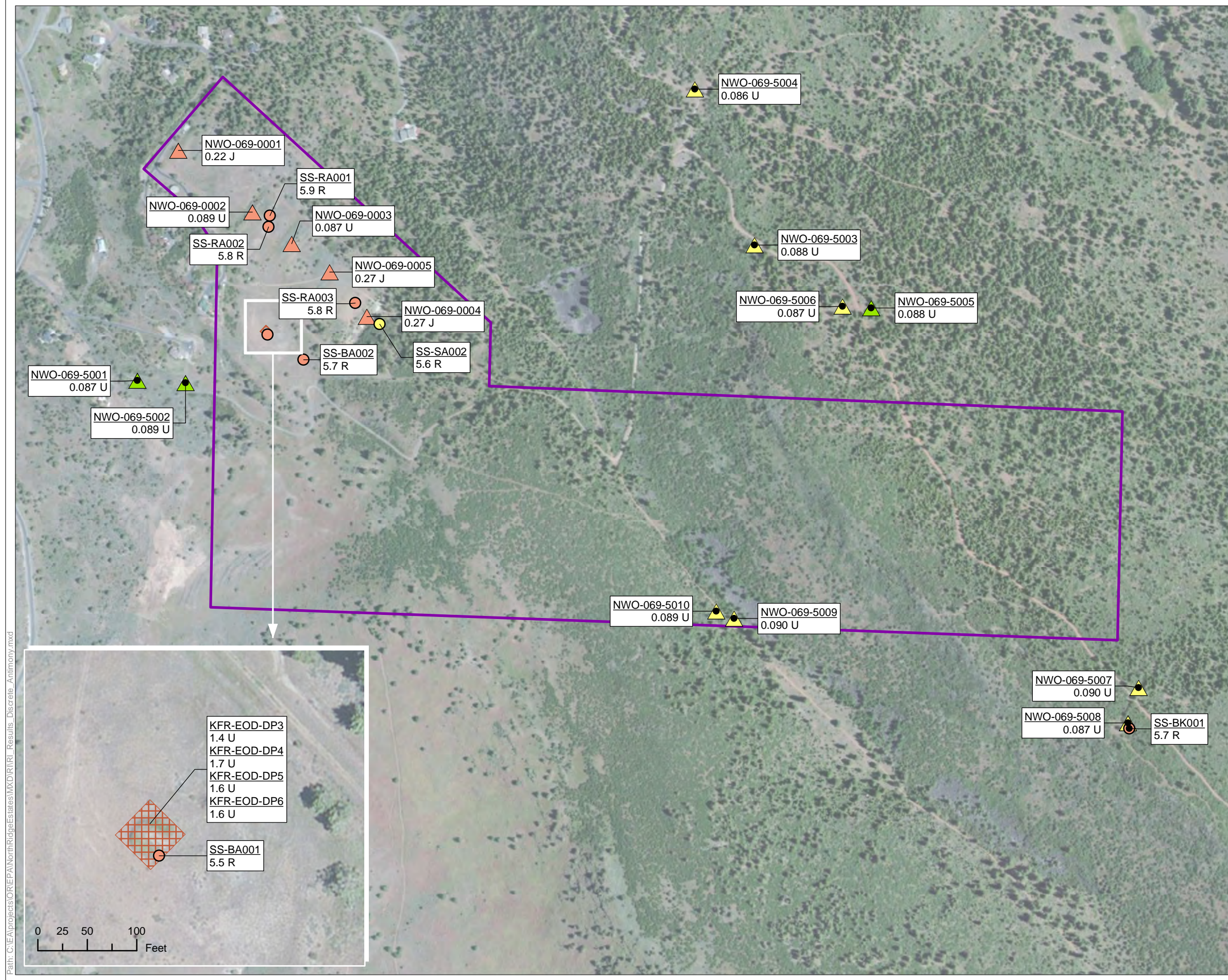
B = Detected constituent is below the sample quantitation limit and above the method detection limit.
J = The analyte was analyzed for and the result is estimated.
K = The associated numerical value is an unknown bias estimate.
L = The associated numerical value is a low-bias estimate.
U = The analyte was analyzed for and not detected at or above the reported value.



Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

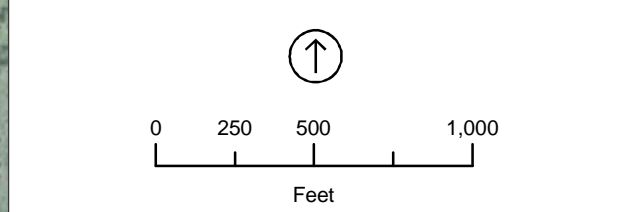
Figure 4-2
Discrete and Composite Soil Sample Results -
Arsenic



- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Background Sample
- 2004 Discrete Sample Location (Surface Soil)
 - Metals
 - Metals and Explosives
- 2007 Composite Sample Location (Surface Soil)
 - Metals
 - Metals and Explosives
 - Metals and Perchlorate
- 2019 Discrete Sample Area (Subsurface Soil)
 - Metals and Explosives

Notes:
Results are shown in mg/kg.

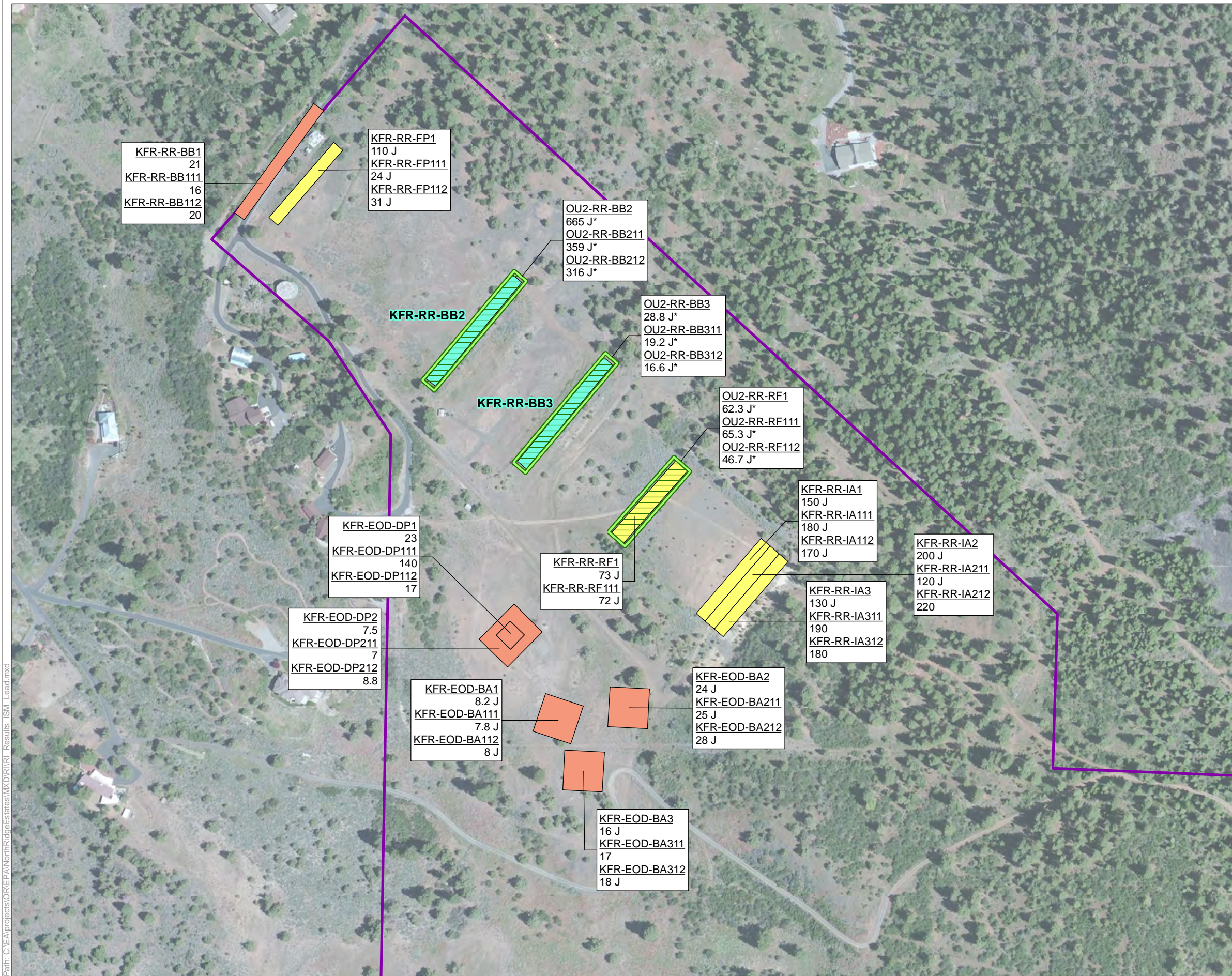
J = The analyte was analyzed for and the result is estimated.
R = The datum was rejected.
U = The analyte was analyzed for and not detected at or above the reported value.
mg/kg = milligram(s) per kilogram



Date: 4/25/2023

North Ridge Estates Operable Unit 2 Klamath County, Oregon

Figure 4-3
Discrete and Composite Soil Sample Results - Antimony



Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)

2019 ISM Decision Unit

- Metals
- Metals and Explosives
- Nitroglycerin

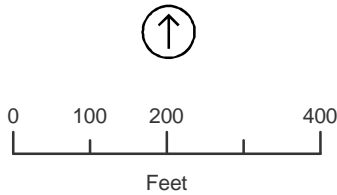
2022 ISM Decision Unit

- Metals

Notes:
Results are shown in mg/kg.

J = The analyte was analyzed for and the result is estimated.
J* = The concentration of at least one sieved fraction included in the calculated analyte value had an acceptable identification of the analyte and the reported value was an estimate.

ISM = Incremental Sampling Methodology
mg/kg = milligram(s) per kilogram

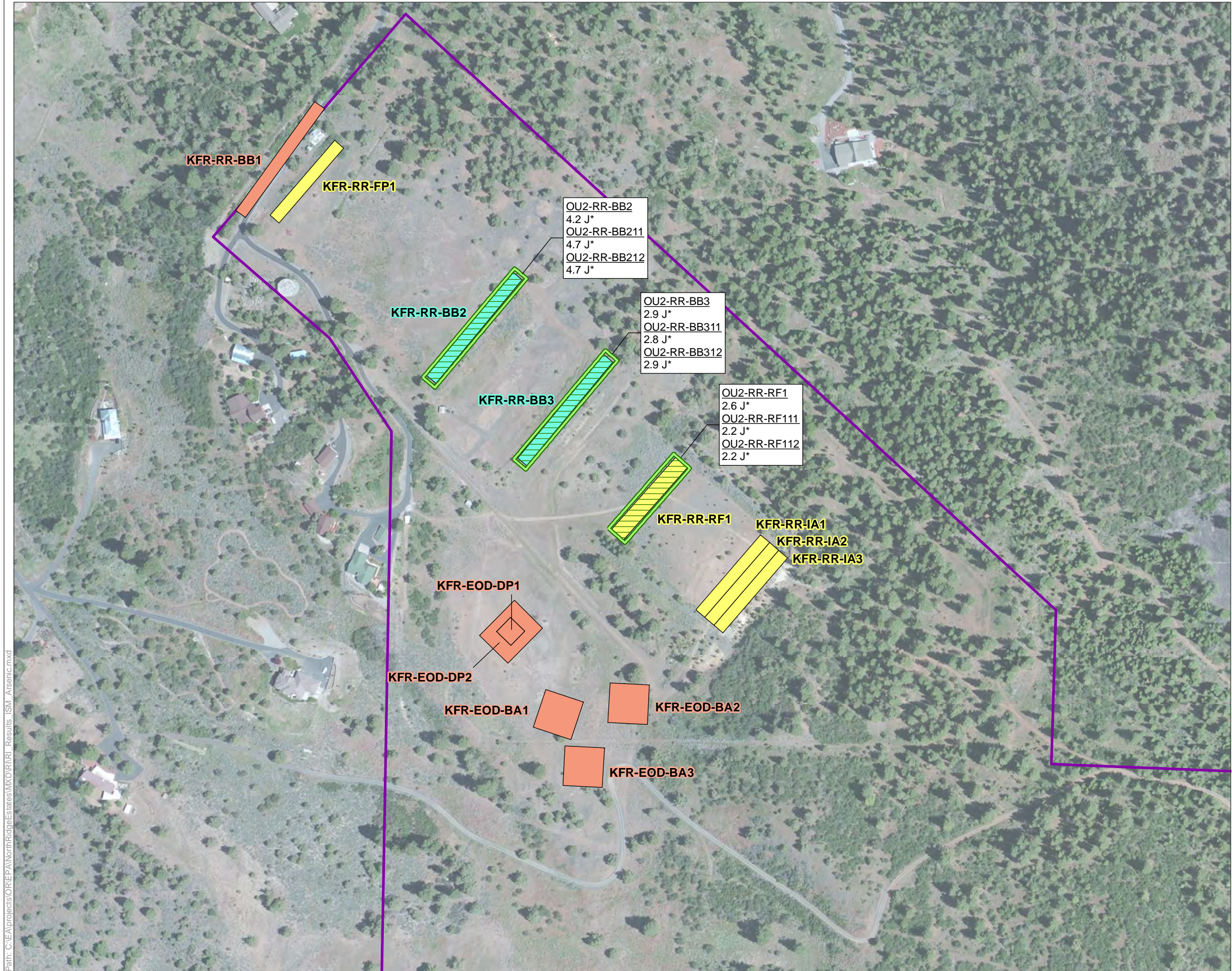


Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 4-4
Incremental Sampling Methodology
Sample Results - Lead





Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)

2019 ISM Decision Unit

- Metals
- Metals and Explosives
- Nitroglycerin

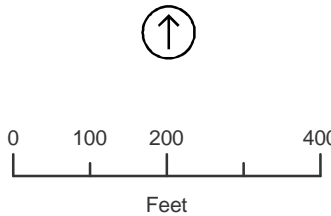
2022 ISM Decision Unit

- Metals

Notes:
Results are shown in mg/kg.

J* = The concentration of at least one sieved fraction included in the calculated analyte value had an acceptable identification of the analyte and the reported value was an estimate.

ISM = Incremental Sampling Methodology
mg/kg = milligram(s) per kilogram



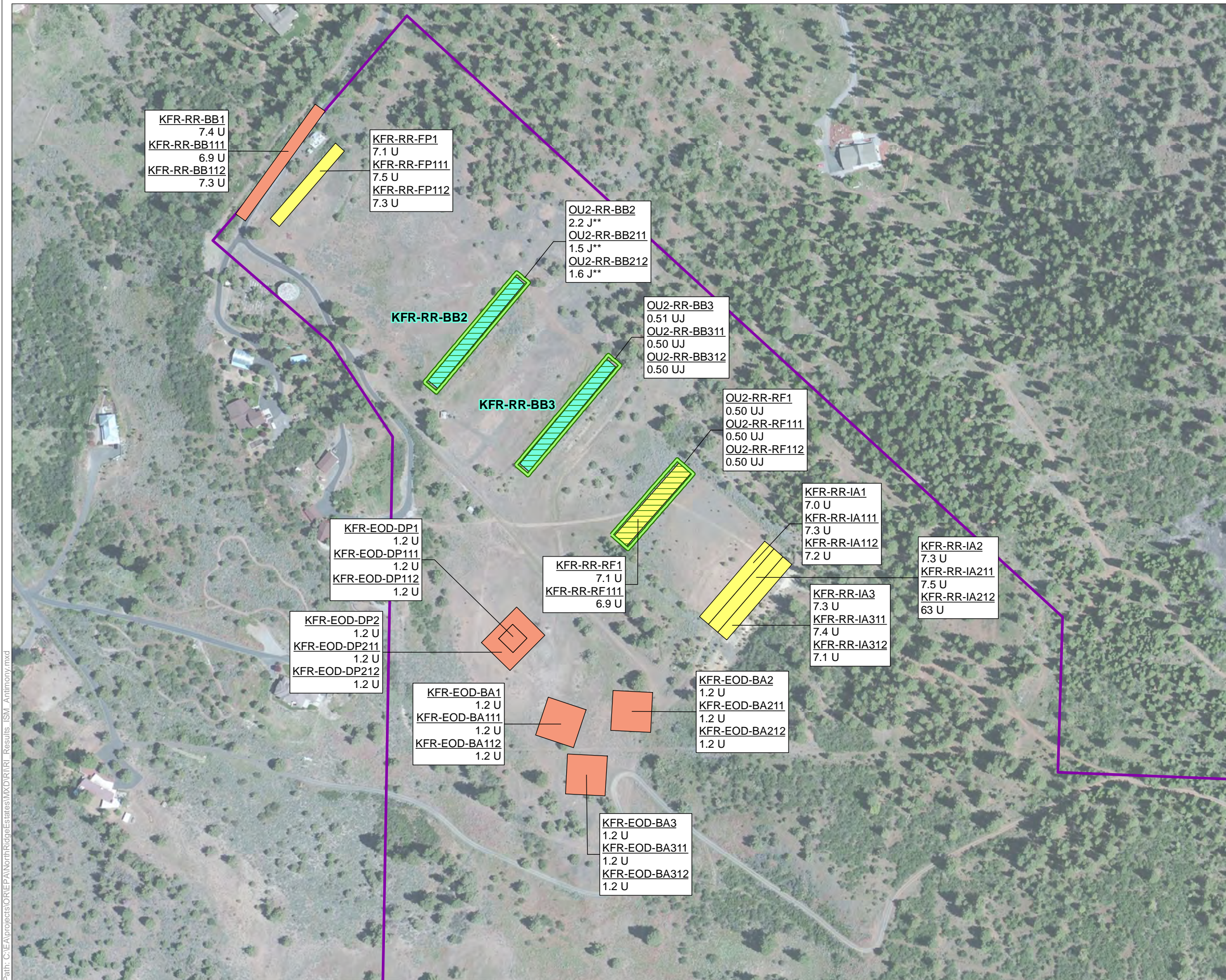
Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 4-5
Incremental Sampling Methodology
Sample Results - Arsenic



Path: C:\EPA\projects\OR\NEPA\NorthRidgeEstates\MXD\RI\RI Results_ISM_Antimony.mxd



Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)

2019 ISM Decision Unit

- Metals
- Metals and Explosives
- Nitroglycerin

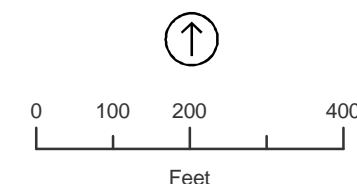
2022 ISM Decision Unit

- Metals

Notes:
Results are shown in mg/kg.

J = The analyte was analyzed for and the result is estimated.
J* = The analyte in at least one sieved fraction included in calculating the total concentration was analyzed for and not detected at or above the reported value; the calculated result is estimated.
U = The analyte was analyzed for and not detected at or above the reported value.

ISM = Incremental Sampling Methodology
mg/kg = milligram(s) per kilogram



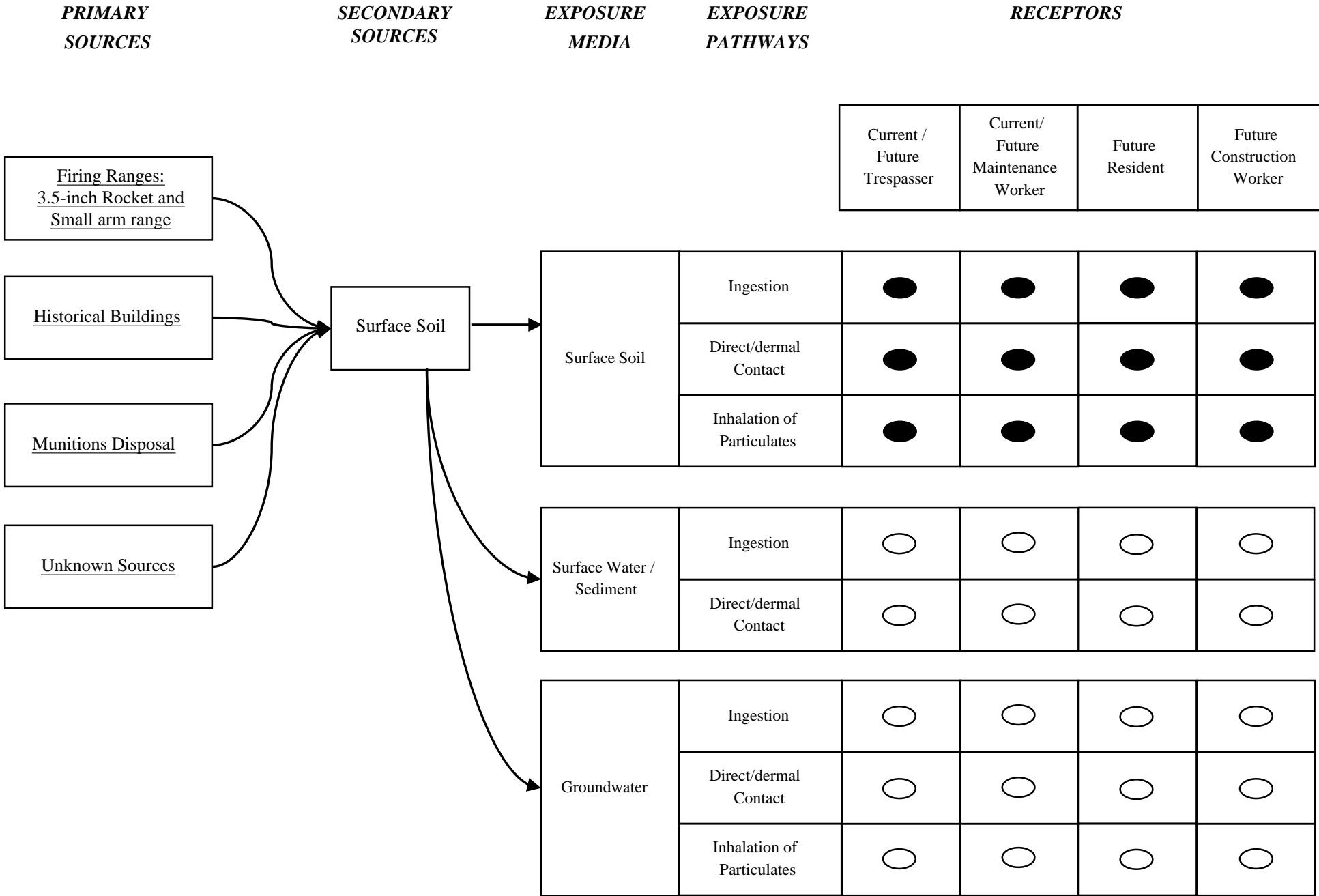
Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 4-6
Incremental Sampling Methodology
Sample Results - Antimony



HUMAN HEALTH EXPOSURE PATHWAYS

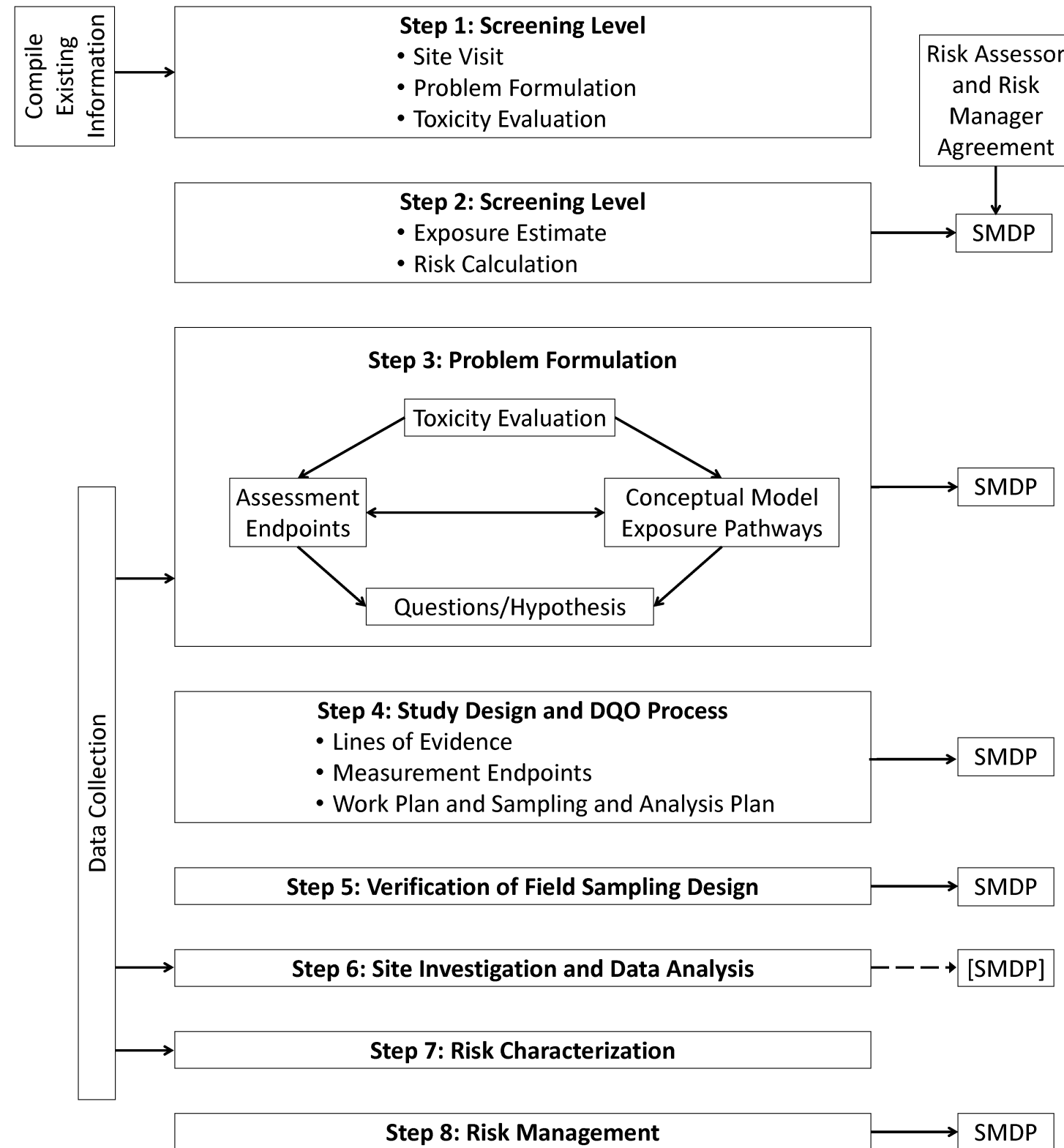


- Complete pathway
- Incomplete pathway
- Clearly defined fate, transport, or exposure relationship

Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 6-1
Human Health Conceptual Site Model



DQO = Data Quality Objective
SDMP = Scientific Management Decision Point
[SMDP] = only if change to the sampling and analysis plan is necessary

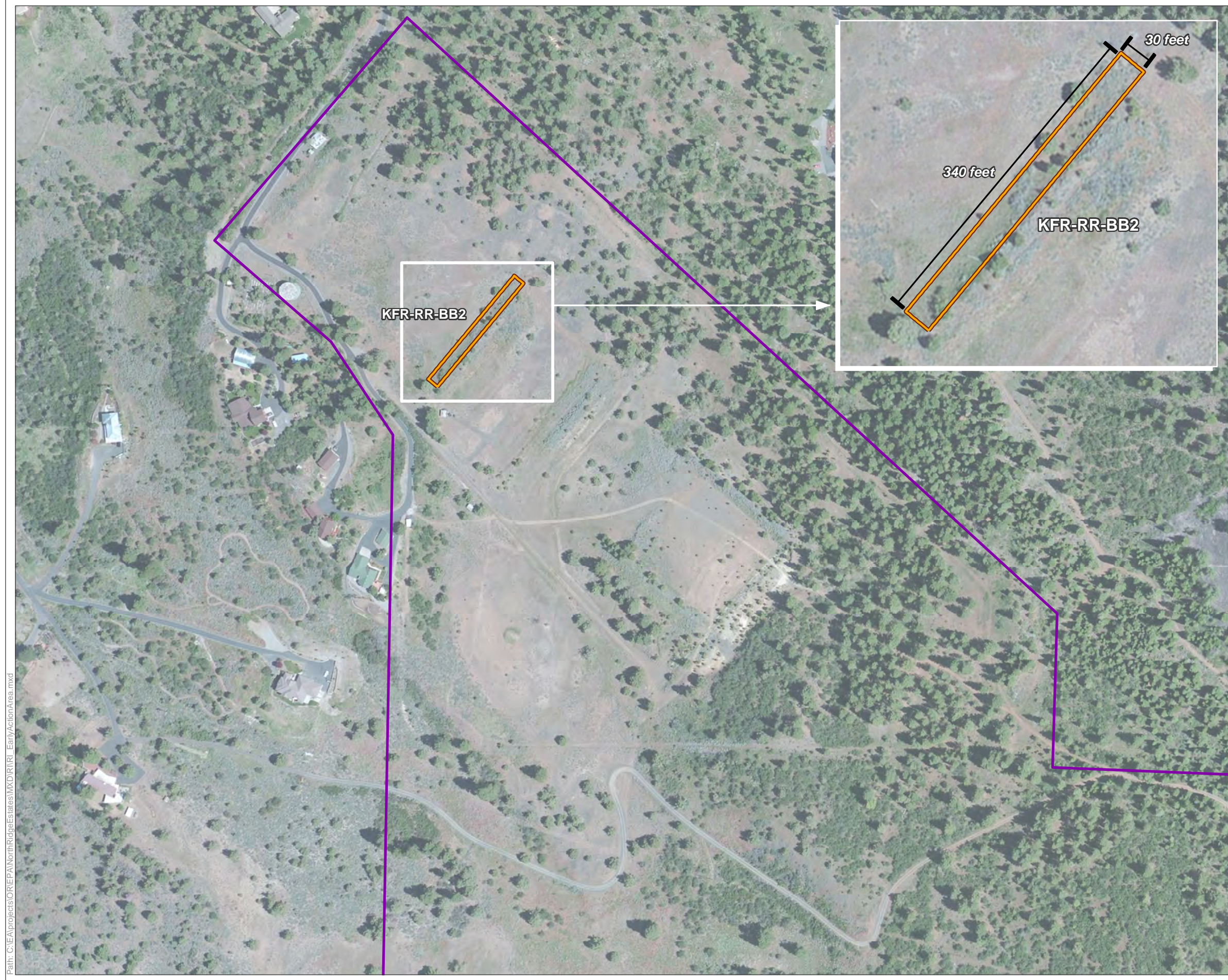
Source: EPA 1997

Date: 7/25/2023

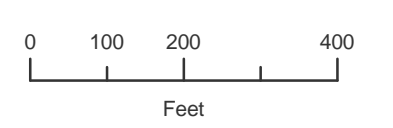
North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 7-1
Eight-Step Ecological Risk Assessment
Process for Superfund





- Kingsley Firing Range Annex
Formerly Used Defense Site Property
(Operable Unit 2)
- Recommended Removal Action Area
(approximate)



Date: 4/25/2023

North Ridge Estates Operable Unit 2
Klamath County, Oregon

Figure 9-1
Recommended Removal Action Area



Path: C:\EAP\projects\OR\NEPAN\NorthRidgeEstates\MXD\DIR\RI EarlyActionArea.mxd

Appendix A

2022 Incremental Sampling Methodology Analytical Documentation

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US EPA Region 10 Laboratory

Multi-Analyte Final Report



Project Code : SFP-003C

Site : NORTH RIDGE ESTATES: RI-FS

Contact : Robert Tan

Account : 2023T10P000FD210RVLA00

Sample : 22334100-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	5.75	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	4.52	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.13	mg/Kg		12/ 6/22	10
7440473	Chromium	65.0	mg/Kg		12/ 6/22	10
7440484	Cobalt	49.8	mg/Kg		12/ 6/22	10
7440508	Copper	69.3	mg/Kg		12/ 6/22	10
7439921	Lead	1690	mg/Kg	J	12/ 6/22	50
7440020	Nickel	96.1	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.209	mg/Kg		12/ 6/22	10
7440280	Thallium	0.24	mg/Kg		12/ 6/22	10
7440622	Vanadium	208	mg/Kg		12/ 6/22	10
7440666	Zinc	88.1	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	73500	mg/Kg	J	3/ 9/23	5
7440393	Barium	423	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11100	mg/Kg	J	3/ 9/23	5
7439896	Iron	74600	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	10400	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1620	mg/Kg	J	3/ 9/23	5

Target Analyte Results (cont.):

7440097	Potassium	3020 mg/Kg	J	3/ 9/23	5
7440235	Sodium	2200 mg/Kg	J	3/ 9/23	5

Sample : 22334100-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	1.3	mg/Kg	J	12/ 5/22	10
7440382	Arsenic	4.65	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.441	mg/Kg		12/ 5/22	10
7440473	Chromium	57.9	mg/Kg		12/ 5/22	10
7440484	Cobalt	42.2	mg/Kg		12/ 5/22	10
7440508	Copper	65.3	mg/Kg	J	12/ 5/22	10
7439921	Lead	296	mg/Kg	J	12/ 5/22	10
7440020	Nickel	76.5	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.086	mg/Kg		12/ 5/22	10
7440280	Thallium	0.20	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	177	mg/Kg		12/ 5/22	10
7440666	Zinc	80.5	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	69500	mg/Kg	J	3/ 9/23	5
7440393	Barium	367	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	8290	mg/Kg	J	3/ 9/23	5
7439896	Iron	63900	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	7320	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1350	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2960	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1210	mg/Kg	J	3/ 9/23	5

Sample : 22334100-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.63	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.447	mg/Kg		12/ 5/22	10
7440473	Chromium	67.2	mg/Kg		12/ 5/22	10
7440484	Cobalt	32.5	mg/Kg		12/ 5/22	10
7440508	Copper	75.9	mg/Kg		12/ 5/22	10
7439921	Lead	274	mg/Kg		12/ 5/22	10
7440020	Nickel	67.7	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.10	mg/Kg		12/ 5/22	10
7440280	Thallium	0.22	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	177	mg/Kg		12/ 5/22	10
7440666	Zinc	86.6	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	73700	mg/Kg		10/ 5/22	5
7440393	Barium	384	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.07	mg/Kg		10/ 5/22	1
7440702	Calcium	9170	mg/Kg		10/ 5/22	5
7439896	Iron	62400	mg/Kg		10/ 5/22	5
7439954	Magnesium	5140	mg/Kg		10/ 5/22	5
7439965	Manganese	1040	mg/Kg		10/ 5/22	5
7440097	Potassium	3150	mg/Kg		10/ 5/22	5
7440235	Sodium	1380	mg/Kg		10/ 5/22	5

Sample : 22334101-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	3.08	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	5.80	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.15	mg/Kg		12/ 6/22	10
7440473	Chromium	60.8	mg/Kg		12/ 6/22	10
7440484	Cobalt	53.2	mg/Kg		12/ 6/22	10
7440508	Copper	64.3	mg/Kg		12/ 6/22	10
7439921	Lead	366	mg/Kg	J	12/ 6/22	50
7440020	Nickel	90.9	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.12	mg/Kg		12/ 6/22	10
7440280	Thallium	0.350	mg/Kg		12/ 6/22	10
7440622	Vanadium	207	mg/Kg		12/ 6/22	10
7440666	Zinc	87.0	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	67600	mg/Kg	J	3/ 9/23	5
7440393	Barium	419	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	9160	mg/Kg	J	3/ 9/23	5
7439896	Iron	71700	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9500	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1680	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2780	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1400	mg/Kg	J	3/ 9/23	5

Sample : 22334101-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	1.3	mg/Kg	J	12/ 5/22	10
7440382	Arsenic	4.85	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.417	mg/Kg		12/ 5/22	10
7440473	Chromium	58.7	mg/Kg		12/ 5/22	10
7440484	Cobalt	39.1	mg/Kg		12/ 5/22	10
7440508	Copper	63.6	mg/Kg	J	12/ 5/22	10
7439921	Lead	356	mg/Kg	J	12/ 5/22	10
7440020	Nickel	74.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.085	mg/Kg		12/ 5/22	10
7440280	Thallium	0.21	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	176	mg/Kg		12/ 5/22	10
7440666	Zinc	80.8	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	71900	mg/Kg	J	3/ 9/23	5
7440393	Barium	368	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	8150	mg/Kg	J	3/ 9/23	5
7439896	Iron	63600	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	6590	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1300	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2940	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1060	mg/Kg	J	3/ 9/23	5

Sample : 22334101-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.72 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.423 mg/Kg		12/ 5/22	10
7440473	Chromium	65.3 mg/Kg		12/ 5/22	10
7440484	Cobalt	31.0 mg/Kg		12/ 5/22	10
7440508	Copper	70.1 mg/Kg		12/ 5/22	10
7439921	Lead	357 mg/Kg		12/ 5/22	10
7440020	Nickel	64.2 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.11 mg/Kg		12/ 5/22	10
7440280	Thallium	0.22 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	164 mg/Kg		12/ 5/22	10
7440666	Zinc	82.8 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	73000	mg/Kg		10/ 5/22	5
7440393	Barium	376	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.04	mg/Kg		10/ 5/22	1
7440702	Calcium	8360	mg/Kg		10/ 5/22	5
7439896	Iron	60800	mg/Kg		10/ 5/22	5
7439954	Magnesium	4520	mg/Kg		10/ 5/22	5
7439965	Manganese	1020	mg/Kg		10/ 5/22	5
7440097	Potassium	3000	mg/Kg		10/ 5/22	5
7440235	Sodium	1100	mg/Kg		10/ 5/22	5

Sample : 22334102-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	3.39	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	5.99	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.15	mg/Kg		12/ 6/22	10
7440473	Chromium	67.2	mg/Kg		12/ 6/22	10
7440484	Cobalt	51.0	mg/Kg		12/ 6/22	10
7440508	Copper	69.7	mg/Kg		12/ 6/22	10
7439921	Lead	320	mg/Kg	J	12/ 6/22	50
7440020	Nickel	99.4	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.141	mg/Kg		12/ 6/22	10
7440280	Thallium	0.22	mg/Kg		12/ 6/22	10
7440622	Vanadium	218	mg/Kg		12/ 6/22	10
7440666	Zinc	90.6	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	72100	mg/Kg	J	3/ 9/23	5
7440393	Barium	409	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	9210	mg/Kg	J	3/ 9/23	5
7439896	Iron	75200	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	10400	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1570	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2850	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1500	mg/Kg	J	3/ 9/23	5

Sample : 22334102-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	1.5	mg/Kg	J	12/ 5/22	10
7440382	Arsenic	4.96	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.451	mg/Kg		12/ 5/22	10
7440473	Chromium	57.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	41.1	mg/Kg		12/ 5/22	10
7440508	Copper	64.7	mg/Kg	J	12/ 5/22	10
7439921	Lead	321	mg/Kg	J	12/ 5/22	10
7440020	Nickel	74.4	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.087	mg/Kg		12/ 5/22	10
7440280	Thallium	0.20	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	177	mg/Kg		12/ 5/22	10
7440666	Zinc	81.0	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	66900	mg/Kg	J	3/ 9/23	5
7440393	Barium	359	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	7530	mg/Kg	J	3/ 9/23	5
7439896	Iron	62800	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	6990	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1330	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2840	mg/Kg	J	3/ 9/23	5
7440235	Sodium	930	mg/Kg	J	3/ 9/23	5

Sample : 22334102-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.65 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.437 mg/Kg		12/ 5/22	10
7440473	Chromium	62.3 mg/Kg		12/ 5/22	10
7440484	Cobalt	31.2 mg/Kg		12/ 5/22	10
7440508	Copper	70.0 mg/Kg		12/ 5/22	10
7439921	Lead	309 mg/Kg		12/ 5/22	10
7440020	Nickel	62.8 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.096 mg/Kg		12/ 5/22	10
7440280	Thallium	0.22 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	161 mg/Kg		12/ 5/22	10
7440666	Zinc	81.7 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	70900 mg/Kg			10/ 5/22	5
7440393	Barium	373 mg/Kg			10/ 5/22	5
7440417	Beryllium	1.06 mg/Kg			10/ 5/22	1
7440702	Calcium	7930 mg/Kg			10/ 5/22	5
7439896	Iron	60200 mg/Kg			10/ 5/22	5
7439954	Magnesium	4510 mg/Kg			10/ 5/22	5
7439965	Manganese	1050 mg/Kg			10/ 5/22	5
7440097	Potassium	2980 mg/Kg			10/ 5/22	5
7440235	Sodium	961 mg/Kg			10/ 5/22	5

Sample : 22334103-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	3.17	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.12	mg/Kg		12/ 6/22	10
7440473	Chromium	60.7	mg/Kg		12/ 6/22	10
7440484	Cobalt	47.9	mg/Kg		12/ 6/22	10
7440508	Copper	65.8	mg/Kg		12/ 6/22	10
7439921	Lead	24.2	mg/Kg	J	12/ 6/22	50
7440020	Nickel	86.6	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.089	mg/Kg		12/ 6/22	10
7440280	Thallium	0.25	mg/Kg		12/ 6/22	10
7440622	Vanadium	153	mg/Kg		12/ 6/22	10
7440666	Zinc	78.0	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	69400	mg/Kg	J	3/ 9/23	5
7440393	Barium	369	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11600	mg/Kg	J	3/ 9/23	5
7439896	Iron	66400	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9620	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1530	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2640	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2150	mg/Kg	J	3/ 9/23	5

Sample : 22334103-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.96	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.439	mg/Kg		12/ 5/22	10
7440473	Chromium	54.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	40.7	mg/Kg		12/ 5/22	10
7440508	Copper	60.0	mg/Kg	J	12/ 5/22	10
7439921	Lead	30.0	mg/Kg	J	12/ 5/22	10
7440020	Nickel	77.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.079	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	144	mg/Kg		12/ 5/22	10
7440666	Zinc	79.0	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	64900	mg/Kg	J	3/ 9/23	5
7440393	Barium	333	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	10200	mg/Kg	J	3/ 9/23	5
7439896	Iron	60300	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	8760	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1340	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2570	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1750	mg/Kg	J	3/ 9/23	5

Sample : 22334103-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.53 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.39 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.434 mg/Kg		12/ 5/22	10
7440473	Chromium	61.7 mg/Kg		12/ 5/22	10
7440484	Cobalt	31.3 mg/Kg		12/ 5/22	10
7440508	Copper	66.1 mg/Kg		12/ 5/22	10
7439921	Lead	33.7 mg/Kg		12/ 5/22	10
7440020	Nickel	66.5 mg/Kg		12/ 5/22	10
7782492	Selenium	0.11 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.088 mg/Kg		12/ 5/22	10
7440280	Thallium	0.19 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	148 mg/Kg		12/ 5/22	10
7440666	Zinc	80.9 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	69000	mg/Kg		10/ 5/22	5
7440393	Barium	333	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.02	mg/Kg		10/ 5/22	1
7440702	Calcium	11000	mg/Kg		10/ 5/22	5
7439896	Iron	60000	mg/Kg		10/ 5/22	5
7439954	Magnesium	6530	mg/Kg		10/ 5/22	5
7439965	Manganese	1000	mg/Kg		10/ 5/22	5
7440097	Potassium	2680	mg/Kg		10/ 5/22	5
7440235	Sodium	1970	mg/Kg		10/ 5/22	5

Sample : 22334104-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	2.95	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.11	mg/Kg		12/ 6/22	10
7440473	Chromium	57.3	mg/Kg		12/ 6/22	10
7440484	Cobalt	51.0	mg/Kg		12/ 6/22	10
7440508	Copper	61.8	mg/Kg		12/ 6/22	10
7439921	Lead	16.7	mg/Kg	J	12/ 6/22	50
7440020	Nickel	85.6	mg/Kg		12/ 6/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.090	mg/Kg		12/ 6/22	10
7440280	Thallium	0.23	mg/Kg		12/ 6/22	10
7440622	Vanadium	147	mg/Kg		12/ 6/22	10
7440666	Zinc	75.0	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	67500	mg/Kg	J	3/ 9/23	5
7440393	Barium	385	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11900	mg/Kg	J	3/ 9/23	5
7439896	Iron	65800	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9680	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1650	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2720	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2240	mg/Kg	J	3/ 9/23	5

Sample : 22334104-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.07	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.438	mg/Kg		12/ 5/22	10
7440473	Chromium	53.2	mg/Kg		12/ 5/22	10
7440484	Cobalt	40.5	mg/Kg		12/ 5/22	10
7440508	Copper	58.4	mg/Kg	J	12/ 5/22	10
7439921	Lead	19.3	mg/Kg	J	12/ 5/22	10
7440020	Nickel	75.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.077	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	147	mg/Kg		12/ 5/22	10
7440666	Zinc	76.5	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	64300	mg/Kg	J	3/ 9/23	5
7440393	Barium	327	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	10000	mg/Kg	J	3/ 9/23	5
7439896	Iron	59700	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	8650	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1350	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2610	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1700	mg/Kg	J	3/ 9/23	5

Sample : 22334104-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.53	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.37	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.393	mg/Kg		12/ 5/22	10
7440473	Chromium	57.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	29.1	mg/Kg		12/ 5/22	10
7440508	Copper	62.0	mg/Kg		12/ 5/22	10
7439921	Lead	22.1	mg/Kg		12/ 5/22	10
7440020	Nickel	62.1	mg/Kg		12/ 5/22	10
7782492	Selenium	0.11	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.081	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	140	mg/Kg		12/ 5/22	10
7440666	Zinc	74.3	mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	65900	mg/Kg		10/ 5/22	5
7440393	Barium	322	mg/Kg		10/ 5/22	5
7440417	Beryllium	0.993	mg/Kg		10/ 5/22	1
7440702	Calcium	10200	mg/Kg		10/ 5/22	5
7439896	Iron	57300	mg/Kg		10/ 5/22	5
7439954	Magnesium	6120	mg/Kg		10/ 5/22	5
7439965	Manganese	976	mg/Kg		10/ 5/22	5
7440097	Potassium	2650	mg/Kg		10/ 5/22	5
7440235	Sodium	1690	mg/Kg		10/ 5/22	5

Sample : 22334105-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	3.00	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.13	mg/Kg		12/ 6/22	10
7440473	Chromium	61.5	mg/Kg		12/ 6/22	10
7440484	Cobalt	47.7	mg/Kg		12/ 6/22	10
7440508	Copper	65.0	mg/Kg		12/ 6/22	10
7439921	Lead	16.9	mg/Kg	J	12/ 6/22	50
7440020	Nickel	88.7	mg/Kg		12/ 6/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.084	mg/Kg		12/ 6/22	10
7440280	Thallium	0.21	mg/Kg		12/ 6/22	10
7440622	Vanadium	154	mg/Kg		12/ 6/22	10
7440666	Zinc	77.8	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	70000	mg/Kg	J	3/ 9/23	5
7440393	Barium	367	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	12300	mg/Kg	J	3/ 9/23	5
7439896	Iron	65500	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9720	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1500	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2720	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2450	mg/Kg	J	3/ 9/23	5

Sample : 22334105-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.19	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.403	mg/Kg		12/ 5/22	10
7440473	Chromium	55.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	37.9	mg/Kg		12/ 5/22	10
7440508	Copper	56.8	mg/Kg	J	12/ 5/22	10
7439921	Lead	15.1	mg/Kg	J	12/ 5/22	10
7440020	Nickel	74.2	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.079	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	145	mg/Kg		12/ 5/22	10
7440666	Zinc	72.9	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	66600	mg/Kg	J	3/ 9/23	5
7440393	Barium	325	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	9220	mg/Kg	J	3/ 9/23	5
7439896	Iron	59000	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	7770	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1290	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2650	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1440	mg/Kg	J	3/ 9/23	5

Sample : 22334105-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.31	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.376	mg/Kg		12/ 5/22	10
7440473	Chromium	56.6	mg/Kg		12/ 5/22	10
7440484	Cobalt	28.5	mg/Kg		12/ 5/22	10
7440508	Copper	57.6	mg/Kg		12/ 5/22	10
7439921	Lead	18.0	mg/Kg		12/ 5/22	10
7440020	Nickel	60.5	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.078	mg/Kg		12/ 5/22	10
7440280	Thallium	0.19	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	134	mg/Kg		12/ 5/22	10
7440666	Zinc	73.8	mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	66200	mg/Kg		10/ 5/22	5
7440393	Barium	329	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.05	mg/Kg		10/ 5/22	1
7440702	Calcium	9430	mg/Kg		10/ 5/22	5
7439896	Iron	57000	mg/Kg		10/ 5/22	5
7439954	Magnesium	5600	mg/Kg		10/ 5/22	5
7439965	Manganese	983	mg/Kg		10/ 5/22	5
7440097	Potassium	2660	mg/Kg		10/ 5/22	5
7440235	Sodium	1430	mg/Kg		10/ 5/22	5

Sample : 22334106-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	3.14	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.15	mg/Kg		12/ 6/22	10
7440473	Chromium	50.3	mg/Kg		12/ 6/22	10
7440484	Cobalt	44.6	mg/Kg		12/ 6/22	10
7440508	Copper	59.2	mg/Kg		12/ 6/22	10
7439921	Lead	51.9	mg/Kg	J	12/ 6/22	50
7440020	Nickel	94.3	mg/Kg		12/ 6/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.071	mg/Kg		12/ 6/22	10
7440280	Thallium	0.16	mg/Kg		12/ 6/22	10
7440622	Vanadium	125	mg/Kg		12/ 6/22	10
7440666	Zinc	86.4	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	53000	mg/Kg	J	3/ 9/23	5
7440393	Barium	304	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.81	mg/Kg	J	3/ 9/23	5
7440702	Calcium	14100	mg/Kg	J	3/ 9/23	5
7439896	Iron	57000	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15300	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1350	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1920	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2610	mg/Kg	J	3/ 9/23	5

Sample : 22334106-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.47	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.481	mg/Kg		12/ 5/22	10
7440473	Chromium	52.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	46.0	mg/Kg		12/ 5/22	10
7440508	Copper	68.8	mg/Kg	J	12/ 5/22	10
7439921	Lead	65.9	mg/Kg	J	12/ 5/22	10
7440020	Nickel	100	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.080	mg/Kg		12/ 5/22	10
7440280	Thallium	0.24	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	133	mg/Kg		12/ 5/22	10
7440666	Zinc	93.7	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	59700	mg/Kg	J	3/ 9/23	5
7440393	Barium	327	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.96	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11900	mg/Kg	J	3/ 9/23	5
7439896	Iron	60100	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15000	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1430	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2130	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2170	mg/Kg	J	3/ 9/23	5

Sample : 22334106-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.22 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.486 mg/Kg		12/ 5/22	10
7440473	Chromium	58.4 mg/Kg		12/ 5/22	10
7440484	Cobalt	37.3 mg/Kg		12/ 5/22	10
7440508	Copper	77.7 mg/Kg		12/ 5/22	10
7439921	Lead	70.7 mg/Kg		12/ 5/22	10
7440020	Nickel	73.7 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.093 mg/Kg		12/ 5/22	10
7440280	Thallium	0.268 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	140 mg/Kg		12/ 5/22	10
7440666	Zinc	98.5 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction : Total****Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis : Dry**

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	62900 mg/Kg			10/ 5/22	5
7440393	Barium	343 mg/Kg			10/ 5/22	5
7440417	Beryllium	0.936 mg/Kg			10/ 5/22	1
7440702	Calcium	11000 mg/Kg			10/ 5/22	5
7439896	Iron	61400 mg/Kg			10/ 5/22	5
7439954	Magnesium	9850 mg/Kg			10/ 5/22	5
7439965	Manganese	1210 mg/Kg			10/ 5/22	5
7440097	Potassium	2300 mg/Kg			10/ 5/22	5
7440235	Sodium	1880 mg/Kg			10/ 5/22	5

Sample : 22334107-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	1.97	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.13	mg/Kg		12/ 6/22	10
7440473	Chromium	48.6	mg/Kg		12/ 6/22	10
7440484	Cobalt	42.7	mg/Kg		12/ 6/22	10
7440508	Copper	57.5	mg/Kg		12/ 6/22	10
7439921	Lead	38.9	mg/Kg	J	12/ 6/22	50
7440020	Nickel	91.3	mg/Kg		12/ 6/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.069	mg/Kg		12/ 6/22	10
7440280	Thallium	0.17	mg/Kg		12/ 6/22	10
7440622	Vanadium	116	mg/Kg		12/ 6/22	10
7440666	Zinc	88.7	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	53400	mg/Kg	J	3/ 9/23	5
7440393	Barium	289	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.75	mg/Kg	J	3/ 9/23	5
7440702	Calcium	15300	mg/Kg	J	3/ 9/23	5
7439896	Iron	54000	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15000	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1320	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1940	mg/Kg	J	3/ 9/23	5
7440235	Sodium	3010	mg/Kg	J	3/ 9/23	5

Sample : 22334107-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.51	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.423	mg/Kg		12/ 5/22	10
7440473	Chromium	50.6	mg/Kg		12/ 5/22	10
7440484	Cobalt	44.3	mg/Kg		12/ 5/22	10
7440508	Copper	62.9	mg/Kg	J	12/ 5/22	10
7439921	Lead	76.1	mg/Kg	J	12/ 5/22	10
7440020	Nickel	104	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.071	mg/Kg		12/ 5/22	10
7440280	Thallium	0.17	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	124	mg/Kg		12/ 5/22	10
7440666	Zinc	98.9	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	56500	mg/Kg	J	3/ 9/23	5
7440393	Barium	305	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.91	mg/Kg	J	3/ 9/23	5
7440702	Calcium	12700	mg/Kg	J	3/ 9/23	5
7439896	Iron	57200	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	16000	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1410	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2100	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2290	mg/Kg	J	3/ 9/23	5

Sample : 22334107-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.33	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.481	mg/Kg		12/ 5/22	10
7440473	Chromium	58.7	mg/Kg		12/ 5/22	10
7440484	Cobalt	36.5	mg/Kg		12/ 5/22	10
7440508	Copper	78.1	mg/Kg		12/ 5/22	10
7439921	Lead	84.5	mg/Kg		12/ 5/22	10
7440020	Nickel	73.2	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.090	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	137	mg/Kg		12/ 5/22	10
7440666	Zinc	112	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	63400	mg/Kg		10/ 5/22	5
7440393	Barium	346	mg/Kg		10/ 5/22	5
7440417	Beryllium	0.962	mg/Kg		10/ 5/22	1
7440702	Calcium	11900	mg/Kg		10/ 5/22	5
7439896	Iron	61800	mg/Kg		10/ 5/22	5
7439954	Magnesium	10100	mg/Kg		10/ 5/22	5
7439965	Manganese	1230	mg/Kg		10/ 5/22	5
7440097	Potassium	2380	mg/Kg		10/ 5/22	5
7440235	Sodium	2030	mg/Kg		10/ 5/22	5

Sample : 22334108-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	1.99	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.12	mg/Kg		12/ 6/22	10
7440473	Chromium	48.5	mg/Kg		12/ 6/22	10
7440484	Cobalt	40.8	mg/Kg		12/ 6/22	10
7440508	Copper	303	mg/Kg		12/ 6/22	10
7439921	Lead	33.6	mg/Kg	J	12/ 6/22	50
7440020	Nickel	90.6	mg/Kg		12/ 6/22	10
7782492	Selenium	0.097	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.139	mg/Kg		12/ 6/22	10
7440280	Thallium	0.16	mg/Kg		12/ 6/22	10
7440622	Vanadium	118	mg/Kg		12/ 6/22	10
7440666	Zinc	101	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	52700	mg/Kg	J	3/ 9/23	5
7440393	Barium	305	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.77	mg/Kg	J	3/ 9/23	5
7440702	Calcium	15300	mg/Kg	J	3/ 9/23	5
7439896	Iron	54500	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15300	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1230	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1880	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2920	mg/Kg	J	3/ 9/23	5

Sample : 22334108-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.49	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.396	mg/Kg		12/ 5/22	10
7440473	Chromium	50.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	44.4	mg/Kg		12/ 5/22	10
7440508	Copper	62.9	mg/Kg	J	12/ 5/22	10
7439921	Lead	48.6	mg/Kg	J	12/ 5/22	10
7440020	Nickel	101	mg/Kg		12/ 5/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.071	mg/Kg		12/ 5/22	10
7440280	Thallium	0.16	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	126	mg/Kg		12/ 5/22	10
7440666	Zinc	82.6	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	56300	mg/Kg	J	3/ 9/23	5
7440393	Barium	289	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.89	mg/Kg	J	3/ 9/23	5
7440702	Calcium	12800	mg/Kg	J	3/ 9/23	5
7439896	Iron	56100	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15600	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1340	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2000	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2360	mg/Kg	J	3/ 9/23	5

Sample : 22334108-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.33 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.467 mg/Kg		12/ 5/22	10
7440473	Chromium	57.2 mg/Kg		12/ 5/22	10
7440484	Cobalt	38.0 mg/Kg		12/ 5/22	10
7440508	Copper	76.9 mg/Kg		12/ 5/22	10
7439921	Lead	58.9 mg/Kg		12/ 5/22	10
7440020	Nickel	74.2 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.10 mg/Kg		12/ 5/22	10
7440280	Thallium	0.18 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	138 mg/Kg		12/ 5/22	10
7440666	Zinc	91.7 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	60400 mg/Kg			10/ 5/22	5
7440393	Barium	343 mg/Kg			10/ 5/22	5
7440417	Beryllium	0.957 mg/Kg			10/ 5/22	1
7440702	Calcium	11400 mg/Kg			10/ 5/22	5
7439896	Iron	60600 mg/Kg			10/ 5/22	5
7439954	Magnesium	10200 mg/Kg			10/ 5/22	5
7439965	Manganese	1260 mg/Kg			10/ 5/22	5
7440097	Potassium	2260 mg/Kg			10/ 5/22	5
7440235	Sodium	1870 mg/Kg			10/ 5/22	5

Sample : 22334106-D Sample Duplicate

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.30	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.542	mg/Kg		12/ 5/22	10
7440473	Chromium	60.2	mg/Kg		12/ 5/22	10
7440484	Cobalt	37.9	mg/Kg		12/ 5/22	10
7440508	Copper	80.4	mg/Kg		12/ 5/22	10
7439921	Lead	71.2	mg/Kg		12/ 5/22	10
7440020	Nickel	75.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.096	mg/Kg		12/ 5/22	10
7440280	Thallium	0.24	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	146	mg/Kg		12/ 5/22	10
7440666	Zinc	101	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	62400	mg/Kg		10/ 5/22	5
7440393	Barium	347	mg/Kg		10/ 5/22	5
7440417	Beryllium	0.938	mg/Kg		10/ 5/22	1
7440702	Calcium	11000	mg/Kg		10/ 5/22	5
7439896	Iron	61700	mg/Kg		10/ 5/22	5
7439954	Magnesium	9910	mg/Kg		10/ 5/22	5
7439965	Manganese	1210	mg/Kg		10/ 5/22	5
7440097	Potassium	2290	mg/Kg		10/ 5/22	5
7440235	Sodium	1860	mg/Kg		10/ 5/22	5

Sample : 22334106-B Sample Duplicate

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	2.3	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	2.22	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.16	mg/Kg		12/ 6/22	10
7440473	Chromium	50.1	mg/Kg		12/ 6/22	10
7440484	Cobalt	45.7	mg/Kg		12/ 6/22	10
7440508	Copper	60.6	mg/Kg		12/ 6/22	10
7439921	Lead	464	mg/Kg	J	12/ 6/22	50
7440020	Nickel	95.7	mg/Kg		12/ 6/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.097	mg/Kg		12/ 6/22	10
7440280	Thallium	0.18	mg/Kg		12/ 6/22	10
7440622	Vanadium	126	mg/Kg		12/ 6/22	10
7440666	Zinc	84.9	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	52400	mg/Kg	J	3/ 9/23	5
7440393	Barium	308	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.80	mg/Kg	J	3/ 9/23	5
7440702	Calcium	13800	mg/Kg	J	3/ 9/23	5
7439896	Iron	57500	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15400	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1400	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1950	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2530	mg/Kg	J	3/ 9/23	5

Sample : 22334106-C Sample Duplicate

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.48 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.68 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.489 mg/Kg		12/ 5/22	10
7440473	Chromium	48.8 mg/Kg		12/ 5/22	10
7440484	Cobalt	45.4 mg/Kg		12/ 5/22	10
7440508	Copper	65.6 mg/Kg	J	12/ 5/22	10
7439921	Lead	109 mg/Kg	J	12/ 5/22	10
7440020	Nickel	95.0 mg/Kg		12/ 5/22	10
7782492	Selenium	0.096 mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.084 mg/Kg		12/ 5/22	10
7440280	Thallium	0.21 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	128 mg/Kg		12/ 5/22	10
7440666	Zinc	90.4 mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	56600 mg/Kg	J		3/ 9/23	5
7440393	Barium	318 mg/Kg	J		3/ 9/23	5
7440417	Beryllium	0.95 mg/Kg	J		3/ 9/23	5
7440702	Calcium	11500 mg/Kg	J		3/ 9/23	5
7439896	Iron	58900 mg/Kg	J		3/ 9/23	5
7439954	Magnesium	14800 mg/Kg	J		3/ 9/23	5
7439965	Manganese	1430 mg/Kg	J		3/ 9/23	5
7440097	Potassium	2090 mg/Kg	J		3/ 9/23	5
7440235	Sodium	2000 mg/Kg	J		3/ 9/23	5

Sample : 22334106-D Matrix Spike**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	9	%Rec		12/ 5/22	10
7440382	Arsenic	90	%Rec		12/ 5/22	10
7440439	Cadmium	93	%Rec		12/ 5/22	10
7440473	Chromium	104	%Rec		12/ 5/22	10
7440484	Cobalt	107	%Rec		12/ 5/22	10
7440508	Copper	105	%Rec		12/ 5/22	10
7439921	Lead	105	%Rec		12/ 5/22	10
7440020	Nickel	98	%Rec		12/ 5/22	10
7782492	Selenium	93	%Rec		12/ 5/22	10
7440224	Silver	95	%Rec		12/ 5/22	10
7440280	Thallium	99	%Rec		12/ 5/22	10
7440622	Vanadium	98	%Rec		12/ 5/22	10
7440666	Zinc	99	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	10/ 5/22	5
7440393	Barium	100	%Rec		10/ 5/22	5
7440417	Beryllium	96	%Rec		10/ 5/22	1
7439896	Iron			NA	10/ 5/22	5
7439965	Manganese			NA	10/ 5/22	5

Sample : 22334106-B Matrix Spike**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	29	%Rec		12/ 6/22	10
7440382	Arsenic	94	%Rec		12/ 6/22	10
7440439	Cadmium	101	%Rec		12/ 6/22	10
7440473	Chromium	100	%Rec		12/ 6/22	10
7440484	Cobalt	107	%Rec		12/ 6/22	10
7440508	Copper	100	%Rec		12/ 6/22	10
7439921	Lead	97	%Rec		12/ 6/22	50
7440020	Nickel	106	%Rec		12/ 6/22	10
7782492	Selenium	96	%Rec		12/ 6/22	10
7440224	Silver	100	%Rec		12/ 6/22	10
7440280	Thallium	99	%Rec		12/ 6/22	10
7440622	Vanadium	101	%Rec		12/ 6/22	10
7440666	Zinc	94	%Rec		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium			NA	3/ 9/23	5
7440417	Beryllium	101	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : 22334106-C Matrix Spike

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	22	%Rec		12/ 5/22	10
7440382	Arsenic	92	%Rec		12/ 5/22	10
7440439	Cadmium	89	%Rec		12/ 5/22	10
7440473	Chromium	104	%Rec		12/ 5/22	10
7440484	Cobalt	120	%Rec		12/ 5/22	10
7440508	Copper	126	%Rec		12/ 5/22	10
7439921	Lead	115	%Rec		12/ 5/22	10

Spiked Compounds (cont.):

7440020	Nickel	99	%Rec	12/ 5/22	10
7782492	Selenium	94	%Rec	12/ 5/22	10
7440224	Silver	90	%Rec	12/ 5/22	10
7440280	Thallium	100	%Rec	12/ 5/22	10
7440622	Vanadium	101	%Rec	12/ 5/22	10
7440666	Zinc	97	%Rec	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium	97	%Rec		3/ 9/23	5
7440417	Beryllium	103	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : 22334106-D Matrix Spike#2**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	13	%Rec		12/ 5/22	10
7440382	Arsenic	93	%Rec		12/ 5/22	10
7440439	Cadmium	92	%Rec		12/ 5/22	10
7440473	Chromium	100	%Rec		12/ 5/22	10
7440484	Cobalt	109	%Rec		12/ 5/22	10
7440508	Copper	112	%Rec		12/ 5/22	10
7439921	Lead	107	%Rec		12/ 5/22	10
7440020	Nickel	99	%Rec		12/ 5/22	10
7782492	Selenium	96	%Rec		12/ 5/22	10
7440224	Silver	98	%Rec		12/ 5/22	10
7440280	Thallium	101	%Rec		12/ 5/22	10
7440622	Vanadium	103	%Rec		12/ 5/22	10
7440666	Zinc	100	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	10/ 5/22	5
7440393	Barium	102	%Rec		10/ 5/22	5
7440417	Beryllium	97	%Rec		10/ 5/22	1
7439896	Iron			NA	10/ 5/22	5
7439965	Manganese			NA	10/ 5/22	5

Sample : 22334106-B Matrix Spike#2**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	29	%Rec		12/ 6/22	10
7440382	Arsenic	95	%Rec		12/ 6/22	10
7440439	Cadmium	100	%Rec		12/ 6/22	10
7440473	Chromium	119	%Rec		12/ 6/22	10
7440484	Cobalt	109	%Rec		12/ 6/22	10
7440508	Copper	115	%Rec		12/ 6/22	10
7439921	Lead	291	%Rec		12/ 6/22	50
7440020	Nickel	111	%Rec		12/ 6/22	10
7782492	Selenium	97	%Rec		12/ 6/22	10
7440224	Silver	99	%Rec		12/ 6/22	10
7440280	Thallium	99	%Rec		12/ 6/22	10
7440622	Vanadium	104	%Rec		12/ 6/22	10
7440666	Zinc	110	%Rec		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium			NA	3/ 9/23	5
7440417	Beryllium	102	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : 22334106-C Matrix Spike#2

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	25	%Rec		12/ 5/22	10
7440382	Arsenic	95	%Rec		12/ 5/22	10
7440439	Cadmium	91	%Rec		12/ 5/22	10
7440473	Chromium	110	%Rec		12/ 5/22	10
7440484	Cobalt	123	%Rec		12/ 5/22	10
7440508	Copper	128	%Rec		12/ 5/22	10
7439921	Lead	108	%Rec		12/ 5/22	10

Spiked Compounds (cont.):

7440020	Nickel	107	%Rec	12/ 5/22	10
7782492	Selenium	94	%Rec	12/ 5/22	10
7440224	Silver	91	%Rec	12/ 5/22	10
7440280	Thallium	101	%Rec	12/ 5/22	10
7440622	Vanadium	113	%Rec	12/ 5/22	10
7440666	Zinc	106	%Rec	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium	95	%Rec		3/ 9/23	5
7440417	Beryllium	103	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : IS100422ABL Blank**Information :** Blank**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	U	12/ 5/22	10
7440382	Arsenic	0.20	mg/Kg	U	12/ 5/22	10
7440439	Cadmium	0.050	mg/Kg	U	12/ 5/22	10
7440473	Chromium	0.40	mg/Kg	U	12/ 5/22	10
7440484	Cobalt	0.050	mg/Kg	U	12/ 5/22	10
7440508	Copper	0.50	mg/Kg	U	12/ 5/22	10
7439921	Lead	0.25	mg/Kg	U	12/ 5/22	10
7440020	Nickel	0.40	mg/Kg	U	12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.025	mg/Kg	U	12/ 5/22	10
7440280	Thallium	0.050	mg/Kg	U	12/ 5/22	10
7440622	Vanadium	0.10	mg/Kg	U	12/ 5/22	10
7440666	Zinc	3.0	mg/Kg	U	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	10	mg/Kg	U	10/ 5/22	1
7440393	Barium	0.10	mg/Kg	U	10/ 5/22	1
7440417	Beryllium	0.10	mg/Kg	U	10/ 5/22	1
7440702	Calcium	5.5	mg/Kg		10/ 5/22	1
7439896	Iron	5.0	mg/Kg	U	10/ 5/22	1
7439954	Magnesium	5.0	mg/Kg	U	10/ 5/22	1
7439965	Manganese	0.20	mg/Kg	U	10/ 5/22	1
7440097	Potassium	70	mg/Kg	U	10/ 5/22	1
7440235	Sodium	10	mg/Kg	U	10/ 5/22	1

Sample : IS112822ABL Blank**Information :** Blank**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	U	12/ 6/22	10
7440382	Arsenic	0.20	mg/Kg	U	12/ 6/22	10
7440439	Cadmium	0.050	mg/Kg	U	12/ 6/22	10
7440473	Chromium	0.40	mg/Kg	U	12/ 6/22	10
7440484	Cobalt	0.050	mg/Kg	U	12/ 6/22	10
7440508	Copper	0.50	mg/Kg	U	12/ 6/22	10
7439921	Lead	0.25	mg/Kg	U	12/ 6/22	10
7440020	Nickel	2.0	mg/Kg	U	12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 6/22	10
7440224	Silver	0.025	mg/Kg	U	12/ 6/22	10
7440280	Thallium	0.050	mg/Kg	U	12/ 6/22	10
7440622	Vanadium	0.10	mg/Kg	U	12/ 6/22	10
7440666	Zinc	3.0	mg/Kg	U	12/ 6/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	10	mg/Kg	U	3/ 9/23	1
7440393	Barium	0.10	mg/Kg	U	3/ 9/23	1
7440417	Beryllium	0.10	mg/Kg	U	3/ 9/23	1
7440702	Calcium	5.0	mg/Kg	U	3/ 9/23	1
7439896	Iron	5.0	mg/Kg	U	3/ 9/23	1
7439954	Magnesium	5.0	mg/Kg	U	3/ 9/23	1
7439965	Manganese	0.20	mg/Kg	U	3/ 9/23	1
7440097	Potassium	70	mg/Kg	U	3/ 9/23	1
7440235	Sodium	10	mg/Kg	U	3/ 9/23	1

Sample : IS112922ABL Blank**Information :** Blank**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	U	12/ 5/22	10
7440382	Arsenic	0.20	mg/Kg	U	12/ 5/22	10
7440439	Cadmium	0.050	mg/Kg	U	12/ 5/22	10
7440473	Chromium	0.40	mg/Kg	U	12/ 5/22	10
7440484	Cobalt	0.050	mg/Kg	U	12/ 5/22	10
7440508	Copper	0.50	mg/Kg	U	12/ 5/22	10
7439921	Lead	0.25	mg/Kg	U	12/ 5/22	10
7440020	Nickel	0.40	mg/Kg	U	12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.025	mg/Kg	U	12/ 5/22	10
7440280	Thallium	0.050	mg/Kg	U	12/ 5/22	10
7440622	Vanadium	0.10	mg/Kg	U	12/ 5/22	10
7440666	Zinc	3.0	mg/Kg	U	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	10	mg/Kg	U	3/ 9/23	1
7440393	Barium	0.10	mg/Kg	U	3/ 9/23	1
7440417	Beryllium	0.10	mg/Kg	U	3/ 9/23	1
7440702	Calcium	5.0	mg/Kg	U	3/ 9/23	1
7439896	Iron	5.0	mg/Kg	U	3/ 9/23	1
7439954	Magnesium	5.0	mg/Kg	U	3/ 9/23	1
7439965	Manganese	0.20	mg/Kg	U	3/ 9/23	1
7440097	Potassium	70	mg/Kg	U	3/ 9/23	1
7440235	Sodium	10	mg/Kg	U	3/ 9/23	1

Sample : IS100422AL1 Lab Control Std**Information :** Lab Control Standard**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	98	%Rec		12/ 5/22	10
7440382	Arsenic	102	%Rec		12/ 5/22	10
7440439	Cadmium	94	%Rec		12/ 5/22	10
7440473	Chromium	95	%Rec		12/ 5/22	10
7440484	Cobalt	101	%Rec		12/ 5/22	10
7440508	Copper	94	%Rec		12/ 5/22	10
7439921	Lead	101	%Rec		12/ 5/22	10
7440020	Nickel	97	%Rec		12/ 5/22	10
7782492	Selenium	102	%Rec		12/ 5/22	10
7440224	Silver	95	%Rec		12/ 5/22	10
7440280	Thallium	94	%Rec		12/ 5/22	10
7440622	Vanadium	95	%Rec		12/ 5/22	10
7440666	Zinc	100	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum	103	%Rec		10/ 5/22	1
7440393	Barium	103	%Rec		10/ 5/22	1
7440417	Beryllium	96	%Rec		10/ 5/22	1
7439896	Iron	104	%Rec		10/ 5/22	1
7439965	Manganese	102	%Rec		10/ 5/22	1

Sample : IS112822AL1 Lab Control Std**Information :** Lab Control Standard**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	101	%Rec		12/ 6/22	10
7440382	Arsenic	104	%Rec		12/ 6/22	10
7440439	Cadmium	97	%Rec		12/ 6/22	10
7440473	Chromium	102	%Rec		12/ 6/22	10
7440484	Cobalt	103	%Rec		12/ 6/22	10
7440508	Copper	102	%Rec		12/ 6/22	10
7439921	Lead	99	%Rec		12/ 6/22	10
7440020	Nickel	104	%Rec		12/ 6/22	10
7782492	Selenium	108	%Rec		12/ 6/22	10
7440224	Silver	103	%Rec		12/ 6/22	10
7440280	Thallium	96	%Rec		12/ 6/22	10
7440622	Vanadium	99	%Rec		12/ 6/22	10
7440666	Zinc	104	%Rec		12/ 6/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

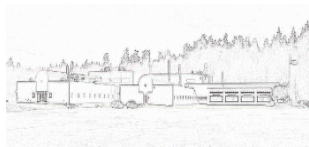
Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum	93	%Rec		3/ 9/23	1
7440393	Barium	100	%Rec		3/ 9/23	1
7440417	Beryllium	98	%Rec		3/ 9/23	1
7439896	Iron	101	%Rec		3/ 9/23	1
7439965	Manganese	101	%Rec		3/ 9/23	1

Sample : IS112922AL1 Lab Control Std**Information :** Lab Control Standard**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	99	%Rec		12/ 5/22	10
7440382	Arsenic	107	%Rec		12/ 5/22	10
7440439	Cadmium	92	%Rec		12/ 5/22	10
7440473	Chromium	96	%Rec		12/ 5/22	10
7440484	Cobalt	96	%Rec		12/ 5/22	10
7440508	Copper	95	%Rec		12/ 5/22	10
7439921	Lead	101	%Rec		12/ 5/22	10
7440020	Nickel	98	%Rec		12/ 5/22	10
7782492	Selenium	106	%Rec		12/ 5/22	10
7440224	Silver	91	%Rec		12/ 5/22	10
7440280	Thallium	99	%Rec		12/ 5/22	10
7440622	Vanadium	95	%Rec		12/ 5/22	10
7440666	Zinc	115	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum	98	%Rec		3/ 9/23	1
7440393	Barium	100	%Rec		3/ 9/23	1
7440417	Beryllium	98	%Rec		3/ 9/23	1
7439896	Iron	99	%Rec		3/ 9/23	1
7439965	Manganese	101	%Rec		3/ 9/23	1



US EPA Region 10 Laboratory

Multi-Sample Final Report



Project Code : SFP-003C

Site : NORTH RIDGE ESTATES: RI-FS

Contact : Robert Tan

Account : 2023T10P000FD210RVLA00

Parameter(s): Part-size

Analyte: *200208 - < 150 um

Weight Basis : Dry

Prep Method(s): D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Analytical Method: D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Target Analyte Results:

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-D sam	OU2-RR-BB2	Soil	33.4	%		9/15/22
22334101-D sam	OU2-RR-BB211	Soil	29.9	%		9/15/22
22334102-D sam	OU2-RR-BB212	Soil	32.9	%		9/15/22
22334103-D sam	OU2-RR-BB3	Soil	23.1	%		9/15/22
22334104-D sam	OU2-RR-BB311	Soil	24.2	%		9/15/22
22334105-D sam	OU2-RR-BB312	Soil	22.1	%		9/15/22
22334106-D sam	OU2-RR-RF1	Soil	22.8	%		9/15/22
22334107-D sam	OU2-RR-RF111	Soil	23.0	%		9/15/22
22334108-D sam	OU2-RR-RF112	Soil	24.7	%		9/15/22

Analyte: *200242 - < 500 um >= 150 um

Weight Basis : Dry

Prep Method(s): D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Analytical Method: D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Target Analyte Results:

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-C sam	OU2-RR-BB2	Soil	28.8	%		11/16/22
22334101-C sam	OU2-RR-BB211	Soil	31.3	%		11/16/22
22334102-C sam	OU2-RR-BB212	Soil	31.0	%		11/16/22
22334103-C sam	OU2-RR-BB3	Soil	23.4	%		11/16/22
22334104-C sam	OU2-RR-BB311	Soil	23.8	%		11/17/22
22334105-C sam	OU2-RR-BB312	Soil	27.2	%		11/17/22
22334106-C sam	OU2-RR-RF1	Soil	21.0	%		11/17/22
22334107-C sam	OU2-RR-RF111	Soil	19.2	%		11/17/22
22334108-C sam	OU2-RR-RF112	Soil	19.5	%		11/17/22

Analyte: *200099 - <2.0 >=0.5mm, Coarse Sand

Weight Basis : Dry

Prep Method(s): D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

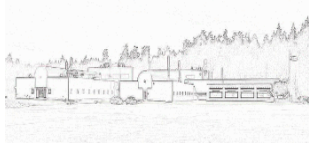
Analytical Method: D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Target Analyte Results:

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-B sam	OU2-RR-BB2	Soil	23.1	%		11/16/22
22334101-B sam	OU2-RR-BB211	Soil	23.2	%		11/16/22
22334102-B sam	OU2-RR-BB212	Soil	22.2	%		11/16/22
22334103-B sam	OU2-RR-BB3	Soil	30.3	%		11/16/22
22334104-B sam	OU2-RR-BB311	Soil	30.3	%		11/17/22
22334105-B sam	OU2-RR-BB312	Soil	31.8	%		11/17/22
22334106-B sam	OU2-RR-RF1	Soil	25.9	%		11/17/22
22334107-B sam	OU2-RR-RF111	Soil	24.7	%		11/17/22
22334108-B sam	OU2-RR-RF112	Soil	25.7	%		11/17/22

Analyte: *200041 - >=2.0mm, Gravel**Weight Basis :** Dry**Prep Method(s):** D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM**Analytical Method:** D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM**Target Analyte Results:**

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-A sam	OU2-RR-BB2	Soil	14.3	%		9/15/22
22334101-A sam	OU2-RR-BB211	Soil	15.1	%		9/15/22
22334102-A sam	OU2-RR-BB212	Soil	13.6	%		9/15/22
22334103-A sam	OU2-RR-BB3	Soil	22.9	%		9/15/22
22334104-A sam	OU2-RR-BB311	Soil	21.4	%		9/15/22
22334105-A sam	OU2-RR-BB312	Soil	18.5	%		9/15/22
22334106-A sam	OU2-RR-RF1	Soil	30.0	%		9/15/22
22334107-A sam	OU2-RR-RF111	Soil	32.8	%		9/15/22
22334108-A sam	OU2-RR-RF112	Soil	29.8	%		9/15/22



US EPA Region 10 Laboratory

Multi-Analyte Final Report



Project Code : SFP-003C

Site : NORTH RIDGE ESTATES: RI-FS

Contact : Robert Tan

Account : 2023T10P000FD210RVLA00

Sample : 22334100-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334101-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334102-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334103-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334104-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334105-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334106-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334107-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334108-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Drive East
Port Orchard, Washington 98366

**QUALITY ASSURANCE MEMORANDUM
FOR INORGANIC CHEMICAL ANALYSES**

March 15, 2023

From: Theresa McBride
Laboratory Services & Applied Sciences Division, US EPA Region 10 Laboratory

To: Robert Tan
RE: North Ridge Estates: RI-FS
Project Code: SFP-003C
Account Code: 2023T10P000FD210RVLA00

ISM TAL Metals

22334100B	22334101B	22334102B	22334103B	22334104B	22334105B
22334106B	22334107B	22334108B			
22334100C	22334101C	22334102C	22334103C	22334104C	22334105C
22334106C	22334107C	22334108C			
22334100D	22334101D	22334102D	22334103D	22334104D	22334105D
22334106D	22334107D	22334108D			

Sample suffixes are described as follows:

B 0.5 mm to 2.0 mm
C 0.15 mm to 0.5 mm
D < 0.150 mm

The following describes the quality assurance review of the data for the analysis parameters and samples listed above. The analyses were performed by the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

1. Data Qualifications

The US EPA Region 10 Laboratory has been accredited by the ANSI National Accreditation Board (ANAB) and has Certificate Number AT-3121. For those tests for which the Laboratory has been accredited by ANAB, results in this report comply with ISO IEC 17025:2017.

Field information was provided to the laboratory from other sources, such as Chain of Custody records.

The data and associated documents were reviewed against the quality control criteria outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). The following areas were reviewed against these quality control measures:

Sample Transport and Receipt
Sample Holding Times
Sample Preparation
Initial Calibration/Continuing Calibration Verification
Laboratory Control Samples
Blank Analysis
Duplicate Analysis

Matrix Spike/Matrix Spike Duplicate (MS/MSD)
Internal Standard Performance
Reference Materials
Instrument Peak Integrations
Interferences

2. QC Elements Not Meeting Laboratory/QAPP Criteria

Antimony spike recoveries were below the acceptance limits of 75-125% recovery for all samples (“B” fraction: 29%/29%, “C” fraction: 22%/25%, “D” fraction: 9%/13%). All antimony results were qualified “J”, estimated.

Copper spike recoveries were above the acceptance limits of 75-125% recovery for “C” fraction samples at 126%/128%. Copper results for “C” fraction samples were qualified “J”, estimated.

“B” and “C” fraction samples were analyzed by ICPAES past the technical holding time of 180 days. Depending on the sample, the exceedance was 29 or 30 days. Note that the samples were digested within holding time and acceptable QC elements indicate that the digestates did not degrade prior to analysis. “B” and “C” fraction results for aluminum, barium, beryllium, calcium, iron, magnesium, manganese, potassium and sodium were qualified “J”, estimated.

During both days of analysis by ICPMS, selenium drifted outside the 90-110% acceptance limits for the continuing calibration verification check. Selenium results for “B” and “C” fraction samples were qualified “J”, estimated.

During the ICPMS analysis on 12/05/2022, thallium suffered from carryover at lower concentrations. Affected thallium sample results (all “C” and “D” fraction samples) were qualified “J”, estimated.

A solid reference material was digested with these samples, and results were within the acceptance limits provided by the manufacturer, with the exception of sodium for the “B” and “C” fractions. Sodium results in “B” and “C” fraction samples were qualified “J”, estimated.

Note that when samples were prepared, they were not spiked with calcium, potassium, magnesium and sodium. However, the solid reference material digested with the samples does contain those elements and their results were within the acceptance limits provided by the manufacturer, except as noted above. This reference material serves as a positive control for these elements for this project. Sample results were not qualified on this basis.

3. Changes from Preliminary and Previous Data

Antimony results were provided as preliminary results on 03/15/2023. No changes were made to these results between the preliminary and final data.

Final results for arsenic and lead were provided previously. No changes were made to the results for these analytes.

4. Data Qualifiers

Data for all samples and analytes were assessed for compliance with each of the requirements described in Section 1. Data qualifiers were assigned, as necessary, to alert the user to instances where data did not meet all requirements. In cases where more than one QC failure occurred, the most restrictive data qualifier has been applied to the data.

The usefulness of qualified data should be treated according to the severity of the qualifier considering the project’s data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

Qualifier	Definition
U	The analyte was not detected at or above the reported value.
J	The identification of the analyte is acceptable; however, the reported value is an estimate.
UJ	The analyte was not detected at or above the reported value. The reported value is an estimate.
R	The presence or absence of the analyte cannot be determined from the data due to severe quality control problems. The data are rejected and considered unusable. <u>No value is reported with this qualification.</u>
NA	Not Applicable, the parameter was not analyzed for, or there is no analytical result for this parameter. <u>No value is reported with this qualification.</u> ‡

‡ NA is most often applied to spike results where the recovery cannot be determined accurately due to the high native sample concentration.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Drive East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM
FOR INORGANIC CHEMICAL ANALYSES

January 9, 2023

From: Theresa McBride
Laboratory Services & Applied Sciences Division, US EPA Region 10 Laboratory

To: Robert Tan
RE: North Ridge Estates: RI-FS
Project Code: SFP-003C
Account Code: 2023T10P000FD210RVLA00

Part-size

22334100A	22334101A	22334102A	22334103A	22334104A	22334105A
22334106A	22334107A	22334108A			
22334100B	22334101B	22334102B	22334103B	22334104B	22334105B
22334106B	22334107B	22334108B			
22334100C	22334101C	22334102C	22334103C	22334104C	22334105C
22334106C	22334107C	22334108C			
22334100D	22334101D	22334102D	22334103D	22334104D	22334105D
22334106D	22334107D	22334108D			

Count (# of > 2 mm fragments identified as bullet fragments)

22334100E	22334101E	22334102E	22334103E	22334104E	22334105E
22334106E	22334107E	22334108E			

SEM/EDX (Scanning Electron Microscopy/Energy Dispersive XRay): 22334108E

Sample suffixes are described as follows:

- A > 2 mm
- B 0.5 mm to 2.0 mm
- C 0.15 mm to 0.5 mm
- D < 0.150 mm
- E > 2 mm fragments identified as bullet fragments

The following describes the quality assurance review of the data for the analysis parameters and samples listed above. The analyses were performed by the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

1. Data Qualifications

The US EPA Region 10 Laboratory has been accredited by A2LA and has Certificate Number 5027.01. For those tests for which the Laboratory has been accredited by A2LA, results in this report comply with ISO IEC 17025:2017 and the 2009 TNI Environmental Testing Laboratory Standard.

Field information was provided to the laboratory from other sources, such as Chain of Custody records.

The data and associated documents were reviewed against the quality control criteria outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). The following areas were reviewed against these quality control measures:

Sample Transport and Receipt
 Sample Holding Times
 Sample Preparation
 Instrument Calibration
 Blank Analysis
 Reference Materials

2. QC Elements Not Meeting Laboratory/QAPP Criteria

None.

Note: The > 2 mm fraction was examined for metallic-looking particles for each sample. One sample, 22334108E, had one metallic-looking particle, which was further analyzed by SEM/EDX to determine whether it was lead-containing (and therefore potentially a lead bullet fragment). The particle did not contain lead. The number of > 2 mm fragments identified as bullet fragments was therefore zero for the project. See the appended narrative for more details on this process.

3. Data Qualifiers

Data for all samples and analytes were assessed for compliance with each of the requirements described in Section 1. Data qualifiers were assigned, as necessary, to alert the user to instances where data did not meet all requirements. In cases where more than one QC failure occurred, the most restrictive data qualifier has been applied to the data.

The usefulness of qualified data should be treated according to the severity of the qualifier considering the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

Qualifier	Definition
U	The analyte was not detected at or above the reported value.
J	The identification of the analyte is acceptable; however, the reported value is an estimate.
UJ	The analyte was not detected at or above the reported value. The reported value is an estimate.
R	The presence or absence of the analyte cannot be determined from the data due to severe quality control problems. The data are rejected and considered unusable. <u>No value is reported with this qualification.</u>
NA	Not Applicable, the parameter was not analyzed for, or there is no analytical result for this parameter. <u>No value is reported with this qualification.</u> ‡

‡ NA is most often applied to spike results where the recovery cannot be determined accurately due to the high native sample concentration.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Drive East
Port Orchard, Washington 98366

Project Narrative

January 9, 2023

From: Jed Januch, Environmental Protection Specialist
Laboratory Services & Applied Science Division, U.S. EPA Region 10 Laboratory

Jed Januch

To: Robert Tan, Remedial Project Manager
Superfund and Emergency Management Division
RE: North Ridge Estates – OU2
Project Code: SFP-003C
Account Code: 2023T10P000FD210RVLA00

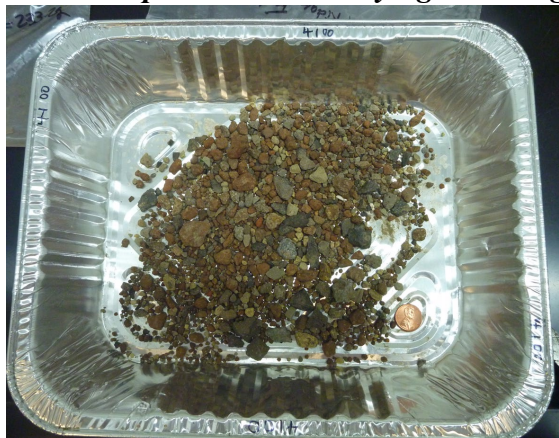
Bullet Fragments or Slugs – Lead

22334100A 22334101A 22334102A 22334103A 22334104A
22334105A 22334106A 22334107A 22334108A

MEL was directed to examine the nine samples listed above to identify and isolate metallic particles, specifically bullet fragments or slugs, and analyze suspect material with the aid of a scanning electron microscope (SEM) equipped with an energy dispersive x-ray analysis (EDXA) detector system. The samples had previously been sieved and the coarse fraction greater than (>) 2-millimeters (mm) was the fraction examined for this part of the project.

Prior to examination, the larger pieces of vegetation were removed by hand. The samples were rinsed with laboratory-grade deionized water to which also aided in removing smaller pieces of vegetation and seeds. The samples were then spread out in a baking pan (Figure 1) and allowed to dry in a HEPA filter hood for several days.

Figure 1 – Sample 22334100A drying in baking pan.



Samples were examined with the aid of a magnifying glass while drying in the hood. Specimens of suspect material were isolated and crushed by hand or with a set of pliers to determine if the specimen was metallic or gravel. One suspect specimen (a shiny particle) was isolated from Sample Number 22334108A and was submitted for analysis by SEM/EDXA (Appendix 1).

Further examination of samples was done with the aid of a sluice box (Figure 2 and 3) with running water in an attempt to isolate heavier particles from lighter particles. There were no metallic or bullet fragments or slugs observed in the initial or final examination.

Figure 2 – Sluice box



Figure 3 – Sample being examined visually.



North Ridge Estates, SFP-003C

Analyst: Jed Januch, LSASD

Bullet Reference Sample

Figure 1 - Fragment shaved from a bullet

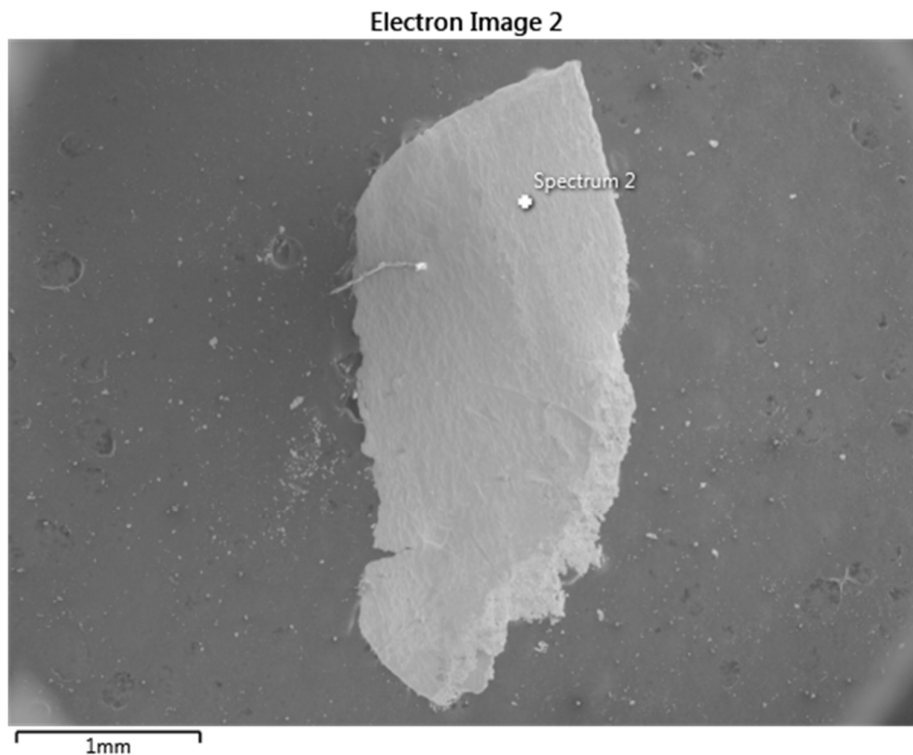
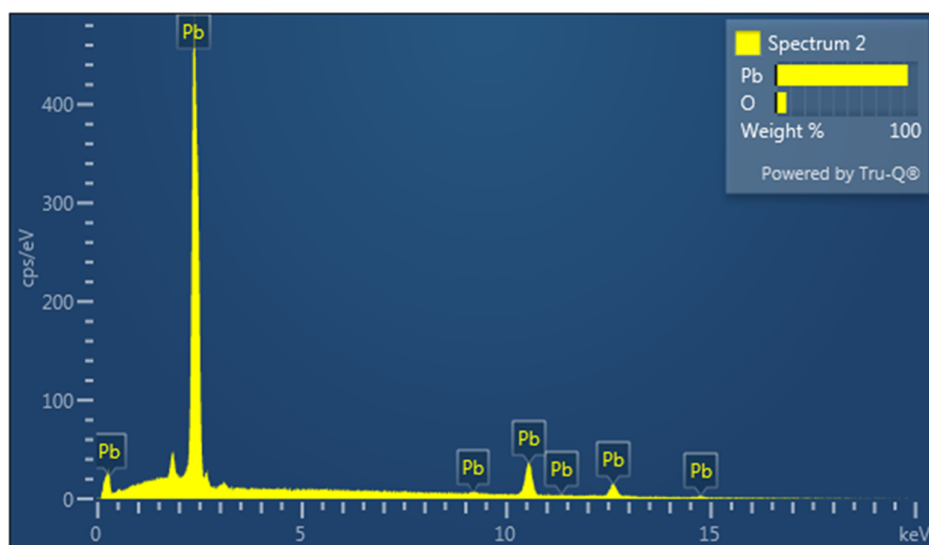


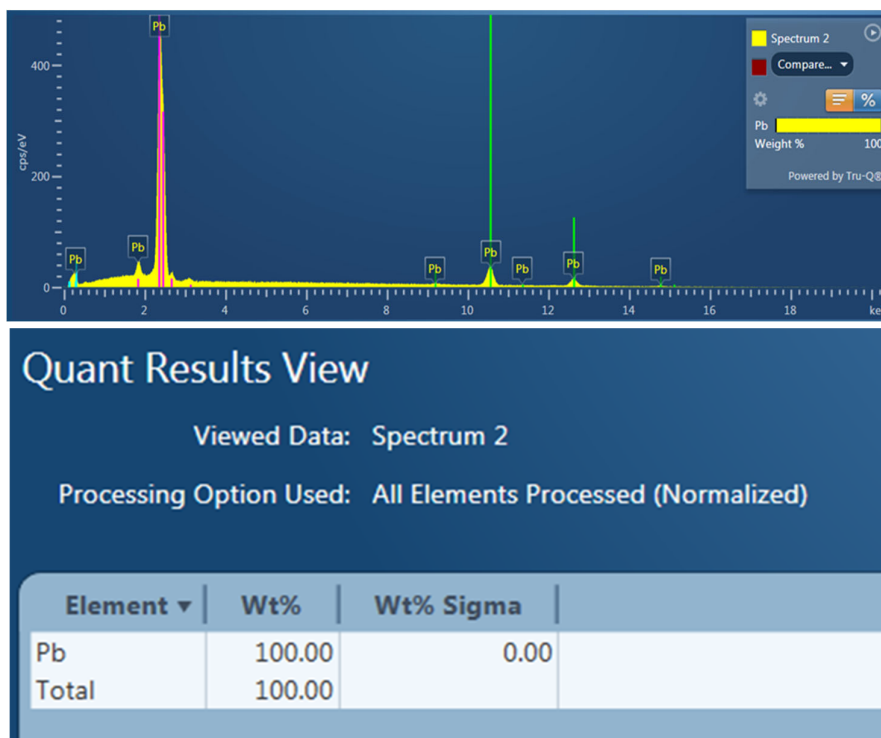
Figure 2 - EDXA spectrum from the reference bullet fragment



North Ridge Estates, SFP-003C

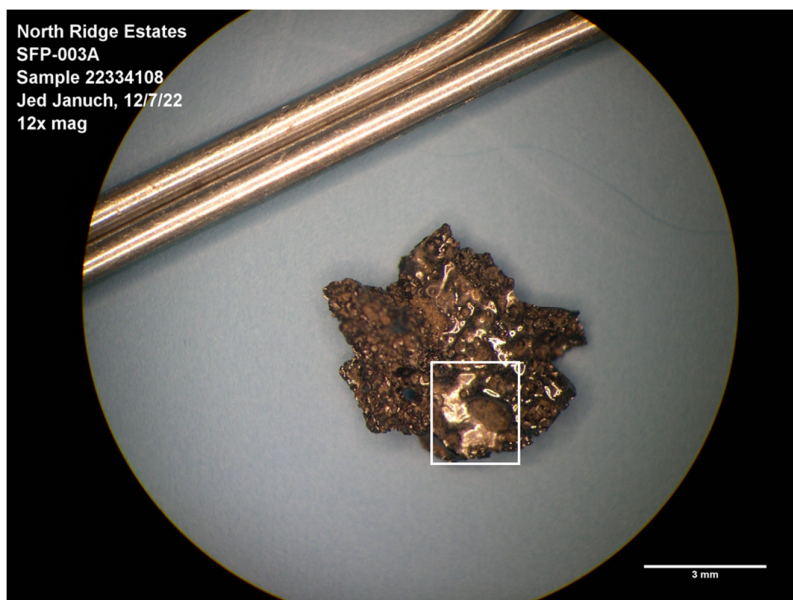
Analyst: Jed Januch, LSASD

Figure 3 - Annotated EDXA spectrum from the reference bullet fragment



22334108A – Suspect metallic fragment isolated from sample

Figure 4 - Stereomicroscope image of suspect metal fragment - sample 22334108A



North Ridge Estates, SFP-003C

Analyst: Jed Januch, LSASD

Figure 5 - SEM image of suspect metallic fragment - sample 22334108A

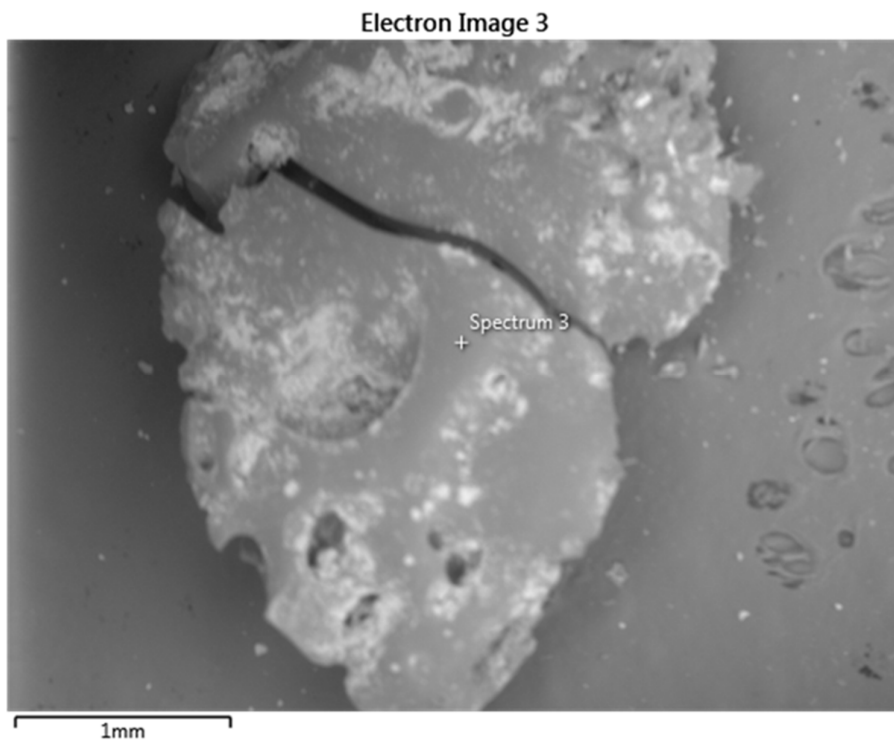
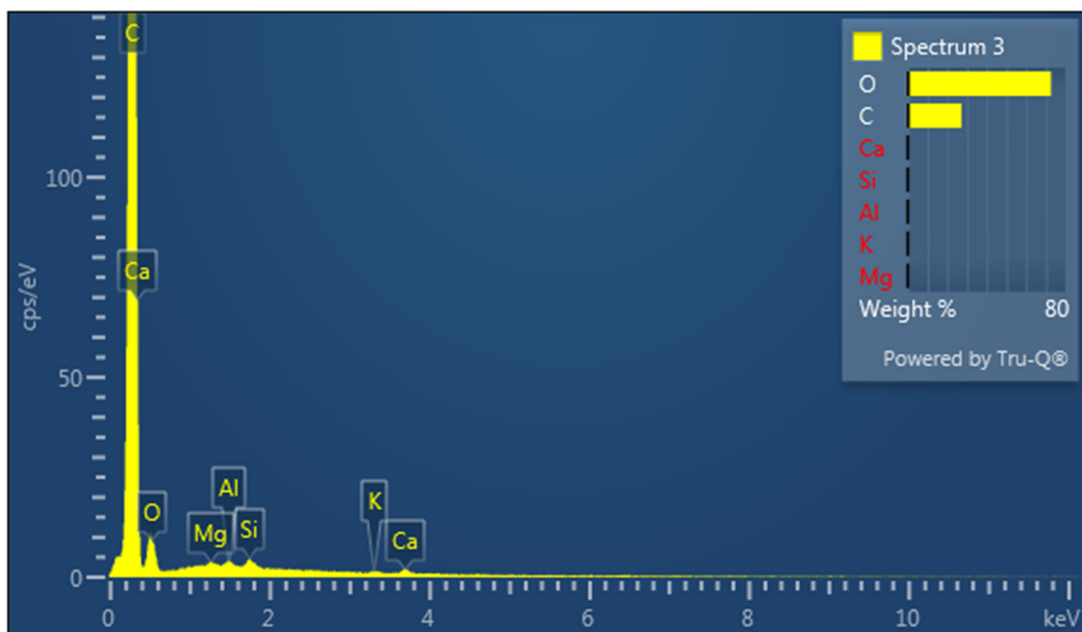


Figure 6 - EDXA spectrum from suspect metallic fragment from sample 22334108A



North Ridge Estates, SFP-003C

Analyst: Jed Januch, LSASD

Figure 7 - General information for spectrum 3. It was collected in low-vacuum mode and was not therefore coated with carbon.

General Information	
Label	Spectrum 3
Acquisition Date	12/7/2022 4:54:19 PM
Acquisition Conditions	
Live Time (seconds)	6.17
Real Time (seconds)	7.55
Process Time	2
Energy Range (keV)	20
Number Of Channels	2048
Energy per Channel (eV)	10.0
Accelerating Voltage (kV)	15.0
Magnification	30
Working Distance (mm)	14.7
Specimen Tilt (degrees)	0.0
Spectrum Information	
Spectrum Area (counts)	312272
Spectrum Count Rate (cps)	41383.1



EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 8/22/2022

CarrierName: FedEx

AirbillNo: 7777 2897 8232

CHAIN OF CUSTODY RECORD

North Ridge Estates OU2/OR

Project Code: SFP-003C

Cooler #: 1 of 1

No: 10-080522-145116-0001

T000FD210RVLA00

Contact Name: Catherine LeCours

Contact Phone: 406-219-1652

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
22334100		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D, IVBA/SW1340(56)	N1 (None) (1)	OU2-RR-BB2	08/11/2022 11:00	Field Sample
22334101		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB211	08/11/2022 13:05	Field Duplicate
22334102		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB212	08/11/2022 16:13	Field Duplicate
22334103		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D, IVBA/SW1340(56)	N1 (None) (1)	OU2-RR-BB3	08/11/2022 17:42	Field Sample
22334104		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB311	08/12/2022 08:45	Field Duplicate
22334105		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB312	08/12/2022 09:54	Field Duplicate
22334106		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D, IVBA/SW1340(56)	N1 (None), N2 (None) (2)	OU2-RR-RF1	08/12/2022 11:28	Field Sample
22334107		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-RF111	08/12/2022 13:33	Field Duplicate
22334108		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-RF112	08/12/2022 14:39	Field Duplicate

Sample(s) to be used for Lab QC: 22334106 Tag N1, 22334106 Tag N2 - Special Instructions: Please see QAPP for sample preparation procedures. DO NOT GRIND SAMPLE - may contain asbestos.

Shipment for Case Complete? Y

Samples Transferred From Chain of Custody #

Analysis Key



Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	 EA	8/22/22 14:30		8/25/22 14:20	

Table A-1 Lead Weighted Totals

ANALYTE	FINAL_RESULT	RESULT_UNITS	FINAL_VALIDATION_QUALIFIER	RESULT_COMMENT	STATION_LOCATION	LOCATION_DESCRIPTION	FIELD_SAMPLE_TYPE	Percent of Sample		Percent of sample <2mm	Adjusted Concentration
Lead	274	mg/kg		< 0.150 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.334	91.516	39.16%	107.2872216
Lead	296	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.288	85.248	33.76%	99.93903869
Lead	1690	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.231	390.39	27.08%	457.6670574
								0.853	567.154	100.00%	664.8933177
Lead	357	mg/kg		< 0.150 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.299	106.743	35.43%	126.4727488
Lead	356	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.313	111.428	37.09%	132.0236967
Lead	366	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.232	84.912	27.49%	100.6066351
								0.844	303.083	100.00%	359.1030806
Lead	309	mg/kg		< 0.150 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.329	101.661	38.21%	118.0731707
Lead	321	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.31	99.51	36.00%	115.5749129
Lead	320	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.222	71.04	25.78%	82.5087108
								0.861	272.211	100.00%	316.1567944
Lead	33.7	mg/kg		< 0.150 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.231	7.7847	30.08%	10.13632813
Lead	30	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.234	7.02	30.47%	9.140625
Lead	24.2	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.303	7.3326	39.45%	9.54765625
								0.768	22.1373	100.00%	28.82460938
Lead	22.1	mg/kg		< 0.150 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.242	5.3482	30.91%	6.830395913
Lead	19.3	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.238	4.5934	30.40%	5.866411239
Lead	16.7	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.303	5.0601	38.70%	6.462452107
								0.783	15.0017	100.00%	19.15925926
Lead	18	mg/kg		< 0.150 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.221	3.978	27.25%	4.905055487
Lead	15.1	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.272	4.1072	33.54%	5.064364982
Lead	16.9	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.318	5.3742	39.21%	6.626633785
								0.811	13.4594	100.00%	16.59605425
Lead	70.7	mg/kg		< 0.150 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.228	16.1196	32.71%	23.12711621
Lead	65.9	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.21	13.839	30.13%	19.85509326
Lead	51.9	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.259	13.4421	37.16%	19.2856528
								0.697	43.4007	100.00%	62.26786227
Lead	84.5	mg/kg		< 0.150 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.23	19.435	34.38%	29.05082212
Lead	76.1	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.192	14.6112	28.70%	21.84035874
Lead	38.9	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.247	9.6083	36.92%	14.36218236
								0.669	43.6545	100.00%	65.25336323
Lead	58.9	mg/kg		< 0.150 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.247	14.5483	35.34%	20.8130186
Lead	48.6	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.195	9.477	27.90%	13.55793991
Lead	33.6	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.257	8.6352	36.77%	12.35364807
								0.699	32.6605	100.00%	46.72460658

>=2.0mm, Gravel	14.3	%	OU2-RR-BB2
>=2.0mm, Gravel	15.1	%	OU2-RR-BB211
>=2.0mm, Gravel	13.6	%	OU2-RR-BB212
>=2.0mm, Gravel	22.9	%	OU2-RR-BB3
>=2.0mm, Gravel	21.4	%	OU2-RR-BB311
>=2.0mm, Gravel	18.5	%	OU2-RR-BB312
>=2.0mm, Gravel	30	%	OU2-RR-RF1
>=2.0mm, Gravel	32.8	%	OU2-RR-RF111
>=2.0mm, Gravel	29.8	%	OU2-RR-RF112

Table A-2 Arsenic Weighted Totals

ANALYTE	FINAL_RESULT	RESULT_UNITS	FINAL_VALIDATION_QUALIFIER	RESULT_COMMENT	STATION_LOCATION	LOCATION_DESCRIPTION	FIELD_SAMPLE_TYPE	Percent of Sample	Percent of sample <2mm	Adjusted Concentration
Arsenic	3.63	mg/kg		< 0.150 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.334	39.16%	1.421359906
Arsenic	4.65	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.288	33.76%	1.569988277
Arsenic	4.52	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.231	27.08%	1.224056272
								0.853	100.00%	4.215404455
Arsenic	3.72	mg/kg		< 0.150 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.299	35.43%	1.317867299
Arsenic	4.85	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.313	37.09%	1.798637441
Arsenic	5.8	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.232	27.49%	1.594312796
								0.844	100.00%	4.710817536
Arsenic	3.65	mg/kg		< 0.150 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.329	38.21%	1.394715447
Arsenic	4.96	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.31	36.00%	1.78583043
Arsenic	5.99	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.222	25.78%	1.54445993
								0.861	100.00%	4.725005807
Arsenic	2.39	mg/kg		< 0.150 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.231	30.08%	0.718867188
Arsenic	2.96	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.234	30.47%	0.901875
Arsenic	3.17	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.303	39.45%	1.250664063
								0.768	100.00%	2.87140625
Arsenic	2.37	mg/kg		< 0.150 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.242	30.91%	0.732490421
Arsenic	3.07	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.238	30.40%	0.933154534
Arsenic	2.95	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.303	38.70%	1.141570881
								0.783	100.00%	2.807215837
Arsenic	2.31	mg/kg		< 0.150 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.221	27.25%	0.629482121
Arsenic	3.19	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.272	33.54%	1.069889026
Arsenic	3	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.318	39.21%	1.176325524
								0.811	100.00%	2.875696671
Arsenic	2.22	mg/kg		< 0.150 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.228	32.71%	0.726197991
Arsenic	2.47	mg/kg		0.15 mm to 0.5 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.21	30.13%	0.744189383
Arsenic	3.14	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.259	37.16%	1.166800574
								0.697	100.00%	2.637187948
Arsenic	2.33	mg/kg		< 0.150 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.23	34.38%	0.801046338
Arsenic	2.51	mg/kg		0.15 mm to 0.5 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.192	28.70%	0.720358744
Arsenic	1.97	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.247	36.92%	0.727339312
								0.669	100.00%	2.248744395
Arsenic	2.33	mg/kg		< 0.150 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.247	35.34%	0.823333333
Arsenic	2.49	mg/kg		0.15 mm to 0.5 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.195	27.90%	0.694635193
Arsenic	1.99	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.257	36.77%	0.731659514
								0.699	100.00%	2.24962804

Table A-3 Antimony Weighted Totals

ANALYTE	FINAL_RESULT	Result_Units	LAB_QUALIFIERS	RESULT_COMMENT	STATION_LOCATION	FIELD_SAMPLE_TYP	Percent of Sample	Percent of sample <2mm	Adjusted Concentration
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB2	Field Sample	0.334	39.16%	0.203610785
Antimony	1.3	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB2	Field Sample	0.288	33.76%	0.438921454
Antimony	5.75	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB2	Field Sample	0.231	27.08%	1.557151231
							0.853	100.00%	2.19968347
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB211	Field Duplicate	0.299	35.43%	0.184218009
Antimony	1.3	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB211	Field Duplicate	0.313	37.09%	0.482109005
Antimony	3.08	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB211	Field Duplicate	0.232	27.49%	0.846635071
							0.844	100.00%	1.512962085
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB212	Field Duplicate	0.329	38.21%	0.198699187
Antimony	1.5	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB212	Field Duplicate	0.31	36.00%	0.540069686
Antimony	3.39	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB212	Field Duplicate	0.222	25.78%	0.874076655
							0.861	100.00%	1.612845528
Antimony	0.53	mg/kg	UJ	< 0.150 mm	OU2-RR-BB3	Field Sample	0.231	30.08%	0.159414063
Antimony	0.5	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-BB3	Field Sample	0.234	30.47%	0.15234375
Antimony	0.5	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-BB3	Field Sample	0.303	39.45%	0.197265625
							0.768	100.00%	0.509023438
Antimony	0.53	mg/kg	UJ	< 0.150 mm	OU2-RR-BB311	Field Duplicate	0.242	30.91%	0.163805875
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-BB311	Field Duplicate	0.238	30.40%	0.148939974
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-BB311	Field Duplicate	0.303	38.70%	0.189616858
							0.783	100.00%	0.502362708
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB312	Field Duplicate	0.221	27.25%	0.141701603
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-BB312	Field Duplicate	0.272	33.54%	0.164340321
Antimony	0.5	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-BB312	Field Duplicate	0.318	39.21%	0.196054254
							0.811	100.00%	0.502096178
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-RF1	Field Sample	0.228	32.71%	0.17010043
Antimony	0.5	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-RF1	Field Sample	0.21	30.13%	0.150645624
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-RF1	Field Sample	0.259	37.16%	0.182080344
							0.697	100.00%	0.502826399
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-RF111	Field Duplicate	0.23	34.38%	0.17877429
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-RF111	Field Duplicate	0.192	28.70%	0.140627803
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-RF111	Field Duplicate	0.247	36.92%	0.180911809
							0.669	100.00%	0.500313901
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-RF112	Field Duplicate	0.247	35.34%	0.183748212
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-RF112	Field Duplicate	0.195	27.90%	0.136695279
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-RF112	Field Duplicate	0.257	36.77%	0.180157368
							0.699	100.00%	0.500600858

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Appendix B

Sample Plan Alteration Form

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US EPA Region 10 Laboratory

Multi-Analyte Final Report



Project Code : SFP-003C

Site : NORTH RIDGE ESTATES: RI-FS

Contact : Robert Tan

Account : 2023T10P000FD210RVLA00

Sample : 22334100-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	5.75	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	4.52	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.13	mg/Kg		12/ 6/22	10
7440473	Chromium	65.0	mg/Kg		12/ 6/22	10
7440484	Cobalt	49.8	mg/Kg		12/ 6/22	10
7440508	Copper	69.3	mg/Kg		12/ 6/22	10
7439921	Lead	1690	mg/Kg	J	12/ 6/22	50
7440020	Nickel	96.1	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.209	mg/Kg		12/ 6/22	10
7440280	Thallium	0.24	mg/Kg		12/ 6/22	10
7440622	Vanadium	208	mg/Kg		12/ 6/22	10
7440666	Zinc	88.1	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	73500	mg/Kg	J	3/ 9/23	5
7440393	Barium	423	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11100	mg/Kg	J	3/ 9/23	5
7439896	Iron	74600	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	10400	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1620	mg/Kg	J	3/ 9/23	5

Target Analyte Results (cont.):

7440097	Potassium	3020 mg/Kg	J	3/ 9/23	5
7440235	Sodium	2200 mg/Kg	J	3/ 9/23	5

Sample : 22334100-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	1.3	mg/Kg	J	12/ 5/22	10
7440382	Arsenic	4.65	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.441	mg/Kg		12/ 5/22	10
7440473	Chromium	57.9	mg/Kg		12/ 5/22	10
7440484	Cobalt	42.2	mg/Kg		12/ 5/22	10
7440508	Copper	65.3	mg/Kg	J	12/ 5/22	10
7439921	Lead	296	mg/Kg	J	12/ 5/22	10
7440020	Nickel	76.5	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.086	mg/Kg		12/ 5/22	10
7440280	Thallium	0.20	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	177	mg/Kg		12/ 5/22	10
7440666	Zinc	80.5	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	69500	mg/Kg	J	3/ 9/23	5
7440393	Barium	367	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	8290	mg/Kg	J	3/ 9/23	5
7439896	Iron	63900	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	7320	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1350	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2960	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1210	mg/Kg	J	3/ 9/23	5

Sample : 22334100-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.63	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.447	mg/Kg		12/ 5/22	10
7440473	Chromium	67.2	mg/Kg		12/ 5/22	10
7440484	Cobalt	32.5	mg/Kg		12/ 5/22	10
7440508	Copper	75.9	mg/Kg		12/ 5/22	10
7439921	Lead	274	mg/Kg		12/ 5/22	10
7440020	Nickel	67.7	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.10	mg/Kg		12/ 5/22	10
7440280	Thallium	0.22	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	177	mg/Kg		12/ 5/22	10
7440666	Zinc	86.6	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	73700	mg/Kg		10/ 5/22	5
7440393	Barium	384	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.07	mg/Kg		10/ 5/22	1
7440702	Calcium	9170	mg/Kg		10/ 5/22	5
7439896	Iron	62400	mg/Kg		10/ 5/22	5
7439954	Magnesium	5140	mg/Kg		10/ 5/22	5
7439965	Manganese	1040	mg/Kg		10/ 5/22	5
7440097	Potassium	3150	mg/Kg		10/ 5/22	5
7440235	Sodium	1380	mg/Kg		10/ 5/22	5

Sample : 22334101-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	3.08	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	5.80	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.15	mg/Kg		12/ 6/22	10
7440473	Chromium	60.8	mg/Kg		12/ 6/22	10
7440484	Cobalt	53.2	mg/Kg		12/ 6/22	10
7440508	Copper	64.3	mg/Kg		12/ 6/22	10
7439921	Lead	366	mg/Kg	J	12/ 6/22	50
7440020	Nickel	90.9	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.12	mg/Kg		12/ 6/22	10
7440280	Thallium	0.350	mg/Kg		12/ 6/22	10
7440622	Vanadium	207	mg/Kg		12/ 6/22	10
7440666	Zinc	87.0	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	67600	mg/Kg	J	3/ 9/23	5
7440393	Barium	419	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	9160	mg/Kg	J	3/ 9/23	5
7439896	Iron	71700	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9500	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1680	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2780	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1400	mg/Kg	J	3/ 9/23	5

Sample : 22334101-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	1.3	mg/Kg	J	12/ 5/22	10
7440382	Arsenic	4.85	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.417	mg/Kg		12/ 5/22	10
7440473	Chromium	58.7	mg/Kg		12/ 5/22	10
7440484	Cobalt	39.1	mg/Kg		12/ 5/22	10
7440508	Copper	63.6	mg/Kg	J	12/ 5/22	10
7439921	Lead	356	mg/Kg	J	12/ 5/22	10
7440020	Nickel	74.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.085	mg/Kg		12/ 5/22	10
7440280	Thallium	0.21	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	176	mg/Kg		12/ 5/22	10
7440666	Zinc	80.8	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	71900	mg/Kg	J	3/ 9/23	5
7440393	Barium	368	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	8150	mg/Kg	J	3/ 9/23	5
7439896	Iron	63600	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	6590	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1300	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2940	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1060	mg/Kg	J	3/ 9/23	5

Sample : 22334101-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.72 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.423 mg/Kg		12/ 5/22	10
7440473	Chromium	65.3 mg/Kg		12/ 5/22	10
7440484	Cobalt	31.0 mg/Kg		12/ 5/22	10
7440508	Copper	70.1 mg/Kg		12/ 5/22	10
7439921	Lead	357 mg/Kg		12/ 5/22	10
7440020	Nickel	64.2 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.11 mg/Kg		12/ 5/22	10
7440280	Thallium	0.22 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	164 mg/Kg		12/ 5/22	10
7440666	Zinc	82.8 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	73000 mg/Kg			10/ 5/22	5
7440393	Barium	376 mg/Kg			10/ 5/22	5
7440417	Beryllium	1.04 mg/Kg			10/ 5/22	1
7440702	Calcium	8360 mg/Kg			10/ 5/22	5
7439896	Iron	60800 mg/Kg			10/ 5/22	5
7439954	Magnesium	4520 mg/Kg			10/ 5/22	5
7439965	Manganese	1020 mg/Kg			10/ 5/22	5
7440097	Potassium	3000 mg/Kg			10/ 5/22	5
7440235	Sodium	1100 mg/Kg			10/ 5/22	5

Sample : 22334102-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	3.39	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	5.99	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.15	mg/Kg		12/ 6/22	10
7440473	Chromium	67.2	mg/Kg		12/ 6/22	10
7440484	Cobalt	51.0	mg/Kg		12/ 6/22	10
7440508	Copper	69.7	mg/Kg		12/ 6/22	10
7439921	Lead	320	mg/Kg	J	12/ 6/22	50
7440020	Nickel	99.4	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.141	mg/Kg		12/ 6/22	10
7440280	Thallium	0.22	mg/Kg		12/ 6/22	10
7440622	Vanadium	218	mg/Kg		12/ 6/22	10
7440666	Zinc	90.6	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	72100	mg/Kg	J	3/ 9/23	5
7440393	Barium	409	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.2	mg/Kg	J	3/ 9/23	5
7440702	Calcium	9210	mg/Kg	J	3/ 9/23	5
7439896	Iron	75200	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	10400	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1570	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2850	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1500	mg/Kg	J	3/ 9/23	5

Sample : 22334102-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	1.5	mg/Kg	J	12/ 5/22	10
7440382	Arsenic	4.96	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.451	mg/Kg		12/ 5/22	10
7440473	Chromium	57.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	41.1	mg/Kg		12/ 5/22	10
7440508	Copper	64.7	mg/Kg	J	12/ 5/22	10
7439921	Lead	321	mg/Kg	J	12/ 5/22	10
7440020	Nickel	74.4	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.087	mg/Kg		12/ 5/22	10
7440280	Thallium	0.20	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	177	mg/Kg		12/ 5/22	10
7440666	Zinc	81.0	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	66900	mg/Kg	J	3/ 9/23	5
7440393	Barium	359	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	7530	mg/Kg	J	3/ 9/23	5
7439896	Iron	62800	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	6990	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1330	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2840	mg/Kg	J	3/ 9/23	5
7440235	Sodium	930	mg/Kg	J	3/ 9/23	5

Sample : 22334102-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.65 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.437 mg/Kg		12/ 5/22	10
7440473	Chromium	62.3 mg/Kg		12/ 5/22	10
7440484	Cobalt	31.2 mg/Kg		12/ 5/22	10
7440508	Copper	70.0 mg/Kg		12/ 5/22	10
7439921	Lead	309 mg/Kg		12/ 5/22	10
7440020	Nickel	62.8 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.096 mg/Kg		12/ 5/22	10
7440280	Thallium	0.22 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	161 mg/Kg		12/ 5/22	10
7440666	Zinc	81.7 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	70900 mg/Kg			10/ 5/22	5
7440393	Barium	373 mg/Kg			10/ 5/22	5
7440417	Beryllium	1.06 mg/Kg			10/ 5/22	1
7440702	Calcium	7930 mg/Kg			10/ 5/22	5
7439896	Iron	60200 mg/Kg			10/ 5/22	5
7439954	Magnesium	4510 mg/Kg			10/ 5/22	5
7439965	Manganese	1050 mg/Kg			10/ 5/22	5
7440097	Potassium	2980 mg/Kg			10/ 5/22	5
7440235	Sodium	961 mg/Kg			10/ 5/22	5

Sample : 22334103-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	3.17	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.12	mg/Kg		12/ 6/22	10
7440473	Chromium	60.7	mg/Kg		12/ 6/22	10
7440484	Cobalt	47.9	mg/Kg		12/ 6/22	10
7440508	Copper	65.8	mg/Kg		12/ 6/22	10
7439921	Lead	24.2	mg/Kg	J	12/ 6/22	50
7440020	Nickel	86.6	mg/Kg		12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.089	mg/Kg		12/ 6/22	10
7440280	Thallium	0.25	mg/Kg		12/ 6/22	10
7440622	Vanadium	153	mg/Kg		12/ 6/22	10
7440666	Zinc	78.0	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	69400	mg/Kg	J	3/ 9/23	5
7440393	Barium	369	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11600	mg/Kg	J	3/ 9/23	5
7439896	Iron	66400	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9620	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1530	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2640	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2150	mg/Kg	J	3/ 9/23	5

Sample : 22334103-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.96	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.439	mg/Kg		12/ 5/22	10
7440473	Chromium	54.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	40.7	mg/Kg		12/ 5/22	10
7440508	Copper	60.0	mg/Kg	J	12/ 5/22	10
7439921	Lead	30.0	mg/Kg	J	12/ 5/22	10
7440020	Nickel	77.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.079	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	144	mg/Kg		12/ 5/22	10
7440666	Zinc	79.0	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	64900	mg/Kg	J	3/ 9/23	5
7440393	Barium	333	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	10200	mg/Kg	J	3/ 9/23	5
7439896	Iron	60300	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	8760	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1340	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2570	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1750	mg/Kg	J	3/ 9/23	5

Sample : 22334103-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.53 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.39 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.434 mg/Kg		12/ 5/22	10
7440473	Chromium	61.7 mg/Kg		12/ 5/22	10
7440484	Cobalt	31.3 mg/Kg		12/ 5/22	10
7440508	Copper	66.1 mg/Kg		12/ 5/22	10
7439921	Lead	33.7 mg/Kg		12/ 5/22	10
7440020	Nickel	66.5 mg/Kg		12/ 5/22	10
7782492	Selenium	0.11 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.088 mg/Kg		12/ 5/22	10
7440280	Thallium	0.19 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	148 mg/Kg		12/ 5/22	10
7440666	Zinc	80.9 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	69000	mg/Kg		10/ 5/22	5
7440393	Barium	333	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.02	mg/Kg		10/ 5/22	1
7440702	Calcium	11000	mg/Kg		10/ 5/22	5
7439896	Iron	60000	mg/Kg		10/ 5/22	5
7439954	Magnesium	6530	mg/Kg		10/ 5/22	5
7439965	Manganese	1000	mg/Kg		10/ 5/22	5
7440097	Potassium	2680	mg/Kg		10/ 5/22	5
7440235	Sodium	1970	mg/Kg		10/ 5/22	5

Sample : 22334104-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	2.95	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.11	mg/Kg		12/ 6/22	10
7440473	Chromium	57.3	mg/Kg		12/ 6/22	10
7440484	Cobalt	51.0	mg/Kg		12/ 6/22	10
7440508	Copper	61.8	mg/Kg		12/ 6/22	10
7439921	Lead	16.7	mg/Kg	J	12/ 6/22	50
7440020	Nickel	85.6	mg/Kg		12/ 6/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.090	mg/Kg		12/ 6/22	10
7440280	Thallium	0.23	mg/Kg		12/ 6/22	10
7440622	Vanadium	147	mg/Kg		12/ 6/22	10
7440666	Zinc	75.0	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	67500	mg/Kg	J	3/ 9/23	5
7440393	Barium	385	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11900	mg/Kg	J	3/ 9/23	5
7439896	Iron	65800	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9680	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1650	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2720	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2240	mg/Kg	J	3/ 9/23	5

Sample : 22334104-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.07	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.438	mg/Kg		12/ 5/22	10
7440473	Chromium	53.2	mg/Kg		12/ 5/22	10
7440484	Cobalt	40.5	mg/Kg		12/ 5/22	10
7440508	Copper	58.4	mg/Kg	J	12/ 5/22	10
7439921	Lead	19.3	mg/Kg	J	12/ 5/22	10
7440020	Nickel	75.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.077	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	147	mg/Kg		12/ 5/22	10
7440666	Zinc	76.5	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	64300	mg/Kg	J	3/ 9/23	5
7440393	Barium	327	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	10000	mg/Kg	J	3/ 9/23	5
7439896	Iron	59700	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	8650	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1350	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2610	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1700	mg/Kg	J	3/ 9/23	5

Sample : 22334104-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.53	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.37	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.393	mg/Kg		12/ 5/22	10
7440473	Chromium	57.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	29.1	mg/Kg		12/ 5/22	10
7440508	Copper	62.0	mg/Kg		12/ 5/22	10
7439921	Lead	22.1	mg/Kg		12/ 5/22	10
7440020	Nickel	62.1	mg/Kg		12/ 5/22	10
7782492	Selenium	0.11	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.081	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	140	mg/Kg		12/ 5/22	10
7440666	Zinc	74.3	mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	65900	mg/Kg		10/ 5/22	5
7440393	Barium	322	mg/Kg		10/ 5/22	5
7440417	Beryllium	0.993	mg/Kg		10/ 5/22	1
7440702	Calcium	10200	mg/Kg		10/ 5/22	5
7439896	Iron	57300	mg/Kg		10/ 5/22	5
7439954	Magnesium	6120	mg/Kg		10/ 5/22	5
7439965	Manganese	976	mg/Kg		10/ 5/22	5
7440097	Potassium	2650	mg/Kg		10/ 5/22	5
7440235	Sodium	1690	mg/Kg		10/ 5/22	5

Sample : 22334105-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	3.00	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.13	mg/Kg		12/ 6/22	10
7440473	Chromium	61.5	mg/Kg		12/ 6/22	10
7440484	Cobalt	47.7	mg/Kg		12/ 6/22	10
7440508	Copper	65.0	mg/Kg		12/ 6/22	10
7439921	Lead	16.9	mg/Kg	J	12/ 6/22	50
7440020	Nickel	88.7	mg/Kg		12/ 6/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.084	mg/Kg		12/ 6/22	10
7440280	Thallium	0.21	mg/Kg		12/ 6/22	10
7440622	Vanadium	154	mg/Kg		12/ 6/22	10
7440666	Zinc	77.8	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	70000	mg/Kg	J	3/ 9/23	5
7440393	Barium	367	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	12300	mg/Kg	J	3/ 9/23	5
7439896	Iron	65500	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	9720	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1500	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2720	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2450	mg/Kg	J	3/ 9/23	5

Sample : 22334105-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	3.19	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.403	mg/Kg		12/ 5/22	10
7440473	Chromium	55.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	37.9	mg/Kg		12/ 5/22	10
7440508	Copper	56.8	mg/Kg	J	12/ 5/22	10
7439921	Lead	15.1	mg/Kg	J	12/ 5/22	10
7440020	Nickel	74.2	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.079	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	145	mg/Kg		12/ 5/22	10
7440666	Zinc	72.9	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	66600	mg/Kg	J	3/ 9/23	5
7440393	Barium	325	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	1.1	mg/Kg	J	3/ 9/23	5
7440702	Calcium	9220	mg/Kg	J	3/ 9/23	5
7439896	Iron	59000	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	7770	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1290	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2650	mg/Kg	J	3/ 9/23	5
7440235	Sodium	1440	mg/Kg	J	3/ 9/23	5

Sample : 22334105-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.31	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.376	mg/Kg		12/ 5/22	10
7440473	Chromium	56.6	mg/Kg		12/ 5/22	10
7440484	Cobalt	28.5	mg/Kg		12/ 5/22	10
7440508	Copper	57.6	mg/Kg		12/ 5/22	10
7439921	Lead	18.0	mg/Kg		12/ 5/22	10
7440020	Nickel	60.5	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.078	mg/Kg		12/ 5/22	10
7440280	Thallium	0.19	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	134	mg/Kg		12/ 5/22	10
7440666	Zinc	73.8	mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	66200	mg/Kg		10/ 5/22	5
7440393	Barium	329	mg/Kg		10/ 5/22	5
7440417	Beryllium	1.05	mg/Kg		10/ 5/22	1
7440702	Calcium	9430	mg/Kg		10/ 5/22	5
7439896	Iron	57000	mg/Kg		10/ 5/22	5
7439954	Magnesium	5600	mg/Kg		10/ 5/22	5
7439965	Manganese	983	mg/Kg		10/ 5/22	5
7440097	Potassium	2660	mg/Kg		10/ 5/22	5
7440235	Sodium	1430	mg/Kg		10/ 5/22	5

Sample : 22334106-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	3.14	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.15	mg/Kg		12/ 6/22	10
7440473	Chromium	50.3	mg/Kg		12/ 6/22	10
7440484	Cobalt	44.6	mg/Kg		12/ 6/22	10
7440508	Copper	59.2	mg/Kg		12/ 6/22	10
7439921	Lead	51.9	mg/Kg	J	12/ 6/22	50
7440020	Nickel	94.3	mg/Kg		12/ 6/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.071	mg/Kg		12/ 6/22	10
7440280	Thallium	0.16	mg/Kg		12/ 6/22	10
7440622	Vanadium	125	mg/Kg		12/ 6/22	10
7440666	Zinc	86.4	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	53000	mg/Kg	J	3/ 9/23	5
7440393	Barium	304	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.81	mg/Kg	J	3/ 9/23	5
7440702	Calcium	14100	mg/Kg	J	3/ 9/23	5
7439896	Iron	57000	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15300	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1350	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1920	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2610	mg/Kg	J	3/ 9/23	5

Sample : 22334106-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.47	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.481	mg/Kg		12/ 5/22	10
7440473	Chromium	52.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	46.0	mg/Kg		12/ 5/22	10
7440508	Copper	68.8	mg/Kg	J	12/ 5/22	10
7439921	Lead	65.9	mg/Kg	J	12/ 5/22	10
7440020	Nickel	100	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.080	mg/Kg		12/ 5/22	10
7440280	Thallium	0.24	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	133	mg/Kg		12/ 5/22	10
7440666	Zinc	93.7	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	59700	mg/Kg	J	3/ 9/23	5
7440393	Barium	327	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.96	mg/Kg	J	3/ 9/23	5
7440702	Calcium	11900	mg/Kg	J	3/ 9/23	5
7439896	Iron	60100	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15000	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1430	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2130	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2170	mg/Kg	J	3/ 9/23	5

Sample : 22334106-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.22 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.486 mg/Kg		12/ 5/22	10
7440473	Chromium	58.4 mg/Kg		12/ 5/22	10
7440484	Cobalt	37.3 mg/Kg		12/ 5/22	10
7440508	Copper	77.7 mg/Kg		12/ 5/22	10
7439921	Lead	70.7 mg/Kg		12/ 5/22	10
7440020	Nickel	73.7 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.093 mg/Kg		12/ 5/22	10
7440280	Thallium	0.268 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	140 mg/Kg		12/ 5/22	10
7440666	Zinc	98.5 mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	62900 mg/Kg			10/ 5/22	5
7440393	Barium	343 mg/Kg			10/ 5/22	5
7440417	Beryllium	0.936 mg/Kg			10/ 5/22	1
7440702	Calcium	11000 mg/Kg			10/ 5/22	5
7439896	Iron	61400 mg/Kg			10/ 5/22	5
7439954	Magnesium	9850 mg/Kg			10/ 5/22	5
7439965	Manganese	1210 mg/Kg			10/ 5/22	5
7440097	Potassium	2300 mg/Kg			10/ 5/22	5
7440235	Sodium	1880 mg/Kg			10/ 5/22	5

Sample : 22334107-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	1.97	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.13	mg/Kg		12/ 6/22	10
7440473	Chromium	48.6	mg/Kg		12/ 6/22	10
7440484	Cobalt	42.7	mg/Kg		12/ 6/22	10
7440508	Copper	57.5	mg/Kg		12/ 6/22	10
7439921	Lead	38.9	mg/Kg	J	12/ 6/22	50
7440020	Nickel	91.3	mg/Kg		12/ 6/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.069	mg/Kg		12/ 6/22	10
7440280	Thallium	0.17	mg/Kg		12/ 6/22	10
7440622	Vanadium	116	mg/Kg		12/ 6/22	10
7440666	Zinc	88.7	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	53400	mg/Kg	J	3/ 9/23	5
7440393	Barium	289	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.75	mg/Kg	J	3/ 9/23	5
7440702	Calcium	15300	mg/Kg	J	3/ 9/23	5
7439896	Iron	54000	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15000	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1320	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1940	mg/Kg	J	3/ 9/23	5
7440235	Sodium	3010	mg/Kg	J	3/ 9/23	5

Sample : 22334107-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.51	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.423	mg/Kg		12/ 5/22	10
7440473	Chromium	50.6	mg/Kg		12/ 5/22	10
7440484	Cobalt	44.3	mg/Kg		12/ 5/22	10
7440508	Copper	62.9	mg/Kg	J	12/ 5/22	10
7439921	Lead	76.1	mg/Kg	J	12/ 5/22	10
7440020	Nickel	104	mg/Kg		12/ 5/22	10
7782492	Selenium	0.099	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.071	mg/Kg		12/ 5/22	10
7440280	Thallium	0.17	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	124	mg/Kg		12/ 5/22	10
7440666	Zinc	98.9	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	56500	mg/Kg	J	3/ 9/23	5
7440393	Barium	305	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.91	mg/Kg	J	3/ 9/23	5
7440702	Calcium	12700	mg/Kg	J	3/ 9/23	5
7439896	Iron	57200	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	16000	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1410	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2100	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2290	mg/Kg	J	3/ 9/23	5

Sample : 22334107-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.33	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.481	mg/Kg		12/ 5/22	10
7440473	Chromium	58.7	mg/Kg		12/ 5/22	10
7440484	Cobalt	36.5	mg/Kg		12/ 5/22	10
7440508	Copper	78.1	mg/Kg		12/ 5/22	10
7439921	Lead	84.5	mg/Kg		12/ 5/22	10
7440020	Nickel	73.2	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.090	mg/Kg		12/ 5/22	10
7440280	Thallium	0.18	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	137	mg/Kg		12/ 5/22	10
7440666	Zinc	112	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	63400	mg/Kg		10/ 5/22	5
7440393	Barium	346	mg/Kg		10/ 5/22	5
7440417	Beryllium	0.962	mg/Kg		10/ 5/22	1
7440702	Calcium	11900	mg/Kg		10/ 5/22	5
7439896	Iron	61800	mg/Kg		10/ 5/22	5
7439954	Magnesium	10100	mg/Kg		10/ 5/22	5
7439965	Manganese	1230	mg/Kg		10/ 5/22	5
7440097	Potassium	2380	mg/Kg		10/ 5/22	5
7440235	Sodium	2030	mg/Kg		10/ 5/22	5

Sample : 22334108-B Component #2 of 5

0.5 mm to 2.0 mm

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 6/22	10
7440382	Arsenic	1.99	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.12	mg/Kg		12/ 6/22	10
7440473	Chromium	48.5	mg/Kg		12/ 6/22	10
7440484	Cobalt	40.8	mg/Kg		12/ 6/22	10
7440508	Copper	303	mg/Kg		12/ 6/22	10
7439921	Lead	33.6	mg/Kg	J	12/ 6/22	50
7440020	Nickel	90.6	mg/Kg		12/ 6/22	10
7782492	Selenium	0.097	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.139	mg/Kg		12/ 6/22	10
7440280	Thallium	0.16	mg/Kg		12/ 6/22	10
7440622	Vanadium	118	mg/Kg		12/ 6/22	10
7440666	Zinc	101	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	52700	mg/Kg	J	3/ 9/23	5
7440393	Barium	305	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.77	mg/Kg	J	3/ 9/23	5
7440702	Calcium	15300	mg/Kg	J	3/ 9/23	5
7439896	Iron	54500	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15300	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1230	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1880	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2920	mg/Kg	J	3/ 9/23	5

Sample : 22334108-C Component #3 of 5

0.15 mm to 0.5 mm

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : ICP/MS

Fraction : Total

3/17/2023 12:38:51PM

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.49	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.49	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.396	mg/Kg		12/ 5/22	10
7440473	Chromium	50.0	mg/Kg		12/ 5/22	10
7440484	Cobalt	44.4	mg/Kg		12/ 5/22	10
7440508	Copper	62.9	mg/Kg	J	12/ 5/22	10
7439921	Lead	48.6	mg/Kg	J	12/ 5/22	10
7440020	Nickel	101	mg/Kg		12/ 5/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.071	mg/Kg		12/ 5/22	10
7440280	Thallium	0.16	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	126	mg/Kg		12/ 5/22	10
7440666	Zinc	82.6	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	56300	mg/Kg	J	3/ 9/23	5
7440393	Barium	289	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.89	mg/Kg	J	3/ 9/23	5
7440702	Calcium	12800	mg/Kg	J	3/ 9/23	5
7439896	Iron	56100	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15600	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1340	mg/Kg	J	3/ 9/23	5
7440097	Potassium	2000	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2360	mg/Kg	J	3/ 9/23	5

Sample : 22334108-D Component #4 of 5

< 0.150 mm

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.52 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.33 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.467 mg/Kg		12/ 5/22	10
7440473	Chromium	57.2 mg/Kg		12/ 5/22	10
7440484	Cobalt	38.0 mg/Kg		12/ 5/22	10
7440508	Copper	76.9 mg/Kg		12/ 5/22	10
7439921	Lead	58.9 mg/Kg		12/ 5/22	10
7440020	Nickel	74.2 mg/Kg		12/ 5/22	10
7782492	Selenium	0.10 mg/Kg	U	12/ 5/22	10
7440224	Silver	0.10 mg/Kg		12/ 5/22	10
7440280	Thallium	0.18 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	138 mg/Kg		12/ 5/22	10
7440666	Zinc	91.7 mg/Kg		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	60400 mg/Kg			10/ 5/22	5
7440393	Barium	343 mg/Kg			10/ 5/22	5
7440417	Beryllium	0.957 mg/Kg			10/ 5/22	1
7440702	Calcium	11400 mg/Kg			10/ 5/22	5
7439896	Iron	60600 mg/Kg			10/ 5/22	5
7439954	Magnesium	10200 mg/Kg			10/ 5/22	5
7439965	Manganese	1260 mg/Kg			10/ 5/22	5
7440097	Potassium	2260 mg/Kg			10/ 5/22	5
7440235	Sodium	1870 mg/Kg			10/ 5/22	5

Sample : 22334106-D Sample Duplicate

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.52	mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.30	mg/Kg		12/ 5/22	10
7440439	Cadmium	0.542	mg/Kg		12/ 5/22	10
7440473	Chromium	60.2	mg/Kg		12/ 5/22	10
7440484	Cobalt	37.9	mg/Kg		12/ 5/22	10
7440508	Copper	80.4	mg/Kg		12/ 5/22	10
7439921	Lead	71.2	mg/Kg		12/ 5/22	10
7440020	Nickel	75.6	mg/Kg		12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.096	mg/Kg		12/ 5/22	10
7440280	Thallium	0.24	mg/Kg	J	12/ 5/22	10
7440622	Vanadium	146	mg/Kg		12/ 5/22	10
7440666	Zinc	101	mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	62400	mg/Kg		10/ 5/22	5
7440393	Barium	347	mg/Kg		10/ 5/22	5
7440417	Beryllium	0.938	mg/Kg		10/ 5/22	1
7440702	Calcium	11000	mg/Kg		10/ 5/22	5
7439896	Iron	61700	mg/Kg		10/ 5/22	5
7439954	Magnesium	9910	mg/Kg		10/ 5/22	5
7439965	Manganese	1210	mg/Kg		10/ 5/22	5
7440097	Potassium	2290	mg/Kg		10/ 5/22	5
7440235	Sodium	1860	mg/Kg		10/ 5/22	5

Sample : 22334106-B Sample Duplicate

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

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Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	2.3	mg/Kg	J	12/ 6/22	10
7440382	Arsenic	2.22	mg/Kg	J	12/ 6/22	10
7440439	Cadmium	0.16	mg/Kg		12/ 6/22	10
7440473	Chromium	50.1	mg/Kg		12/ 6/22	10
7440484	Cobalt	45.7	mg/Kg		12/ 6/22	10
7440508	Copper	60.6	mg/Kg		12/ 6/22	10
7439921	Lead	464	mg/Kg	J	12/ 6/22	50
7440020	Nickel	95.7	mg/Kg		12/ 6/22	10
7782492	Selenium	0.098	mg/Kg	UJ	12/ 6/22	10
7440224	Silver	0.097	mg/Kg		12/ 6/22	10
7440280	Thallium	0.18	mg/Kg		12/ 6/22	10
7440622	Vanadium	126	mg/Kg		12/ 6/22	10
7440666	Zinc	84.9	mg/Kg		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	52400	mg/Kg	J	3/ 9/23	5
7440393	Barium	308	mg/Kg	J	3/ 9/23	5
7440417	Beryllium	0.80	mg/Kg	J	3/ 9/23	5
7440702	Calcium	13800	mg/Kg	J	3/ 9/23	5
7439896	Iron	57500	mg/Kg	J	3/ 9/23	5
7439954	Magnesium	15400	mg/Kg	J	3/ 9/23	5
7439965	Manganese	1400	mg/Kg	J	3/ 9/23	5
7440097	Potassium	1950	mg/Kg	J	3/ 9/23	5
7440235	Sodium	2530	mg/Kg	J	3/ 9/23	5

Sample : 22334106-C Sample Duplicate

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						

Target Analyte Results (cont.):

7440360	Antimony	0.48 mg/Kg	UJ	12/ 5/22	10
7440382	Arsenic	2.68 mg/Kg		12/ 5/22	10
7440439	Cadmium	0.489 mg/Kg		12/ 5/22	10
7440473	Chromium	48.8 mg/Kg		12/ 5/22	10
7440484	Cobalt	45.4 mg/Kg		12/ 5/22	10
7440508	Copper	65.6 mg/Kg	J	12/ 5/22	10
7439921	Lead	109 mg/Kg	J	12/ 5/22	10
7440020	Nickel	95.0 mg/Kg		12/ 5/22	10
7782492	Selenium	0.096 mg/Kg	UJ	12/ 5/22	10
7440224	Silver	0.084 mg/Kg		12/ 5/22	10
7440280	Thallium	0.21 mg/Kg	J	12/ 5/22	10
7440622	Vanadium	128 mg/Kg		12/ 5/22	10
7440666	Zinc	90.4 mg/Kg		12/ 5/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	56600 mg/Kg	J		3/ 9/23	5
7440393	Barium	318 mg/Kg	J		3/ 9/23	5
7440417	Beryllium	0.95 mg/Kg	J		3/ 9/23	5
7440702	Calcium	11500 mg/Kg	J		3/ 9/23	5
7439896	Iron	58900 mg/Kg	J		3/ 9/23	5
7439954	Magnesium	14800 mg/Kg	J		3/ 9/23	5
7439965	Manganese	1430 mg/Kg	J		3/ 9/23	5
7440097	Potassium	2090 mg/Kg	J		3/ 9/23	5
7440235	Sodium	2000 mg/Kg	J		3/ 9/23	5

Sample : 22334106-D Matrix Spike**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	9	%Rec		12/ 5/22	10
7440382	Arsenic	90	%Rec		12/ 5/22	10
7440439	Cadmium	93	%Rec		12/ 5/22	10
7440473	Chromium	104	%Rec		12/ 5/22	10
7440484	Cobalt	107	%Rec		12/ 5/22	10
7440508	Copper	105	%Rec		12/ 5/22	10
7439921	Lead	105	%Rec		12/ 5/22	10
7440020	Nickel	98	%Rec		12/ 5/22	10
7782492	Selenium	93	%Rec		12/ 5/22	10
7440224	Silver	95	%Rec		12/ 5/22	10
7440280	Thallium	99	%Rec		12/ 5/22	10
7440622	Vanadium	98	%Rec		12/ 5/22	10
7440666	Zinc	99	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	10/ 5/22	5
7440393	Barium	100	%Rec		10/ 5/22	5
7440417	Beryllium	96	%Rec		10/ 5/22	1
7439896	Iron			NA	10/ 5/22	5
7439965	Manganese			NA	10/ 5/22	5

Sample : 22334106-B Matrix Spike**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	29	%Rec		12/ 6/22	10
7440382	Arsenic	94	%Rec		12/ 6/22	10
7440439	Cadmium	101	%Rec		12/ 6/22	10
7440473	Chromium	100	%Rec		12/ 6/22	10
7440484	Cobalt	107	%Rec		12/ 6/22	10
7440508	Copper	100	%Rec		12/ 6/22	10
7439921	Lead	97	%Rec		12/ 6/22	50
7440020	Nickel	106	%Rec		12/ 6/22	10
7782492	Selenium	96	%Rec		12/ 6/22	10
7440224	Silver	100	%Rec		12/ 6/22	10
7440280	Thallium	99	%Rec		12/ 6/22	10
7440622	Vanadium	101	%Rec		12/ 6/22	10
7440666	Zinc	94	%Rec		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium			NA	3/ 9/23	5
7440417	Beryllium	101	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : 22334106-C Matrix Spike

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	22	%Rec		12/ 5/22	10
7440382	Arsenic	92	%Rec		12/ 5/22	10
7440439	Cadmium	89	%Rec		12/ 5/22	10
7440473	Chromium	104	%Rec		12/ 5/22	10
7440484	Cobalt	120	%Rec		12/ 5/22	10
7440508	Copper	126	%Rec		12/ 5/22	10
7439921	Lead	115	%Rec		12/ 5/22	10

Spiked Compounds (cont.):

7440020	Nickel	99	%Rec	12/ 5/22	10
7782492	Selenium	94	%Rec	12/ 5/22	10
7440224	Silver	90	%Rec	12/ 5/22	10
7440280	Thallium	100	%Rec	12/ 5/22	10
7440622	Vanadium	101	%Rec	12/ 5/22	10
7440666	Zinc	97	%Rec	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium	97	%Rec		3/ 9/23	5
7440417	Beryllium	103	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : 22334106-D Matrix Spike#2**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	13	%Rec		12/ 5/22	10
7440382	Arsenic	93	%Rec		12/ 5/22	10
7440439	Cadmium	92	%Rec		12/ 5/22	10
7440473	Chromium	100	%Rec		12/ 5/22	10
7440484	Cobalt	109	%Rec		12/ 5/22	10
7440508	Copper	112	%Rec		12/ 5/22	10
7439921	Lead	107	%Rec		12/ 5/22	10
7440020	Nickel	99	%Rec		12/ 5/22	10
7782492	Selenium	96	%Rec		12/ 5/22	10
7440224	Silver	98	%Rec		12/ 5/22	10
7440280	Thallium	101	%Rec		12/ 5/22	10
7440622	Vanadium	103	%Rec		12/ 5/22	10
7440666	Zinc	100	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	10/ 5/22	5
7440393	Barium	102	%Rec		10/ 5/22	5
7440417	Beryllium	97	%Rec		10/ 5/22	1
7439896	Iron			NA	10/ 5/22	5
7439965	Manganese			NA	10/ 5/22	5

Sample : 22334106-B Matrix Spike#2**Information :** OU2-RR-RF1**Matrix :** Soil**Collected :** 8/12/2022 11:28:00AM**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	29	%Rec		12/ 6/22	10
7440382	Arsenic	95	%Rec		12/ 6/22	10
7440439	Cadmium	100	%Rec		12/ 6/22	10
7440473	Chromium	119	%Rec		12/ 6/22	10
7440484	Cobalt	109	%Rec		12/ 6/22	10
7440508	Copper	115	%Rec		12/ 6/22	10
7439921	Lead	291	%Rec		12/ 6/22	50
7440020	Nickel	111	%Rec		12/ 6/22	10
7782492	Selenium	97	%Rec		12/ 6/22	10
7440224	Silver	99	%Rec		12/ 6/22	10
7440280	Thallium	99	%Rec		12/ 6/22	10
7440622	Vanadium	104	%Rec		12/ 6/22	10
7440666	Zinc	110	%Rec		12/ 6/22	10

Parameter : ICP-AES

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium			NA	3/ 9/23	5
7440417	Beryllium	102	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : 22334106-C Matrix Spike#2

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : ICP/MS

Fraction : Total

Prep Method: 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling

Analysis Method: 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846

Weight Basis : Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	25	%Rec		12/ 5/22	10
7440382	Arsenic	95	%Rec		12/ 5/22	10
7440439	Cadmium	91	%Rec		12/ 5/22	10
7440473	Chromium	110	%Rec		12/ 5/22	10
7440484	Cobalt	123	%Rec		12/ 5/22	10
7440508	Copper	128	%Rec		12/ 5/22	10
7439921	Lead	108	%Rec		12/ 5/22	10

Spiked Compounds (cont.):

7440020	Nickel	107	%Rec	12/ 5/22	10
7782492	Selenium	94	%Rec	12/ 5/22	10
7440224	Silver	91	%Rec	12/ 5/22	10
7440280	Thallium	101	%Rec	12/ 5/22	10
7440622	Vanadium	113	%Rec	12/ 5/22	10
7440666	Zinc	106	%Rec	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum			NA	3/ 9/23	5
7440393	Barium	95	%Rec		3/ 9/23	5
7440417	Beryllium	103	%Rec		3/ 9/23	5
7439896	Iron			NA	3/ 9/23	5
7439965	Manganese			NA	3/ 9/23	5

Sample : IS100422ABL Blank**Information :** Blank**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	U	12/ 5/22	10
7440382	Arsenic	0.20	mg/Kg	U	12/ 5/22	10
7440439	Cadmium	0.050	mg/Kg	U	12/ 5/22	10
7440473	Chromium	0.40	mg/Kg	U	12/ 5/22	10
7440484	Cobalt	0.050	mg/Kg	U	12/ 5/22	10
7440508	Copper	0.50	mg/Kg	U	12/ 5/22	10
7439921	Lead	0.25	mg/Kg	U	12/ 5/22	10
7440020	Nickel	0.40	mg/Kg	U	12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.025	mg/Kg	U	12/ 5/22	10
7440280	Thallium	0.050	mg/Kg	U	12/ 5/22	10
7440622	Vanadium	0.10	mg/Kg	U	12/ 5/22	10
7440666	Zinc	3.0	mg/Kg	U	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	10	mg/Kg	U	10/ 5/22	1
7440393	Barium	0.10	mg/Kg	U	10/ 5/22	1
7440417	Beryllium	0.10	mg/Kg	U	10/ 5/22	1
7440702	Calcium	5.5	mg/Kg		10/ 5/22	1
7439896	Iron	5.0	mg/Kg	U	10/ 5/22	1
7439954	Magnesium	5.0	mg/Kg	U	10/ 5/22	1
7439965	Manganese	0.20	mg/Kg	U	10/ 5/22	1
7440097	Potassium	70	mg/Kg	U	10/ 5/22	1
7440235	Sodium	10	mg/Kg	U	10/ 5/22	1

Sample : IS112822ABL Blank**Information :** Blank**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	U	12/ 6/22	10
7440382	Arsenic	0.20	mg/Kg	U	12/ 6/22	10
7440439	Cadmium	0.050	mg/Kg	U	12/ 6/22	10
7440473	Chromium	0.40	mg/Kg	U	12/ 6/22	10
7440484	Cobalt	0.050	mg/Kg	U	12/ 6/22	10
7440508	Copper	0.50	mg/Kg	U	12/ 6/22	10
7439921	Lead	0.25	mg/Kg	U	12/ 6/22	10
7440020	Nickel	2.0	mg/Kg	U	12/ 6/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 6/22	10
7440224	Silver	0.025	mg/Kg	U	12/ 6/22	10
7440280	Thallium	0.050	mg/Kg	U	12/ 6/22	10
7440622	Vanadium	0.10	mg/Kg	U	12/ 6/22	10
7440666	Zinc	3.0	mg/Kg	U	12/ 6/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	10	mg/Kg	U	3/ 9/23	1
7440393	Barium	0.10	mg/Kg	U	3/ 9/23	1
7440417	Beryllium	0.10	mg/Kg	U	3/ 9/23	1
7440702	Calcium	5.0	mg/Kg	U	3/ 9/23	1
7439896	Iron	5.0	mg/Kg	U	3/ 9/23	1
7439954	Magnesium	5.0	mg/Kg	U	3/ 9/23	1
7439965	Manganese	0.20	mg/Kg	U	3/ 9/23	1
7440097	Potassium	70	mg/Kg	U	3/ 9/23	1
7440235	Sodium	10	mg/Kg	U	3/ 9/23	1

Sample : IS112922ABL Blank**Information :** Blank**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7440360	Antimony	0.50	mg/Kg	U	12/ 5/22	10
7440382	Arsenic	0.20	mg/Kg	U	12/ 5/22	10
7440439	Cadmium	0.050	mg/Kg	U	12/ 5/22	10
7440473	Chromium	0.40	mg/Kg	U	12/ 5/22	10
7440484	Cobalt	0.050	mg/Kg	U	12/ 5/22	10
7440508	Copper	0.50	mg/Kg	U	12/ 5/22	10
7439921	Lead	0.25	mg/Kg	U	12/ 5/22	10
7440020	Nickel	0.40	mg/Kg	U	12/ 5/22	10
7782492	Selenium	0.10	mg/Kg	U	12/ 5/22	10
7440224	Silver	0.025	mg/Kg	U	12/ 5/22	10
7440280	Thallium	0.050	mg/Kg	U	12/ 5/22	10
7440622	Vanadium	0.10	mg/Kg	U	12/ 5/22	10
7440666	Zinc	3.0	mg/Kg	U	12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Target Analyte Results:						
7429905	Aluminum	10	mg/Kg	U	3/ 9/23	1
7440393	Barium	0.10	mg/Kg	U	3/ 9/23	1
7440417	Beryllium	0.10	mg/Kg	U	3/ 9/23	1
7440702	Calcium	5.0	mg/Kg	U	3/ 9/23	1
7439896	Iron	5.0	mg/Kg	U	3/ 9/23	1
7439954	Magnesium	5.0	mg/Kg	U	3/ 9/23	1
7439965	Manganese	0.20	mg/Kg	U	3/ 9/23	1
7440097	Potassium	70	mg/Kg	U	3/ 9/23	1
7440235	Sodium	10	mg/Kg	U	3/ 9/23	1

Sample : IS100422AL1 Lab Control Std**Information :** Lab Control Standard**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	98	%Rec		12/ 5/22	10
7440382	Arsenic	102	%Rec		12/ 5/22	10
7440439	Cadmium	94	%Rec		12/ 5/22	10
7440473	Chromium	95	%Rec		12/ 5/22	10
7440484	Cobalt	101	%Rec		12/ 5/22	10
7440508	Copper	94	%Rec		12/ 5/22	10
7439921	Lead	101	%Rec		12/ 5/22	10
7440020	Nickel	97	%Rec		12/ 5/22	10
7782492	Selenium	102	%Rec		12/ 5/22	10
7440224	Silver	95	%Rec		12/ 5/22	10
7440280	Thallium	94	%Rec		12/ 5/22	10
7440622	Vanadium	95	%Rec		12/ 5/22	10
7440666	Zinc	100	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum	103	%Rec		10/ 5/22	1
7440393	Barium	103	%Rec		10/ 5/22	1
7440417	Beryllium	96	%Rec		10/ 5/22	1
7439896	Iron	104	%Rec		10/ 5/22	1
7439965	Manganese	102	%Rec		10/ 5/22	1

Sample : IS112822AL1 Lab Control Std**Information :** Lab Control Standard**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	101	%Rec		12/ 6/22	10
7440382	Arsenic	104	%Rec		12/ 6/22	10
7440439	Cadmium	97	%Rec		12/ 6/22	10
7440473	Chromium	102	%Rec		12/ 6/22	10
7440484	Cobalt	103	%Rec		12/ 6/22	10
7440508	Copper	102	%Rec		12/ 6/22	10
7439921	Lead	99	%Rec		12/ 6/22	10
7440020	Nickel	104	%Rec		12/ 6/22	10
7782492	Selenium	108	%Rec		12/ 6/22	10
7440224	Silver	103	%Rec		12/ 6/22	10
7440280	Thallium	96	%Rec		12/ 6/22	10
7440622	Vanadium	99	%Rec		12/ 6/22	10
7440666	Zinc	104	%Rec		12/ 6/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum	93	%Rec		3/ 9/23	1
7440393	Barium	100	%Rec		3/ 9/23	1
7440417	Beryllium	98	%Rec		3/ 9/23	1
7439896	Iron	101	%Rec		3/ 9/23	1
7439965	Manganese	101	%Rec		3/ 9/23	1

Sample : IS112922AL1 Lab Control Std**Information :** Lab Control Standard**Matrix :** Solid**Parameter :** ICP/MS**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6020B - Inductively Coupled Plasma-Mass Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7440360	Antimony	99	%Rec		12/ 5/22	10
7440382	Arsenic	107	%Rec		12/ 5/22	10
7440439	Cadmium	92	%Rec		12/ 5/22	10
7440473	Chromium	96	%Rec		12/ 5/22	10
7440484	Cobalt	96	%Rec		12/ 5/22	10
7440508	Copper	95	%Rec		12/ 5/22	10
7439921	Lead	101	%Rec		12/ 5/22	10
7440020	Nickel	98	%Rec		12/ 5/22	10
7782492	Selenium	106	%Rec		12/ 5/22	10
7440224	Silver	91	%Rec		12/ 5/22	10
7440280	Thallium	99	%Rec		12/ 5/22	10
7440622	Vanadium	95	%Rec		12/ 5/22	10
7440666	Zinc	115	%Rec		12/ 5/22	10

Parameter : ICP-AES**Fraction :** Total**Prep Method:** 3050B-MIS - Acid Digestion of Sediments, Sludges, and Soils, Incremental Subsampling**Analysis Method:** 6010D - Inductively Coupled Plasma-Atomic Emission Spectrometry, SW-846**Weight Basis :** Dry

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date	Dilution
Spiked Compounds:						
7429905	Aluminum	98	%Rec		3/ 9/23	1
7440393	Barium	100	%Rec		3/ 9/23	1
7440417	Beryllium	98	%Rec		3/ 9/23	1
7439896	Iron	99	%Rec		3/ 9/23	1
7439965	Manganese	101	%Rec		3/ 9/23	1



US EPA Region 10 Laboratory

Multi-Sample Final Report



Project Code : SFP-003C

Site : NORTH RIDGE ESTATES: RI-FS

Contact : Robert Tan

Account : 2023T10P000FD210RVLA00

Parameter(s): Part-size

Analyte: *200208 - < 150 um

Weight Basis : Dry

Prep Method(s): D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Analytical Method: D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Target Analyte Results:

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-D sam	OU2-RR-BB2	Soil	33.4	%		9/15/22
22334101-D sam	OU2-RR-BB211	Soil	29.9	%		9/15/22
22334102-D sam	OU2-RR-BB212	Soil	32.9	%		9/15/22
22334103-D sam	OU2-RR-BB3	Soil	23.1	%		9/15/22
22334104-D sam	OU2-RR-BB311	Soil	24.2	%		9/15/22
22334105-D sam	OU2-RR-BB312	Soil	22.1	%		9/15/22
22334106-D sam	OU2-RR-RF1	Soil	22.8	%		9/15/22
22334107-D sam	OU2-RR-RF111	Soil	23.0	%		9/15/22
22334108-D sam	OU2-RR-RF112	Soil	24.7	%		9/15/22

Analyte: *200242 - < 500 um >= 150 um

Weight Basis : Dry

Prep Method(s): D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Analytical Method: D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Target Analyte Results:

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-C sam	OU2-RR-BB2	Soil	28.8	%		11/16/22
22334101-C sam	OU2-RR-BB211	Soil	31.3	%		11/16/22
22334102-C sam	OU2-RR-BB212	Soil	31.0	%		11/16/22
22334103-C sam	OU2-RR-BB3	Soil	23.4	%		11/16/22
22334104-C sam	OU2-RR-BB311	Soil	23.8	%		11/17/22
22334105-C sam	OU2-RR-BB312	Soil	27.2	%		11/17/22
22334106-C sam	OU2-RR-RF1	Soil	21.0	%		11/17/22
22334107-C sam	OU2-RR-RF111	Soil	19.2	%		11/17/22
22334108-C sam	OU2-RR-RF112	Soil	19.5	%		11/17/22

Analyte: *200099 - <2.0 >=0.5mm, Coarse Sand

Weight Basis : Dry

Prep Method(s): D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

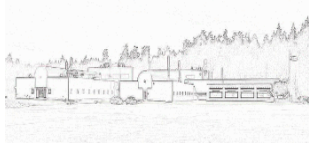
Analytical Method: D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM

Target Analyte Results:

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-B sam	OU2-RR-BB2	Soil	23.1	%		11/16/22
22334101-B sam	OU2-RR-BB211	Soil	23.2	%		11/16/22
22334102-B sam	OU2-RR-BB212	Soil	22.2	%		11/16/22
22334103-B sam	OU2-RR-BB3	Soil	30.3	%		11/16/22
22334104-B sam	OU2-RR-BB311	Soil	30.3	%		11/17/22
22334105-B sam	OU2-RR-BB312	Soil	31.8	%		11/17/22
22334106-B sam	OU2-RR-RF1	Soil	25.9	%		11/17/22
22334107-B sam	OU2-RR-RF111	Soil	24.7	%		11/17/22
22334108-B sam	OU2-RR-RF112	Soil	25.7	%		11/17/22

Analyte: *200041 - >=2.0mm, Gravel**Weight Basis :** Dry**Prep Method(s):** D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM**Analytical Method:** D422 - Standard Test Method for Particle-Size Analysis of Soils, ASTM**Target Analyte Results:**

Sample	Information	Lab Matrix	Result	Unit	Qual.	Analysis Date
22334100-A sam	OU2-RR-BB2	Soil	14.3	%		9/15/22
22334101-A sam	OU2-RR-BB211	Soil	15.1	%		9/15/22
22334102-A sam	OU2-RR-BB212	Soil	13.6	%		9/15/22
22334103-A sam	OU2-RR-BB3	Soil	22.9	%		9/15/22
22334104-A sam	OU2-RR-BB311	Soil	21.4	%		9/15/22
22334105-A sam	OU2-RR-BB312	Soil	18.5	%		9/15/22
22334106-A sam	OU2-RR-RF1	Soil	30.0	%		9/15/22
22334107-A sam	OU2-RR-RF111	Soil	32.8	%		9/15/22
22334108-A sam	OU2-RR-RF112	Soil	29.8	%		9/15/22



US EPA Region 10 Laboratory

Multi-Analyte Final Report



Project Code : SFP-003C

Site : NORTH RIDGE ESTATES: RI-FS

Contact : Robert Tan

Account : 2023T10P000FD210RVLA00

Sample : 22334100-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB2

Matrix : Soil

Collected : 8/11/2022 11:00:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334101-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB211

Matrix : Soil

Collected : 8/11/2022 1:05:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334102-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB212

Matrix : Soil

Collected : 8/11/2022 4:13:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334103-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB3

Matrix : Soil

Collected : 8/11/2022 5:42:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334104-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB311

Matrix : Soil

Collected : 8/12/2022 8:45:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334105-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-BB312

Matrix : Soil

Collected : 8/12/2022 9:54:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334106-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-RF1

Matrix : Soil

Collected : 8/12/2022 11:28:00AM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334107-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-RF111

Matrix : Soil

Collected : 8/12/2022 1:33:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22

Sample : 22334108-E Component #5 of 5

> 2 mm bullet fragments

Information : OU2-RR-RF112

Matrix : Soil

Collected : 8/12/2022 2:39:00PM

Parameter : Count

Prep Method: UNSPECIFIED (P) - Unspecified Prep Method

Analysis Method: UNSPECIFIED - Unspecified

Weight Basis : N/A

Analyte Code	Analyte Name	Result	Unit	Qual.	Analysis Date
Target Analyte Results:					
*90269	#Particles	0	#particles		11/30/22



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Drive East
Port Orchard, Washington 98366

QUALITY ASSURANCE MEMORANDUM
FOR INORGANIC CHEMICAL ANALYSES

March 15, 2023

From: Theresa McBride
Laboratory Services & Applied Sciences Division, US EPA Region 10 Laboratory

To: Robert Tan
RE: North Ridge Estates: RI-FS
Project Code: SFP-003C
Account Code: 2023T10P000FD210RVLA00

ISM TAL Metals

22334100B	22334101B	22334102B	22334103B	22334104B	22334105B
22334106B	22334107B	22334108B			
22334100C	22334101C	22334102C	22334103C	22334104C	22334105C
22334106C	22334107C	22334108C			
22334100D	22334101D	22334102D	22334103D	22334104D	22334105D
22334106D	22334107D	22334108D			

Sample suffixes are described as follows:

B 0.5 mm to 2.0 mm
C 0.15 mm to 0.5 mm
D < 0.150 mm

The following describes the quality assurance review of the data for the analysis parameters and samples listed above. The analyses were performed by the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

1. Data Qualifications

The US EPA Region 10 Laboratory has been accredited by the ANSI National Accreditation Board (ANAB) and has Certificate Number AT-3121. For those tests for which the Laboratory has been accredited by ANAB, results in this report comply with ISO IEC 17025:2017.

Field information was provided to the laboratory from other sources, such as Chain of Custody records.

The data and associated documents were reviewed against the quality control criteria outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). The following areas were reviewed against these quality control measures:

Sample Transport and Receipt
Sample Holding Times
Sample Preparation
Initial Calibration/Continuing Calibration Verification
Laboratory Control Samples
Blank Analysis
Duplicate Analysis

Matrix Spike/Matrix Spike Duplicate (MS/MSD)
Internal Standard Performance
Reference Materials
Instrument Peak Integrations
Interferences

2. QC Elements Not Meeting Laboratory/QAPP Criteria

Antimony spike recoveries were below the acceptance limits of 75-125% recovery for all samples (“B” fraction: 29%/29%, “C” fraction: 22%/25%, “D” fraction: 9%/13%). All antimony results were qualified “J”, estimated.

Copper spike recoveries were above the acceptance limits of 75-125% recovery for “C” fraction samples at 126%/128%. Copper results for “C” fraction samples were qualified “J”, estimated.

“B” and “C” fraction samples were analyzed by ICPAES past the technical holding time of 180 days. Depending on the sample, the exceedance was 29 or 30 days. Note that the samples were digested within holding time and acceptable QC elements indicate that the digestates did not degrade prior to analysis. “B” and “C” fraction results for aluminum, barium, beryllium, calcium, iron, magnesium, manganese, potassium and sodium were qualified “J”, estimated.

During both days of analysis by ICPMS, selenium drifted outside the 90-110% acceptance limits for the continuing calibration verification check. Selenium results for “B” and “C” fraction samples were qualified “J”, estimated.

During the ICPMS analysis on 12/05/2022, thallium suffered from carryover at lower concentrations. Affected thallium sample results (all “C” and “D” fraction samples) were qualified “J”, estimated.

A solid reference material was digested with these samples, and results were within the acceptance limits provided by the manufacturer, with the exception of sodium for the “B” and “C” fractions. Sodium results in “B” and “C” fraction samples were qualified “J”, estimated.

Note that when samples were prepared, they were not spiked with calcium, potassium, magnesium and sodium. However, the solid reference material digested with the samples does contain those elements and their results were within the acceptance limits provided by the manufacturer, except as noted above. This reference material serves as a positive control for these elements for this project. Sample results were not qualified on this basis.

3. Changes from Preliminary and Previous Data

Antimony results were provided as preliminary results on 03/15/2023. No changes were made to these results between the preliminary and final data.

Final results for arsenic and lead were provided previously. No changes were made to the results for these analytes.

4. Data Qualifiers

Data for all samples and analytes were assessed for compliance with each of the requirements described in Section 1. Data qualifiers were assigned, as necessary, to alert the user to instances where data did not meet all requirements. In cases where more than one QC failure occurred, the most restrictive data qualifier has been applied to the data.

The usefulness of qualified data should be treated according to the severity of the qualifier considering the project’s data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

Qualifier	Definition
U	The analyte was not detected at or above the reported value.
J	The identification of the analyte is acceptable; however, the reported value is an estimate.
UJ	The analyte was not detected at or above the reported value. The reported value is an estimate.
R	The presence or absence of the analyte cannot be determined from the data due to severe quality control problems. The data are rejected and considered unusable. <u>No value is reported with this qualification.</u>
NA	Not Applicable, the parameter was not analyzed for, or there is no analytical result for this parameter. <u>No value is reported with this qualification.</u> ‡

‡ NA is most often applied to spike results where the recovery cannot be determined accurately due to the high native sample concentration.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Drive East
Port Orchard, Washington 98366

**QUALITY ASSURANCE MEMORANDUM
FOR INORGANIC CHEMICAL ANALYSES**

January 9, 2023

From: Theresa McBride
Laboratory Services & Applied Sciences Division, US EPA Region 10 Laboratory

To: Robert Tan
RE: North Ridge Estates: RI-FS
Project Code: SFP-003C
Account Code: 2023T10P000FD210RVLA00

Part-size

22334100A	22334101A	22334102A	22334103A	22334104A	22334105A
22334106A	22334107A	22334108A			
22334100B	22334101B	22334102B	22334103B	22334104B	22334105B
22334106B	22334107B	22334108B			
22334100C	22334101C	22334102C	22334103C	22334104C	22334105C
22334106C	22334107C	22334108C			
22334100D	22334101D	22334102D	22334103D	22334104D	22334105D
22334106D	22334107D	22334108D			

Count (# of > 2 mm fragments identified as bullet fragments)

22334100E	22334101E	22334102E	22334103E	22334104E	22334105E
22334106E	22334107E	22334108E			

SEM/EDX (Scanning Electron Microscopy/Energy Dispersive XRay): 22334108E

Sample suffixes are described as follows:

- A > 2 mm
- B 0.5 mm to 2.0 mm
- C 0.15 mm to 0.5 mm
- D < 0.150 mm
- E > 2 mm fragments identified as bullet fragments

The following describes the quality assurance review of the data for the analysis parameters and samples listed above. The analyses were performed by the US EPA Region 10 Laboratory in Port Orchard, WA, following US EPA and Laboratory guidelines.

1. Data Qualifications

The US EPA Region 10 Laboratory has been accredited by A2LA and has Certificate Number 5027.01. For those tests for which the Laboratory has been accredited by A2LA, results in this report comply with ISO IEC 17025:2017 and the 2009 TNI Environmental Testing Laboratory Standard.

Field information was provided to the laboratory from other sources, such as Chain of Custody records.

The data and associated documents were reviewed against the quality control criteria outlined in the Laboratory's current Quality Assurance Manual, Standard Operating Procedures (SOPs) and the Quality Assurance Project Plan (QAPP). The following areas were reviewed against these quality control measures:

Sample Transport and Receipt
 Sample Holding Times
 Sample Preparation
 Instrument Calibration
 Blank Analysis
 Reference Materials

2. QC Elements Not Meeting Laboratory/QAPP Criteria

None.

Note: The > 2 mm fraction was examined for metallic-looking particles for each sample. One sample, 22334108E, had one metallic-looking particle, which was further analyzed by SEM/EDX to determine whether it was lead-containing (and therefore potentially a lead bullet fragment). The particle did not contain lead. The number of > 2 mm fragments identified as bullet fragments was therefore zero for the project. See the appended narrative for more details on this process.

3. Data Qualifiers

Data for all samples and analytes were assessed for compliance with each of the requirements described in Section 1. Data qualifiers were assigned, as necessary, to alert the user to instances where data did not meet all requirements. In cases where more than one QC failure occurred, the most restrictive data qualifier has been applied to the data.

The usefulness of qualified data should be treated according to the severity of the qualifier considering the project's data quality objectives. Should questions arise regarding the data, contact Katie Adams at the Region 10 Laboratory, phone number (360) 871-8748.

Qualifier	Definition
U	The analyte was not detected at or above the reported value.
J	The identification of the analyte is acceptable; however, the reported value is an estimate.
UJ	The analyte was not detected at or above the reported value. The reported value is an estimate.
R	The presence or absence of the analyte cannot be determined from the data due to severe quality control problems. The data are rejected and considered unusable. <u>No value is reported with this qualification.</u>
NA	Not Applicable, the parameter was not analyzed for, or there is no analytical result for this parameter. <u>No value is reported with this qualification.</u> ‡

‡ NA is most often applied to spike results where the recovery cannot be determined accurately due to the high native sample concentration.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Drive East
Port Orchard, Washington 98366

Project Narrative

January 9, 2023

From: Jed Januch, Environmental Protection Specialist
Laboratory Services & Applied Science Division, U.S. EPA Region 10 Laboratory

Jed Januch

To: Robert Tan, Remedial Project Manager
Superfund and Emergency Management Division
RE: North Ridge Estates – OU2
Project Code: SFP-003C
Account Code: 2023T10P000FD210RVLA00

Bullet Fragments or Slugs – Lead

22334100A 22334101A 22334102A 22334103A 22334104A
22334105A 22334106A 22334107A 22334108A

MEL was directed to examine the nine samples listed above to identify and isolate metallic particles, specifically bullet fragments or slugs, and analyze suspect material with the aid of a scanning electron microscope (SEM) equipped with an energy dispersive x-ray analysis (EDXA) detector system. The samples had previously been sieved and the coarse fraction greater than (>) 2-millimeters (mm) was the fraction examined for this part of the project.

Prior to examination, the larger pieces of vegetation were removed by hand. The samples were rinsed with laboratory-grade deionized water to which also aided in removing smaller pieces of vegetation and seeds. The samples were then spread out in a baking pan (Figure 1) and allowed to dry in a HEPA filter hood for several days.

Figure 1 – Sample 22334100A drying in baking pan.



Samples were examined with the aid of a magnifying glass while drying in the hood. Specimens of suspect material were isolated and crushed by hand or with a set of pliers to determine if the specimen was metallic or gravel. One suspect specimen (a shiny particle) was isolated from Sample Number 22334108A and was submitted for analysis by SEM/EDXA (Appendix 1).

Further examination of samples was done with the aid of a sluice box (Figure 2 and 3) with running water in an attempt to isolate heavier particles from lighter particles. There were no metallic or bullet fragments or slugs observed in the initial or final examination.

Figure 2 – Sluice box



Figure 3 – Sample being examined visually.



North Ridge Estates, SFP-003C

Analyst: Jed Januch, LSASD

Bullet Reference Sample

Figure 1 - Fragment shaved from a bullet

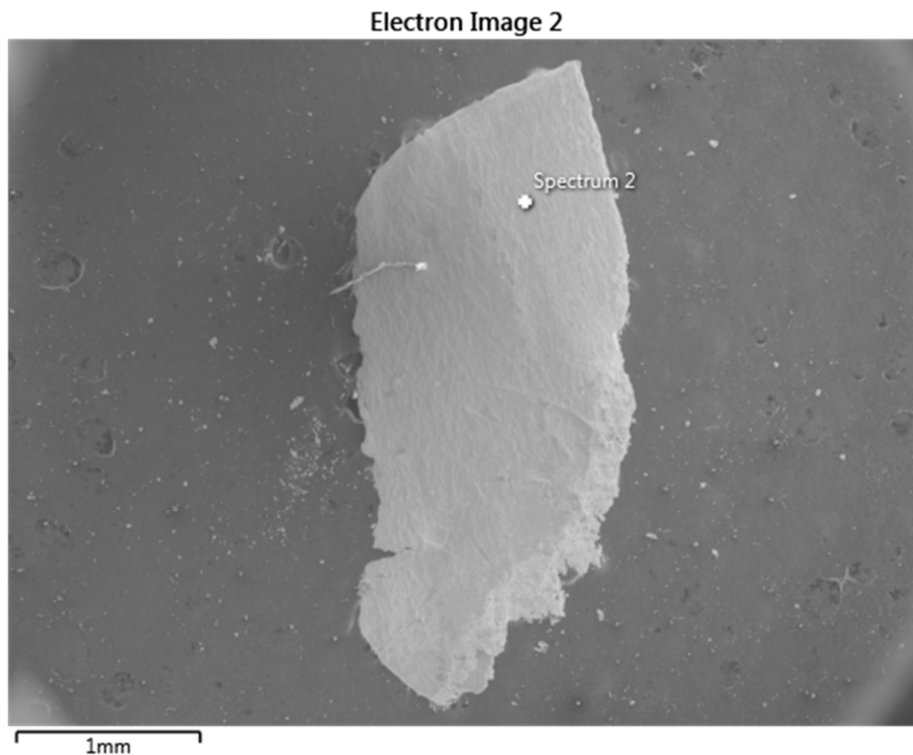
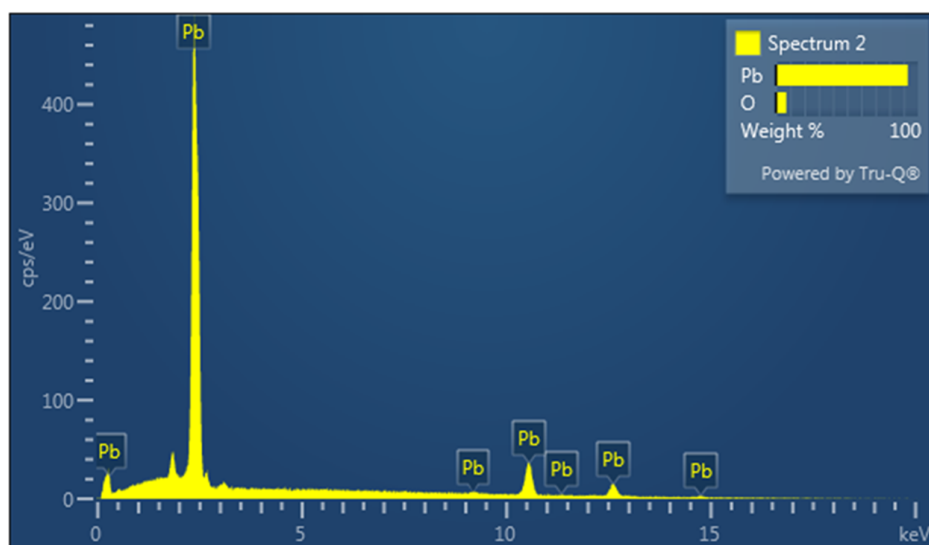


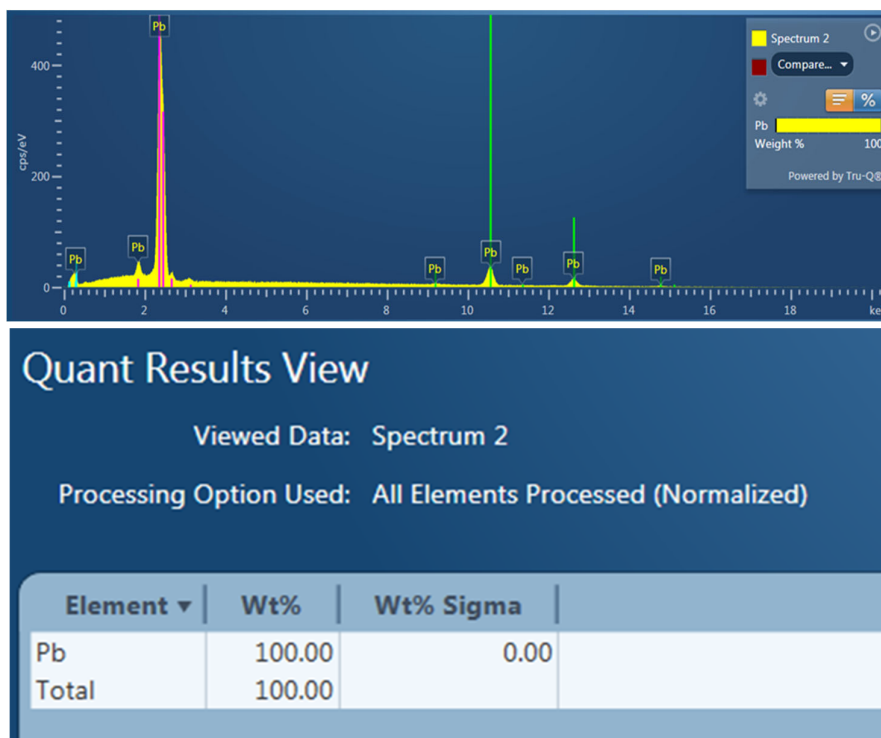
Figure 2 - EDXA spectrum from the reference bullet fragment



North Ridge Estates, SFP-003C

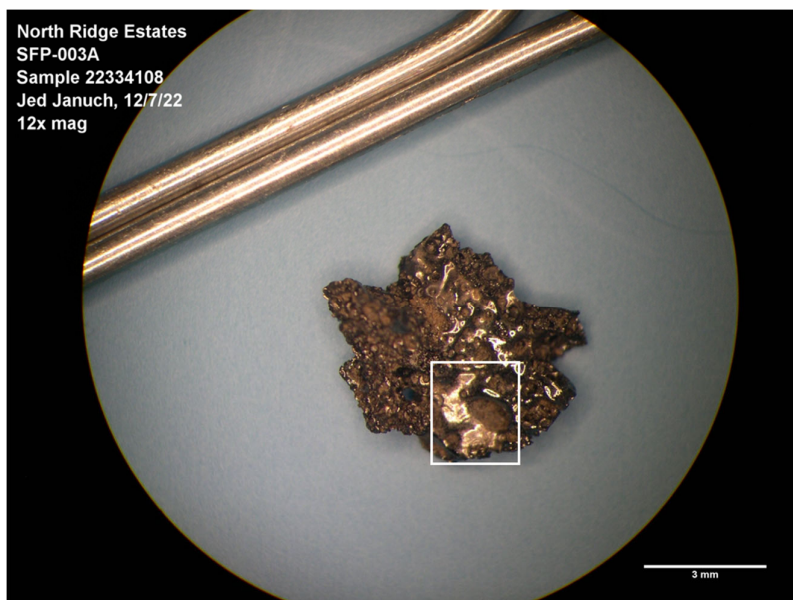
Analyst: Jed Januch, LSASD

Figure 3 - Annotated EDXA spectrum from the reference bullet fragment



22334108A – Suspect metallic fragment isolated from sample

Figure 4 - Stereomicroscope image of suspect metal fragment - sample 22334108A



North Ridge Estates, SFP-003C

Analyst: Jed Januch, LSASD

Figure 5 - SEM image of suspect metallic fragment - sample 22334108A

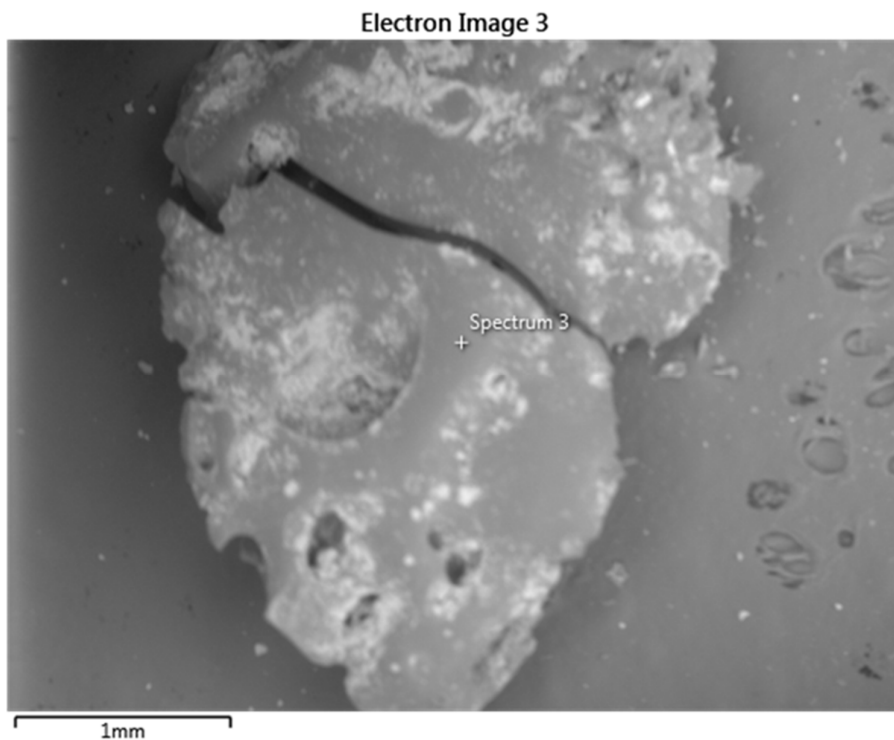
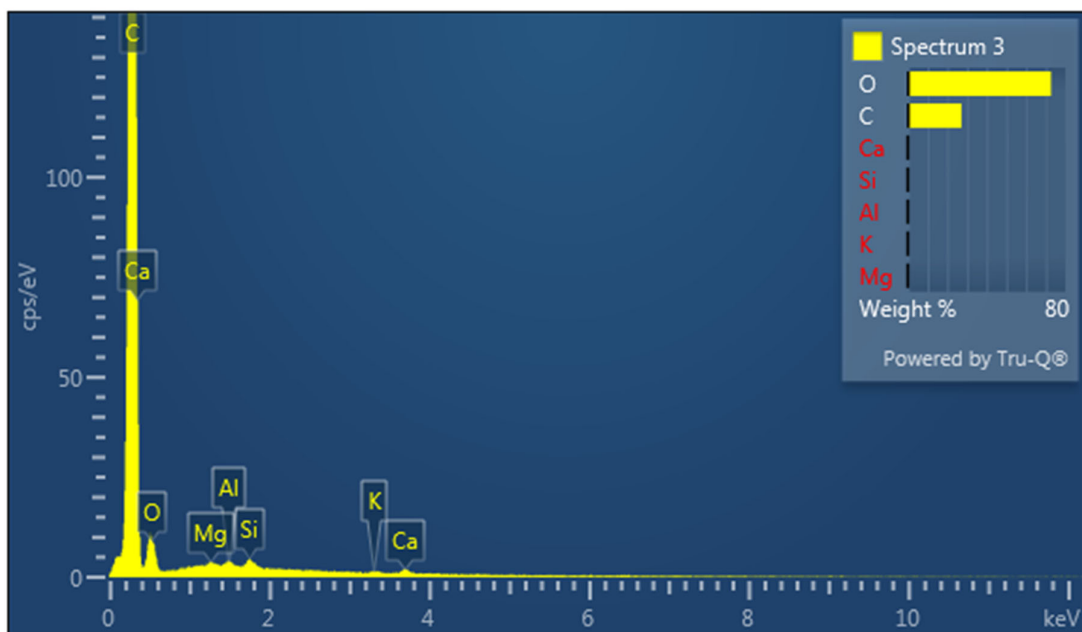


Figure 6 - EDXA spectrum from suspect metallic fragment from sample 22334108A



North Ridge Estates, SFP-003C

Analyst: Jed Januch, LSASD

Figure 7 - General information for spectrum 3. It was collected in low-vacuum mode and was not therefore coated with carbon.

General Information	
Label	Spectrum 3
Acquisition Date	12/7/2022 4:54:19 PM
Acquisition Conditions	
Live Time (seconds)	6.17
Real Time (seconds)	7.55
Process Time	2
Energy Range (keV)	20
Number Of Channels	2048
Energy per Channel (eV)	10.0
Accelerating Voltage (kV)	15.0
Magnification	30
Working Distance (mm)	14.7
Specimen Tilt (degrees)	0.0
Spectrum Information	
Spectrum Area (counts)	312272
Spectrum Count Rate (cps)	41383.1



EPA R10 Lab (MEL) COC (REGION COPY)

DateShipped: 8/22/2022

CarrierName: FedEx

AirbillNo: 7777 2897 8232

CHAIN OF CUSTODY RECORD

North Ridge Estates OU2/OR

Project Code: SFP-003C

Cooler #: 1 of 1

No: 10-080522-145116-0001

T000FD210RVLA00

Contact Name: Catherine LeCours

Contact Phone: 406-219-1652

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
22334100		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D, IVBA/SW1340(56)	N1 (None) (1)	OU2-RR-BB2	08/11/2022 11:00	Field Sample
22334101		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB211	08/11/2022 13:05	Field Duplicate
22334102		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB212	08/11/2022 16:13	Field Duplicate
22334103		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D, IVBA/SW1340(56)	N1 (None) (1)	OU2-RR-BB3	08/11/2022 17:42	Field Sample
22334104		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB311	08/12/2022 08:45	Field Duplicate
22334105		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-BB312	08/12/2022 09:54	Field Duplicate
22334106		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D, IVBA/SW1340(56)	N1 (None), N2 (None) (2)	OU2-RR-RF1	08/12/2022 11:28	Field Sample
22334107		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-RF111	08/12/2022 13:33	Field Duplicate
22334108		Soil Surface/ O. Mathiesen	Composite	Metals/SW6010D(56)	N1 (None) (1)	OU2-RR-RF112	08/12/2022 14:39	Field Duplicate

Sample(s) to be used for Lab QC: 22334106 Tag N1, 22334106 Tag N2 - Special Instructions: Please see QAPP for sample preparation procedures. DO NOT GRIND SAMPLE - may contain asbestos.

Shipment for Case Complete? Y

Samples Transferred From Chain of Custody #

Analysis Key



Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	 EA	8/22/22 14:30		8/25/22 14:20	

Table A-1 Lead Weighted Totals

ANALYTE	FINAL_RESULT	RESULT_UNITS	FINAL_VALIDATION_QUALIFIER	RESULT_COMMENT	STATION_LOCATION	LOCATION_DESCRIPTION	FIELD_SAMPLE_TYPE	Percent of Sample		Percent of sample <2mm	Adjusted Concentration
Lead	274	mg/kg		< 0.150 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.334	91.516	39.16%	107.2872216
Lead	296	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.288	85.248	33.76%	99.93903869
Lead	1690	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.231	390.39	27.08%	457.6670574
								0.853	567.154	100.00%	664.8933177
Lead	357	mg/kg		< 0.150 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.299	106.743	35.43%	126.4727488
Lead	356	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.313	111.428	37.09%	132.0236967
Lead	366	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.232	84.912	27.49%	100.6066351
								0.844	303.083	100.00%	359.1030806
Lead	309	mg/kg		< 0.150 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.329	101.661	38.21%	118.0731707
Lead	321	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.31	99.51	36.00%	115.5749129
Lead	320	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.222	71.04	25.78%	82.5087108
								0.861	272.211	100.00%	316.1567944
Lead	33.7	mg/kg		< 0.150 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.231	7.7847	30.08%	10.13632813
Lead	30	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.234	7.02	30.47%	9.140625
Lead	24.2	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.303	7.3326	39.45%	9.54765625
								0.768	22.1373	100.00%	28.82460938
Lead	22.1	mg/kg		< 0.150 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.242	5.3482	30.91%	6.830395913
Lead	19.3	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.238	4.5934	30.40%	5.866411239
Lead	16.7	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.303	5.0601	38.70%	6.462452107
								0.783	15.0017	100.00%	19.15925926
Lead	18	mg/kg		< 0.150 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.221	3.978	27.25%	4.905055487
Lead	15.1	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.272	4.1072	33.54%	5.064364982
Lead	16.9	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.318	5.3742	39.21%	6.626633785
								0.811	13.4594	100.00%	16.59605425
Lead	70.7	mg/kg		< 0.150 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.228	16.1196	32.71%	23.12711621
Lead	65.9	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.21	13.839	30.13%	19.85509326
Lead	51.9	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.259	13.4421	37.16%	19.2856528
								0.697	43.4007	100.00%	62.26786227
Lead	84.5	mg/kg		< 0.150 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.23	19.435	34.38%	29.05082212
Lead	76.1	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.192	14.6112	28.70%	21.84035874
Lead	38.9	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.247	9.6083	36.92%	14.36218236
								0.669	43.6545	100.00%	65.25336323
Lead	58.9	mg/kg		< 0.150 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.247	14.5483	35.34%	20.8130186
Lead	48.6	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.195	9.477	27.90%	13.55793991
Lead	33.6	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.257	8.6352	36.77%	12.35364807
								0.699	32.6605	100.00%	46.72460658

>=2.0mm, Gravel	14.3	%	OU2-RR-BB2
>=2.0mm, Gravel	15.1	%	OU2-RR-BB211
>=2.0mm, Gravel	13.6	%	OU2-RR-BB212
>=2.0mm, Gravel	22.9	%	OU2-RR-BB3
>=2.0mm, Gravel	21.4	%	OU2-RR-BB311
>=2.0mm, Gravel	18.5	%	OU2-RR-BB312
>=2.0mm, Gravel	30	%	OU2-RR-RF1
>=2.0mm, Gravel	32.8	%	OU2-RR-RF111
>=2.0mm, Gravel	29.8	%	OU2-RR-RF112

Table A-2 Arsenic Weighted Totals

ANALYTE	FINAL_RESULT	RESULT_UNITS	FINAL_VALIDATION_QUALIFIER	RESULT_COMMENT	STATION_LOCATION	LOCATION_DESCRIPTION	FIELD_SAMPLE_TYPE	Percent of Sample	Percent of sample <2mm	Adjusted Concentration
Arsenic	3.63	mg/kg		< 0.150 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.334	39.16%	1.421359906
Arsenic	4.65	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.288	33.76%	1.569988277
Arsenic	4.52	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB2	OU2-RR-BB2 Grid Red Squares	Field Sample	0.231	27.08%	1.224056272
								0.853	100.00%	4.215404455
Arsenic	3.72	mg/kg		< 0.150 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.299	35.43%	1.317867299
Arsenic	4.85	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.313	37.09%	1.798637441
Arsenic	5.8	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB211	OU2-RR-BB211 Green Circles	Field Duplicate	0.232	27.49%	1.594312796
								0.844	100.00%	4.710817536
Arsenic	3.65	mg/kg		< 0.150 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.329	38.21%	1.394715447
Arsenic	4.96	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.31	36.00%	1.78583043
Arsenic	5.99	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB212	OU2-RR-BB212 Yellow Triangles	Field Duplicate	0.222	25.78%	1.54445993
								0.861	100.00%	4.725005807
Arsenic	2.39	mg/kg		< 0.150 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.231	30.08%	0.718867188
Arsenic	2.96	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.234	30.47%	0.901875
Arsenic	3.17	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB3	OU2-RR-BB3 Red Squares	Field Sample	0.303	39.45%	1.250664063
								0.768	100.00%	2.87140625
Arsenic	2.37	mg/kg		< 0.150 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.242	30.91%	0.732490421
Arsenic	3.07	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.238	30.40%	0.933154534
Arsenic	2.95	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB311	OU2-RR-BB311 Green Circles	Field Duplicate	0.303	38.70%	1.141570881
								0.783	100.00%	2.807215837
Arsenic	2.31	mg/kg		< 0.150 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.221	27.25%	0.629482121
Arsenic	3.19	mg/kg		0.15 mm to 0.5 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.272	33.54%	1.069889026
Arsenic	3	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB312	OU2-RR-BB312 Yellow Triangles	Field Duplicate	0.318	39.21%	1.176325524
								0.811	100.00%	2.875696671
Arsenic	2.22	mg/kg		< 0.150 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.228	32.71%	0.726197991
Arsenic	2.47	mg/kg		0.15 mm to 0.5 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.21	30.13%	0.744189383
Arsenic	3.14	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF1	OU2-RR-RF1 Red Squares	Field Sample	0.259	37.16%	1.166800574
								0.697	100.00%	2.637187948
Arsenic	2.33	mg/kg		< 0.150 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.23	34.38%	0.801046338
Arsenic	2.51	mg/kg		0.15 mm to 0.5 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.192	28.70%	0.720358744
Arsenic	1.97	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF111	OU2-RR-RF111 Green Circles	Field Duplicate	0.247	36.92%	0.727339312
								0.669	100.00%	2.248744395
Arsenic	2.33	mg/kg		< 0.150 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.247	35.34%	0.823333333
Arsenic	2.49	mg/kg		0.15 mm to 0.5 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.195	27.90%	0.694635193
Arsenic	1.99	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-RF112	OU2-RR-RF112 Yellow Triangles	Field Duplicate	0.257	36.77%	0.731659514
								0.699	100.00%	2.24962804

Table A-3 Antimony Weighted Totals

ANALYTE	FINAL_RESULT	Result_Units	LAB_QUALIFIERS	RESULT_COMMENT	STATION_LOCATION	FIELD_SAMPLE_TYP	Percent of Sample	Percent of sample <2mm	Adjusted Concentration
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB2	Field Sample	0.334	39.16%	0.203610785
Antimony	1.3	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB2	Field Sample	0.288	33.76%	0.438921454
Antimony	5.75	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB2	Field Sample	0.231	27.08%	1.557151231
							0.853	100.00%	2.19968347
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB211	Field Duplicate	0.299	35.43%	0.184218009
Antimony	1.3	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB211	Field Duplicate	0.313	37.09%	0.482109005
Antimony	3.08	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB211	Field Duplicate	0.232	27.49%	0.846635071
							0.844	100.00%	1.512962085
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB212	Field Duplicate	0.329	38.21%	0.198699187
Antimony	1.5	mg/kg	J	0.15 mm to 0.5 mm	OU2-RR-BB212	Field Duplicate	0.31	36.00%	0.540069686
Antimony	3.39	mg/kg	J	0.5 mm to 2.0 mm	OU2-RR-BB212	Field Duplicate	0.222	25.78%	0.874076655
							0.861	100.00%	1.612845528
Antimony	0.53	mg/kg	UJ	< 0.150 mm	OU2-RR-BB3	Field Sample	0.231	30.08%	0.159414063
Antimony	0.5	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-BB3	Field Sample	0.234	30.47%	0.15234375
Antimony	0.5	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-BB3	Field Sample	0.303	39.45%	0.197265625
							0.768	100.00%	0.509023438
Antimony	0.53	mg/kg	UJ	< 0.150 mm	OU2-RR-BB311	Field Duplicate	0.242	30.91%	0.163805875
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-BB311	Field Duplicate	0.238	30.40%	0.148939974
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-BB311	Field Duplicate	0.303	38.70%	0.189616858
							0.783	100.00%	0.502362708
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-BB312	Field Duplicate	0.221	27.25%	0.141701603
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-BB312	Field Duplicate	0.272	33.54%	0.164340321
Antimony	0.5	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-BB312	Field Duplicate	0.318	39.21%	0.196054254
							0.811	100.00%	0.502096178
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-RF1	Field Sample	0.228	32.71%	0.17010043
Antimony	0.5	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-RF1	Field Sample	0.21	30.13%	0.150645624
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-RF1	Field Sample	0.259	37.16%	0.182080344
							0.697	100.00%	0.502826399
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-RF111	Field Duplicate	0.23	34.38%	0.17877429
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-RF111	Field Duplicate	0.192	28.70%	0.140627803
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-RF111	Field Duplicate	0.247	36.92%	0.180911809
							0.669	100.00%	0.500313901
Antimony	0.52	mg/kg	UJ	< 0.150 mm	OU2-RR-RF112	Field Duplicate	0.247	35.34%	0.183748212
Antimony	0.49	mg/kg	UJ	0.15 mm to 0.5 mm	OU2-RR-RF112	Field Duplicate	0.195	27.90%	0.136695279
Antimony	0.49	mg/kg	UJ	0.5 mm to 2.0 mm	OU2-RR-RF112	Field Duplicate	0.257	36.77%	0.180157368
							0.699	100.00%	0.500600858

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Appendix C

2022 Activity-Based Sampling Analytical Documentation

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LabCor, Inc.

Laboratories in Seattle and Portland

October 31, 2022

Brenda Nuding
EA Engineering
2200 6th Avenue
Seattle, WA 98121

Dear Brenda,

Enclosed is the final data package for LabCor, Inc. job number 220805; North Ridge Estates Project; these samples were analyzed by ISO 10312 and ISO 13794.

ISO Analysis Narrative

Upon sample receipt the samples and the associated packaging are checked to ensure that samples were not packaged in untreated polystyrene foam (peanuts), vermiculite, paper shreds, or excelsior packing materials; top covers and end plugs were in place for each cassette; and samples were properly sealed and undamaged, neither shipped nor stored with bulk samples, and were labeled upon receipt at the laboratory. Any items of note are recorded on the sample preparation form before being submitted to the technician for preparation. If there were any sample preparation notes, they would be recorded by the preparation technician on the sample preparation form.

Preparation and analysis of the above samples was conducted in accordance with the ISO method 10312 (Direct) for the identification of asbestos. Briefly, the samples were collapsed with a solution of N,N-dimethylformamide and acetic acid, then etched in a low temperature plasma etcher to remove the top surface of the filter and other organics. The samples were carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in N,N-Dimethylformamide / Acetone baths until cleared of filter debris.

One of the high flow / low flow sets of samples were overloaded at the time of prep, ABS1-02-H and ASB1-02-L. ISO 13794 Indirect analysis was approved by Catherine LeCours on September 6, 2022.

All of the High Flow ABS samples were determined to be overloaded at prep; there was either loose particulate on the filter or the particulate shifted when filter preparation was attempted on these samples. Two of the High Flow COL samples were also overloaded at prep and not prepped onto grids, COL1-02-H and COL3-01-H. TEM analysis was performed using a transmission electron microscope equipped with an EDS X ray analyzer. The air samples were analyzed at an approximate screen magnification of 15,000 – 20,000x for asbestos structures greater than 0.5 micrometer lengths. An accelerating voltage of 100 KV was applied. The sizing of grid openings was performed using a calibrated digital imaging system at low magnification. The analyst records the quality of each grid preparation as part of the analytical procedures outlined in the TEM Standard Operation Procedure.

The count categories used on this report are the standard ISO 10312 categories with the exception of the PCM Equivalent category. The PCM Equivalent count category used for this report was modified from the Statement of Work in an email from Brenda Nuding to Kate March stating the appropriate PCMe category should have the following criteria: all structures >5µm long, >=0.25µm – 3µm in width, with a >=3:1 aspect ratio. PCMe Structures counts include all the primary structure types (F, B, MD, MC, CC, CD). PCMe Fiber counts include all total structure types (F, B, MF, MB, MR, CF, CB, CR).

Based on client request, the ISO confidence limits have been adjusted so 0 structures = 0, 1 structure = 1, 2 structures = 2, etc. The ISO method uses specific one-sided upper 95% Poisson confidence limits to calculate sample concentrations when structure counts are below four structures. Standard ISO limits are 0 structures = 2.99, 1 structure = 4.74, 2 structures = 6.3 and 3 structures = 7.75.

Laboratories in Seattle and Portland

- Chain of Custody: 220805_coc.pdf
- Final Reports – The NADES sheets for the ISO jobs were uploaded to Dropbox.:
 - *PDF reports were emailed directly and NADES were uploaded to Dropbox due to their size.*
- Images – All the pertinent image data has been uploaded to Dropbox. Brightfield, Diffraction and Spectra files are included along with a Log to be used with each number to organize and find the images.
 - *Spectra Files – Word documents of each spectra file.*
 - *Brightfields (F****BF.tif files)*
 - *Diffraction Images (F****DF.tif)*
- Invoices:
 - 220805-4148_20220923_Invoice.pdf – was uploaded to pacificap@eaest.com on Sept 23, 2022.
- Prep Sheets:
 - *TEM Prep 220805 Prep Form.pdf - sent via email*
- TEM QC Data
 - Analytical QC - ISO QC submitted via email on Sept 23, 2022.
 - 220805 Analyst Completed QC.pdf - This has the ISO QC Summary Table.xlsx that shows the analytical QC summary for the secondary analysis performed. No issues with QC analyses.
 - Instrument Data submitted via email on Sept 23, 2022.
 - The following QC and calibration items were included::
 - Plasma Ash Rate = 5 minute ash rate is most recent best fit.
 - Grid Calibrations – Average grid opening measurement highlighted in yellow.
 - Equipment Logs for both scopes included.
 - Daily Cu Al Check for both scopes.
 - Mag Calibrations for both scopes.
 - Camera Constant (Camera Length) for both scopes.
 - Probe (Spot) Size for both scopes.
 - EDS Resolution: Mn Calibration for both scopes.
 - Na Sensitivity for both scopes.
 - K Factor for both scopes.

Sincerely,

Kate March
Lab/Cor, Inc.
Seattle WA, 98117
(206)781-0155
kmarch@labcor.net

ISO 10312 - Direct Report

Job Number: 220805

Client: EA Engineering

Address: 54 North Last Chance Gulch

Suite 14

Helena, MT 59601

Project Name: North Ridge Estates - OU2

Project No.: 1578503

PO Number: 23966

Sub Project:

Reference No.:

Report Number: 220805R01

Report Date: 9/20/2022

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
220805 - S1	ABS1-01-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/15/2022	8/24/2022
220805 - S2	ABS1-01-L	ISO 10312 - Direct		8/15/2022	8/24/2022
220805 - S3	ABS1-02-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/15/2022	8/24/2022
220805 - S4	ABS1-02-L	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/15/2022	8/24/2022
220805 - S5	ABS2-01-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/16/2022	8/24/2022
220805 - S6	ABS2-01-L	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S7	ABS2-02-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/16/2022	8/24/2022
220805 - S8	ABS2-02-L	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S9	ABS3-01-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/17/2022	8/24/2022
220805 - S10	ABS3-01-L	ISO 10312 - Direct		8/17/2022	8/24/2022
220805 - S11	ABS3-02-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/17/2022	8/24/2022
220805 - S12	ABS3-02-L	ISO 10312 - Direct		8/17/2022	8/24/2022
220805 - S13	ABS4-01-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/19/2022	8/24/2022
220805 - S14	ABS4-01-L	ISO 10312 - Direct		8/19/2022	8/24/2022
220805 - S15	ABS4-02-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/19/2022	8/24/2022
220805 - S16	ABS4-02-L	ISO 10312 - Direct		8/19/2022	8/24/2022
220805 - S17	ABS5-01-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/18/2022	8/24/2022
220805 - S18	ABS5-01-L	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S19	ABS5-02-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/18/2022	8/24/2022
220805 - S20	ABS5-02-L	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S21	PM1-UW	ISO 10312 - Direct		8/15/2022	8/24/2022
220805 - S22	PM1-DW	ISO 10312 - Direct		8/15/2022	8/24/2022
220805 - S23	PM1-CW	ISO 10312 - Direct		8/15/2022	8/24/2022
220805 - S24	PM2-UW	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S25	PM2-DW	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S26	PM2-CW	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S27	PM3-UW	ISO 10312 - Direct		8/17/2022	8/24/2022
220805 - S28	PM3-DW	ISO 10312 - Direct		8/17/2022	8/24/2022
220805 - S29	PM3-CW	ISO 10312 - Direct		8/17/2022	8/24/2022

ISO 10312 - Direct Report

Job Number: 220805

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Report Date: 9/20/2022

220805 - S30	PM4-UW	ISO 10312 - Direct		8/19/2022	8/24/2022
220805 - S31	PM4-DW	ISO 10312 - Direct		8/19/2022	8/24/2022
220805 - S32	PM4-CW	ISO 10312 - Direct		8/19/2022	8/24/2022
220805 - S33	PM5-UW	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S34	PM5-DW	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S35	PM5-CW	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S36	LB-15082022	ISO 10312 - Direct		8/15/2022	8/24/2022
220805 - S37	COL1-02-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/15/2022	8/24/2022
220805 - S38	COL2-DW	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S39	COL3-01-H	ISO 10312 - Direct	Not Analyzed - Overloaded, did not prepare.	8/17/2022	8/24/2022
220805 - S40	COL4-UW	ISO 10312 - Direct		8/19/2022	8/24/2022
220805 - S41	COL5-01-H	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S42	FB-15082022	ISO 10312 - Direct		8/15/2022	8/24/2022
220805 - S43	FB-16082022	ISO 10312 - Direct		8/16/2022	8/24/2022
220805 - S44	FB-17082022	ISO 10312 - Direct		8/17/2022	8/24/2022
220805 - S45	FB-18082022	ISO 10312 - Direct		8/18/2022	8/24/2022
220805 - S46	FB-19082022	ISO 10312 - Direct		8/19/2022	8/24/2022

ISO 10312 - Direct Report

Job Number: 220805

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Report Date: 9/20/2022

ISO 10312 - Direct Upon sample receipt the samples and the associated packaging are checked to ensure that samples were not packaged in untreated polystyrene foam (peanuts), vermiculite, paper shreds, or excelsior packing materials; top covers and end plugs were in place for each cassette; and samples were properly sealed and undamaged, neither shipped nor stored with bulk samples, and were labeled upon receipt at the laboratory. Any items of note are recorded on the sample preparation form before being submitted to the technician for preparation. If there were any sample preparation notes, they would be recorded by the preparation technician on the sample preparation form.

Preparation and analysis of the above samples was conducted in accordance with the ISO method 10312 (Direct) for the identification of asbestos. Briefly, the samples were collapsed with a solution of N,N-dimethylformamide and acetic acid, then etched in a low temperature plasma etcher to remove the top surface of the filter and other organics. The samples were carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in N,N-Dimethylformamide / Acetone baths until cleared of filter debris.

One of the high flow / low flow sets of samples were overloaded at the time of prep, ABS1-02-H and ASB1-02-L. ISO 13794 Indirect analysis was approved by Catherine LeCours on September 6, 2022.

All of the High Flow ABS samples were determined to be overloaded at prep; there was either loose particulate on the filter or the particulate shifted when filter preparation was attempted on these samples. Two of the High Flow COL samples were also overloaded at prep and not prepped onto grids, COL1-02-H and COL3-01-H.

TEM analysis was performed using a transmission electron microscope equipped with an EDS X ray analyzer. The air samples were analyzed at an approximate screen magnification of 15,000 – 20,000x for asbestos structures greater than 0.5 micrometer lengths. An accelerating voltage of 100 KV was applied. The sizing of grid openings was performed using a calibrated digital imaging system at low magnification. The analyst records the quality of each grid preparation as part of the analytical procedures outlined in the TEM Standard Operation Procedure.

The count categories used on this report are the standard ISO 10312 categories with the exception of the PCM Equivalent category. The PCM Equivalent count category used for this report was modified from the Statement of Work in an email from Brenda Nuding to Kate March stating the appropriate PCMe category should have the following criteria: all structures >5µm long, >=0.25µm – 3µm in width, with a >=3:1 aspect ratio. PCMe Structures counts include all the primary structure types (F, B, MD, MC, CC, CD). PCMe Fiber counts include all total structure types (F, B, MF, MB, MR, CF, CB, CR).

Based on client request, the ISO confidence limits have been adjusted so 0 structures = 0, 1 structure = 1, 2 structures = 2, etc. The ISO method uses specific one-sided upper 95% Poisson confidence limits to calculate sample concentrations when structure counts are below four structures. Standard ISO limits are 0 structures = 2.99, 1 structure = 4.74, 2 structures = 6.3 and 3 structures = 7.75.

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,



Kate March
Quality Control Officer

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S2

Volume (L) : 423.5

Client Sample No.: ABS1-01-L

Lab Filter Area (mm2) : 385

Analyst(s)	Analysis Date	Microscope	Magnification
KM	9/2/2022	Hitachi 7000FA	20000
KM	9/6/2022	Hitachi 7000FA	20000
KM	9/12/2022	Hitachi 7000FA	20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0080451

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.008	0 - 0.0297 - Poisson	0	
Total Asbestos Structures	0	< 0.008	0 - 0.0297 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.008	0 - 0.0297 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.008	0 - 0.0297 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.008	0 - 0.0297 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.008	0 - 0.0297 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.008	0 - 0.0297 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.008	0 - 0.0297 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S6

Volume (L) : 250

Client Sample No.: ABS2-01-L

Lab Filter Area (mm2) : 385

Analyst(s)	Analysis Date	Microscope	Magnification
KM	9/6/2022	Hitachi 7000FA	20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0136283

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0136	0 - 0.0503 - Poisson	0	
Total Asbestos Structures	0	< 0.0136	0 - 0.0503 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0136	0 - 0.0503 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0136	0 - 0.0503 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0136	0 - 0.0503 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0136	0 - 0.0503 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0136	0 - 0.0503 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0136	0 - 0.0503 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S8
Client Sample No.: ABS2-02-L

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/6/2022 Hitachi 7000FA 20000

Volume (L) : 240
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0141962

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0142	0 - 0.0524 - Poisson	0	
Total Asbestos Structures	0	< 0.0142	0 - 0.0524 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0142	0 - 0.0524 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0142	0 - 0.0524 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0142	0 - 0.0524 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0142	0 - 0.0524 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0142	0 - 0.0524 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0142	0 - 0.0524 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S10
Client Sample No.: ABS3-01-L

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/6/2022 Hitachi 7000FA 20000
KM 9/12/2022 Hitachi 7000FA 20000

Volume (L) : 259.88
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0131102

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0131	0 - 0.0484 - Poisson	0	
Total Asbestos Structures	0	< 0.0131	0 - 0.0484 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0131	0 - 0.0484 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0131	0 - 0.0484 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0131	0 - 0.0484 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0131	0 - 0.0484 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0131	0 - 0.0484 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0131	0 - 0.0484 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S12

Volume (L) : 253.78

Client Sample No.: ABS3-02-L

Lab Filter Area (mm²) : 385

Analyst(s) Analysis Date Microscope Magnification
SB 9/6/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.113
Analytical Sens. (struc/cc) : 0.0134253

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0134	0 - 0.0495 - Poisson	0	
Total Asbestos Structures	0	< 0.0134	0 - 0.0495 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0495 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0495 - Poisson		0
Asbestos Structures > 5µm and 5:1	0	< 0.0134	0 - 0.0495 - Poisson	0	
Asbestos Fibers and Bundles > 5µm and 3:1	0	< 0.0134	0 - 0.0495 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0495 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0495 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S14

Volume (L) : 259

Client Sample No.: ABS4-01-L

Lab Filter Area (mm²) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/12/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.113
Analytical Sens. (struc/cc) : 0.0131547

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	8.8	0.0132	0.0003 - 0.0733 - Poisson	1	
Total Asbestos Structures	8.8	0.0132	0.0003 - 0.0733 - Poisson		1
Primary Asb & Libby-Other Amph Structures	8.8	0.0132	0.0003 - 0.0733 - Poisson	1	
Total Asb & Libby-Other Amph Structures	8.8	0.0132	0.0003 - 0.0733 - Poisson		1
Asbestos Structures > 5µm and 5:1	8.8	0.0132	0.0003 - 0.0733 - Poisson	1	
Asbestos Fibers and Bundles > 5µm and 3:1	0	< 0.0132	0 - 0.0485 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0132	0 - 0.0485 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0132	0 - 0.0485 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S16

Volume (L) : 259.4

Client Sample No.: ABS4-02-L

Lab Filter Area (mm²) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/12/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.113
Analytical Sens. (struc/cc) : 0.0131345

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0131	0 - 0.0485 - Poisson	0	
Total Asbestos Structures	0	< 0.0131	0 - 0.0485 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0131	0 - 0.0485 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0131	0 - 0.0485 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0131	0 - 0.0485 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0131	0 - 0.0485 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0131	0 - 0.0485 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0131	0 - 0.0485 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S18

Volume (L) : 254.6

Client Sample No.: ABS5-01-L

Lab Filter Area (mm²) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/14/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.113
Analytical Sens. (struc/cc) : 0.0133821

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0134	0 - 0.0494 - Poisson	0	
Total Asbestos Structures	0	< 0.0134	0 - 0.0494 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0494 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0494 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0134	0 - 0.0494 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0134	0 - 0.0494 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0494 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0494 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S20

Volume (L) : 254.1

Client Sample No.: ABS5-02-L

Lab Filter Area (mm2) : 385

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/14/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0134084

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0134	0 - 0.0495 - Poisson	0	
Total Asbestos Structures	0	< 0.0134	0 - 0.0495 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0495 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0495 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0134	0 - 0.0495 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0134	0 - 0.0495 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0495 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0495 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S21

Volume (L) : 3581.5

Client Sample No.: PM1-UW

Lab Filter Area (mm2) : 385

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/14/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 32
Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.3616
Analytical Sens. (struc/cc) : 0.0002973

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S22

Client Sample No.: PM1-DW

Analyst(s)	Analysis Date	Microscope	Magnification
KM	9/14/2022	JEOL-Sr 1200	20000
KM	9/15/2022	JEOL-Sr 1200	20000

Volume (L) : 3648
Lab Filter Area (mm²) : 385
Grid Openings Analyzed : 32
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.3616
Analytical Sens. (struc/cc) : 0.0002919

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S23

Client Sample No.: PM1-CW

Analyst(s)	Analysis Date	Microscope	Magnification
KM	9/15/2022	JEOL-Sr 1200	20000

Volume (L) : 3572
Lab Filter Area (mm²) : 385
Grid Openings Analyzed : 32
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.3616
Analytical Sens. (struc/cc) : 0.0002981

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S24

Volume (L) : 3240

Client Sample No.: PM2-UW

Lab Filter Area (mm²) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/15/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 36
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.4068
Analytical Sens. (struc/cc) : 0.0002921

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5µm and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5µm and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S25

Volume (L) : 3193

Client Sample No.: PM2-DW

Lab Filter Area (mm²) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/15/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 36
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.4068
Analytical Sens. (struc/cc) : 0.0002964

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5µm and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5µm and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No.: S26

Client Sample No.: PM2-CW

Analyst(s) Analysis Date Microscope Magnification
KM 9/15/2022 JEOL-Sr 1200 20000

Volume (L) : 3256
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 36
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.4068
Analytical Sens. (struc/cc) : 0.0002907

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S27

Client Sample No.: PM3-UW

Analyst(s) Analysis Date Microscope Magnification
KM 9/16/2022 JEOL-Sr 1200 20000

Volume (L) : 2682.56
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 43
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.4859
Analytical Sens. (struc/cc) : 0.0002954

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	6.2	0.0009	0.0002 - 0.0026 - Poisson	3	
Total Asbestos Structures	6.2	0.0009	0.0002 - 0.0026 - Poisson		3
Primary Asb & Libby-Other Amph Structures	6.2	0.0009	0.0002 - 0.0026 - Poisson	3	
Total Asb & Libby-Other Amph Structures	6.2	0.0009	0.0002 - 0.0026 - Poisson		3
Asbestos Structures > 5um and 5:1	2.1	0.0003	0 - 0.0016 - Poisson	1	
Asbestos Fibers and Bundles > 5um and 3:1	2.1	0.0003	0 - 0.0016 - Poisson		1
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	2.1	0.0003	0 - 0.0016 - Poisson		1
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S28

Volume (L) : 2586.29

Client Sample No.: PM3-DW

Lab Filter Area (mm2) : 385

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/16/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 44

Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.4972

Analytical Sens. (struc/cc) : 0.0002994

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	2	0.0003	0 - 0.0017 - Poisson	1	
Total Asbestos Structures	2	0.0003	0 - 0.0017 - Poisson		1
Primary Asb & Libby-Other Amph Structures	2	0.0003	0 - 0.0017 - Poisson	1	
Total Asb & Libby-Other Amph Structures	2	0.0003	0 - 0.0017 - Poisson		1
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S29

Volume (L) : 2632

Client Sample No.: PM3-CW

Lab Filter Area (mm2) : 385

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/16/2022 JEOL-Sr 1200 20000

Grid Openings Analyzed : 44

Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.4972

Analytical Sens. (struc/cc) : 0.0002942

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S30

Volume (L) : 2325.9

Client Sample No.: PM4-UW

Lab Filter Area (mm²) : 385

Analyst(s)	Analysis Date	Microscope	Magnification
KM	9/16/2022	JEOL-Sr 1200	20000
KM	9/17/2022	JEOL-Sr 1200	20000

Grid Openings Analyzed : 49
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.5537
Analytical Sens. (struc/cc) : 0.0002989

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	1.8	0.0003	0 - 0.0017 - Poisson	1	
Total Asbestos Structures	1.8	0.0003	0 - 0.0017 - Poisson		1
Primary Asb & Libby-Other Amph Structures	1.8	0.0003	0 - 0.0017 - Poisson	1	
Total Asb & Libby-Other Amph Structures	1.8	0.0003	0 - 0.0017 - Poisson		1
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	1.8	0.0003	0 - 0.0017 - Poisson		1
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	1.8	0.0003	0 - 0.0017 - Poisson		1
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	1.8	0.0003	0 - 0.0017 - Poisson	1	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S31

Volume (L) : 2321.8

Client Sample No.: PM4-DW

Lab Filter Area (mm²) : 385

Analyst(s)	Analysis Date	Microscope	Magnification
KM	9/17/2022	JEOL-Sr 1200	20000

Grid Openings Analyzed : 49
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.5537
Analytical Sens. (struc/cc) : 0.0002995

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S32

Volume (L) : 2320.7

Client Sample No.: PM4-CW

Lab Filter Area (mm2) : 385

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/19/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 49

Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.5537

Analytical Sens. (struc/cc) : 0.0002996

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S33

Volume (L) : 3285.2

Client Sample No.: PM5-UW

Lab Filter Area (mm2) : 385

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/19/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 36

Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.4068

Analytical Sens. (struc/cc) : 0.0002881

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S34

Volume (L) : 3246.9

Client Sample No.: PM5-DW

Lab Filter Area (mm2) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/19/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 35
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.3955
Analytical Sens. (struc/cc) : 0.0002998

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S35

Volume (L) : 3239.2

Client Sample No.: PM5-CW

Lab Filter Area (mm2) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/19/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 36
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.4068
Analytical Sens. (struc/cc) : 0.0002922

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S36

Client Sample No.: LB-15082022

Analyst(s) Analysis Date Microscope Magnification
KM 9/19/2022 Hitachi 7000FA 20000

Volume (L) : 0
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : NA

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	Not Applicable	Not Applicable	0	
Total Asbestos Structures	0	Not Applicable	Not Applicable		0
Primary Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0	
Total Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable		0
Asbestos Structures > 5um and 5:1	0	Not Applicable	Not Applicable	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S38

Client Sample No.: COL2-DW

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Volume (L) : 3248
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 36
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.4068
Analytical Sens. (struc/cc) : 0.0002914

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S40

Volume (L) : 2346.1

Client Sample No.: COL4-UW

Lab Filter Area (mm2) : 385

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Grid Openings Analyzed : 50
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.565
Analytical Sens. (struc/cc) : 0.0002904

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S41

Volume (L) : 995.6

Client Sample No.: COL5-01-H

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0034221

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0034	0 - 0.0126 - Poisson	0	
Total Asbestos Structures	0	< 0.0034	0 - 0.0126 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0034	0 - 0.0126 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0034	0 - 0.0126 - Poisson		0
Asbestos Structures > 5um and 5:1	0	< 0.0034	0 - 0.0126 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0034	0 - 0.0126 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0034	0 - 0.0126 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0034	0 - 0.0126 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S42

Client Sample No.: FB-15082022

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/20/2022 Hitachi 7000FA 20000

Volume (L) : 0
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : NA

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	Not Applicable	Not Applicable	0	
Total Asbestos Structures	0	Not Applicable	Not Applicable		0
Primary Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0	
Total Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable		0
Asbestos Structures > 5um and 5:1	0	Not Applicable	Not Applicable	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S43

Client Sample No.: FB-16082022

Analyst(s) **Analysis Date** **Microscope** **Magnification**
KM 9/20/2022 Hitachi 7000FA 20000

Volume (L) : 0
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : NA

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	Not Applicable	Not Applicable	0	
Total Asbestos Structures	0	Not Applicable	Not Applicable		0
Primary Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0	
Total Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable		0
Asbestos Structures > 5um and 5:1	0	Not Applicable	Not Applicable	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No.: S44

Client Sample No.: FB-17082022

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Volume (L) : 0
Lab Filter Area (mm²) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.113
Analytical Sens. (struc/cc) : NA

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	Not Applicable	Not Applicable	0	
Total Asbestos Structures	0	Not Applicable	Not Applicable		0
Primary Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0	
Total Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable		0
Asbestos Structures > 5um and 5:1	0	Not Applicable	Not Applicable	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Lab/Cor Sample No.: S45

Client Sample No.: FB-18082022

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Volume (L) : 0
Lab Filter Area (mm²) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm²) : 0.113
Analytical Sens. (struc/cc) : NA

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	Not Applicable	Not Applicable	0	
Total Asbestos Structures	0	Not Applicable	Not Applicable		0
Primary Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0	
Total Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable		0
Asbestos Structures > 5um and 5:1	0	Not Applicable	Not Applicable	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

* One-sided upper 95% Poisson confidence limits may be used to calculate sample concentrations ([Struc count] * [Analytical Sensitivity]) when the structure count is below 4. The limits are: 0 str - 0, 1 str - 1, 2 str - 2, 3 str - 3

ISO 10312 - Direct Summary Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No.: S46

Client Sample No.: FB-19082022

Volume (L) : 0

Lab Filter Area (mm²) : 385

Grid Openings Analyzed : 10

Average Grid Opening Area : 0.0113

Area Analyzed (mm²) : 0.113

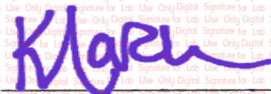
Analytical Sens. (struc/cc) : NA

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Structure Type	Filter Density (s/mm ²)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total
Primary Asbestos Structures	0	Not Applicable	Not Applicable	0
Total Asbestos Structures	0	Not Applicable	Not Applicable	0
Primary Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0
Total Asb & Libby-Other Amph Structures	0	Not Applicable	Not Applicable	0
Asbestos Structures > 5um and 5:1	0	Not Applicable	Not Applicable	0
Asbestos Fibers and Bundles > 5um and 3:1	0	Not Applicable	Not Applicable	0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	Not Applicable	Not Applicable	0

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Reviewed by:


X
Kate March
Quality Control Officer

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2
Project No.: 1578503

Report Number: 220805R01
Date Received: 8/24/2022

Lab/Cor Sample No: S2
Client Sample No: ABS1-01-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	E33				NSD							
G1	2	E34				NSD							
G1	3	F33				NSD							
G1	4	G31				NSD							
G1	5	G32				NSD							
G2	6	C34				NSD							
G2	7	E33				NSD							
G2	8	E42				NSD							
G2	9	F41				NSD							
G2	10	F44				NSD							

Lab/Cor Sample No: S6
Client Sample No: ABS2-01-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	E31				NSD							
G1	2	E32				NSD							
G1	3	F31				NSD							
G1	4	F34				NSD							
G1	5	G41				NSD							
G2	6	C42				NSD							
G2	7	E41				NSD							
G2	8	E44				NSD							
G2	9	F43				NSD							
G2	10	F52				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S8

Client Sample No: ABS2-02-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C31				NSD							
G1	2	C34				NSD							
G1	3	E33				NSD							
G1	4	E42				NSD							
G1	5	F41	NAS	1		MD 1-1	14.2	3.85	3.7	Non Asbestos Structure			
G1	5	F41	NAS		1	MF	14.2	2.1	6.8	Non Asbestos Structure	Mg, Al, Si, Ca, Ti, Mn, Fe		
							ItemType	ItemNum			Confirmed	Comment	
							Spectra	F69236SP			KM	9/6/2022	
							Brightfield	F69236BF					
G2	6	C41				NSD							
G2	7	C44				NSD							
G2	8	E43				NSD							
G2	9	E52				NSD							
G2	10	F51				NSD							

Lab/Cor Sample No: S10

Client Sample No: ABS3-01-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B42				NSD							
G1	2	C41				NSD							
G1	3	C44				NSD							
G1	4	E43				NSD							
G1	5	E52				NSD							
G2	6	B31				NSD							
G2	7	B34				NSD							
G2	8	C33				NSD							
G2	9	C42				NSD							
G2	10	E41				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S12

Client Sample No: ABS3-02-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B42				NSD							
G1	2	C41				NSD							
G1	3	C33				NSD							
G1	4	E52				NSD							
G1	5	F51				NSD							
G2	6	E52				NSD							
G2	7	E44				NSD							
G2	8	F43				NSD							
G2	9	E32				NSD							
G2	10	F31				NSD							

Lab/Cor Sample No: S14

Client Sample No: ABS4-01-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C32				NSD							
G1	2	E31				NSD							
G1	3	E34				NSD							
G1	4	F33				NSD							
G1	5	F42				NSD							
G2	6	F32				NSD							
G2	7	G31				NSD							
G2	8	G34				NSD							
G2	9	H33	ADQ	1	1	MC 3-3	22.4	8.5	2.6	Anthophyllite	Mg, Al, Si, Ca, Ti, Mn, Fe		PAOS, TAOS, AS>5
						ItemType	ItemNum		Confirmed		Comment		
						Spectra	F69261SP		KM 9/12/2022				
						Diffraction	F69261DF		KM 9/12/2022		0.53nm ROW SPACING		
						Brightfield	F69261BF						
G2	10	H42				NSD							

Lab/Cor Sample No: S16

Client Sample No: ABS4-02-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C23				NSD							
G1	2	C32				NSD							
G1	3	E31				NSD							
G1	4	E34				NSD							
G1	5	F33				NSD							
G2	6	C42				NSD							
G2	7	E41				NSD							
G2	8	E44				NSD							
G2	9	F43				NSD							
G2	10	F52				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S18

Client Sample No: ABS5-01-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C44				NSD							
G1	2	E43				NSD							
G1	3	E52				NSD							
G1	4	F51				NSD							
G1	5	F54				NSD							
G1	6	G53				NSD							
G2	7	E34				NSD							
G2	8	F33				NSD							
G2	9	F42				NSD							
G2	10	G41				NSD							

Lab/Cor Sample No: S20

Client Sample No: ABS5-02-L

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C42				NSD							
G1	2	E41				NSD							
G1	3	E44				NSD							
G1	4	F43				NSD							
G1	5	F52				NSD							
G1	6	G51				NSD							
G2	7	G33				NSD							
G2	8	G42				NSD							
G2	9	H41				NSD							
G2	10	H44				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S21

Client Sample No: PM1-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C33				NSD							
G1	2	C34				NSD							
G1	3	E33				NSD							
G1	4	E34				NSD							
G1	5	F33				NSD							
G1	6	F34				NSD							
G1	7	C41				NSD							
G1	8	C42				NSD							
G1	9	E41				NSD							
G1	10	E42				NSD							
G1	11	F41				NSD							
G1	12	F42				NSD							
G1	13	B44				NSD							
G1	14	C43				NSD							
G1	15	C44				NSD							
G1	16	E43				NSD							
G1	17	E44				NSD							
G2	18	E34				NSD							
G2	19	F33				NSD							
G2	20	F34				NSD							
G2	21	G33				NSD							
G2	22	G34				NSD							
G2	23	H33				NSD							
G2	24	H34				NSD							
G2	25	K33				NSD							
G2	26	F44				NSD							
G2	27	G43				NSD							
G2	28	G44				NSD							
G2	29	H43				NSD							
G2	30	H44				NSD							
G2	31	F52				NSD							
G2	32	G51				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S22

Client Sample No: PM1-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B34				NSD							
G1	2	C33				NSD							
G1	3	C34				NSD							
G1	4	E33				NSD							
G1	5	E34				NSD							
G1	6	F33				NSD							
G1	7	F34				NSD							
G1	8	G33				NSD							
G1	9	C44				NSD							
G1	10	E43				NSD							
G1	11	E44				NSD							
G1	12	F43				NSD							
G1	13	F44				NSD							
G1	14	G43				NSD							
G1	15	G44				NSD							
G1	16	E52				NSD							
G1	17	F51				NSD							
G1	18	F52				NSD							
G1	19	G51				NSD							
G1	20	G52				NSD							
G2	21	B34				NSD							
G2	22	C33				NSD							
G2	23	C34				NSD							
G2	24	E33				NSD							
G2	25	E34				NSD							
G2	26	F33				NSD							
G2	27	F34				NSD							
G2	28	G33				NSD							
G2	29	G34				NSD							
G2	30	H33				NSD							
G2	31	G44				NSD							
G2	32	G43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S23

Client Sample No: PM1-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C61				NSD							
G1	2	C62				NSD							
G1	3	E61				NSD							
G1	4	E62				NSD							
G1	5	F53				NSD							
G1	6	F54				NSD							
G1	7	G53				NSD							
G1	8	G54				NSD							
G1	9	H53				NSD							
G1	10	H54				NSD							
G1	11	K53				NSD							
G1	12	K54				NSD							
G1	13	F43				NSD							
G1	14	F44				NSD							
G1	15	G43				NSD							
G1	16	G44				NSD							
G1	17	H43				NSD							
G2	18	C53				NSD							
G2	19	C54				NSD							
G2	20	E53				NSD							
G2	21	E54				NSD							
G2	22	F53				NSD							
G2	23	F54				NSD							
G2	24	G53				NSD							
G2	25	G54				NSD							
G2	26	B43				NSD							
G2	27	B44				NSD							
G2	28	C43				NSD							
G2	29	C44				NSD							
G2	30	E43				NSD							
G2	31	E44				NSD							
G2	32	F43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S24

Client Sample No: PM2-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	F24				NSD							
G1	2	G23				NSD							
G1	3	G24				NSD							
G1	4	H23				NSD							
G1	5	H31				NSD							
G1	6	G32				NSD							
G1	7	G31				NSD							
G1	8	F32				NSD							
G1	9	C31				NSD							
G1	10	B33				NSD							
G1	11	B34				NSD							
G1	12	C33				NSD							
G1	13	C34				NSD							
G1	14	F33				NSD							
G1	15	F34				NSD							
G1	16	G33				NSD							
G1	17	G34				NSD							
G1	18	H33				NSD							
G2	19	B34				NSD							
G2	20	C33				NSD							
G2	21	C34				NSD							
G2	22	E33				NSD							
G2	23	E34				NSD							
G2	24	F33				NSD							
G2	25	F34				NSD							
G2	26	G33				NSD							
G2	27	G34				NSD							
G2	28	H33				NSD							
G2	29	C43				NSD							
G2	30	C44				NSD							
G2	31	E43				NSD							
G2	32	E44				NSD							
G2	33	F43				NSD							
G2	34	F44				NSD							
G2	35	E52				NSD							
G2	36	F51				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S25

Client Sample No: PM2-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B34				NSD							
G1	2	C33				NSD							
G1	3	C34				NSD							
G1	4	E33				NSD							
G1	5	E34				NSD							
G1	6	F33				NSD							
G1	7	F34				NSD							
G1	8	H33				NSD							
G1	9	H34				NSD							
G1	10	K33				NSD							
G1	11	C43				NSD							
G1	12	C44				NSD							
G1	13	E43				NSD							
G1	14	E44				NSD							
G1	15	F43				NSD							
G1	16	F44				NSD							
G1	17	G43				NSD							
G1	18	G44				NSD							
G1	19	H43				NSD							
G2	20	F34				NSD							
G2	21	G33				NSD							
G2	22	G34				NSD							
G2	23	H33				NSD							
G2	24	H34				NSD							
G2	25	K33				NSD							
G2	26	F43				NSD							
G2	27	F44				NSD							
G2	28	G43				NSD							
G2	29	G44				NSD							
G2	30	H43				NSD							
G2	31	H42				NSD							
G2	32	H41				NSD							
G2	33	G42				NSD							
G2	34	G41				NSD							
G2	35	F42				NSD							
G2	36	F41				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S26

Client Sample No: PM2-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C32				NSD							
G1	2	E31				NSD							
G1	3	E32				NSD							
G1	4	F31				NSD							
G1	5	F32				NSD							
G1	6	G31				NSD							
G1	7	G32				NSD							
G1	8	H31				NSD							
G1	9	H32				NSD							
G1	10	B42				NSD							
G1	11	C41				NSD							
G1	12	C42				NSD							
G1	13	E41				NSD							
G1	14	G41				NSD							
G1	15	G42				NSD							
G1	16	H41				NSD							
G1	17	H42				NSD							
G1	18	K41				NSD							
G1	19	K33				NSD							
G1	20	H34				NSD							
G1	21	H33				NSD							
G1	22	G34				NSD							
G2	23	C33				NSD							
G2	24	C34				NSD							
G2	25	E33				NSD							
G2	26	E34				NSD							
G2	27	F33				NSD							
G2	28	F34				NSD							
G2	29	G33				NSD							
G2	30	G34				NSD							
G2	31	C44				NSD							
G2	32	E43				NSD							
G2	33	E44				NSD							
G2	34	F43				NSD							
G2	35	F44				NSD							
G2	36	G43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S27

Client Sample No: PM3-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C31				NSD							
G1	2	C32				NSD							
G1	3	E31				NSD							
G1	4	E32				NSD							
G1	5	F31				NSD							
G1	6	F32				NSD							
G1	7	G31				NSD							
G1	8	G32				NSD							
G1	9	H31				NSD							
G1	10	H32				NSD							
G1	11	B42				NSD							
G1	12	C41				NSD							
G1	13	C42				NSD							
G1	14	E41				NSD							
G1	15	E42				NSD							
G1	16	F41				NSD							
G1	17	F42				NSD							
G1	18	G41				NSD							
G1	19	G42				NSD							
G1	20	C51				NSD							
G1	21	C52				NSD							
G1	22	E51				NSD							
G1	23	E52	AZQ	1		MD 1-1	9.3	3.5	2.7	Actinolite			PAOS, AS>5
G1	23	E52	AZQ		1	MF	5.7	0.5	11.4	Actinolite	Mg, Al, Si, Ca, Fe		PCMEFmodNIOSH, TAOS, AFB>5, 3:1
						ItemType	ItemNum				Confirmed	Comment	
						Spectra	J69293SP				KM	9/16/2022	
						Diffraction	J69293DF				KM	9/16/2022	
						Brightfield	J69293BF					ZONE AXIS [3 -1 4]	
G1	23	E52	CMQ	2	2	MC 1-0	2	0.85	2.4	Chrysotile	Mg, Si		PAOS, TAOS
						ItemType	ItemNum				Confirmed	Comment	
						Spectra	J69294SP				KM	9/16/2022	
						Brightfield	J69294BF						
G1	24	F51				NSD							
G1	25	F52				NSD							
G1	26	G51				NSD							
G2	27	E33				NSD							
G2	28	E34				NSD							
G2	29	F33	CDQ	3	3	F	0.98	0.11	8.9	Chrysotile	Mg, Si		PAOS, TAOS
						ItemType	ItemNum				Confirmed	Comment	
						Spectra	J69295SP				KM	9/16/2022	
						Diffraction	J69295DF				KM	9/16/2022	
						Brightfield	J69295BF					0.53nm ROW SPACING	
G2	30	F34				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S27

Client Sample No: PM3-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	31	G33				NSD							
G2	32	G34				NSD							
G2	33	H33				NSD							
G2	34	H34				NSD							
G2	35	E43				NSD							
G2	36	E44				NSD							
G2	37	F43				NSD							
G2	38	F44				NSD							
G2	39	G43				NSD							
G2	40	G44				NSD							
G2	41	H43				NSD							
G2	42	H44				NSD							
G2	43	K43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S28

Client Sample No: PM3-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	1	C33				NSD							
G2	2	C34				NSD							
G2	3	E34				NSD							
G2	4	F33				NSD							
G2	5	F34				NSD							
G2	6	G33				NSD							
G2	7	G34	ADQ	1	1	F	1.2	0.12	10	Actinolite	Na, Mg, Al, Si, Ca, Mn, Fe		PAOS, TAOS
						ItemType	ItemNum			Confirmed	Comment		
						Spectra	J69296SP			KM 9/16/2022			
						Diffraction	J69296DF			KM 9/16/2022	0.53nm ROW SPACING		
						Brightfield	J69296BF						
G2	8	H33				NSD							
G2	9	H34				NSD							
G2	10	K33				NSD							
G2	11	C43				NSD							
G2	12	C44				NSD							
G2	13	E43				NSD							
G2	14	E44				NSD							
G2	15	F43				NSD							
G2	16	F44				NSD							
G2	17	G43				NSD							
G2	18	G44				NSD							
G2	19	H43				NSD							
G2	20	H44				NSD							
G2	21	E52				NSD							
G2	22	F51				NSD							
G2	23	F52				NSD							
G1	24	C43				NSD							
G1	25	C44				NSD							
G1	26	E43				NSD							
G1	27	E44				NSD							
G1	28	F43				NSD							
G1	29	F44				NSD							
G1	30	G43				NSD							
G1	31	G44				NSD							
G1	32	H43				NSD							
G1	33	H44				NSD							
G1	34	C53				NSD							
G1	35	C54				NSD							
G1	36	E53				NSD							
G1	37	E54				NSD							

**ISO 10312 - Direct Raw Data -
Final Report**

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S28

Client Sample No: PM3-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	38	F53				NSD							
G1	39	F54				NSD							
G1	40	G53				NSD							
G1	41	G54				NSD							
G1	42	E52				NSD							
G1	43	F51				NSD							
G1	44	F52				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S29

Client Sample No: PM3-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C31				NSD							
G1	2	C32				NSD							
G1	3	E31				NSD							
G1	4	E32				NSD							
G1	5	F31	NAS	1	1	F	16.5	1.35	12.2	Non Asbestos Structure	Mg, Al, Si, K, Ca, Mn, Fe	Transitional Talc/Antho Fiber	
						ItemType	ItemNum				Confirmed	Comment	
						Spectra	J69297SP				KM	9/16/2022	
						Diffraction	J69297DF				KM	9/16/2022	Both Hexagonal and 0.53nm ROW SPACING present.
						Brightfield	J69297BF						
G1	6	F32				NSD							
G1	7	G31				NSD							
G1	8	G32				NSD							
G1	9	H31				NSD							
G1	10	H32				NSD							
G1	11	K31				NSD							
G1	12	C41				NSD							
G1	13	C42				NSD							
G1	14	E41				NSD							
G1	15	E42				NSD							
G1	16	F41				NSD							
G1	17	F42				NSD							
G1	18	G41				NSD							
G1	19	G42				NSD							
G1	20	H41				NSD							
G1	21	H42				NSD							
G1	22	K41				NSD							
G1	23	H44				NSD							
G1	24	H43				NSD							
G1	25	G44				NSD							
G2	26	B54				NSD							
G2	27	C53				NSD							
G2	28	C54				NSD							
G2	29	E54				NSD							
G2	30	F53				NSD							
G2	31	F54				NSD							
G2	32	G53				NSD							
G2	33	G54				NSD							
G2	34	H53				NSD							
G2	35	H54				NSD							
G2	36	K53				NSD							
G2	37	F43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S29

Client Sample No: PM3-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	38	F44				NSD							
G2	39	G43				NSD							
G2	40	G44				NSD							
G2	41	H43				NSD							
G2	42	H44				NSD							
G2	43	K43				NSD							
G2	44	H42				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S30

Client Sample No: PM4-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C31				NSD							
G1	2	C32				NSD							
G1	3	E31				NSD							
G1	4	E32				NSD							
G1	5	F31				NSD							
G1	6	F32				NSD							
G1	7	G31	ADQ	1	1	F	7.5	1.8	4.2	Tremolite	Mg, Si, Ca, Fe		PCMEFmodNIOSH, PAOS, TAOS, AFB>5, 3:1, PCMESmodNIOSH
						ItemType	ItemNum				Confirmed	Comment	
						Spectra	J69298SP				KM 9/17/2022		
						Diffraction	J69298DF				KM 9/17/2022	0.53nm ROW SPACING	
						Brightfield	J69298BF						
G1	8	G32				NSD							
G1	9	H31				NSD							
G1	10	H32				NSD							
G1	11	B42				NSD							
G1	12	C41				NSD							
G1	13	C42				NSD							
G1	14	E41				NSD							
G1	15	E42				NSD							
G1	16	F41				NSD							
G1	17	F42				NSD							
G1	18	G41				NSD							
G1	19	G42				NSD							
G1	20	H41				NSD							
G1	21	H42				NSD							
G1	22	K41				NSD							
G1	23	C43				NSD							
G1	24	C44				NSD							
G1	25	E43				NSD							
G1	26	E44				NSD							
G1	27	F43				NSD							
G1	28	F44				NSD							
G2	29	C31				NSD							
G2	30	C32				NSD							
G2	31	E31				NSD							
G2	32	E32				NSD							
G2	33	F31				NSD							
G2	34	F32				NSD							
G2	35	G31				NSD							
G2	36	G32				NSD							
G2	37	H31				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S30

Client Sample No: PM4-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	38	H32				NSD							
G2	39	B42				NSD							
G2	40	C41				NSD							
G2	41	C42				NSD							
G2	42	E41				NSD							
G2	43	E42				NSD							
G2	44	F41				NSD							
G2	45	F42				NSD							
G2	46	G41				NSD							
G2	47	G42				NSD							
G2	48	H41				NSD							
G2	49	H42				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S31

Client Sample No: PM4-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C33				NSD							
G1	2	C34				NSD							
G1	3	E33				NSD							
G1	4	E34				NSD							
G1	5	F33				NSD							
G1	6	F34				NSD							
G1	7	G33				NSD							
G1	8	G34				NSD							
G1	9	H33				NSD							
G1	10	H34				NSD							
G1	11	B44				NSD							
G1	12	C43				NSD							
G1	13	C44				NSD							
G1	14	E43				NSD							
G1	15	E44				NSD							
G1	16	F43				NSD							
G1	17	F44				NSD							
G1	18	G43				NSD							
G1	19	G44				NSD							
G1	20	H43				NSD							
G1	21	H44				NSD							
G1	22	K43				NSD							
G1	23	H52				NSD							
G1	24	H51				NSD							
G1	25	G52				NSD							
G1	26	G51				NSD							
G1	27	F52				NSD							
G1	28	F51				NSD							
G2	29	C33				NSD							
G2	30	C34				NSD							
G2	31	E33				NSD							
G2	32	E34				NSD							
G2	33	F33				NSD							
G2	34	F34				NSD							
G2	35	G33				NSD							
G2	36	G34				NSD							
G2	37	H33				NSD							
G2	38	H34				NSD							
G2	39	E43				NSD							
G2	40	E44				NSD							
G2	41	F43				NSD							
G2	42	F44				NSD							

**ISO 10312 - Direct Raw Data -
Final Report**

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S31

Client Sample No: PM4-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	43	G43				NSD							
G2	44	G44				NSD							
G2	45	H43				NSD							
G2	46	H44				NSD							
G2	47	H51				NSD							
G2	48	G52				NSD							
G2	49	G51				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S32

Client Sample No: PM4-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B34				NSD							
G1	2	C33				NSD							
G1	3	C34				NSD							
G1	4	E33				NSD							
G1	5	E34				NSD							
G1	6	F33				NSD							
G1	7	F34				NSD							
G1	8	G33				NSD							
G1	9	G34				NSD							
G1	10	H33				NSD							
G1	11	H34				NSD							
G1	12	B44				NSD							
G1	13	C43				NSD							
G1	14	C44				NSD							
G1	15	E43				NSD							
G1	16	E44				NSD							
G1	17	F43				NSD							
G1	18	F44				NSD							
G1	19	G43				NSD							
G1	20	G44				NSD							
G1	21	H43				NSD							
G1	22	H52				NSD							
G1	23	G52				NSD							
G1	24	G51				NSD							
G1	25	F52				NSD							
G2	26	C31				NSD							
G2	27	C32				NSD							
G2	28	E31				NSD							
G2	29	E32				NSD							
G2	30	F31				NSD							
G2	31	F32				NSD							
G2	32	G31				NSD							
G2	33	G32				NSD							
G2	34	H31				NSD							
G2	35	H32				NSD							
G2	36	C41				NSD							
G2	37	C42				NSD							
G2	38	E41				NSD							
G2	39	E42				NSD							
G2	40	F41				NSD							
G2	41	F42				NSD							
G2	42	G41				NSD							

**ISO 10312 - Direct Raw Data -
Final Report**

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S32

Client Sample No: PM4-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	43	G42				NSD							
G2	44	H41				NSD							
G2	45	H42				NSD							
G2	46	H51				NSD							
G2	47	G52				NSD							
G2	48	G51				NSD							
G2	49	F52				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S33

Client Sample No: PM5-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B34				NSD							
G1	2	C33				NSD							
G1	3	C34				NSD							
G1	4	E33				NSD							
G1	5	E34				NSD							
G1	6	F33				NSD							
G1	7	F34				NSD							
G1	8	G33				NSD							
G1	9	G34				NSD							
G1	10	H33				NSD							
G1	11	H34				NSD							
G1	12	K33				NSD							
G1	13	B43				NSD							
G1	14	B44				NSD							
G1	15	C43				NSD							
G1	16	C44				NSD							
G1	17	E43				NSD							
G1	18	E44				NSD							
G1	19	F43				NSD							
G1	20	F44				NSD							
G2	21	C33				NSD							
G2	22	C34				NSD							
G2	23	E33				NSD							
G2	24	E34				NSD							
G2	25	F33				NSD							
G2	26	F34				NSD							
G2	27	G33				NSD							
G2	28	G34				NSD							
G2	29	H33				NSD							
G2	30	H34				NSD							
G2	31	B44				NSD							
G2	32	C43				NSD							
G2	33	C44				NSD							
G2	34	E43				NSD							
G2	35	E44				NSD							
G2	36	F43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S34

Client Sample No: PM5-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C31				NSD							
G1	2	C32				NSD							
G1	3	E31				NSD							
G1	4	E32				NSD							
G1	5	F31				NSD							
G1	6	F32				NSD							
G1	7	G31				NSD							
G1	8	G32				NSD							
G1	9	H31				NSD							
G1	10	H32				NSD							
G1	11	B42				NSD							
G1	12	C41				NSD							
G1	13	C42				NSD							
G1	14	E41				NSD							
G1	15	E42				NSD							
G1	16	F41				NSD							
G1	17	F42				NSD							
G1	18	G41				NSD							
G1	19	G42				NSD							
G2	20	B41				NSD							
G2	21	B42				NSD							
G2	22	C41				NSD							
G2	23	C42				NSD							
G2	24	E41				NSD							
G2	25	E42				NSD							
G2	26	F41				NSD							
G2	27	F42				NSD							
G2	28	G41				NSD							
G2	29	G42				NSD							
G2	30	H41				NSD							
G2	31	C52				NSD							
G2	32	E51				NSD							
G2	33	E52				NSD							
G2	34	F51				NSD							
G2	35	F52				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S35

Client Sample No: PM5-CW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B33				NSD							
G1	2	B34				NSD							
G1	3	C33				NSD							
G1	4	C34				NSD							
G1	5	E33				NSD							
G1	6	E34				NSD							
G1	7	F33				NSD							
G1	8	F34				NSD							
G1	9	G33				NSD							
G1	10	G34				NSD							
G1	11	H33				NSD							
G1	12	B43				NSD							
G1	13	B44				NSD							
G1	14	C43				NSD							
G1	15	C44				NSD							
G1	16	E43				NSD							
G1	17	E44				NSD							
G1	18	F43				NSD							
G1	19	F44				NSD							
G1	20	G43				NSD							
G2	21	B34				NSD							
G2	22	C33				NSD							
G2	23	C34				NSD							
G2	24	E33				NSD							
G2	25	F33				NSD							
G2	26	F34				NSD							
G2	27	G33				NSD							
G2	28	G34				NSD							
G2	29	H33				NSD							
G2	30	H34				NSD							
G2	31	C44				NSD							
G2	32	E43				NSD							
G2	33	E44				NSD							
G2	34	F43				NSD							
G2	35	F44				NSD							
G2	36	G43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S36

Client Sample No: LB-15082022

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B33				NSD							
G1	2	B34				NSD							
G1	3	C33				NSD							
G1	4	C42				NSD							
G1	5	E41				NSD							
G1	6	E44				NSD							
G2	7	C33				NSD							
G2	8	C42				NSD							
G2	9	E41				NSD							
G2	10	E44				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S38

Client Sample No: COL2-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C33				NSD							
G1	2	C34				NSD							
G1	3	E33				NSD							
G1	4	E34				NSD							
G1	5	F33				NSD							
G1	6	F34				NSD							
G1	7	G33				NSD							
G1	8	G34				NSD							
G1	9	H33				NSD							
G1	10	H34				NSD							
G1	11	B44				NSD							
G1	12	C43				NSD							
G1	13	C44				NSD							
G1	14	E43				NSD							
G1	15	E44				NSD							
G1	16	F43				NSD							
G1	17	F44				NSD							
G1	18	G43				NSD							
G1	19	G44				NSD							
G1	20	H43				NSD							
G1	21	H44				NSD							
G2	22	B34				NSD							
G2	23	C33				NSD							
G2	24	C34				NSD							
G2	25	E33				NSD							
G2	26	E34				NSD							
G2	27	F33				NSD							
G2	28	F34				NSD							
G2	29	G33				NSD							
G2	30	G34				NSD							
G2	31	C44				NSD							
G2	32	E43				NSD							
G2	33	E44				NSD							
G2	34	F43				NSD							
G2	35	F44				NSD							
G2	36	G43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S40

Client Sample No: COL4-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B32				NSD							
G1	2	C31				NSD							
G1	3	C32				NSD							
G1	4	E31				NSD							
G1	5	E32				NSD							
G1	6	F31				NSD							
G1	7	F32				NSD							
G1	8	G31				NSD							
G1	9	G32				NSD							
G1	10	H31				NSD							
G1	11	B42				NSD							
G1	12	C41				NSD							
G1	13	C42				NSD							
G1	14	E41				NSD							
G1	15	E42				NSD							
G1	16	F41				NSD							
G1	17	F42				NSD							
G1	18	G41				NSD							
G1	19	G42				NSD							
G1	20	H41				NSD							
G1	21	B52				NSD							
G1	22	C51				NSD							
G1	23	C52				NSD							
G1	24	E51				NSD							
G1	25	E52				NSD							
G1	26	F51				NSD							
G1	27	F52				NSD							
G1	28	G51				NSD							
G2	29	B32				NSD							
G2	30	C31				NSD							
G2	31	C32				NSD							
G2	32	E31				NSD							
G2	33	E32				NSD							
G2	34	F31				NSD							
G2	35	F32				NSD							
G2	36	G31				NSD							
G2	37	G32				NSD							
G2	38	H31				NSD							
G2	39	B42				NSD							
G2	40	C41				NSD							
G2	41	C42				NSD							
G2	42	E41				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S40

Client Sample No: COL4-UW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	43	E42				NSD							
G2	44	F41				NSD							
G2	45	F42				NSD							
G2	46	B44				NSD							
G2	47	C43				NSD							
G2	48	C44				NSD							
G2	49	E43				NSD							
G2	50	E44				NSD							

Lab/Cor Sample No: S41

Client Sample No: COL5-01-H

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	B34				NSD							
G1	2	C33				NSD							
G1	3	C42				NSD							
G1	4	E41				NSD							
G1	5	E44				NSD							
G1	6	F43				NSD							
G2	7	C44				NSD							
G2	8	E43				NSD							
G2	9	E44				NSD							
G2	10	F51				NSD							

Lab/Cor Sample No: S42

Client Sample No: FB-15082022

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C32				NSD							
G1	2	E31				NSD							
G1	3	E34				NSD							
G1	4	F33				NSD							
G1	5	F42				NSD							
G1	6	G41				NSD							
G2	7	C44				NSD							
G2	8	E43				NSD							
G2	9	E52				NSD							
G2	10	F51				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 **SEA**

Client: EA Engineering

Report Number: 220805R01

Project Name: North Ridge Estates - OU2

Date Received: 8/24/2022

Lab/Cor Sample No: S43

Client Sample No: FB-16082022

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	E32				NSD							
G1	2	F31				NSD							
G1	3	F34				NSD							
G1	4	G33				NSD							
G1	5	G42				NSD							
G1	6	H41				NSD							
G2	7	C44				NSD							
G2	8	E43				NSD							
G2	9	E52				NSD							
G2	10	F51				NSD							

Lab/Cor Sample No: S44

Client Sample No: FB-17082022

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	E34				NSD							
G1	2	F34				NSD							
G1	3	G34				NSD							
G1	4	G42				NSD							
G1	5	F44				NSD							
G1	6	E43				NSD							
G2	7	C44				NSD							
G2	8	E43				NSD							
G2	9	E44				NSD							
G2	10	F43				NSD							

Lab/Cor Sample No: S45

Client Sample No: FB-18082022

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C34				NSD							
G1	2	E33				NSD							
G1	3	E42				NSD							
G1	4	F41				NSD							
G1	5	F44				NSD							
G1	6	G43				NSD							
G2	7	C43				NSD							
G2	8	E44				NSD							
G2	9	E52				NSD							
G2	10	F51				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: 220805 SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R01

Date Received: 8/24/2022

Lab/Cor Sample No: S46

Client Sample No: FB-19082022

Gr	No.	Loc.	ID	Prim Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C32			NSD							
G1	2	E31			NSD							
G1	3	E34			NSD							
G1	4	F33			NSD							
G1	5	F42			NSD							
G1	6	G41			NSD							
G2	7	C34			NSD							
G2	8	E33			NSD							
G2	9	E42			NSD							
G2	10	F41			NSD							
Count Categories												
AFB>5, 3:1	Asbestos Fibers and Bundles > 5um and 3:1				AS>5	Asbestos Structures > 5um and 5:1				PAOS	Primary Asb & Libby-Other Amph Structures	
PAS	Primary Asbestos Structures				PCMEFmodNIO	PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1				PCMESmodNIO	PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	
TAOS	Total Asb & Libby-OtherAmph Structures				TAS	Total Asbestos Structures						

Reviewed by:

[Handwritten Signature: Kate March]

Kate March
Quality Control Officer

ISO 10312 - Direct Report

Job Number: Q220805a
Client: EA Engineering
Address: 54 North Last Chance Gulch
Suite 14
Helena, MT 59601
Project Name: North Ridge Estates - OU2
Project No.: 1578503
PO Number: 23966
Sub Project:
Reference No.:

Report Number: Q220805aR01
Report Date: 9/20/2022

Report Note: REPLICATE Analysis - Same Grid Openings

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
Q220805a - S2	ABS1-01-L	ISO 10312 - Direct		8/15/2022	8/24/2022

ISO 10312 - Direct These quality assurance tests were performed, either by the original analyst or a different analyst, over the same grid openings. The original preparations were used for these analyses.

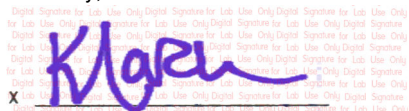
TEM analysis was performed using a transmission electron microscope equipped with an EDS X ray analyzer. The air samples were analyzed at an approximate screen magnification of 20,000x for asbestos structures greater than 0.5 micrometer lengths. An accelerating voltage of 100 KV was applied. The sizing of grid openings was performed using a calibrated digital imaging system at low magnification. The analyst records the quality of each grid preparation as part of the analytical procedures outlined in the TEM Standard Operation Procedure.

The count categories used on this report are the standard ISO 10312 categories with the exception of the PCM Equivalent category. The PCM Equivalent count category used for this report was modified from the Statement of Work in an email from Brenda Nuding to Kate March stating the appropriate PCMe category should have the following criteria: all structures >5µm long, >=0.25µm – 3µm in width, with a >=3:1 aspect ratio. PCMe Structures counts include all the primary structure types (F, B, MD, MC, CC, CD). PCMe Fiber counts include all total structure types (F, B, MF, MB, MR, CF, CB, CR).

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,



Kate March
Quality Control Officer

ISO 10312 - Direct Summary Data - Final Report

Job Number: Q220805a SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: Q220805aR01
Date Received: 8/24/2022

Lab/Cor Sample No.: S2
Client Sample No.: ABS1-01-L

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Volume (L) : 423.5
Lab Filter Area (mm2) : 385
Grid Openings Analyzed : 10
Average Grid Opening Area : 0.0113
Area Analyzed (mm2) : 0.113
Analytical Sens. (struc/cc) : 0.0080451

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.008	0 - 0.0297 - Poisson	0	
Total Asbestos Structures	0	< 0.008	0 - 0.0297 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.008	0 - 0.0297 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.008	0 - 0.0297 - Poisson		0
Asbestos Structures >5um and 3:1	0	< 0.008	0 - 0.0297 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.008	0 - 0.0297 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.008	0 - 0.0297 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.008	0 - 0.0297 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Reviewed by:

Kate March
X

Kate March
Quality Control Officer

ISO 10312 - Direct Raw Data - Final Report

Job Number: Q220805a **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2
Project No.: 1578503

Report Number: Q220805aR01
Date Received: 8/24/2022

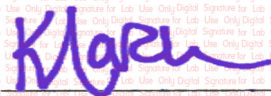
Lab/Cor Sample No: S2
Client Sample No: ABS1-01-L

Gr	No.	Loc.	ID	Prim Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	E33			NSD							
G1	2	E34			NSD							
G1	3	F33			NSD							
G1	4	G31			NSD							
G1	5	G32			NSD							
G2	6	C34			NSD							
G2	7	E33			NSD							
G2	8	E42			NSD							
G2	9	F41			NSD							
G2	10	F44			NSD							

Count Categories

AFB>5, 3:1	Asbestos Fibers and Bundles > 5um and 3:1	AS>5, 3:1	Asbestos Structures >5um and 3:1	PAOS	Primary Asb & Libby-Other Amph Structures
PAS	Primary Asbestos Structures	PCMEFmodNIO	PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	PCMESmodNIO	PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1
TAOS	Total Asb & Libby-OtherAmph Structures	TAS	Total Asbestos Structures		

Reviewed by:


X

Kate March
Quality Control Officer

ISO 10312 - Direct Report

Job Number: Q220805b
Client: EA Engineering
Address: 54 North Last Chance Gulch
Suite 14
Helena, MT 59601
Project Name: North Ridge Estates - OU2
Project No.: 1578503
PO Number: 23966
Sub Project:
Reference No.:

Report Number: Q220805bR01
Report Date: 9/20/2022

Report Note: REPLICATE Analysis - Same Grid Openings

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
Q220805b - S20	ABS5-02-L	ISO 10312 - Direct		8/18/2022	8/24/2022

ISO 10312 - Direct These quality assurance tests were performed, either by the original analyst or a different analyst, over the same grid openings. The original preparations were used for these analyses.

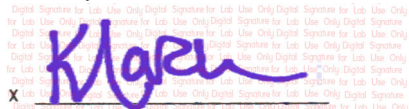
TEM analysis was performed using a transmission electron microscope equipped with an EDS X ray analyzer. The air samples were analyzed at an approximate screen magnification of 20,000x for asbestos structures greater than 0.5 micrometer lengths. An accelerating voltage of 100 KV was applied. The sizing of grid openings was performed using a calibrated digital imaging system at low magnification. The analyst records the quality of each grid preparation as part of the analytical procedures outlined in the TEM Standard Operation Procedure.

The count categories used on this report are the standard ISO 10312 categories with the exception of the PCM Equivalent category. The PCM Equivalent count category used for this report was modified from the Statement of Work in an email from Brenda Nuding to Kate March stating the appropriate PCMe category should have the following criteria: all structures >5µm long, >=0.25µm – 3µm in width, with a >=3:1 aspect ratio. PCMe Structures counts include all the primary structure types (F, B, MD, MC, CC, CD). PCMe Fiber counts include all total structure types (F, B, MF, MB, MR, CF, CB, CR).

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,



Kate March
Quality Control Officer

ISO 10312 - Direct Summary Data - Final Report

Job Number: Q220805b SEA

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: Q220805bR01

Date Received: 8/24/2022

Lab/Cor Sample No.: S20

Client Sample No.: ABS5-02-L

Volume (L) : 254.1

Lab Filter Area (mm2) : 385

Grid Openings Analyzed : 10

Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.113

Analytical Sens. (struc/cc) : 0.0134084

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0134	0 - 0.0495 - Poisson	0	
Total Asbestos Structures	0	< 0.0134	0 - 0.0495 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0495 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0134	0 - 0.0495 - Poisson		0
Asbestos Structures >5um and 3:1	0	< 0.0134	0 - 0.0495 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0134	0 - 0.0495 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0495 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0134	0 - 0.0495 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Reviewed by:

Kate March
X

Kate March
Quality Control Officer

ISO 10312 - Direct Raw Data - Final Report

Job Number: Q220805b **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2
Project No.: 1578503

Report Number: Q220805bR01
Date Received: 8/24/2022

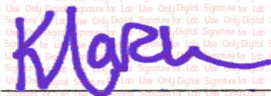
Lab/Cor Sample No: S20
Client Sample No: ABS5-02-L

Gr	No.	Loc.	ID	Prim Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C42			NSD							
G1	2	E41			NSD							
G1	3	E44			NSD							
G1	4	F43			NSD							
G1	5	F52			NSD							
G1	6	G51			NSD							
G2	7	G33			NSD							
G2	8	G42			NSD							
G2	9	H41			NSD							
G2	10	H44			NSD							

Count Categories

AFB>5, 3:1	Asbestos Fibers and Bundles > 5um and 3:1	AS>5, 3:1	Asbestos Structures >5um and 3:1	PAOS	Primary Asb & Libby-Other Amph Structures
PAS	Primary Asbestos Structures	PCMEFmodNIO	PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	PCMESmodNIO	PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1
TAOS	Total Asb & Libby-OtherAmph Structures	TAS	Total Asbestos Structures		

Reviewed by:


X

Kate March
Quality Control Officer

ISO 10312 - Direct Report

Job Number: Q220805c
Client: EA Engineering
Address: 54 North Last Chance Gulch
Suite 14
Helena, MT 59601
Project Name: North Ridge Estates - OU2
Project No.: 1578503
PO Number: 23966
Sub Project:
Reference No.:

Report Number: Q220805cR01
Report Date: 9/20/2022

Report Note: REPLICATE Analysis - Same Grid Openings

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
Q220805c - S31	PM4-DW	ISO 10312 - Direct		8/19/2022	8/24/2022

ISO 10312 - Direct These quality assurance tests were performed, either by the original analyst or a different analyst, over the same grid openings. The original preparations were used for these analyses.

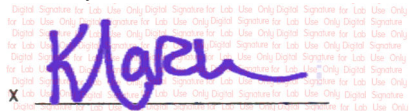
TEM analysis was performed using a transmission electron microscope equipped with an EDS X ray analyzer. The air samples were analyzed at an approximate screen magnification of 20,000x for asbestos structures greater than 0.5 micrometer lengths. An accelerating voltage of 100 KV was applied. The sizing of grid openings was performed using a calibrated digital imaging system at low magnification. The analyst records the quality of each grid preparation as part of the analytical procedures outlined in the TEM Standard Operation Procedure.

The count categories used on this report are the standard ISO 10312 categories with the exception of the PCM Equivalent category. The PCM Equivalent count category used for this report was modified from the Statement of Work in an email from Brenda Nuding to Kate March stating the appropriate PCMe category should have the following criteria: all structures >5µm long, >=0.25µm – 3µm in width, with a >=3:1 aspect ratio. PCMe Structures counts include all the primary structure types (F, B, MD, MC, CC, CD). PCMe Fiber counts include all total structure types (F, B, MF, MB, MR, CF, CB, CR).vvv

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,



Kate March
Quality Control Officer

ISO 10312 - Direct Summary Data - Final Report

Job Number: Q220805c SEA
Client: EA Engineering
Project Name: North Ridge Estates - OU2

Report Number: Q220805cR01
Date Received: 8/24/2022

Lab/Cor Sample No.: S31

Volume (L) : 2321.8

Client Sample No.: PM4-DW

Lab Filter Area (mm2) : 385

Grid Openings Analyzed : 49

Analyst(s) Analysis Date Microscope Magnification
KM 9/20/2022 Hitachi 7000FA 20000

Average Grid Opening Area : 0.0113

Area Analyzed (mm2) : 0.5537

Analytical Sens. (struc/cc) : 0.0002995

Structure Type	Filter Density (s/mm2)	Concentration* (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asbestos Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Primary Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson	0	
Total Asb & Libby-Other Amph Structures	0	< 0.0003	0 - 0.0011 - Poisson		0
Asbestos Structures >5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	0	< 0.0003	0 - 0.0011 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.

Reviewed by:

Kate March
X

Kate March
Quality Control Officer

ISO 10312 - Direct Raw Data - Final Report

Job Number: Q220805c **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2
Project No.: 1578503

Report Number: Q220805cR01
Date Received: 8/24/2022

Lab/Cor Sample No: S31
Client Sample No: PM4-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G1	1	C33				NSD							
G1	2	C34				NSD							
G1	3	E33				NSD							
G1	4	E34				NSD							
G1	5	F33				NSD							
G1	6	F34				NSD							
G1	7	G33				NSD							
G1	8	G34				NSD							
G1	9	H33				NSD							
G1	10	H34				NSD							
G1	11	B44				NSD							
G1	12	C43				NSD							
G1	13	C44				NSD							
G1	14	E43				NSD							
G1	15	E44				NSD							
G1	16	F43				NSD							
G1	17	F44				NSD							
G1	18	G43				NSD							
G1	19	G44				NSD							
G1	20	H43				NSD							
G1	21	H44				NSD							
G1	22	K43				NSD							
G1	23	H52				NSD							
G1	24	H51				NSD							
G1	25	G52				NSD							
G1	26	G51				NSD							
G1	27	F52				NSD							
G1	28	F51				NSD							
G2	29	C33				NSD							
G2	30	C34				NSD							
G2	31	E33				NSD							
G2	32	E34				NSD							
G2	33	F33				NSD							
G2	34	F34				NSD							
G2	35	G33				NSD							
G2	36	G34				NSD							
G2	37	H33				NSD							
G2	38	H34				NSD							
G2	39	E43				NSD							
G2	40	E44				NSD							
G2	41	F43				NSD							

ISO 10312 - Direct Raw Data - Final Report

Job Number: Q220805c **SEA**

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: Q220805cR01

Date Received: 8/24/2022

Lab/Cor Sample No: S31

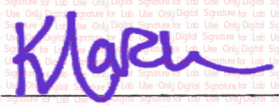
Client Sample No: PM4-DW

Gr	No.	Loc.	ID	Prim	Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G2	42	F44				NSD							
G2	43	G43				NSD							
G2	44	G44				NSD							
G2	45	H43				NSD							
G2	46	H44				NSD							
G2	47	H51				NSD							
G2	48	G52				NSD							
G2	49	G51				NSD							

Count Categories

AFB>5, 3:1	Asbestos Fibers and Bundles > 5um and 3:1	AS>5, 3:1	Asbestos Structures >5um and 3:1	PAOS	Primary Asb & Libby-Other Amph Structures
PAS	Primary Asbestos Structures	PCMEFmodNIO	PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	PCMESmodNIO	PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1
TAOS	Total Asb & Libby-OtherAmph Structures	TAS	Total Asbestos Structures		

Reviewed by:


X

Kate March
Quality Control Officer

ISO 13794 - Indirect Report

Job Number: 220805

Client: EA Engineering

Address: 54 North Last Chance Gulch

Suite 14

Helena, MT 59601

Project Name: North Ridge Estates - OU2

Project No.: 1578503

PO Number: 23966

Sub Project:

Reference No.:

Report Number: 220805R02

Report Date: 9/22/2022

Report Note: R01 = Final ISO 10312 Direct Analysis Report

Enclosed please find results for samples submitted to our laboratory. A list of samples and analyses follows:

Lab/Cor Num.	Client Sample Number	Analysis	Analysis Notes	Date Sampled:	Date Received:
220805 - S4	ABS1-02-L	ISO 13794 - Indirect	- Original Overloaded, Indirect analysis approved 9/6/2022.	8/15/2022	8/24/2022

ISO 13794 - Indirect Report

Job Number: 220805

Client: EA Engineering

Project Name: North Ridge Estates - OU2

Report Number: 220805R02

Report Date: 9/22/2022

ISO 13794 - Indirect Upon sample receipt the samples and the associated packaging are checked to ensure that samples were not packaged in untreated polystyrene foam (peanuts), vermiculite, paper shreds, or excelsior packing materials; top covers and end plugs were in place for each cassette; and samples were properly sealed and undamaged, neither shipped nor stored with bulk samples, and were labeled upon receipt at the laboratory. Any items of note are recorded on the sample preparation form before being submitted to the technician for preparation.

Samples identified during sample preparation as having loose particulate, uneven loading or had overloaded filters (indicated by dark grey/brown particulate coverage) were immediately rejected for ISO 10312 Direct analysis and recommended for ISO 13794 analysis. Catherine LeCour approved the Indirect ISO 13794 analysis for S4 (ABS1-02-L).

Preparation and analysis of the above samples was conducted in accordance with the ISO method 13794 (Indirect) for the identification of asbestos. Briefly, a portion of the original filter was ashed to isolate the material of interest and then suspended in laboratory reagent water. The suspension is then treated with acetic acid and briefly sonicated. The samples were then aliquoted onto lab filters which were collapsed with a solution of N,N-dimethylformamide and acetic acid, then etched in a low temperature plasma etcher to remove the top surface of the filter and other organics. The samples were carbon coated at high vacuum with a thin layer of carbon, placed on 200 mesh copper grids and allowed to dissolve in N,N-Dimethylformamide / Acetone baths until cleared of filter debris.

TEM analysis was performed using a transmission electron microscope equipped with an EDS X ray analyzer. The redeposit samples were analyzed at 20,000x for asbestos structures greater than 0.5 micrometer lengths. An accelerating voltage of 100 KV was applied. The sizing of grid openings was performed using a calibrated digital imaging system at low magnification.

There were no additional preparation notes or analysis notes on the samples that were analyzable.


The count categories used on this report are the standard ISO 10312 categories apart from the PCM Equivalent category. The PCM Equivalent count category used for this report follows the NIOSH counting rules (per the SOW). All structures >5µm long, >=0.25µm in width, with a >=3:1 aspect ratio. PCMe Structures counts include all the primary structure types (F, B, MD, MC, CC, CD). PCMe Fiber counts include all total structure types (F, B, MF, MB, MR, CF, CB, CR).

Based on client request, the ISO confidence limits have been adjusted so 0 structures = 0, 1 structure = 1, 2 structures = 2, etc. The ISO method uses specific one-sided upper 95% Poisson confidence limits to calculate sample concentrations when structure counts are below four structures. Standard ISO limits are 0 structures = 2.99, 1 structure = 4.74, 2 structures = 6.3 and 3 structures = 7.75.

Disclaimer The results reported relate only to the samples tested or analyzed; the laboratory is not responsible for data collected by personnel who are not affiliated with the laboratory. Results reported in both structures/cm3 and structures/mm2 are dependent on the sample volume and area. These parameters are measured and recorded by non-laboratory personnel and are not covered by the laboratory's accreditation. Interpretation of these results is the sole responsibility of the client.

If further clarification of these results is needed, please call us. Thank you for allowing the staff at Lab/Cor, Inc. the opportunity to provide you with the analytical services.

Sincerely,


X

Kate March
Quality Control Officer

ISO 13794 - Indirect Final Report

Job Number: 220805 SEA

Client: EA Engineering

Report Number: 220805R02

Date Received: 8/24/2022

Project Name: North Ridge Estates - OU2

Lab/Cor Sample No.: S4

Client Sample No.: ABS1-02-L

Filter Fraction: 0.5

Residual Ash Vol: 20 ml

Begin Volume: 20 ml

Volume Taken: 5 ml

Aliquot Dilution: 0.25

Final Dilution: 0.25

Sample Area/Mass/Volume (L) : 420

Lab Filter Area (mm2) : 289.38

Grid Openings Analyzed : 17

Average Grid Opening Area : 0.0113

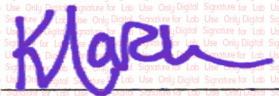
Area Analyzed (mm2) : 0.1921

Analytical Sens. (struc/cc) : 0.0287

Analyst(s)	Analysis Date	Microscope	Magnification
SB	9/21/2022	JEOL-Sr 1200	20000

Structure Type	Concentration (struc/cc)	95% Confidence Interval (struc/cc)	Structure Count ¹ Prim/Total	
Primary Asbestos Structures	< 0.0287	0 - 0.1058 - Poisson	0	
Total Asbestos Structures	< 0.0287	0 - 0.1058 - Poisson		0
Primary Asb & Libby-Other Amph Structures	< 0.0287	0 - 0.1058 - Poisson	0	
Total Asb & Libby-Other Amph Structures	< 0.0287	0 - 0.1058 - Poisson		0
Asbestos Structures >5um and 3:1	< 0.0287	0 - 0.1058 - Poisson	0	
Asbestos Fibers and Bundles > 5um and 3:1	< 0.0287	0 - 0.1058 - Poisson		0
PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	< 0.0287	0 - 0.1058 - Poisson		0
PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1	< 0.0287	0 - 0.1058 - Poisson	0	

¹ Concentration and 95% Confidence Level are calculated based upon the number showing under the Structure Count header.


Kate March
Quality Control Officer

ISO 13794 - Indirect Raw Data - Final Report

Job Number: 220805 **SEA**
Client: EA Engineering
Project Name: North Ridge Estates - OU2
Project No.: 1578503

Report Number: 220805R02
Date Received: 8/24/2022

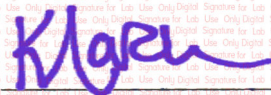
Lab/Cor Sample No: S4
Client Sample No: ABS1-02-L

Gr	No.	Loc.	ID	Prim Tot	Class	Length	Width	Aspect	Analyte	Elements	Comment	Count Categories
G10	1	E42			NSD							
G10	2	F41			NSD							
G10	3	F33			NSD							
G10	4	F52			NSD							
G10	5	G51			NSD							
G10	6	C32			NSD							
G10	7	E24			NSD							
G10	8	G34			NSD							
G10	9	H33			NSD							
G11	10	F52			NSD							
G11	11	G51			NSD							
G11	12	C51			NSD							
G11	13	C43			NSD							
G11	14	E42			NSD							
G11	15	E34			NSD							
G11	16	C34			NSD							
G11	17	E41			NSD							

Count Categories

AFB>5, 3:1	Asbestos Fibers and Bundles > 5um and 3:1	AS>5, 3:1	Asbestos Structures >5um and 3:1	PAOS	Primary Asb & Libby-Other Amph Structures
PAS	Primary Asbestos Structures	PCMEFmodNIO	PCM Equivalent Fibers - 0.25-3.0, > 5 & 3:1	PCMESmodNIO	PCM Equivalent Structures - 0.25-3.0, > 5 & 3:1
TAOS	Total Asb & Libby-OtherAmph Structures	TAS	Total Asbestos Structures		

Reviewed by:


X

Kate March
Quality Control Officer

TEM / PCM / PLM Chain of Custody Record

220805

pg 1 of 5

Lab/Cor, Inc
 7619 6th Ave NW
 Seattle, WA 98117
 Office (206) 781-0155
 mail@labcor.net
 www.labcor.net

Client: EA Engineering, Science, & Technology
Address: 555 University Avenue, Suite 110
City, State, Zip: Sacramento, CA 95825
Contact: Catherine LeCours
Phone: 406-219-1652 **Fax:** _____
Email: clecours@eaest.com
Other Info: _____

Analytical Protocol:
☐ AHERA
☐ Modified EPA II
☐ EPA II (Yamate)
☐ NIOSH 7402 (TEM)
☐ NIOSH 7400 (PCM)
☐ ASTM Dust
☐ EPA 100.1/ 100.2
☒ ISO: 10312
☐ Bulk PLM
☐ Bulk TEM
☐ Quantitative
☐ Semi-Quant
☐ Qualitative

Turnaround Time:
☒ 5 days
☐ 3 days
☐ 2 days
☐ 24 hours*
☐ 6 hr RUSH*
 _____ Redeposit

Project Name: NRE OU2

Project Number: 1578503

P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
ABS1-01-H	Grid 1 Scenario 1 Air Filter Sample	08/15/2022	11:45	13:45	120	9.0	9.0	9.0	1080 L			
ABS1-01-L	Grid 1 Scenario 1 Air Filter Sample	08/15/2022	11:44	13:45	121	3.5	3.5	3.5	423.5 L			
ABS1-02-H	Grid 1 Scenario 2 Air Filter Sample	08/15/2022	15:00	17:02	122	9.0	9.0	9.0	1098 L			
ABS1-02-L	Grid 1 Scenario 2 Air Filter Sample	08/15/2022	15:00	17:00	120	3.5	3.5	3.5	420 L			
ABS2-01-H	Grid 2 Scenario 1 Air Filter Sample	08/16/2022	08:55	10:59	124	8.0	8.0	8.0	992 L			
ABS2-01-L	Grid 2 Scenario 1 Air Filter Sample	08/16/2022	08:55	11:00	125	2.0	2.0	2.0	250 L			
ABS2-02-H	Grid 2 Scenario 2 Air Filter Sample	08/16/2022	11:24	13:24	120	8.0	8.0	8.0	960 L			
ABS2-02-L	Grid 2 Scenario 2 Air Filter Sample	08/16/2022	11:24	13:24	120	2.0	2.0	2.0	240 L			
ABS3-01-H	Grid 3 Scenario 1 Air Filter Sample	08/17/2022	08:11	10:19	128	8.0655	8.4623	8.264	1057.8 L			
ABS3-01-L	Grid 3 Scenario 1 Air Filter Sample	08/17/2022	08:12	10:17	125	2.099	2.0582	2.079	259.88 L			

Internal Lab Use Only:
 Prelim Released: _____ Final Results Released: _____ Hardcopy Invoice Released: _____
 By: ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal By: ☐ Fax ☐ Phone ☐ E-mail
 Reviewed By: SB 9/2/22

By signing below you are agreeing to comply with Lab/Cor's Requests, Tenders and Contracts.

* Call ahead for TATs of 24hrs or less

Relinquished by: [Signature] Date: 8/19/22 Time: 16:00

Relinquished by: _____ Date: _____ Time: _____

Received by: [Signature] Date: 8/24/22 Time: 10:30AM

Received by: _____ Date: _____ Time: _____

TEM / PCM / PLM Chain of Custody Record 210805

pg 215

Lab/Cor, Inc

7619 6th Ave NW
Seattle, WA 98117

Office (206) 781-0155

mail@labcor.net
www.labcor.net

Client: **EA Engineering, Science, & Technology**

Address: 555 University Avenue, Suite 110

City, State, Zip: Sacramento, CA 95825

Contact: Catherine LeCours

Phone: 406-219-1652

Fax:

Email: clecours@eaest.com

Other Info:

Analytical Protocol:

☐ AHERA
☐ Modified EPA II
☐ EPA II (Yamate)
☐ NIOSH 7402 (TEM)
☐ NIOSH 7400 (PCM)
☐ ASTM Dust
☐ EPA 100.1/ 100.2
☒ ISO: 10312
☐ Bulk PLM
☐ Bulk TEM

☐ Quantitative
☐ Semi-Quant
☐ Qualitative

Turnaround Time:

☒ 5 days
☐ 3 days
☐ 2 days
☐ 24 hours*
☐ 6 hr RUSH*

Redeposit

Project Name: **NRE OU2**

Project Number: **1578503**

P.O. Number: **23966**

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
11 ABS3-02-H	Grid 3 Scenario 2 Air Filter Sample	08/17/2022	10:32	12:34	122	8.2166	8.3158	8.266	1008.45 L			
ABS3-02-L	Grid 3 Scenario 2 Air Filter Sample	08/17/2022	10:32	12:34	122	2.1368	2.2036	2.080	253.78 L			
ABS4-01-H	Grid 4 Scenario 1 Air Filter Sample	08/19/2022	07:05	09:07	122	8.181	7.906	8.04	980.9 L			
ABS4-01-L	Grid 4 Scenario 1 Air Filter Sample	08/19/2022	07:05	09:07	122	2.119	2.127	2.123	259 L			
15 ABS4-02-H	Grid 4 Scenario 2 Air Filter Sample	08/19/2022	09:18	11:20	122	8.0138	8.455	8.23	1004 L			
ABS4-02-L	Grid 4 Scenario 2 Air Filter Sample	08/19/2022	09:18	11:20	122	2.059	2.193	2.126	259.4 L			
ABS5-01-H	Grid 5 Scenario 1 Air Filter Sample	08/18/2022	08:48	10:51	123	7.988	8.074	8.031	987.8 L			
ABS5-01-L	Grid 5 Scenario 1 Air Filter Sample	08/18/2022	08:48	10:50	122	2.096	2.078	2.087	254.6 L			
ABS5-02-H	Grid 5 Scenario 2 Air Filter Sample	08/18/2022	13:06	15:06	120	8.049	8.196	8.12	974.4 L			
20 ABS5-02-L	Grid 5 Scenario 2 Air Filter Sample	08/18/2022	13:06	15:07	121	2.111	2.100	2.10	254.1 L			

Internal Lab Use Only:

Prelim Released:

Final Results Released:

Hardcopy Invoice Released:

☐ Mail ☐ E-mail

By: ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal

By: ☐ Fax ☐ Phone ☐ E-mail

Reviewed By:

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* Call ahead for TATs of 24hrs or less

Relinquished by: [Signature] Date: 8/19/22 Time: 16:00

Relinquished by: _____ Date: _____ Time: _____

Received by: [Signature] Date: 8/24/22 Time: 10:30AM

Received by: _____ Date: _____ Time: _____

TEM / PCM / PLM Chain of Custody Record

220805

pg 3 of 5

Lab/Cor, Inc
 7619 6th Ave NW
 Seattle, WA 98117

 Office (206) 781-0155

 mail@labcor.net
 www.labcor.net

Client: EA Engineering, Science, & Technology
Address: 555 University Avenue, Suite 110
City, State, Zip: Sacramento, CA 95825
Contact: Catherine LeCours
Phone: 406-219-1652 **Fax:** _____
Email: clecours@eaest.com
Other Info: _____

Analytical Protocol:
☐ AHERA
☐ Modified EPA II
☐ EPA II (Yamate)
☐ NIOSH 7402 (TEM)
☐ NIOSH 7400 (PCM)
☐ ASTM Dust
☒ EPA 100.1/ 100.2
☒ ISO: 10312
☐ Bulk PLM
☐ Bulk TEM
☐ Quantitative
☐ Semi-Quant
☐ Qualitative

Turnaround Time:
☒ 5 days
☐ 3 days
☐ 2 days
☐ 24 hours*
☐ 6 hr RUSH*

☐ Redeposit

Project Name: NRE OU2

Project Number: 1578503

P.O. Number: 23966

21

25

30

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
PM1-UW	Grid 1 Upwind Perimeter Monitor Air Filter Sample	08/15/2022	11:00	17:17	377	9.5	9.5	9.5	3581.5 L			
PM1-DW	Grid 1 Downwind Perimeter Monitor Air Filter Sample	08/15/2022	10:50	17:14	384	9.5	9.5	9.5	3648 L			
PM1-CW	Grid 1 Crosswind Perimeter Monitor Air Filter Sample	08/15/2022	10:56	17:12	376	9.5	9.5	9.5	3572 L			
PM2-UW	Grid 2 Upwind Perimeter Monitor Air Filter Sample	08/16/2022	08:20	15:05	405	8.0	8.0	8.0	3240 L			
PM2-DW	Grid 2 Downwind Perimeter Monitor Air Filter Sample	08/16/2022	08:11	15:03	412	8.0	7.5	7.75	3193 L			
PM2-CW	Grid 2 Crosswind Perimeter Monitor Air Filter Sample	08/16/2022	08:16	15:03	407	8.0	8.0	8.0	3256 L			
PM3-UW	Grid 3 Upwind Perimeter Monitor Air Filter Sample	08/17/2022	07:50	13:10	320	8.1447	8.6213	8.383	2682.56 L			
PM3-DW	Grid 3 Downwind Perimeter Monitor Air Filter Sample	08/17/2022	07:56	13:14	318	8.0618	8.2038	8.133	2586.29 L			
PM3-CW	Grid 3 Crosswind Perimeter Monitor Air Filter Sample	08/17/2022	07:52	13:12	320	8.1158	8.3349	8.225	2632 L			
PM4-UW	Grid 4 Upwind Perimeter Monitor Air Filter Sample	08/19/2022	06:37	11:26	289	8.007	8.089	8.048	2325.9 L			

Internal Lab Use Only:

Prelim Released: _____ Final Results Released: _____ Hardcopy Invoice Released: _____
 By: ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal By: ☐ Fax ☐ Phone ☐ E-mail Reviewed By: _____
☐ Mail ☐ E-mail

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Relinquished by: [Signature] Date: 8/19/22 Time: 16:00

Relinquished by: _____ Date: _____ Time: _____

Received by: [Signature] Date: 8/24/22 Time: 10:30 AM

Received by: _____ Date: _____ Time: _____

220805

Pg 4 of 5

<p>Lab/Cor, Inc 7619 6th Ave NW Seattle, WA 98117</p> <p>Office (206) 781-0155</p> <p>mail@labcor.net www.labcor.net</p>	<p>Client: EA Engineering, Science, & Technology</p> <p>Address: 555 University Avenue, Suite 110</p> <p>City, State, Zip: Sacramento, CA 95825</p> <p>Contact: Catherine LeCours</p> <p>Phone: 406-219-1652 Fax:</p> <p>Email: clecours@eaest.com</p> <p>Other Info:</p>	<p>Analytical Protocol:</p> <p><input type="checkbox"/> AHERA</p> <p><input type="checkbox"/> Modified EPA II</p> <p><input type="checkbox"/> EPA II (Yamate)</p> <p><input type="checkbox"/> NIOSH 7402 (TEM)</p> <p><input type="checkbox"/> NIOSH 7400 (PCM)</p> <p><input type="checkbox"/> ASTM Dust</p> <p><input type="checkbox"/> EPA 100.1/ 100.2</p> <p><input checked="" type="checkbox"/> ISO: 10312</p> <p><input type="checkbox"/> Bulk PLM</p> <p><input type="checkbox"/> Bulk TEM</p>	<p>Turnaround Time:</p> <p><input checked="" type="checkbox"/> 5 days</p> <p><input type="checkbox"/> 3 days</p> <p><input type="checkbox"/> 2 days</p> <p><input type="checkbox"/> 24 hours*</p> <p><input type="checkbox"/> 6 hr RUSH*</p> <p><input type="checkbox"/> Redeposit</p>
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Project Number: 1578503

P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
PM4-DW	Grid 4 Downwind Perimeter Monitor Air Filter Sample	08/19/2022	06:42	11:29	287	8.128	8.052	8.09	2321.8 L			
PM4-CW	Grid 4 Crosswind Perimeter Monitor Air Filter Sample	08/19/2022	06:41	11:28	287	8.055	8.117	8.086	2320.7 L			
PM5-UW	Grid 5 Upwind Perimeter Monitor Air Filter Sample	08/18/2022	08:30	15:10	400	8.135	8.291	8.213	3285.2 L			
PM5-DW	Grid 5 Downwind Perimeter Monitor Air Filter Sample	08/18/2022	08:31	15:16	405	8.147	7.887	8.017	3246.9 L			
PM5-CW	Grid 5 Crosswind Perimeter Monitor Air Filter Sample	08/18/2022	08:33	15:13	400	8.073	8.123	8.098	3239.2 L			
LB-15082022	Lot Blank Air Filter Sample	08/15/2022	10:40	10:40	0	-	-	-	0 L			
COL1-02-H	Collocated Grid 1 Scenario 2 Air Filter Sample	08/15/2022	15:00	17:04	124	9.0	9.0	9.0	1116 L			
COL2-DW	Collocated Grid 2 Downwind Perimeter Air Filter Sample	08/16/2022	08:14	15:03	406	8.0	8.0	8.0	3248 L			
COL3-01-H	Collocated Grid 3 Scenario 1 Air Filter Sample	08/17/2022	08:11	10:18	127	8.0424	8.2230	8.1327	1032.85 L			
COL4-UW	Collocated Grid 4 Upwind Perimeter Air Filter Sample	08/19/2022	06:36	11:26	290	8.048	8.132	8.09	2346.1 L			

Internal Lab Use Only:			
Prelim Released: _____		Final Results Released: _____	
By: <input type="checkbox"/> Fax <input type="checkbox"/> Phone <input type="checkbox"/> E-mail <input type="checkbox"/> Verbal		By: <input type="checkbox"/> Fax <input type="checkbox"/> Phone <input type="checkbox"/> E-mail	
		Hardcopy Invoice Released: <input type="checkbox"/> Mail <input type="checkbox"/> E-mail	
		Reviewed By: _____	

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Relinquished by: <u>Olivia Mann</u> Date: <u>8/19/22</u> Time: <u>16:00</u>	Relinquished by: _____ Date: _____ Time: _____
Received by: <u>Xander</u> Date: <u>8/24/22</u> Time: <u>10:30 AM</u>	Received by: _____ Date: _____ Time: _____

** Call ahead for TATs of 24hrs or less*

220405

Turnaround Time:

- ☐ Quantitative
- ☐ Semi-Quant
- ☐ Qualitative

Received by: _____ Date: _____ Time: _____














TEM / PCM / PLM Chain of Custody Record

<p>Lab/Cor, Inc 7619 6th Ave NW Seattle, WA 98117</p> <p>Office (206) 781-0155</p> <p>mail@labcor.net www.labcor.net</p>	<p>Client: <u>EA Engineering, Science, & Technology</u></p> <p>Address: <u>555 University Avenue, Suite 110</u></p> <p>City, State, Zip: <u>Sacramento, CA 95825</u></p> <p>Contact: <u>Catherine LeCours</u></p> <p>Phone: <u>406-219-1652</u> Fax: _____</p> <p>Email: <u>clecours@eaest.com</u></p> <p>Other Info: _____</p>	<p>Analytical Protocol:</p> <p>____ AHERA</p> <p>____ Modified EPA II</p> <p>____ EPA II (Yamate)</p> <p>____ NIOSH 7402 (TEM)</p> <p>____ NIOSH 7400 (PCM)</p> <p>____ ASTM Dust</p> <p>____ EPA 100.1/ 100.2</p> <p><input checked="" type="checkbox"/> ISO: 10312</p> <p>____ Bulk PLM</p> <p>____ Bulk TEM</p> <div style="border: 1px solid black; padding: 2px; margin-top: 5px;"> <input type="checkbox"/> Quantitative <input type="checkbox"/> Semi-Quant <input type="checkbox"/> Qualitative </div>	<p>Turnaround Time:</p> <p><input checked="" type="checkbox"/> 5 days</p> <p>____ 3 days</p> <p>____ 2 days</p> <p>____ 24 hours*</p> <p>____ 6 hr RUSH*</p> <p>____ Redeposit</p>
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Project Name: NRE OU2

Project Number: 1578503

P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
ABS1-01-H	Grid 1 Scenario 1 Air Filter Sample	08/15/2022 	11:45	13:45	120	9.0	9.0	9.0	1080 L			
ABS1-01-L	Grid 1 Scenario 1 Air Filter Sample	08/15/2022 	11:44	13:45	121	3.5	3.5	3.5	423.5 L			
ABS1-02-H	Grid 1 Scenario 2 Air Filter Sample	08/15/2022 	15:00	17:02	122	9.0	9.0	9.0	1098 L			
ABS1-02-L	Grid 1 Scenario 2 Air Filter Sample	08/15/2022 	15:00	17:00	120	3.5	3.5	3.5	420 L			
ABS2-01-H	Grid 2 Scenario 1 Air Filter Sample	08/16/2022 	08:55	10:59	124	8.0	8.0	8.0	992 L			
ABS2-01-L	Grid 2 Scenario 1 Air Filter Sample	08/16/2022 	08:55	11:00	125	2.0	2.0	2.0	250 L			
ABS2-02-H	Grid 2 Scenario 2 Air Filter Sample	08/16/2022 	11:24	13:24	120	8.0	8.0	8.0	960 L			
ABS2-02-L	Grid 2 Scenario 2 Air Filter Sample	08/16/2022 	11:24	13:24	120	2.0	2.0	2.0	240 L			
ABS3-01-H	Grid 3 Scenario 1 Air Filter Sample	08/17/2022 	08:11	10:19	128	8.0655 	8.4622 	8.264	1057.8 L			
ABS3-01-L	Grid 3 Scenario 1 Air Filter Sample	08/17/2022 	08:12	10:17	125	2.099	2.0582 	2.079	259.88 L			

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Prelim Released: _____ Final Results Released: _____ Hardcopy Invoice Released: _____ ☐ Mail ☐ E-mail

By : ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal By : ☐ Fax ☐ Phone ☐ E-mail Reviewed By: _____

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Relinquished by: _____	Date: _____	Time: _____	Relinquished by: _____	Date: _____	Time: _____
Received by: _____	Date: _____	Time: _____	Received by: _____	Date: _____	Time: _____

TEM / PCM / PLM Chain of Custody Record

Lab/Cor, Inc 7619 6 th Ave NW Seattle, WA 98117 Office (206) 781-0155 mail@labcor.net www.labcor.net	Client: <u>EA Engineering, Science, & Technology</u> Address: <u>555 University Avenue, Suite 110</u> City, State, Zip: <u>Sacramento, CA 95825</u> Contact: <u>Catherine LeCours</u> Phone: <u>406-219-1652</u> Fax: _____ Email: <u>clecours@eaest.com</u> Other Info: _____	Analytical Protocol: _____ AHERA _____ Modified EPA II _____ EPA II (Yamate) _____ NIOSH 7402 (TEM) _____ NIOSH 7400 (PCM) _____ ASTM Dust _____ EPA 100.1/ 100.2 <input checked="" type="checkbox"/> ISO: 10312 _____ Bulk PLM _____ Bulk TEM <div style="border: 1px solid black; padding: 2px; margin-top: 5px;"> <input type="checkbox"/> Quantitative <input type="checkbox"/> Semi-Quant <input type="checkbox"/> Qualitative </div>	Turnaround Time: <input checked="" type="checkbox"/> 5 days _____ 3 days _____ 2 days _____ 24 hours* _____ 6 hr RUSH* _____ Redeposit
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Project Name: NRE OU2
Project Number: 1578503
P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
ABS3-02-H	Grid 3 Scenario 2 Air Filter Sample	08/17/2022	10:32	12:34	122	8.21	8.31	8.266	1008.45 L			
ABS3-02-L	Grid 3 Scenario 2 Air Filter Sample	08/17/2022	10:32	12:34	122	2.13	2.20	2.080	253.78 L			
ABS4-01-H	Grid 4 Scenario 1 Air Filter Sample	08/19/2022	07:05	09:07	122	8.181	7.906	8.04	980.9 L			
ABS4-01-L	Grid 4 Scenario 1 Air Filter Sample	08/19/2022	07:05	09:07	122	2.119	2.127	2.123	259 L			
ABS4-02-H	Grid 4 Scenario 2 Air Filter Sample	08/19/2022	09:18	11:20	122	8.01	8.455	8.23	1004 L			
ABS4-02-L	Grid 4 Scenario 2 Air Filter Sample	08/19/2022	09:18	11:20	122	2.059	2.193	2.126	259.4 L			
ABS5-01-H	Grid 5 Scenario 1 Air Filter Sample	08/18/2022	08:48	10:51	123	7.988	8.074	8.031	987.8 L			
ABS5-01-L	Grid 5 Scenario 1 Air Filter Sample	08/18/2022	08:48	10:50	122	2.096	2.078	2.087	254.6 L			
ABS5-02-H	Grid 5 Scenario 2 Air Filter Sample	08/18/2022	13:06	15:06	120	8.049	8.196	8.12	974.4 L			
ABS5-02-L	Grid 5 Scenario 2 Air Filter Sample	08/18/2022	13:06	15:07	121	2.111	2.100	2.10	254.1 L			

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Relinquished by: _____ Date: _____ Time: _____ Relinquished by: _____ Date: _____ Time: _____
 Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____

TEM / PCM / PLM Chain of Custody Record

Lab/Cor, Inc 7619 6 th Ave NW Seattle, WA 98117 Office (206) 781-0155 mail@labcor.net www.labcor.net	Client: <u>EA Engineering, Science, & Technology</u> Address: <u>555 University Avenue, Suite 110</u> City, State, Zip: <u>Sacramento, CA 95825</u> Contact: <u>Catherine LeCours</u> Phone: <u>406-219-1652</u> Fax: _____ Email: <u>clecours@eaest.com</u> Other Info: _____	Analytical Protocol: <input type="checkbox"/> AHERA <input type="checkbox"/> Modified EPA II <input type="checkbox"/> EPA II (Yamate) <input type="checkbox"/> NIOSH 7402 (TEM) <input type="checkbox"/> NIOSH 7400 (PCM) <input type="checkbox"/> ASTM Dust <input type="checkbox"/> EPA 100.1/ 100.2 <input checked="" type="checkbox"/> ISO: 10312 <input type="checkbox"/> Bulk PLM <input type="checkbox"/> Bulk TEM <div style="border: 1px solid black; padding: 2px; margin-top: 5px;"> <input type="checkbox"/> Quantitative <input type="checkbox"/> Semi-Quant <input type="checkbox"/> Qualitative </div>	Turnaround Time: <input checked="" type="checkbox"/> 5 days <input type="checkbox"/> 3 days <input type="checkbox"/> 2 days <input type="checkbox"/> 24 hours* <input type="checkbox"/> 6 hr RUSH* <input type="checkbox"/> Redeposit
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Project Name: NRE OU2
Project Number: 1578503
P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
PM1-UW	Grid 1 Upwind Perimeter Monitor Air Filter Sample	08/15/2022 	11:00	17:17	377	9.5	9.5	9.5	3581.5 L			
PM1-DW	Grid 1 Downwind Perimeter Monitor Air Filter Sample	08/15/2022 	10:50	17:14	384	9.5	9.5	9.5	3648 L			
PM1-CW	Grid 1 Crosswind Perimeter Monitor Air Filter Sample	08/15/2022 	10:56	17:12	376	9.5	9.5	9.5	3572 L			
PM2-UW	Grid 2 Upwind Perimeter Monitor Air Filter Sample	08/16/2022 	08:20	15:05	405	8.0	8.0	8.0	3240 L			
PM2-DW	Grid 2 Downwind Perimeter Monitor Air Filter Sample	08/16/2022 	08:11	15:03	412	8.0	7.5	7.75	3193 L			
PM2-CW	Grid 2 Crosswind Perimeter Monitor Air Filter Sample	08/16/2022 	08:16	15:03	407	8.0	8.0	8.0	3256 L			
PM3-UW	Grid 3 Upwind Perimeter Monitor Air Filter Sample	08/17/2022 	07:50	13:10	320	8.14 	8.62 	8.383	2682.56 L			
PM3-DW	Grid 3 Downwind Perimeter Monitor Air Filter Sample	08/17/2022 	07:56	13:14	318	8.06 	8.20 	8.133	2586.29 L			
PM3-CW	Grid 3 Crosswind Perimeter Monitor Air Filter Sample	08/17/2022 	07:52	13:12	320	8.11 	8.33 	8.225	2632 L			
PM4-UW	Grid 4 Upwind Perimeter Monitor Air Filter Sample	08/19/2022 	06:37	11:26	289	8.007	8.089	8.048	2325.9 L			

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 By : ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal By : ☐ Fax ☐ Phone ☐ E-mail Reviewed By: _____

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Relinquished by: _____ Date: _____ Time: _____ Relinquished by: _____ Date: _____ Time: _____
 Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____














TEM / PCM / PLM Chain of Custody Record

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---	---	---	--

Project Name: NRE OU2

Project Number: 1578503

P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
PM4-DW	Grid 4 Downwind Perimeter Monitor Air Filter Sample	08/19/2022 	06:42	11:29	287	8.128	8.052	8.09	2321.8 L			
PM4-CW	Grid 4 Crosswind Perimeter Monitor Air Filter Sample	08/19/2022 	06:41	11:28	287	8.055	8.117	8.086	2320.7 L			
PM5-UW	Grid 5 Upwind Perimeter Monitor Air Filter Sample	08/18/2022 	08:30	15:10	400	8.135	8.291	8.213	3285.2 L			
PM5-DW	Grid 5 Downwind Perimeter Monitor Air Filter Sample	08/18/2022 	08:31	15:16	405	8.147	7.887	8.017	3246.9 L			
PM5-CW	Grid 5 Crosswind Perimeter Monitor Air Filter Sample	08/18/2022 	08:33	15:13	400	8.073	8.123	8.098	3239.2 L			
LB-15082022	Lot Blank Air Filter Sample	08/15/2022 	10:40	10:40	0	-	-	-	0 L			
COL1-02-H	Collocated Grid 1 Scenario 2 Air Filter Sample	08/15/2022 	15:00	17:04	124	9.0	9.0	9.0	1116 L			
COL2-DW	Collocated Grid 2 Downwind Perimeter Air Filter Sample	08/16/2022 	08:14	15:03	406	8.0	8.0	8.0	3248 L			
COL3-01-H	Collocated Grid 3 Scenario 1 Air Filter Sample	08/17/2022 	08:11	10:18	127	8.042 	8.222 	8.132 	1032.85 L			
COL4-UW	Collocated Grid 4 Upwind Perimeter Air Filter Sample	08/19/2022 	06:36	11:26	290	8.048	8.132	8.09	2346.1 L			

Internal Lab Use Only:

Prelim Released: _____ Final Results Released: _____ Hardcopy Invoice Released: _____ ☐ Mail ☐ E-mail

By : ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal By : ☐ Fax ☐ Phone ☐ E-mail Reviewed By: _____

By signing below you are agreeing to comply with Lab/Cor's Requests, Tenders and Contracts.

* Call ahead for TATs of 24hrs or less

Relinquished by: _____ Date: _____ Time: _____ Relinquished by: _____ Date: _____ Time: _____

Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____







TEM / PCM / PLM Chain of Custody Record

Lab/Cor, Inc 7619 6 th Ave NW Seattle, WA 98117 Office (206) 781-0155 mail@labcor.net www.labcor.net	Client: <u>EA Engineering, Science, & Technology</u> Address: <u>555 University Avenue, Suite 110</u> City, State, Zip: <u>Sacramento, CA 95825</u> Contact: <u>Catherine LeCours</u> Phone: <u>406-219-1652</u> Fax: _____ Email: <u>clecours@eaest.com</u> Other Info: _____	Analytical Protocol: <input type="checkbox"/> AHERA <input type="checkbox"/> Modified EPA II <input type="checkbox"/> EPA II (Yamate) <input type="checkbox"/> NIOSH 7402 (TEM) <input type="checkbox"/> NIOSH 7400 (PCM) <input type="checkbox"/> ASTM Dust <input type="checkbox"/> EPA 100.1/ 100.2 <input checked="" type="checkbox"/> ISO: 10312 <input type="checkbox"/> Bulk PLM <input type="checkbox"/> Bulk TEM <div style="border: 1px solid black; padding: 2px; margin-top: 5px;"> <input type="checkbox"/> Quantitative <input type="checkbox"/> Semi-Quant <input type="checkbox"/> Qualitative </div>	Turnaround Time: <input checked="" type="checkbox"/> 5 days <input type="checkbox"/> 3 days <input type="checkbox"/> 2 days <input type="checkbox"/> 24 hours* <input type="checkbox"/> 6 hr RUSH* <input type="checkbox"/> Redeposit
---	--	--	---

Project Name: NRE OU2

Project Number: 1578503

P.O. Number: 23966

Sample Number	Sample Description	Sample Date	Sample Time			Flow Rate (lpm)			Total Volume	IWA	OWA	Blank
			On	Off	Total	Start	End	Avg				
COL5-01-H	Collocated Grid 5 Scenario 1 Air Filter Sample	08/18/2022 	08:48	10:51	123	8.074	8.114	8.094	995.6 L			
FB-15082022	Field Blank Air Filter Sample	08/15/2022 	10:40	10:41	1	-	-	-	0 L			
FB-16082022	Field Blank Air Filter Sample	08/16/2022 	08:11	08:12	1	-	-	-	0 L			
FB-17082022	Field Blank Air Filter Sample	08/17/2022 	07:45	07:46	1	-	-	-	0 L			
FB-18082022	Field Blank Air Filter Sample	08/18/2022 	08:30	08:31	1	-	-	-	0 L			
FB-19082022	Field Blank Air Filter Sample	08/19/2022 	06:35	06:36	1	-	-	-	0 L			

Internal Lab Use Only:

Prelim Released: _____ Final Results Released: _____ Hardcopy Invoice Released: _____ ☐ Mail ☐ E-mail
 By : ☐ Fax ☐ Phone ☐ E-mail ☐ Verbal By : ☐ Fax ☐ Phone ☐ E-mail Reviewed By: _____

By signing below you are agreeing to comply with Lab/Cor's Requests, Tenders and Contracts.

* Call ahead for TATs of 24hrs or less

Relinquished by: _____ Date: _____ Time: _____ Relinquished by: _____ Date: _____ Time: _____
 Received by: _____ Date: _____ Time: _____ Received by: _____ Date: _____ Time: _____

Lab/Cor, Inc. Prep Verification Sheet - Manual

EA Engineering ✓

Project: North Ridge Estates - OU2 - 1578503 - 23966 ✓

Job 220805 ✓

Printed: 8/24/2022 11:39:4

Turn Around Time: Special ✓

ISO 10312 - Direct ✓

Media: Cass.-MCE-0.8-25 ✓

LC ID Client Number - Sample Description

DNP

Meas/Vol Purpose

Prep 1 Prep 1 Date Prep 2 Prep 2 Date Prep 3 Prep 3 Date Sam
Par

S1	ABS1-01-H	overloaded - Did NOT Prep *	1080 L ✓
S2	ABS1-01-L	Borderline - prepped	423.5 L ✓
S3	ABS1-02-H	DNP	1098 L ✓
S4	ABS1-02-L	DNP - Indirect approved 9/6 420 L	720 L
S5	ABS2-01-H	DNP	992 L
S6	ABS2-01-L	Borderline - prepped	250 L
S7	ABS2-02-H	DNP	960 L
S8	ABS2-02-L	Prepped	240 L
S9	ABS3-01-H	DNP	1057.8 L
S10	ABS3-01-L	prepped	259.88 L
S11	ABS3-02-H	DNP → could be borderline	1008.45 L
S12	ABS3-02-L	prepped	253.78 L
S13	ABS4-01-H	DND	980.9 L
S14	ABS4-01-L	prepped	259 L
S15	ABS4-02-H	DNP	1004 L
S16	ABS4-02-L	prepped - Borderline	259.4 L
S17	ABS5-01-H	DNP	987.8 L
S18	ABS5-01-L	prepped	241.6 L 954.6 L
S19	ABS5-02-H	DNP	974.4 L
S20	ABS5-02-L	prepped	254.1 L
S21	PM1-UW	prepped	3581.5 L 358.15 L
S22	PM1-DW	Borderline	3648 L
S23	PM1-CW	✓	3572 L
S24	PM2-UW	✓	3240 L
S25	PM2-DW	✓	3193 L
S26	PM2-CW	GOOD - clean	3256 L
S27	PM3-UW	GOOD - clean	2682.56 L
S28	PM3-DW	✓	2586.29 L
S29	PM3-CW	✓	2632 L
S30	PM4-UW	✓	2325.9 L
S31	PM4-DW	✓	2321.8 L
S32	PM4-CW	✓	2320.7 L
S33	PM5-UW	✓	3285.2 L
S34	PM5-DW	✓	3246.9 L
S35	PM5-CW	✓	3239.2 L
S36	LB-15082022	✓	0 L
S37	COL1-02-H	DNP	1116 L
S38	COL2-DW	prepped	3248 L
S39	COL3-01-H	DNP	1032.85 L
S40	COL4-UW	prepped - Borderline	2346.1 L 234.61 L
S41	COL5-01-H	prepped	995.6 L
S42	FB-15082022	✓	0 L
S43	FB-16082022	✓	0 L
S44	FB-17082022	✓	0 L
S45	FB-18082022	✓	0 L

SB 8/24	SK 8/24	SK 9/6
SB 9/1/22		KM 9/13/22 0.5 Ft
		SK 9/6
SB 8/31		

Lab/Cor, Inc. Prep Verification Sheet - Manual

Job 220805

5

EA Engineering

Printed: 8/24/2022 11:39:4

Project: North Ridge Estates - OU2 - 1578503 - 23966

Turn Around Time: Special

LC ID	Client Number	Sample Description	Meas/Vol	Purpose	Prep 1	Prep 1 Date	Prep 2	Prep 2 Date	Prep 3	Prep 3 Date	Samg Par
S46	FB-19082022	✓prepped	0 L		SB	8/31					
B1	Blank	✓	0 L								
B2	Blank	✓	0 L								
B3	Blank	✓	0 L								
B4	Blank	✓	0 L								
B5	Blank	✓	0 L								
B6 - indirect process blank											
Employee Signature for Verification											Date

S4 indirect

A1 0mL
A2 5mL
A3 10mL

SB 9/9/2022

B6 - indirect process blank

A1 20mL



Lab/Cor, Inc.

7619 6th Ave NW
Seattle, WA 98117

Completed QC Report

9/1/2022 - 9/23/2022

Phone: (206) 781-0155

<http://www.labcor.net>

A Professional Service Corporation in the Northwest

QC Job Number	Sample Num	Analyst Name	Date Done	QC Analyst Name	Analysis Date	Original Structures	Original Weight %	QC Structures	QC Weight%	Passed	Pass/Fail Precision/Accuracy	R	LWL UWL	LAL UAL	Accuracy Lower Upper
ISO		Replicate		SameGO											
Q220805c	S31	KM	9/20/2022	KM	9/20/2022	0		0		<input checked="" type="checkbox"/>	PASS	0.000			
Q220805b	S20	KM	9/20/2022	KM	9/20/2022	0		0		<input checked="" type="checkbox"/>	PASS	0.000	0.000	0.000	
													0.000	0.000	
Q220805a	S2	KM	9/20/2022	KM	9/20/2022	0		0		<input checked="" type="checkbox"/>	PASS	0.000	0.000	0.000	
													0.000	0.000	

LabCor

Laboratories in Seattle, Portland and Eugene

Image Name: Plasma Ash Library 0min 0° tilt



Image Name: Plasma Ash Library 0min 25° til



LabCor

Laboratories in Seattle, Portland and Eugene

Image Name: Plasma Ash Library 2min 0° tilt

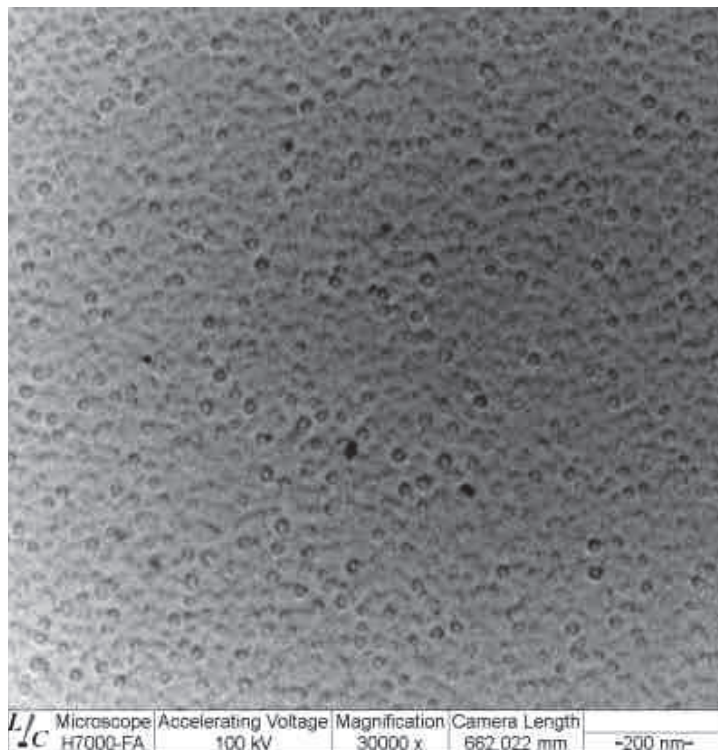
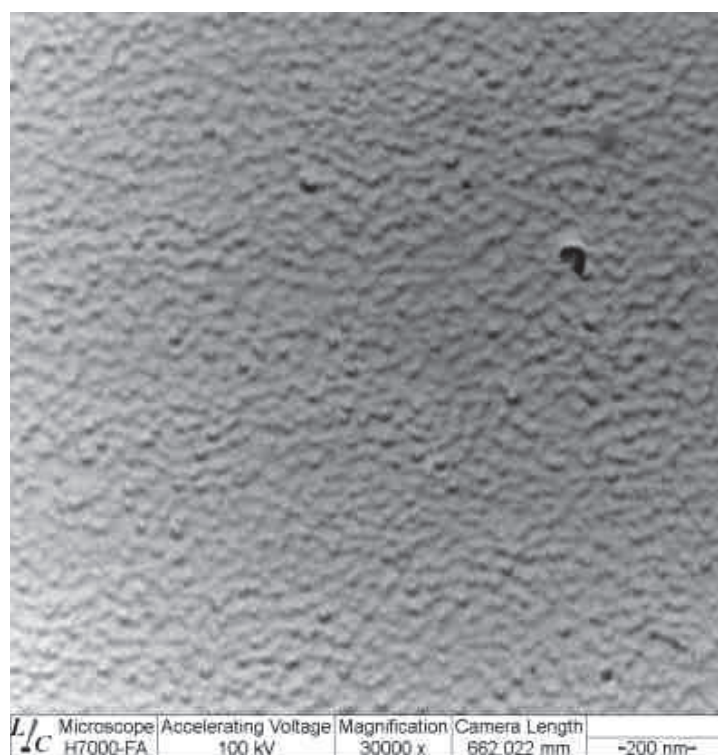


Image Name: Plasma Ash Library 2min 25° til



LabCor

Laboratories in Seattle, Portland and Eugene

Image Name: Plasma Ash Library 4min 0° tilt

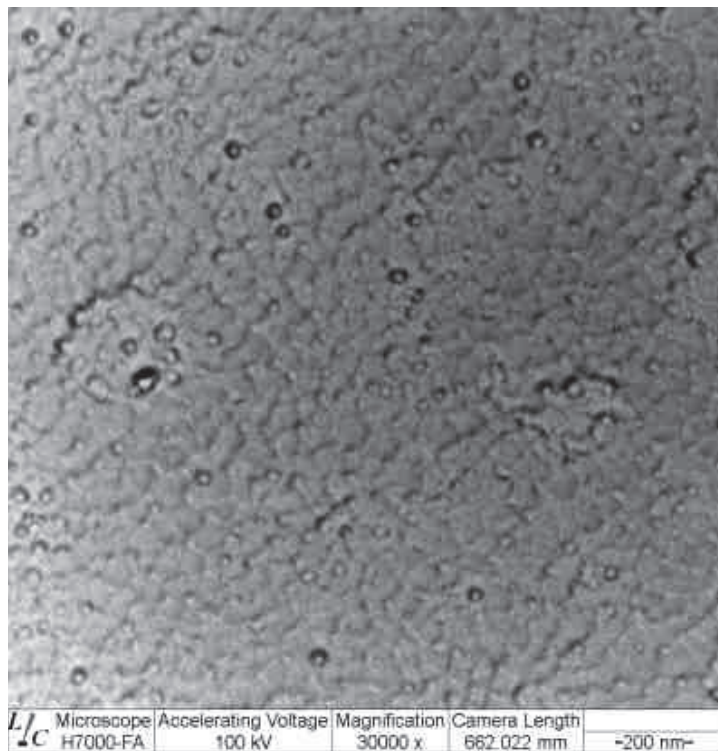
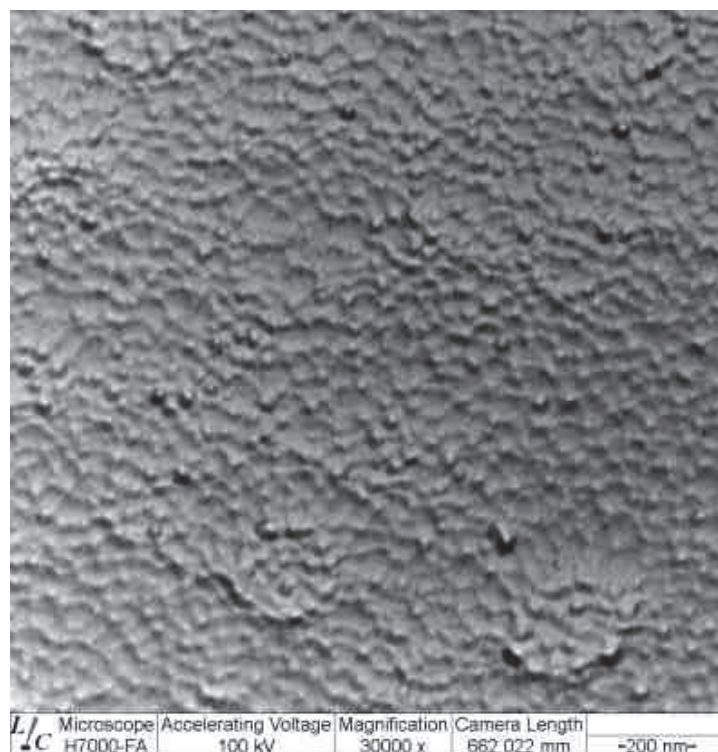


Image Name: Plasma Ash Library 4min 25° til



LabCor

Laboratories in Seattle, Portland and Eugene

Image Name: Plasma Ash Library 5min 0° tilt

BEST RATE: 5 MINUTES

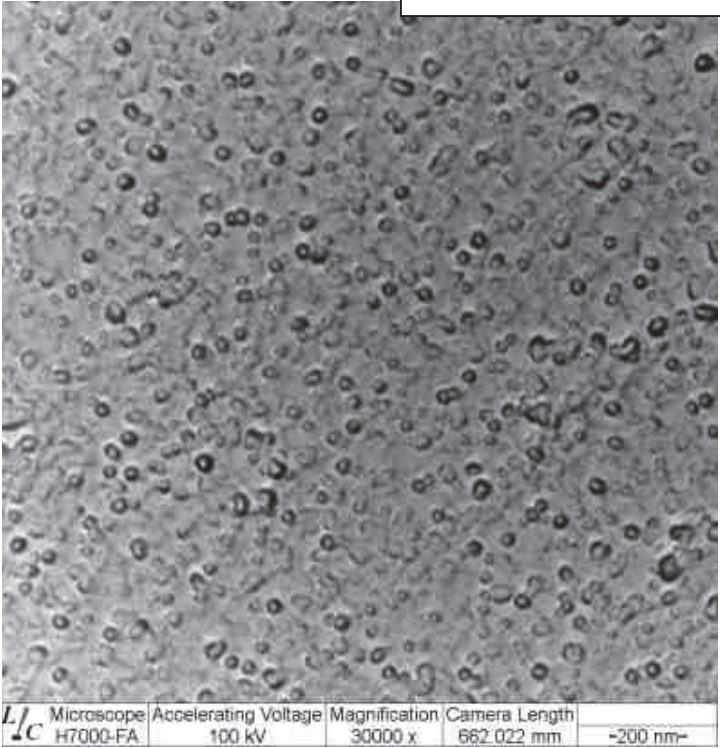
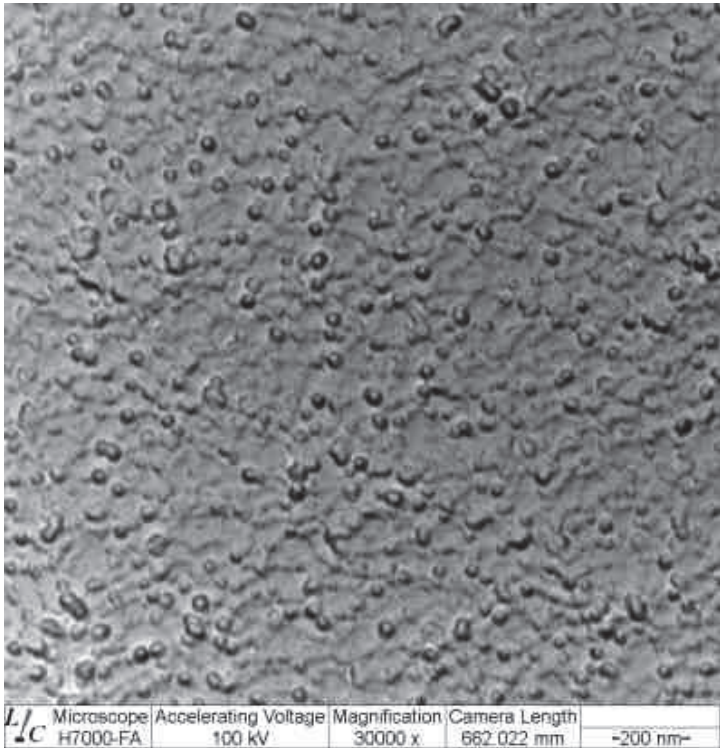


Image Name: Plasma Ash Library 5min 25° til



LabCor

Laboratories in Seattle, Portland and Eugene

Image Name: Plasma Ash Library 6min 0° tilt

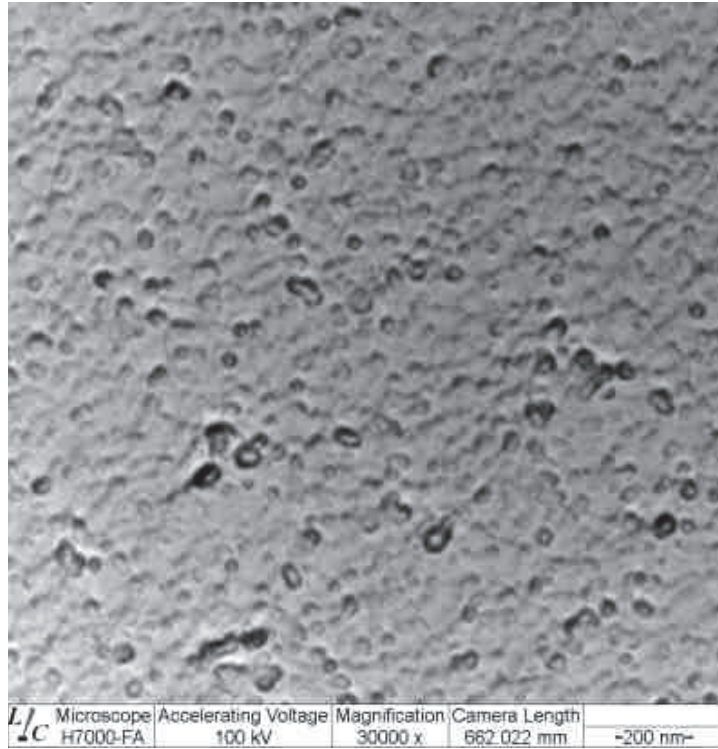
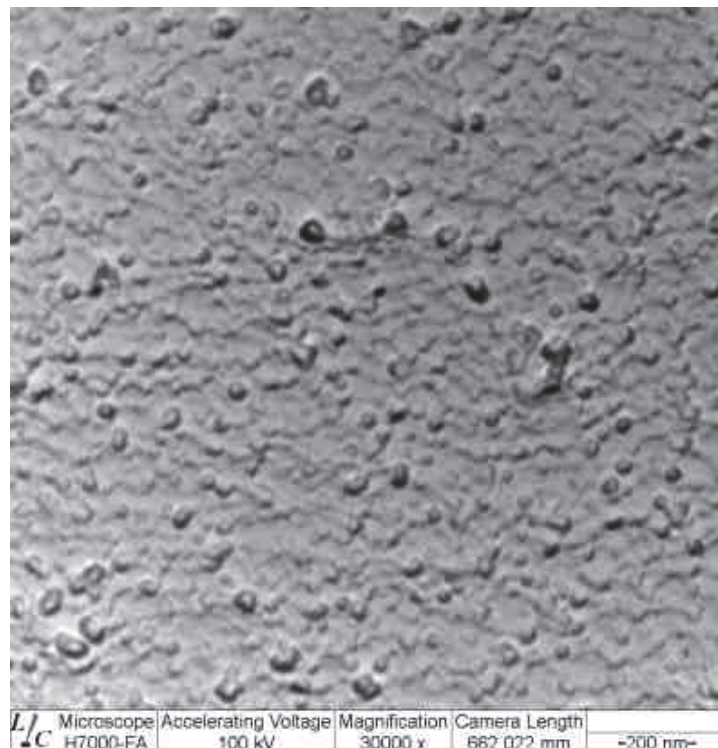


Image Name: Plasma Ash Library 6min 25° til



Statistical Function	Image Nam ID	2D Object Area	2D Object Perimeter
Base Unit		mm ²	mm
Count	283	283	#
Mean	0.011305999 0		
Minimum	1	0.010454169	0
Maximum	25	0.01226274	0
Standard Deviation	5.987764	0.000366344	0

Image Name	ID	2D Object Area mm ²	2D Object Perimeter mm				
Grid Cal V1G1 6_8_2022 J68536BF	1	0.011724	0.449625641	Grid Cal V4G1 6_8_2022 J68542BF	13	0.010928	0.446618
Grid Cal V1G1 6_8_2022 J68536BF	2	0.011821	0.451501648	Grid Cal V4G1 6_8_2022 J68542BF	14	0.010941	0.446457
Grid Cal V1G1 6_8_2022 J68536BF	3	0.011519	0.447266785	Grid Cal V4G1 6_8_2022 J68542BF	15	0.011064	0.450276
Grid Cal V1G1 6_8_2022 J68536BF	4	0.011571	0.447977203	Grid Cal V4G1 6_8_2022 J68542BF	16	0.011179	0.453479
Grid Cal V1G1 6_8_2022 J68536BF	5	0.011431	0.445551697	Grid Cal V4G1 6_8_2022 J68542BF	17	0.011179	0.45238
Grid Cal V1G1 6_8_2022 J68536BF	6	0.011513	0.446878265	Grid Cal V4G1 6_8_2022 J68542BF	18	0.010803	0.433498
Grid Cal V1G1 6_8_2022 J68536BF	7	0.011507	0.445390747	Grid Cal V4G2 6_8_2022 J68543BF	1	0.011271	0.450499
Grid Cal V1G1 6_8_2022 J68536BF	8	0.011476	0.445551697	Grid Cal V4G2 6_8_2022 J68543BF	2	0.011229	0.45066
Grid Cal V1G1 6_8_2022 J68536BF	9	0.01169	0.448915222	Grid Cal V4G2 6_8_2022 J68543BF	3	0.011276	0.451048
Grid Cal V1G1 6_8_2022 J68536BF	10	0.011644	0.448687622	Grid Cal V4G2 6_8_2022 J68543BF	4	0.011412	0.454318
Grid Cal V1G1 6_8_2022 J68536BF	11	0.011946	0.448915222	Grid Cal V4G2 6_8_2022 J68543BF	5	0.011773	0.458592
Grid Cal V1G1 6_8_2022 J68536BF	12	0.01216	0.455736511	Grid Cal V4G2 6_8_2022 J68543BF	6	0.011594	0.456649
Grid Cal V1G1 6_8_2022 J68536BF	13	0.011917	0.452600616	Grid Cal V4G2 6_8_2022 J68543BF	7	0.011229	0.449949
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Grid Cal V1G1 6_8_2022 J68536BF	15	0.011701	0.45001416	Grid Cal V4G2 6_8_2022 J68543BF	9	0.011004	0.445903
Grid Cal V1G1 6_8_2022 J68536BF	16	0.012061	0.453538635	Grid Cal V4G2 6_8_2022 J68543BF	10	0.011114	0.449883
Grid Cal V1G1 6_8_2022 J68536BF	17	0.012056	0.458067749	Grid Cal V4G2 6_8_2022 J68543BF	11	0.011234	0.450499
Grid Cal V1G1 6_8_2022 J68536BF	18	0.012263	0.45667453	Grid Cal V4G2 6_8_2022 J68543BF	12	0.011565	0.452897
Grid Cal V1G2 6_8_2022 J68537BF	1	0.011083	0.43538028	Grid Cal V4G2 6_8_2022 J68543BF	13	0.011317	0.451826
Grid Cal V1G2 6_8_2022 J68537BF	2	0.01099	0.432177704	Grid Cal V4G2 6_8_2022 J68543BF	14	0.01115	0.448945
Grid Cal V1G2 6_8_2022 J68537BF	3	0.010951	0.432177704	Grid Cal V4G2 6_8_2022 J68543BF	15	0.011057	0.449883
Grid Cal V1G2 6_8_2022 J68537BF	4	0.011006	0.433343323	Grid Cal V4G2 6_8_2022 J68543BF	16	0.011104	0.448007
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Grid Cal V1G2 6_8_2022 J68537BF	10	0.010777	0.429296997	Grid Cal V4G2 6_8_2022 J68543BF	22	0.011456	0.453996
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Grid Cal V1G2 6_8_2022 J68537BF	12	0.010644	0.432044373	Grid Cal V5G1 6_8_2022 J68544BF	2	0.011243	0.448671
Grid Cal V1G2 6_8_2022 J68537BF	13	0.010624	0.429163666	Grid Cal V5G1 6_8_2022 J68544BF	3	0.011214	0.448444
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Grid Cal V1G2 6_8_2022 J68537BF	15	0.010916	0.430301666	Grid Cal V5G1 6_8_2022 J68544BF	5	0.010833	0.439319
Grid Cal V1G2 6_8_2022 J68537BF	16	0.010894	0.430462616	Grid Cal V5G1 6_8_2022 J68544BF	6	0.010812	0.437992
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Grid Cal V1G2 6_8_2022 J68537BF	18	0.011054	0.43460321	Grid Cal V5G1 6_8_2022 J68544BF	8	0.01109	0.445241
Grid Cal V1G2 6_8_2022 J68537BF	19	0.011252	0.440780762	Grid Cal V5G1 6_8_2022 J68544BF	9	0.011392	0.447156
Grid Cal V1G2 6_8_2022 J68537BF	20	0.011352	0.437711517	Grid Cal V5G1 6_8_2022 J68544BF	10	0.011181	0.447506
Grid Cal V1G2 6_8_2022 J68537BF	21	0.011021	0.426682953	Grid Cal V5G1 6_8_2022 J68544BF	11	0.010954	0.442361
Grid Cal V2G1 6_8_2022 J68538BF	1	0.011505	0.458063019	Grid Cal V5G1 6_8_2022 J68544BF	12	0.010832	0.439319
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Grid Cal V2G1 6_8_2022 J68538BF	9	0.011336	0.455248962	Grid Cal V5G2 6_8_2022 J68545BF	1	0.011858	0.444705
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Grid Cal V2G1 6_8_2022 J68538BF	12	0.010986	0.448977142	Grid Cal V5G2 6_8_2022 J68545BF	4	0.011675	0.441503
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Grid Cal V2G1 6_8_2022 J68538BF	14	0.011337	0.455088043	Grid Cal V5G2 6_8_2022 J68545BF	6	0.011507	0.436424
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Grid Cal V2G1 6_8_2022 J68538BF	16	0.011606	0.458384888	Grid Cal V5G2 6_8_2022 J68545BF	8	0.011308	0.427888
Grid Cal V2G1 6_8_2022 J68538BF	17	0.011298	0.454310944	Grid Cal V5G2 6_8_2022 J68545BF	9	0.01133	0.429536
Grid Cal V2G1 6_8_2022 J68538BF	18	0.011222	0.452273987	Grid Cal V5G2 6_8_2022 J68545BF	10	0.011484	0.441181
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Grid Cal V2G1 6_8_2022 J68538BF	21	0.011254	0.442250122	Grid Cal V5G2 6_8_2022 J68545BF	13	0.01127	0.429308
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Grid Cal V2G2 6_8_2022 J68539BF	4	0.011393	0.457913513	Grid Cal V5G2 6_8_2022 J68545BF	17	0.011599	0.439399
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Grid Cal V2G2 6_8_2022 J68539BF	6	0.010983	0.449110474	Grid Cal V5G2 6_8_2022 J68545BF	19	0.011579	0.4383
Grid Cal V2G2 6_8_2022 J68539BF	7	0.010826	0.445358398	Grid Cal V5G2 6_8_2022 J68545BF	20	0.011831	0.444156
Grid Cal V2G2 6_8_2022 J68539BF	8	0.010833	0.444969879	Grid Cal V5G2 6_8_2022 J68545BF	21	0.01213	0.452531
Grid Cal V2G2 6_8_2022 J68539BF	9	0.010873	0.45199118	Grid Cal V5G2 6_8_2022 J68545BF	22	0.011959	0.44823
Grid Cal V2G2 6_8_2022 J68539BF	10	0.011063	0.450503693	Grid Cal V5G2 6_8_2022 J68545BF	23	0.01193	0.444544
Grid Cal V2G2 6_8_2022 J68539BF	11	0.011429	0.457980164	Grid Cal V5G2 6_8_2022 J68545BF	24	0.011906	0.449101
Grid Cal V2G2 6_8_2022 J68539BF	12	0.011001	0.439380829	Grid Cal V5G2 6_8_2022 J68545BF	25	0.012145	0.453469
Grid Cal V2G2 6_8_2022 J68539BF	13	0.010994	0.449498993	Grid Cal V6G1 6_8_2022 J68546BF	1	0.01098	0.435916
Grid Cal V2G2 6_8_2022 J68539BF	14	0.01085	0.446296417	Grid Cal V6G1 6_8_2022 J68546BF	2	0.010958	0.436077
Grid Cal V2G2 6_8_2022 J68539BF	15	0.010862	0.445746948	Grid Cal V6G1 6_8_2022 J68546BF	3	0.011059	0.439119
Grid Cal V2G2 6_8_2022 J68539BF	16	0.010885	0.447073486	Grid Cal V6G1 6_8_2022 J68546BF	4	0.011354	0.445041
Grid Cal V2G2 6_8_2022 J68539BF	17	0.011094	0.451280762	Grid Cal V6G1 6_8_2022 J68546BF	5	0.010454	0.41568
Grid Cal V2G2 6_8_2022 J68539BF	18	0.011398	0.457430695	Grid Cal V6G1 6_8_2022 J68546BF	6	0.010933	0.435139
Grid Cal V2G2 6_8_2022 J68539BF	19	0.011213	0.454161469	Grid Cal V6G1 6_8_2022 J68546BF	7	0.01077	0.430999
Grid Cal V2G2 6_8_2022 J68539BF	20	0.011356	0.456426025	Grid Cal V6G1 6_8_2022 J68546BF	8	0.010813	0.432486
Grid Cal V3G1 6_8_2022 J68540BF	1	0.011187	0.451774994	Grid Cal V6G1 6_8_2022 J68546BF	9	0.010869	0.433263
Grid Cal V3G1 6_8_2022 J68540BF	2	0.011044	0.450220856	Grid Cal V6G1 6_8_2022 J68546BF	10	0.011109	0.440512
Grid Cal V3G1 6_8_2022 J68540BF	3	0.0111	0.4542005	Grid Cal V6G1 6_8_2022 J68546BF	11	0.010782	0.423117
Grid Cal V3G1 6_8_2022 J68540BF	4	0.01119	0.452713013	Grid Cal V6G1 6_8_2022 J68546BF	12	0.011085	0.434951
Grid Cal V3G1 6_8_2022 J68540BF	5	0.011407	0.456759338	Grid Cal V6G1 6_8_2022 J68546BF	13	0.010928	0.435528
Grid Cal V3G1 6_8_2022 J68540BF	6	0.011254	0.453329163	Grid Cal V6G1 6_8_2022 J68546BF	14	0.010792	0.431387
Grid Cal V3G1 6_8_2022 J68540BF	7	0.011049	0.448894318	Grid Cal V6G1 6_8_2022 J68546BF	15	0.010784	0.431548
Grid Cal V3G1 6_8_2022 J68540BF	8	0.010919	0.447340149	Grid Cal V6G1 6_8_2022 J68546BF	16	0.010892	0.43459
Grid Cal V3G1 6_8_2022 J68540BF	9	0.010953	0.447179199	Grid Cal V6G1 6_8_2022 J68546BF	17	0.011117	0.440285
Grid Cal V3G1 6_8_2022 J68540BF	10	0.011002	0.447956299	Grid Cal V6G1 6_8_2022 J68546BF	18	0.010979	0.436693
Grid Cal V3G1 6_8_2022 J68540BF	11	0.011262	0.453878632	Grid Cal V6G1 6_8_2022 J68546BF	19	0.010975	0.436693
Grid Cal V3G1 6_8_2022 J68540BF	12	0.011016	0.450381805	Grid Cal V6G2 6_8_2022 J68547BF	1	0.011651	0.456327
Grid Cal V3G1 6_8_2022 J68540BF	13	0.010968	0.448117218	Grid Cal V6G2 6_8_2022 J68547BF	2	0.011561	0.454384
Grid Cal V3G1 6_8_2022 J68540BF	14	0.010972	0.447179199	Grid Cal V6G2 6_8_2022 J68547BF	3	0.011534	0.453835
Grid Cal V3G1 6_8_2022 J68540BF	15	0.011058	0.449671387	Grid Cal V6G2 6_8_2022 J68547BF	4	0.011681	0.456327
Grid Cal V3G1 6_8_2022 J68540BF	16	0.011264	0.453490082	Grid Cal V6G2 6_8_2022 J68547BF	5	0.011275	0.452442
Grid Cal V3G1 6_8_2022 J68540BF	17	0.011115	0.449898987	Grid Cal V6G2 6_8_2022 J68547BF	6	0.011184	0.448623
Grid Cal V3G1 6_8_2022 J68540BF	18	0.011141	0.450997925	Grid Cal V6G2 6_8_2022 J68547BF	7	0.011222	0.448784
Grid Cal V3G1 6_8_2022 J68540BF	19	0.011235	0.455915588	Grid Cal V6G2 6_8_2022 J68547BF	8	0.011339	0.451115
Grid Cal V3G1 6_8_2022 J68540BF	20	0.011447	0.457697357	Grid Cal V6G2 6_8_2022 J68547BF	9	0.011307	0.450177
Grid Cal V3G2 6_8_2022 J68541BF	1	0.011231	0.443167206	Grid Cal V6G2 6_8_2022 J68547BF	10	0.011262	0.449949
Grid Cal V3G2 6_8_2022 J68541BF	2	0.011206	0.437378204	Grid Cal V6G2 6_8_2022 J68547BF	11	0.011192	0.448073
Grid Cal V3G2 6_8_2022 J68541BF	3	0.011501	0.446275513	Grid Cal V6G2 6_8_2022 J68547BF	12	0.011305	0.450727
Grid Cal V3G2 6_8_2022 J68541BF	4	0.011011	0.438959961	Grid Cal V6G2 6_8_2022 J68547BF	13	0.01165	0.455
Grid Cal V3G2 6_8_2022 J68541BF	5	0.010924	0.437955292	Grid Cal V6G2 6_8_2022 J68547BF	14	0.011988	0.458175
Grid Cal V3G2 6_8_2022 J68541BF	6	0.010946	0.437955292	Grid Cal V6G2 6_8_2022 J68547BF	15	0.011616	0.455711
Grid Cal V3G2 6_8_2022 J68541BF	7	0.011036	0.438959961	Grid Cal V6G2 6_8_2022 J68547BF	16	0.011876	0.452936
Grid Cal V3G2 6_8_2022 J68541BF	8	0.011251	0.442068268	Grid Cal V6G2 6_8_2022 J68547BF	17	0.011595	0.454773
Grid Cal V3G2 6_8_2022 J68541BF	9	0.011118	0.441063568	Grid Cal V6G2 6_8_2022 J68547BF	18	0.011689	0.457426
Grid Cal V3G2 6_8_2022 J68541BF	10	0.010919	0.437405792	Grid Cal V6G2 6_8_2022 J68547BF	19	0.012023	0.461311
Grid Cal V3G2 6_8_2022 J68541BF	11	0.010814	0.435851654	Grid Cal V7G1 6_8_2022 J68548BF	1	0.012087	0.456405
Grid Cal V3G2 6_8_2022 J68541BF	12	0.010832	0.435690704	Grid Cal V7G1 6_8_2022 J68548BF	2	0.011845	0.450777

Grid Cal V3G2 6_8_2022 J68541BF	13	0.01091	0.436467773	Grid Cal V7G1 6_8_2022 J68548BF	3	0.011801	0.449678
Grid Cal V3G2 6_8_2022 J68541BF	14	0.011162	0.43996463	Grid Cal V7G1 6_8_2022 J68548BF	4	0.01184	0.451166
Grid Cal V3G2 6_8_2022 J68541BF	15	0.011408	0.439159943	Grid Cal V7G1 6_8_2022 J68548BF	5	0.01205	0.455628
Grid Cal V3G2 6_8_2022 J68541BF	16	0.011591	0.446891663	Grid Cal V7G1 6_8_2022 J68548BF	6	0.01168	0.447574
Grid Cal V3G2 6_8_2022 J68541BF	17	0.011237	0.441840668	Grid Cal V7G1 6_8_2022 J68548BF	7	0.011554	0.444211
Grid Cal V3G2 6_8_2022 J68541BF	18	0.011045	0.43934848	Grid Cal V7G1 6_8_2022 J68548BF	8	0.011477	0.443273
Grid Cal V3G2 6_8_2022 J68541BF	19	0.010931	0.437244873	Grid Cal V7G1 6_8_2022 J68548BF	9	0.011526	0.44405
Grid Cal V3G2 6_8_2022 J68541BF	20	0.010884	0.442872955	Grid Cal V7G1 6_8_2022 J68548BF	10	0.011705	0.448191
Grid Cal V3G2 6_8_2022 J68541BF	21	0.011014	0.438571411	Grid Cal V7G1 6_8_2022 J68548BF	11	0.011684	0.445537
Grid Cal V3G2 6_8_2022 J68541BF	22	0.011252	0.443006256	Grid Cal V7G1 6_8_2022 J68548BF	12	0.011509	0.442723
Grid Cal V4G1 6_8_2022 J68542BF	1	0.011281	0.454094788	Grid Cal V7G1 6_8_2022 J68548BF	13	0.011506	0.442563
Grid Cal V4G1 6_8_2022 J68542BF	2	0.011464	0.458851532	Grid Cal V7G1 6_8_2022 J68548BF	14	0.011543	0.443661
Grid Cal V4G1 6_8_2022 J68542BF	3	0.011418	0.457524963	Grid Cal V7G1 6_8_2022 J68548BF	15	0.011726	0.447963
Grid Cal V4G1 6_8_2022 J68542BF	4	0.011133	0.450664612	Grid Cal V7G1 6_8_2022 J68548BF	16	0.012145	0.457504
Grid Cal V4G1 6_8_2022 J68542BF	5	0.010938	0.447395386	Grid Cal V7G1 6_8_2022 J68548BF	17	0.011918	0.453913
Grid Cal V4G1 6_8_2022 J68542BF	6	0.01088	0.446068817	Grid Cal V7G1 6_8_2022 J68548BF	18	0.011896	0.450616
Grid Cal V4G1 6_8_2022 J68542BF	7	0.010925	0.446457367	Grid Cal V7G1 6_8_2022 J68548BF	19	0.011883	0.452975
Grid Cal V4G1 6_8_2022 J68542BF	8	0.011082	0.449887543	Grid Cal V7G2 6_8_2022 J68549BF	1	0.012052	0.466528
Grid Cal V4G1 6_8_2022 J68542BF	9	0.011325	0.455809875	Grid Cal V7G2 6_8_2022 J68549BF	2	0.011772	0.464263
Grid Cal V4G1 6_8_2022 J68542BF	10	0.011316	0.455260406	Grid Cal V7G2 6_8_2022 J68549BF	3	0.011913	0.466917
Grid Cal V4G1 6_8_2022 J68542BF	11	0.01114	0.451214081	Grid Cal V7G2 6_8_2022 J68549BF	4	0.011657	0.461516
Grid Cal V4G1 6_8_2022 J68542BF	12	0.01095	0.447395386	Grid Cal V7G2 6_8_2022 J68549BF	5	0.011692	0.462615
				Grid Cal V7G2 6_8_2022 J68549BF	6	0.011699	0.462615
				Grid Cal V7G2 6_8_2022 J68549BF	7	0.011784	0.465751
				Grid Cal V7G2 6_8_2022 J68549BF	8	0.01153	0.458702
				Grid Cal V7G2 6_8_2022 J68549BF	9	0.011499	0.457764
				Grid Cal V7G2 6_8_2022 J68549BF	10	0.011657	0.462226
				Grid Cal V7G2 6_8_2022 J68549BF	11	0.011714	0.462615
				Grid Cal V7G2 6_8_2022 J68549BF	12	0.011578	0.45964
				Grid Cal V7G2 6_8_2022 J68549BF	13	0.011563	0.459251
				Grid Cal V7G2 6_8_2022 J68549BF	14	0.011644	0.461288
				Grid Cal V7G2 6_8_2022 J68549BF	15	0.011913	0.466689
				Grid Cal V7G2 6_8_2022 J68549BF	16	0.012104	0.471151
				Grid Cal V7G2 6_8_2022 J68549BF	17	0.011929	0.467077
				Grid Cal V7G2 6_8_2022 J68549BF	18	0.011774	0.464103
				Grid Cal V7G2 6_8_2022 J68549BF	19	0.011781	0.464491
				Grid Cal V7G2 6_8_2022 J68549BF	20	0.011579	0.449938

Lab/Cor, Inc. Equipment Maintenance Form

JEOL Sr. 1200EX

Year: 2022

Reviewed:

Scheduled Maintenance

Equipment: JEOL Sr 1200EX
Model Number: 1200EX

Serial Number: EM157034-26
Installation Date: 2003
Location: JEOL Sr Room

Associated Software: Thermo Pathfinder
Olympus ITEM
CRISP

Version 1.4, Workstation Build 11, Analyzer Build 200
Version 5.2, Build 6074
Version 2.1

JULY			AUGUST			SEPTEMBER			OCTOBER			NOVEMBER			DECEMBER		
Day	Daily	Monthly	Day	Daily	Monthly	Day	Daily	Monthly	Day	Daily	Monthly	Day	Daily	Monthly	Day	Daily	Monthly
1	SB		1	SB		1	SB		1			1			1		
2	KM		2	SB		2	SB		2			2			2		
3			3	SB		3			3			3			3		
4			4	SB		4			4			4			4		
5	SB KM		5	SB		5			5			5			5		
6	SB		6			6	SB		6			6			6		
7	SB		7			7	SB		7			7			7		
8	SB		8	SB		8			8			8			8		
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17			17	SB KM		17			17			17			17		
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23			23	SB		23			23			23			23		
24			24	KM		24			24			24			24		
25	SB		25	SB		25			25			25			25		
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30			30	SB		30			30			30			30		
31			31	SB		31			31			31			31		

Daily (if date is blank equipment not in use):

Check for water/ air leaks. Check for vacuum leaks. Grease the specimen rod O' ring lightly. Daily scope/EDS alignment. Prop room door open at end of day.

Monthly:

Full column alignment - done before monthly calibrations performed.

Check blow-off line for presence of water (behind microscope column). Press valve at the bottom of glass bulb to expel any residual water in air lines.

Check pressure reading, water pressure must be 40PSI. Check oil level and color in rotary pump in housing behind scope. If level is below the 'fill' mark, add Hydrocarbon based oil only (NO SILICON OIL).

Associated Hardware:

Olympus Megaview Camera:

Model: 09540121 S/N: A2433301-3CB543C5

Thermo UltraDry Detector:

Model: 6611N-3UPS-SN

S/N 8114

Lab/Cor, Inc. Equipment Maintenance Form

Hitachi-7000 FA

Year: 2022

Reviewed:

Scheduled Maintenance

Equipment: Hitachi-7000FA
Model Number: 7000FA

Serial Number: 747-32-03
Installation Date: 2005
Location: Hitachi Room

Associated Software: CRSP
Thermo Pathfinder
Olympus ITEM

Version 2.1
Version 1.4, Workstation Build 11, Analyzer Build 200
Version 5.2, Build 6074

Day	JULY		Day	AUGUST		Day	SEPTEMBER		Day	OCTOBER		Day	NOVEMBER		Day	DECEMBER	
	Daily	Monthly		Daily	Monthly		Daily	Monthly		Daily	Monthly		Daily	Monthly		Daily	Monthly
1			1			1			1			1			1		
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30			30			30			30			30			30		
31			31			31			31			31			31		

Daily (if date is blank equipment not in use):
Check for water/ air leaks. Check for vacuum leaks. Grease the specimen rod O' ring lightly. Daily scope/EDS alignment. Prop room door open at end of day.

Monthly:

Full column alignment - done before monthly calibrations performed.

Check blow-off line for presence of water (behind microscope column). Press valve at the bottom of glass bulb to expel any residual water in air lines.

Check pressure reading, water pressure must be 40PSI. Check oil level and color in rotary pump in housing behind scope. If level is below the 'fill' mark, add Hydrocarbon based oil only (NO SILICON OIL).

Associated Hardware:

Olympus Megaview Camera: Model: S/N A2433301-3CB543C5

Thermo UltraDry Detector:

Model: 4418E-3UPS-SN

S/N 8110

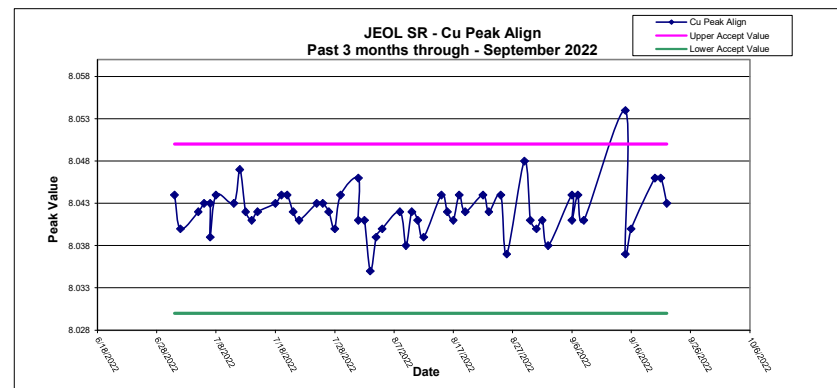
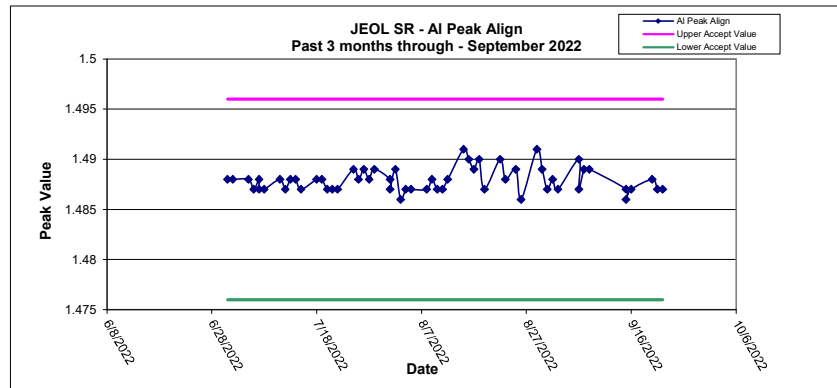
Out of Service

LabCor, Inc.

JEOL EDS Calibration (Al, Cu)

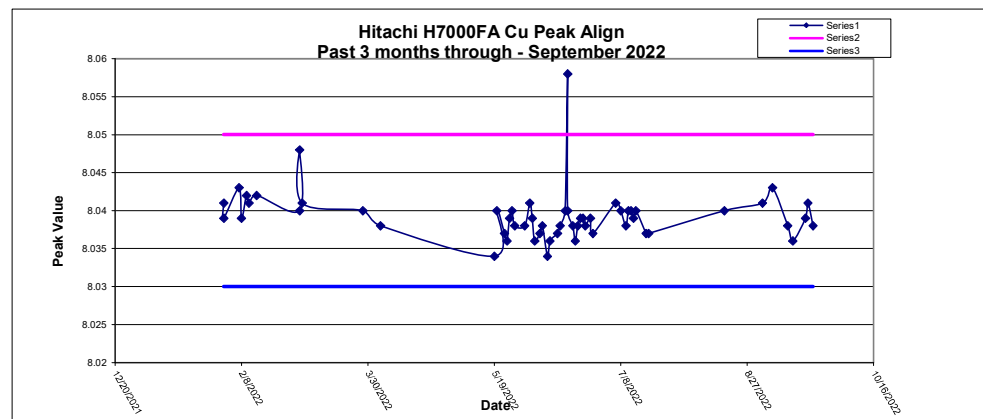
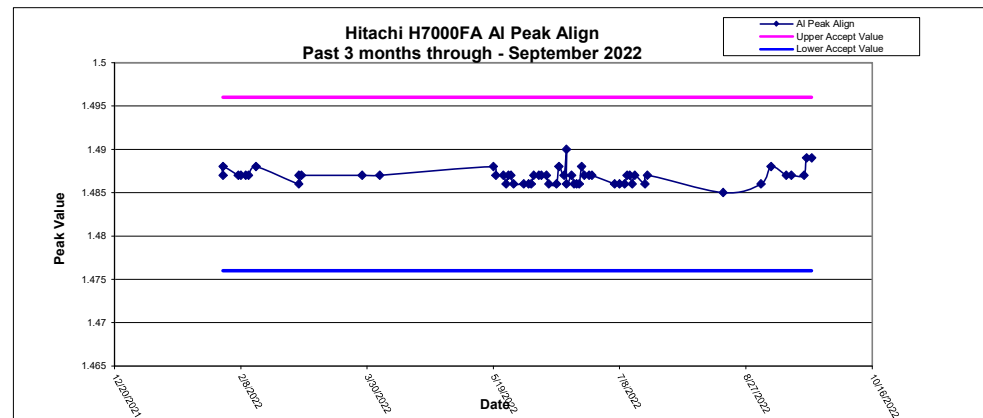
Date	Al Peak Align	Upper Accept Value	Lower Accept Value	Cu Peak Align	Upper Accept Value	Lower Accept Value	Analyst	Scope
7/1/2022	1.488	1.496	1.476	8.044	8.05	8.03	SB	J
7/2/2022	1.488	1.496	1.476	8.04	8.05	8.03	KM	J
7/5/2022	1.488	1.496	1.476	8.042	8.05	8.03	SB	J
7/6/2022	1.487	1.496	1.476	8.043	8.05	8.03	SB	J
7/7/2022	1.488	1.496	1.476	8.043	8.05	8.03	SB	J
7/7/2022	1.487	1.496	1.476	8.039	8.05	8.03	SB	J
7/8/2022	1.487	1.496	1.476	8.044	8.05	8.03	SB	J
7/11/2022	1.488	1.496	1.476	8.043	8.05	8.03	SB	J
7/12/2022	1.487	1.496	1.476	8.047	8.05	8.03	SB	J
7/13/2022	1.488	1.496	1.476	8.042	8.05	8.03	SB	J
7/14/2022	1.488	1.496	1.476	8.041	8.05	8.03	SB	J
7/15/2022	1.487	1.496	1.476	8.042	8.05	8.03	SB	J
7/18/2022	1.488	1.496	1.476	8.043	8.05	8.03	SB	J
7/19/2022	1.488	1.496	1.476	8.044	8.05	8.03	SB	J
7/20/2022	1.487	1.496	1.476	8.044	8.05	8.03	SB	J
7/21/2022	1.487	1.496	1.476	8.042	8.05	8.03	SB	J
7/22/2022	1.487	1.496	1.476	8.041	8.05	8.03	SB	J
7/25/2022	1.489	1.496	1.476	8.043	8.05	8.03	SB	J
7/26/2022	1.488	1.496	1.476	8.043	8.05	8.03	SB	J
7/27/2022	1.489	1.496	1.476	8.042	8.05	8.03	SB	J
7/28/2022	1.488	1.496	1.476	8.04	8.05	8.03	SB	J
7/29/2022	1.489	1.496	1.476	8.044	8.05	8.03	SB	J
8/1/2022	1.488	1.496	1.476	8.046	8.05	8.03	SB	J
8/1/2022	1.487	1.496	1.476	8.041	8.05	8.03	SB	J
8/2/2022	1.489	1.496	1.476	8.041	8.05	8.03	SB	J
8/3/2022	1.486	1.496	1.476	8.035	8.05	8.03	SB	J
8/4/2022	1.487	1.496	1.476	8.039	8.05	8.03	SB	J
8/5/2022	1.487	1.496	1.476	8.04	8.05	8.03	SB	J
8/8/2022	1.487	1.496	1.476	8.042	8.05	8.03	SB	J
8/9/2022	1.488	1.496	1.476	8.038	8.05	8.03	SB	J
8/10/2022	1.487	1.496	1.476	8.042	8.05	8.03	SB	J
8/11/2022	1.487	1.496	1.476	8.041	8.05	8.03	SB	J
8/12/2022	1.488	1.496	1.476	8.039	8.05	8.03	SB	J
8/15/2022	1.491	1.496	1.476	8.044	8.05	8.03	SB	J
8/16/2022	1.49	1.496	1.476	8.042	8.05	8.03	SB	J
8/17/2022	1.489	1.496	1.476	8.041	8.05	8.03	SB	J
8/18/2022	1.49	1.496	1.476	8.044	8.05	8.03	SB	J
8/19/2022	1.487	1.496	1.476	8.042	8.05	8.03	SB	J
8/22/2022	1.49	1.496	1.476	8.044	8.05	8.03	SB	J
8/23/2022	1.488	1.496	1.476	8.042	8.05	8.03	SB	J
8/25/2022	1.489	1.496	1.476	8.044	8.05	8.03	SB	J
8/26/2022	1.486	1.496	1.476	8.037	8.05	8.03	SB	J
8/29/2022	1.491	1.496	1.476	8.048	8.05	8.03	SB	J
8/30/2022	1.489	1.496	1.476	8.041	8.05	8.03	SB	J
8/31/2022	1.487	1.496	1.476	8.04	8.05	8.03	SB	J
9/1/2022	1.488	1.496	1.476	8.041	8.05	8.03	SB	J
9/2/2022	1.487	1.496	1.476	8.038	8.05	8.03	SB	J
9/6/2022	1.49	1.496	1.476	8.044	8.05	8.03	SB	J
9/6/2022	1.487	1.496	1.476	8.041	8.05	8.03	SB	J
9/7/2022	1.489	1.496	1.476	8.044	8.05	8.03	SB	J
9/8/2022	1.489	1.496	1.476	8.041	8.05	8.03	SB	J
9/15/2022	1.487	1.496	1.476	8.054	8.05	8.03	KM	J
9/15/2022	1.486	1.496	1.476	8.037	8.05	8.03	KM	J
9/16/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	J
9/20/2022	1.488	1.496	1.476	8.046	8.05	8.03	SB	J
9/21/2022	1.487	1.496	1.476	8.046	8.05	8.03	SB	J
9/22/2022	1.487	1.496	1.476	8.043	8.05	8.03	SB	J

9/22/2022 last 3 month: 6/19/2022

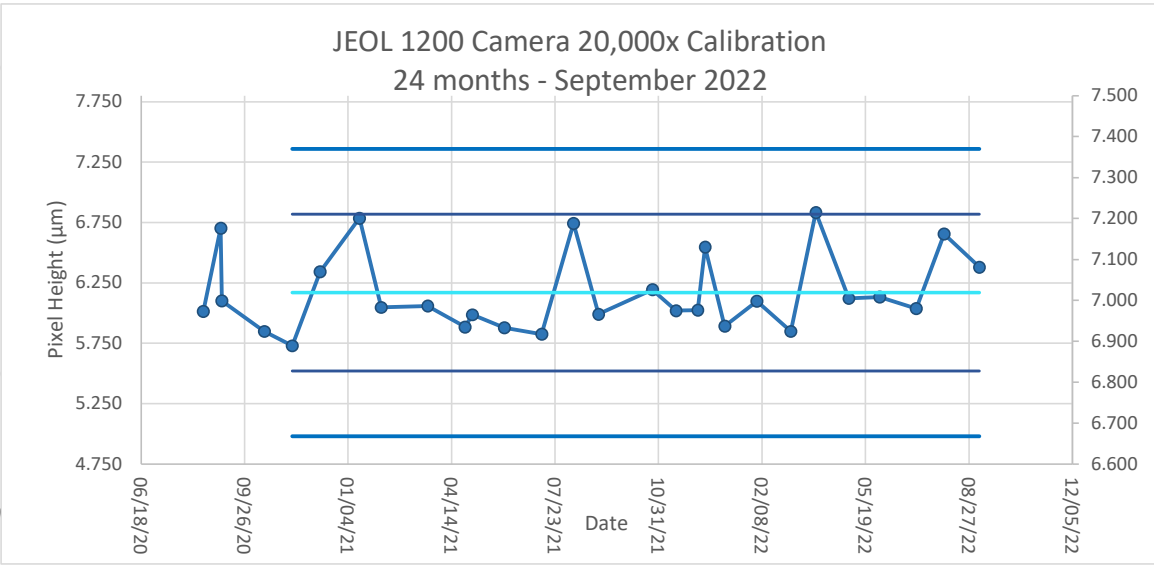


HITACHI H7000FA EDS Calibration (Al, Cu)

Date	Al Peak Align	Upper Accept Value	Lower Accept Value	Cu Peak Align	Upper Accept Value	Lower Accept Value	Analyst	Scope
2/1/2022	1.487	1.496	1.476	8.041	8.05	8.03	SH	F
2/1/2022	1.488	1.496	1.476	8.039	8.05	8.03	SH	F
2/7/2022	1.487	1.496	1.476	8.043	8.05	8.03	SH	F
2/8/2022	1.487	1.496	1.476	8.039	8.05	8.03	SH	F
2/10/2022	1.487	1.496	1.476	8.042	8.05	8.03	SH	F
2/11/2022	1.487	1.496	1.476	8.041	8.05	8.03	SH	F
2/14/2022	1.488	1.496	1.476	8.042	8.05	8.03	SH	F
3/3/2022	1.486	1.496	1.476	8.04	8.05	8.03	SH	F
3/3/2022	1.487	1.496	1.476	8.048	8.05	8.03	SH	F
3/4/2022	1.487	1.496	1.476	8.041	8.05	8.03	SH	F
3/28/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
4/4/2022	1.487	1.496	1.476	8.038	8.05	8.03	KM	F
5/19/2022	1.488	1.496	1.476	8.034	8.05	8.03	KM	F
5/20/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
5/23/2022	1.487	1.496	1.476	8.037	8.05	8.03	KM	F
5/24/2022	1.486	1.496	1.476	8.036	8.05	8.03	KM	F
5/25/2022	1.487	1.496	1.476	8.039	8.05	8.03	KM	F
5/26/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
5/27/2022	1.486	1.496	1.476	8.038	8.05	8.03	KM	F
5/31/2022	1.486	1.496	1.476	8.038	8.05	8.03	KM	F
6/2/2022	1.486	1.496	1.476	8.041	8.05	8.03	KM	F
6/3/2022	1.486	1.496	1.476	8.039	8.05	8.03	KM	F
6/4/2022	1.487	1.496	1.476	8.036	8.05	8.03	KM	F
6/6/2022	1.487	1.496	1.476	8.037	8.05	8.03	KM	F
6/7/2022	1.487	1.496	1.476	8.038	8.05	8.03	KM	F
6/9/2022	1.487	1.496	1.476	8.034	8.05	8.03	KM	F
6/10/2022	1.486	1.496	1.476	8.036	8.05	8.03	KM	F
6/13/2022	1.486	1.496	1.476	8.037	8.05	8.03	KM	F
6/14/2022	1.488	1.496	1.476	8.038	8.05	8.03	KM	F
6/16/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
6/17/2022	1.49	1.496	1.476	8.058	8.05	8.03	KM	F
6/17/2022	1.486	1.496	1.476	8.04	8.05	8.03	KM	F
6/19/2022	1.487	1.496	1.476	8.038	8.05	8.03	KM	F
6/20/2022	1.486	1.496	1.476	8.036	8.05	8.03	KM	F
6/21/2022	1.486	1.496	1.476	8.038	8.05	8.03	KM	F
6/22/2022	1.486	1.496	1.476	8.039	8.05	8.03	KM	F
6/23/2022	1.488	1.496	1.476	8.039	8.05	8.03	KM	F
6/24/2022	1.487	1.496	1.476	8.038	8.05	8.03	KM	F
6/26/2022	1.487	1.496	1.476	8.039	8.05	8.03	KM	F
6/27/2022	1.487	1.496	1.476	8.037	8.05	8.03	KM	F
7/6/2022	1.486	1.496	1.476	8.041	8.05	8.03	KM	F
7/8/2022	1.486	1.496	1.476	8.04	8.05	8.03	KM	F
7/10/2022	1.486	1.496	1.476	8.038	8.05	8.03	KM	F
7/11/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
7/12/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
7/13/2022	1.486	1.496	1.476	8.039	8.05	8.03	KM	F
7/14/2022	1.487	1.496	1.476	8.04	8.05	8.03	KM	F
7/18/2022	1.486	1.496	1.476	8.037	8.05	8.03	KM	F
7/19/2022	1.487	1.496	1.476	8.037	8.05	8.03	KM	F
8/18/2022	1.485	1.496	1.476	8.04	8.05	8.03	KM	F
9/2/2022	1.486	1.496	1.476	8.041	8.05	8.03	KM	F
9/6/2022	1.488	1.496	1.476	8.043	8.05	8.03	KM	F
9/12/2022	1.487	1.496	1.476	8.038	8.05	8.03	KM	F
9/14/2022	1.487	1.496	1.476	8.036	8.05	8.03	KM	F
9/19/2022	1.487	1.496	1.476	8.039	8.05	8.03	KM	F
9/20/2022	1.489	1.496	1.476	8.041	8.05	8.03	KM	F
9/22/2022	1.489	1.496	1.476	8.038	8.05	8.03	KM	F



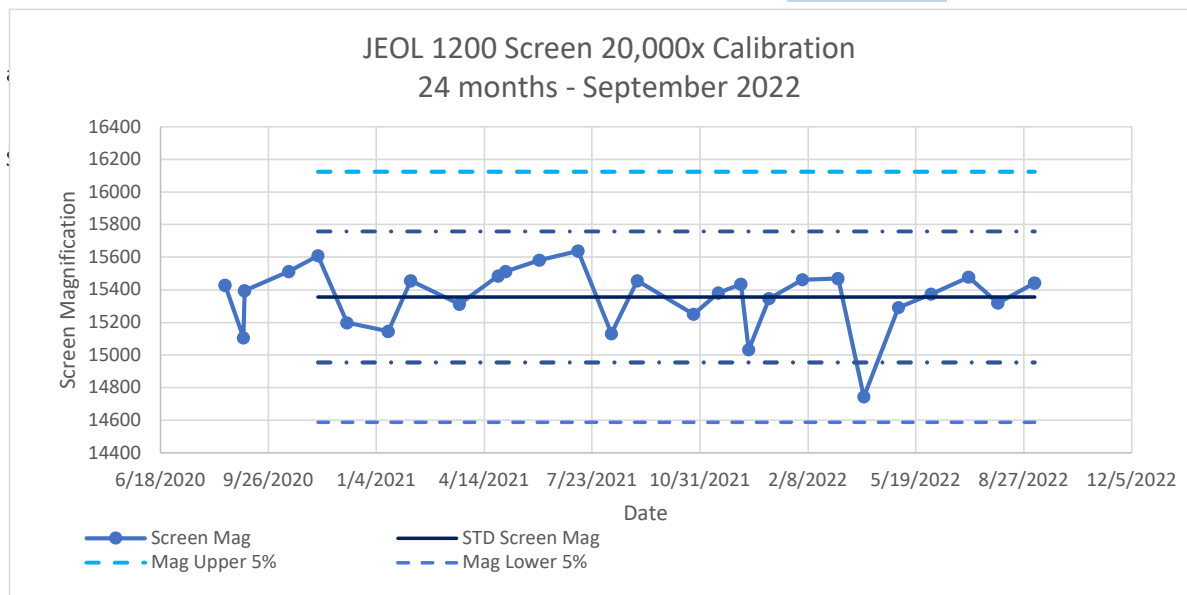
Calibration	Negative#	Date	Screen Width (μm)	Screen Height (μm)	Width Pass/ Fail	Height Pass/ Fail	WDTH Upper 5% 7.370	WDTH Lower 5% 6.668	STD WIDTH 7.019	WDTH Upper 2s 7.210	WDTH Lower 2s 6.827	WDTH 2s 0.191	Do Not Edit: 11/11/2020 9/6/2022 24	Comments
68	J61658	08/17/20	6.973	5.230	PASS	PASS								
69	J61974	09/03/20	7.176	5.382	PASS	PASS								
70	J62000BF	09/04/20	6.999	5.249	PASS	PASS								
71	J62179	10/15/20	6.924	5.193	PASS	PASS								
72	J62383BF	11/11/20	6.889	5.167	PASS	PASS								
73	J62558BF	12/08/20	7.070	5.303	PASS	PASS								
74	J62685	01/15/21	7.201	5.407	PASS	PASS								
75	J62795	02/05/21	6.983	5.237	PASS	PASS								
76	J63385BF	03/22/21	6.986	5.239	PASS	PASS								
77	J63655BF	04/27/21	6.935	5.201	PASS	PASS								
78	J63695	05/04/21	6.965	5.224	PASS	PASS								
79	J64037	06/04/21	6.933	5.200	PASS	PASS								
80	J65023	07/10/21	6.918	5.180	PASS	PASS								
81	J65609	08/10/21	7.188	5.391	PASS	PASS								
82	J65873	09/03/21	6.966	5.225	PASS	PASS								
83	J67022	10/25/21	7.026	5.269	PASS	PASS								
84	J67187	11/17/21	6.975	5.231	PASS	PASS								
85	J67284	12/08/21	6.976	5.232	PASS	PASS								
86	J67334	12/15/21	7.130	5.348	PASS	PASS								
87	J67364	01/03/22	6.937	5.203	PASS	PASS								
88	J67536	02/03/22	6.998	5.248	PASS	PASS								
89	J67764	03/08/22	6.924	5.193	PASS	PASS								
90	J67937	04/01/22	7.215	5.411	Warning	Warning								SB - After Servicing by Joe
91	J68146	05/03/22	7.005	5.254	PASS	PASS								
92	J68453	06/02/22	7.008	5.256	PASS	PASS								
93	J68788	07/07/22	6.980	5.235	PASS	PASS								
94	J68944	08/03/22	7.162	5.371	PASS	PASS								
95	J69230	09/06/22	7.081	5.311	PASS	PASS								



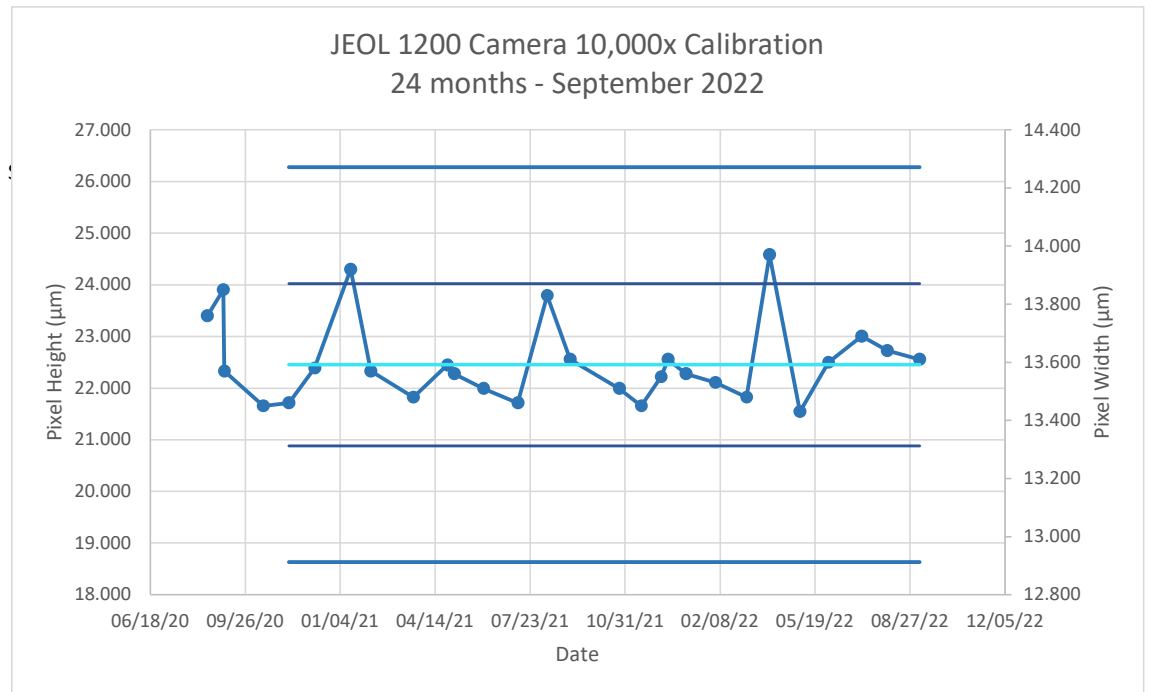
Calibration	Date	# Spaces	Screen Mag	PASS/Fail	Mag Upper 5%	Mag Lower 5%	STD Screen Mag	Mag Upper 2s	Mag Lower 2s	Screen Mag 2s
					16124.116	14588.486	15356.301	15757.785	14954.817	401.484

Do Not Edit:
11/11/2020
9/6/2022
24

68	8/17/2020	22.40	15428.571	PASS
69	9/3/2020	22.88	15104.895	PASS
70	9/4/2020	22.45	15394.209	PASS
71	10/15/2020	22.28	15511.670	PASS
72	11/11/2020	22.14	15609.756	PASS
73	12/8/2020	22.74	15197.889	PASS
74	1/15/2021	22.82	15144.610	PASS
75	2/5/2021	22.36	15456.172	PASS
76	3/22/2021	22.57	15312.362	PASS
77	4/27/2021	22.32	15483.871	PASS
78	5/4/2021	22.28	15511.670	PASS
79	6/4/2021	22.18	15581.605	PASS
80	7/10/2021	22.10	15638.009	PASS
81	8/10/2021	22.84	15131.349	PASS
82	9/3/2021	22.36	15456.172	PASS
83	10/25/2021	22.66	15251.545	PASS
84	11/17/2021	22.47	15380.507	PASS
85	12/8/2021	22.39	15435.462	PASS
86	12/15/2021	22.99	15032.623	PASS
87	1/3/2022	22.52	15346.359	PASS
88	2/3/2022	22.35	15463.087	PASS
89	3/8/2022	22.34	15470.009	PASS
90	4/1/2022	23.44	14744.027	Warning
91	5/3/2022	22.60	15292.035	PASS
92	6/2/2022	22.48	15373.665	PASS
93	7/7/2022	22.33	15476.937	PASS
94	8/3/2022	22.56	15319.149	PASS
95	9/6/2022	22.38	15442.359	PASS

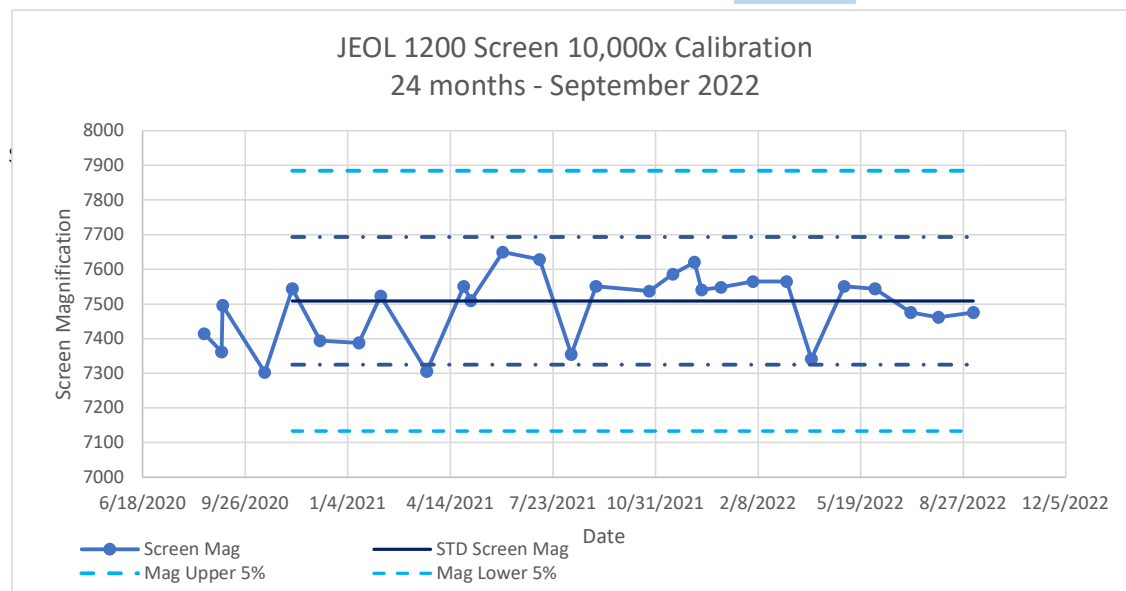


Calibration	Negative#	Date	Screen Width (μm)	Screen Height (μm)	Width Pass/ Fail	Height Pass/ Fail	WDTH Upper 5%	WDTH Lower 5%	STD WIDTH	WDTH Upper 2s	WDTH Lower 2s	WDTH 2s	Do Not Edit: 11/11/2020 9/6/2022 24
							14.271	12.912	13.592	13.871	13.312	0.279	
									10.194			0.210	
68	J61858	08/17/20	13.760	10.320	PASS	PASS							
69	J61975	09/03/20	13.850	10.380	PASS	PASS							
70	J62001	09/04/20	13.570	10.180	PASS	PASS							
71	J62180	10/15/20	13.450	10.090	PASS	PASS							
72	J62384	11/11/20	13.460	10.090	PASS	PASS							
73	J62559	12/08/20	13.580	10.190	PASS	PASS							
74	J62686	01/15/21	13.920	10.440	Warning	Warning							
75	J62796	02/05/21	13.570	10.170	PASS	PASS							
76	J63386BF	03/22/21	13.480	10.110	PASS	PASS							
77	J63656	04/27/21	13.590	10.190	PASS	PASS							
78	J63696	05/04/21	13.560	10.170	PASS	PASS							
79	J64038	06/04/21	13.510	10.130	PASS	PASS							
80	J65024	07/10/21	13.460	10.100	PASS	PASS							
81	J65610	08/10/21	13.830	10.370	PASS	PASS							
82	J65874	09/03/21	13.610	10.210	PASS	PASS							
83	J67023	10/25/21	13.510	10.130	PASS	PASS							
84	J67188	11/17/21	13.450	10.090	PASS	PASS							
85	J67285	12/08/21	13.550	10.160	PASS	PASS							
86	J67335	12/15/21	13.610	10.210	PASS	PASS							
87	J67365	01/03/22	13.560	10.170	PASS	PASS							
88	J67537	02/03/22	13.530	10.150	PASS	PASS							
89	J67765	03/08/22	13.480	10.110	PASS	PASS							
90	J67938	04/01/22	13.970	10.480	Warning	Warning							
91	J68147	05/03/22	13.430	10.070	PASS	PASS							
92	J68454	06/02/22	13.600	10.200	PASS	PASS							
93	J68789	07/07/22	13.690	10.270	PASS	PASS							
94	J68945	08/03/22	13.640	10.230	PASS	PASS							
95	J69231	09/06/22	13.610	10.210	PASS	PASS							



Calibration	Date	# Spaces	Screen Mag	PASS/Fail	Mag Upper 5%	Mag Lower 5%	STD Screen Mag	Mag Upper 2s	Mag Lower 2s	Screen Mag 2s	Do Not Edit:
					7884.282	7133.398	7508.840	7693.147	7324.533	184.307	11/11/2020 9/6/2022 24

58	8/17/2020	22.14	7414.634	PASS
59	9/3/2020	22.30	7361.435	PASS
60	9/4/2020	21.90	7495.890	PASS
61	10/15/2020	22.48	7302.491	Warning
62	11/11/2020	21.76	7544.118	PASS
63	12/8/2020	22.20	7394.595	PASS
64	1/15/2021	22.22	7387.939	PASS
65	2/5/2021	21.82	7523.373	PASS
66	3/22/2021	22.47	7305.741	Warning
67	4/27/2021	21.74	7551.058	PASS
68	5/4/2021	21.86	7509.607	PASS
69	6/4/2021	21.46	7649.581	PASS
70	7/10/2021	21.52	7628.253	PASS
71	8/10/2021	22.32	7354.839	PASS
72	9/3/2021	21.74	7551.058	PASS
73	10/25/2021	21.78	7537.190	PASS
74	11/17/2021	21.64	7585.952	PASS
75	12/8/2021	21.54	7621.170	PASS
76	12/15/2021	21.77	7540.652	PASS
77	1/3/2022	21.75	7547.586	PASS
78	2/3/2022	21.70	7564.977	PASS
79	3/8/2022	21.70	7564.977	PASS
80	4/1/2022	22.36	7341.682	PASS
81	5/3/2022	21.74	7551.058	PASS
82	6/2/2022	21.76	7544.118	PASS
83	7/7/2022	21.96	7475.410	PASS
84	8/3/2022	22.00	7461.818	PASS
85	9/6/2022	21.96	7475.410	PASS



Calibration	Negative#	Date	Screen Width (µm)	Screen Height (µm)	Width Pass/ Fail	WDTH Upper 5%	WDTH Lower 5%	STD WIDTH	WDTH Upper 2s	WDTH Lower 2s	WDTH 2s
						3.014	2.727	2.871	3.229	2.512	0.359

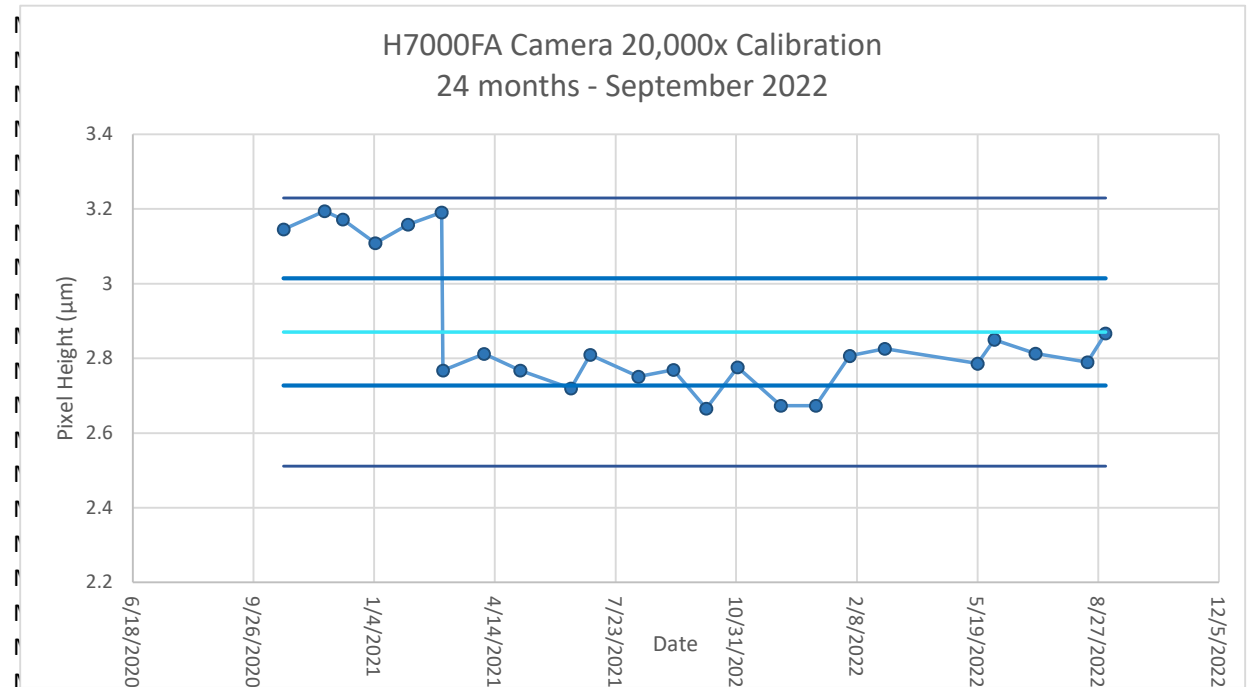
DO NOT
EDIT:

10/21/2020
9/2/2022
24

Chart Title:

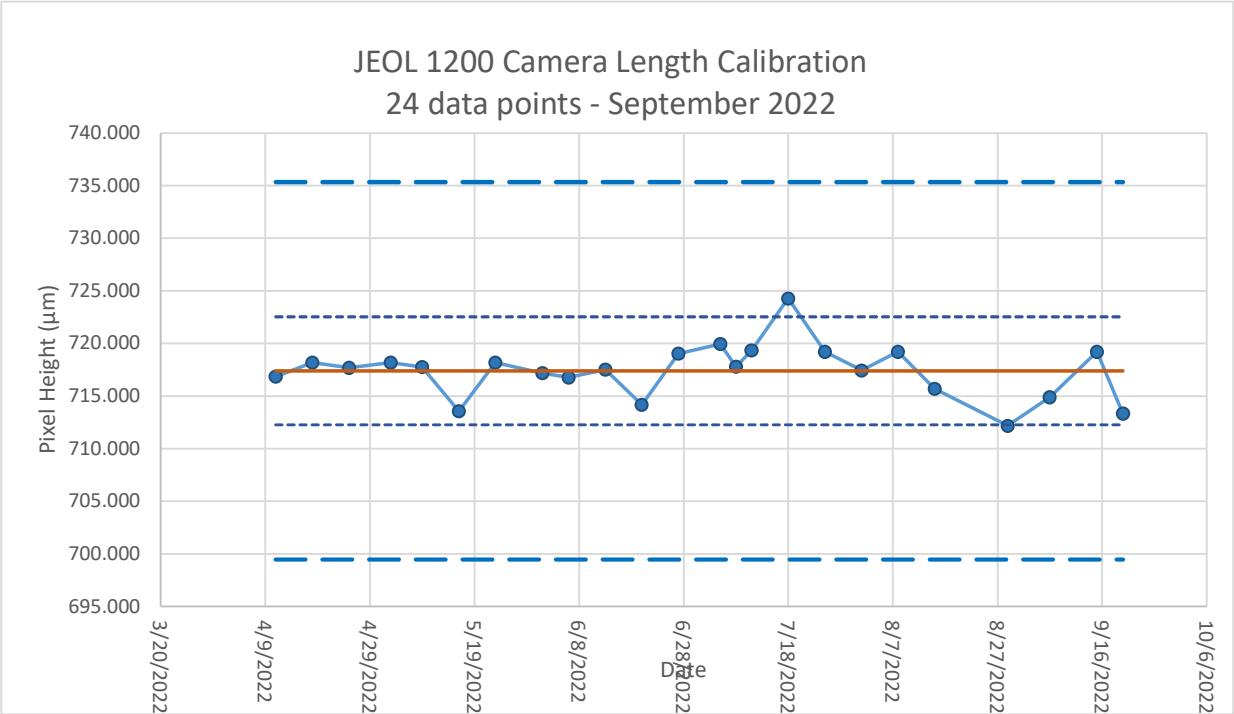
Any Maintenance Notes avail on Digital Version

69	F62254	10/21/2020	3.145	3.085	FAIL
70	F62506	11/24/2020	3.194	3.133	FAIL
71	F62567	12/9/2020	3.172	3.112	FAIL
72	F62649	1/5/2021	3.109	3.05	FAIL
73	F62782	2/1/2021	3.158	3.098	FAIL
74	F63033	3/1/2021	3.191	3.13	FAIL
75	F63047	3/2/2021	2.768	2.715	PASS
76	F63513	4/5/2021	2.812	2.758	PASS
77	F63712	5/5/2021	2.768	2.715	PASS
78	F64397	6/16/2021	2.72	2.668	FAIL
79	F64647	7/2/2021	2.81	2.756	PASS
80	F65622	8/11/2021	2.751	2.698	PASS
81	F65938	9/9/2021	2.769	2.716	PASS
82	F66533	10/6/2021	2.666	2.615	FAIL
83	F67098	11/1/2021	2.776	2.723	PASS
84	F67278	12/7/2021	2.673	2.622	FAIL
85	F67382	1/5/2022	2.673	2.622	FAIL
86	F67528	2/2/2022	2.807	2.753	PASS
87	F67745	3/3/2022	2.826	2.772	PASS
88	F68265	5/19/2022	2.786	2.733	PASS
89	F68464	6/2/2022	2.85	2.795	PASS
90	F68774	7/6/2022	2.813	2.759	PASS
91	F69022	8/18/2022	2.79	2.737	PASS
92	F69178	9/2/2022	2.867	2.812	PASS



Calibration	Negative#	Date	Camera Length	Pass/ Fail	Upper 2.5%	Lower 2.5%	STD WIDTH	Upper 2s	Lower 2s	2s	DO NOT EDIT
					735.334	699.464	717.399	722.529	712.269	5.130	4/11/2022
											9/20/2022
											24

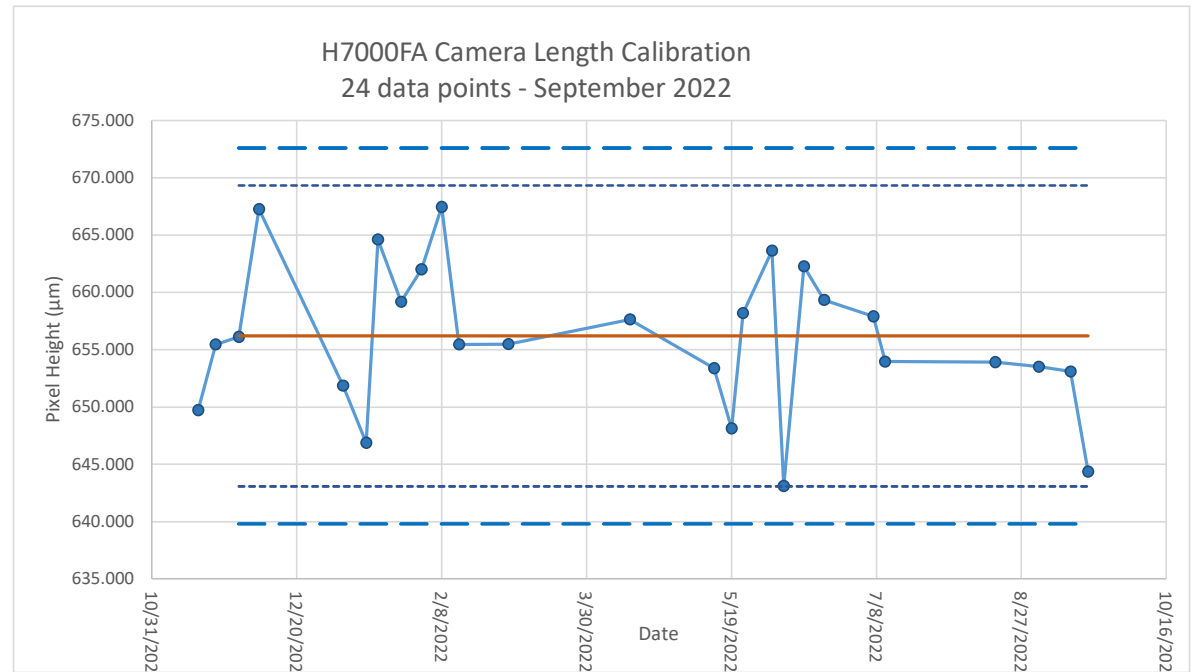
242	J67956	4/4/2022	712.009	Warning	SB
243	J68000	4/11/2022	716.839	PASS	SB
244	J68087	4/18/2022	718.179	PASS	SB
245	J68124	4/25/2022	717.680	PASS	SB
246	J68142	5/3/2022	718.179	PASS	SB
247	J68179	5/9/2022	717.779	PASS	SB
248	J68226	5/16/2022	713.552	PASS	SB
249	J68282	5/23/2022	718.179	PASS	SB
250	J68426	6/1/2022	717.187	PASS	SB
251	J68513	6/6/2022	716.778	PASS	SB
252	J68566	6/13/2022	717.522	PASS	SB
253	J68609	6/20/2022	714.164	PASS	SB
254	J68682	6/27/2022	719.034	PASS	SB
255	J68763	7/5/2022	719.961	PASS	KM
256	J68803	7/8/2022	717.802	PASS	SB
257	J68806	7/11/2022	719.348	PASS	SB
258	J68861	7/18/2022	724.280	Warning	SB
259	J68915	7/25/2022	719.195	PASS	SB
260	J68931	8/1/2022	717.441	PASS	SB
261	J68964	8/8/2022	719.195	PASS	SB
262	J68988	8/15/2022	715.687	PASS	SB
263	J69105	8/29/2022	712.179	Warning	SB
264	J69227	9/6/2022	714.894	PASS	SB
265	J69289	9/15/2022	719.195	PASS	KM
266	J69289	9/20/2022	713.330	PASS	SB



Calibration	Analyst	Negative#	Date	Camera Length	Pass/ Fail	Upper 2.5%	Lower 2.5%	STD WIDTH	Upper 2s	Lower 2s	2s	DO NOT EDIT
						672.609	639.799	656.204	669.339	643.069	13.135	11/30/2021 9/19/2022 24

Comments:

233	SH	F67184	11/16/2021	649.720	PASS
234	SH	F67200	11/22/2021	655.451	PASS
235	SH	F67249	11/30/2021	656.115	PASS
236	SH	F67274	12/7/2021	667.255	PASS
237	SH	F67381	1/5/2022	651.864	PASS
238	SH	F67411	1/13/2022	646.889	PASS
239	SH	F67424	1/17/2022	664.616	PASS
240	SH	F67475	1/25/2022	659.188	PASS
241	SH	F67522	2/1/2022	662.022	PASS
242	SH	F67565	2/8/2022	667.467	PASS
243	SH	F67585	2/14/2022	655.451	PASS
244	SH	F67742	3/3/2022	655.492	PASS
245	km	F68059	4/14/2022	657.653	PASS
246	km	F68224	5/13/2022	653.390	PASS
247	km	F68258	5/19/2022	648.143	PASS
248	KM	F68286	5/23/2022	658.203	PASS
249	KM	F68460	6/2/2022	663.637	PASS
250	KM	F68524	6/6/2022	643.103	PASS
251	KM	F68569	6/13/2022	662.269	PASS
252	KM	F68612	6/20/2022	659.345	PASS
253	KM	F68782	7/7/2022	657.914	PASS
254	KM	F68809	7/11/2022	653.962	PASS
255	KM	F69019	8/18/2022	653.923	PASS
256	KM	F69175	9/2/2022	653.530	PASS
257	KM	F69262	9/13/2022	653.109	PASS
258	KM	F69299	9/19/2022	644.353	PASS



Digital Spot Size Calibration

JEOL

Spot Size Calculation

Run #	Negative Number	Spot Size (nm)	Avg. SpotSize nm	MEASURE: X axis	MEASURE: Y axis
1	J68839	215.6	197.846667	207.99	223.21
2	J68840	182.63		182.63	182.63
3	J68841	195.31		218.14	172.48

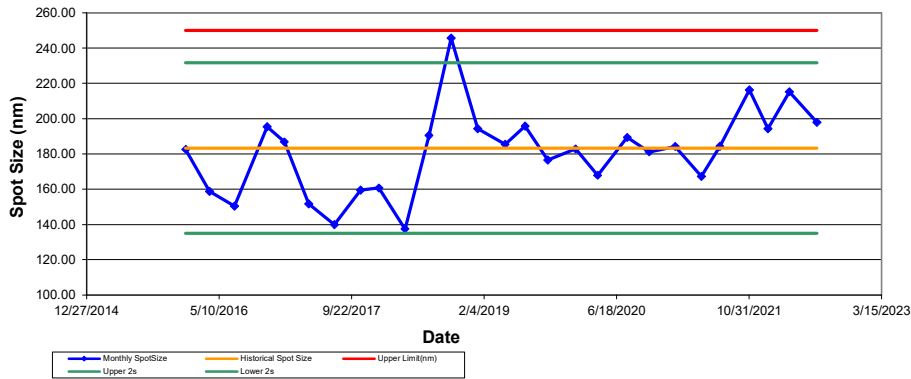
Use the crosshairs on ITEM to measure X-axis (otherwise the measurements overlap)

** Data prior to 2011 is still listed below, just hidden (row height = 1).

Analyst	Date	Monthly SpotSize	Historical Spot Size	Upper Limit(nm)	Upper 2s	Lower 2s	2S	Pass/Fail	
KM	1/5/2016	182.61	183.34	250	231.76	134.91	39.16	PASS	100us
KM	4/4/2016	158.80	183.34	250	231.76	134.91	38.33	PASS	100us
KM	7/7/2016	150.33	183.34	250	231.76	134.91	38.54	PASS	100us
KM	11/7/2016	195.45	183.34	250	231.76	134.91	39.32	PASS	100us
KM	1/11/2017	186.81	183.34	250	231.76	134.91	38.76	PASS	100us
KM	4/13/2017	151.65	183.34	250	231.76	134.91	38.89	PASS	100us
KM	7/19/2017	139.88	183.34	250	231.76	134.91	40.47	PASS	100us
KM	10/26/2017	159.45	183.34	250	231.76	134.91	39.67	PASS	100us
KM	1/3/2018	160.63	183.34	250	231.76	134.91	38.85	PASS	100us
KM	4/11/2018	137.42	183.34	250	231.76	134.91	40.21	PASS	100us
KM	7/11/2018	190.49	183.34	250	231.76	134.91	40.44	PASS	100us
KM	10/3/2018	245.65	183.34	250	231.76	134.91	50.58	FAIL	100us
KM	1/11/2019	194.28	183.34	250	231.76	134.91	50.57	PASS	100us
KM	4/24/2019	185.50	183.34	250	231.76	134.91	50.80	PASS	100us
KM	7/9/2019	195.73	183.34	250	231.76	134.91	50.77	PASS	100us
KM	10/2/2019	176.48	183.34	250	231.76	134.91	49.94	PASS	100us
KM	1/15/2020	182.77	183.34	250	231.76	134.91	49.31	PASS	100us
KM	4/7/2020	167.90	183.34	250	231.76	134.91	45.98	PASS	100us
KM	7/28/2020	189.33	183.34	250	231.76	134.91	45.96	PASS	100us
KM	10/19/2020	181.17	183.34	250	231.76	134.91	45.59	PASS	100us
KM	1/25/2021	184.30	183.34	250	231.76	134.91	45.61	PASS	100us
KM	5/4/2021	167.15	183.34	250	231.76	134.91	45.61	PASS	100us
KM	7/12/2021	184.35	183.34	250	231.76	134.91	45.38	PASS	100us
SB	11/1/2021	216.29	183.34	250	231.76	134.91	48.04	PASS	100us
SB	1/10/2022	194.33	183.34	250	231.76	134.91	48.45	PASS	100us
SB	4/1/2022	215.26	183.34	250	231.76	134.91	49.82	PASS	100us
SB	7/14/2022	197.85	183.34	250	231.76	134.91	48.43	PASS	100us

Beam seer

Probe Size for JEOL-Sr

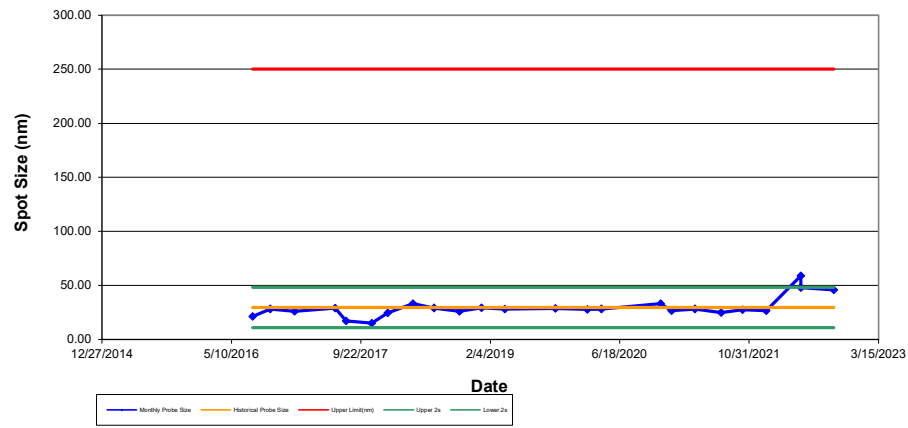


Digital Probe Size Calibration

H7000FA

Analyst	Negative	Date	Monthly Probe Size	Historical Probe Size	Upper Limit(nm)	Upper 2s	Lower 2s	2S	Pass/Fail	Special Settings
JH	F46493	1/7/2016	34.08	29.63	250	48.39	10.87	24.48	PASS	STEM at 30 EDX Mode, Cond Aperture #1, 3 sec exposure
JH	F46493	4/4/2016	26.27	29.63	250	48.39	10.87	23.75	PASS	STEM at 30 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F51333	7/31/2016	21.42	29.63	250	48.39	10.87	23.16	PASS	STEM at 30 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F51333	10/7/2016	28.17	29.63	250	48.39	10.87	22.58	PASS	STEM at 30 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F52336	1/9/2017	26.03	29.63	250	48.39	10.87	22.01	PASS	STEM at 30 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F53494	6/15/2017	28.99	29.63	250	48.39	10.87	21.53	PASS	STEM at 26 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F53847	7/27/2017	17.04	29.63	250	48.39	10.87	21.34	PASS	STEM at 26 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F53847	11/3/2017	15.00	29.63	250	48.39	10.87	21.29	PASS	STEM at 26 EDX Mode, Cond Aperture #1, 3 sec exposure
SL	F55274	1/4/2018	24.63	29.63	250	48.39	10.87	20.85	PASS	STEM at 31 EDX Mode, Cond Aperture #1, 5 sec exposure
SH	F55854	4/11/2018	33.08	29.63	250	48.39	10.87	20.68	PASS	STEM at 35 EDX Mode, Cond Aperture #1, 15 sec exposure
SL	F56426	7/2/2018	29.05	29.63	250	48.39	10.87	20.33	PASS	STEM at 31 EDX Mode, Cond Aperture #1, 20 sec exposure
SH	F57245	10/8/2018	26.08	29.63	250	48.39	10.87	19.95	PASS	STEM at 26 EDX Mode, Cond Aperture #1, 8 sec exposure
SL	F57756	1/2/2019	29.18	29.63	250	48.39	10.87	19.64	PASS	STEM at 35 EDX Mode, Cond Aperture #1, 5 sec exposure
SH	F58405	4/1/2019	28.00	29.63	250	48.39	10.87	19.32	PASS	STEM at 34 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F59660	10/14/2019	28.79	29.63	250	48.39	10.87	19.03	PASS	STEM at 34 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F60159	2/14/2020	27.96	29.63	250	48.39	10.87	18.74	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F60537	4/8/2020	28.16	29.63	250	48.39	10.87	18.46	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F62510	11/24/2020	33.09	29.63	250	48.39	10.87	18.35	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F62655	1/5/2021	26.64	29.63	250	48.39	10.87	18.08	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F63519	4/5/2021	28.16	29.63	250	48.39	10.87	17.83	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F65359	7/15/2021	24.80	29.63	250	48.39	10.87	17.59	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F66552	10/6/2021	27.56	29.63	250	48.39	10.87	17.36	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
SH	F67390	1/5/2022	26.61	29.63	250	48.39	10.87	17.13	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 8 sec exposure
KM	F68273	5/19/2022	58.77	29.63	250	48.39	10.87	19.81	WARNING	STEM at 27 EDX Mode, Cond Aperture #1, 5 sec exposure; New Analyst, probably slightly different conditions
KM	Redo	5/19/2022	47.95	29.63	250	48.39	10.87	17.46	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 5 sec exposure
KM	F69317	9/23/2022	45.91	29.63	250	48.39	10.87	18.76	PASS	STEM at 27 EDX Mode, Cond Aperture #1, 5 sec exposure;

Probe Size for H-7000FA



JEOL MnKa Peak Resolution Calibration

Date	Analyst	EDS	Resolution (ev)	Std Dev	Std Dev (2s)	Pass/Fail	
1/11/2019	KM	J57787	134.53	3.277	6.5542485	Pass	SS6
2/7/2019	KM	J58080	137.63	3.265	6.5297246	Pass	SS6
3/1/2019	KM	J58227	139.43	3.283	6.5661839	Pass	SS6
4/24/2019	KM	J58478	133.47	3.197	6.3943027	Pass	SS6
5/20/2019	KM	J58805	138.53	3.204	6.408346	Pass	SS6
6/18/2019	KM	J59017	128.99	3.513	7.0250713	Pass	SS6
7/9/2019	KM	J59201	134.73	3.361	6.7217872	Pass	SS6
8/21/2019	KM	J59425SP	138.7	3.372	6.7431793	Pass	SS6
9/23/2019	KM	J59563	147	4.060	8.1203111	Pass	SS6
10/2/2019	KM	J59584	139.49	4.050	8.0996711	Pass	SS6
11/20/2019	KM	J59813	140.16	4.043	8.0851307	Pass	SS6
12/12/2019	KM	J59878	139.73	4.079	8.158598	Pass	SS6
1/14/2020	KM	J60000	135.65	3.920	7.8405435	Pass	SS6
2/17/2020	KM	J60167	142.19	3.972	7.9434194	Pass	SS6
3/10/2020	KM	J60421	132.72	4.067	8.1340394	Pass	SS6
4/7/2020	KM	J60518	137.05	3.906	7.8112193	Pass	SS6
5/19/2020	KM	J60875	135.11	3.927	7.8544753	Pass	SS6
6/18/2020	KM	J61220	137.24	3.923	7.8459504	Pass	SS6
7/20/2020	KM	J61624	141.08	3.958	7.9154433	Pass	SS6
8/24/2020	KM	J61907	139.56	3.976	7.9525338	Pass	SS6
9/10/2020	KM	J62020	136.21	3.933	7.8667195	Pass	SS6
10/19/2020	KM	J62226	133.37	3.799	7.5976882	Pass	SS6
11/24/2020	KM	J62491	132.62	3.866	7.7317797	Pass	SS6
12/8/2020	SB	J62556	136.62	3.785	7.5697368	Pass	SS6
1/15/2021	KM	J62684	133.92	3.805	7.610564	Pass	SS6
2/5/2021	KM	J62794	137.11	3.804	7.6076224	Pass	SS6
3/23/2021	SB	J63394	141.55	3.884	7.7675288	Pass	SS6
5/4/2021	KM	J63699	131.7	3.973	7.9468885	Pass	SS6
6/8/2021	KM	J64236	136.46	3.964	7.9282083	Pass	SS6
7/12/2021	KM	J65116	135.57	3.593	7.1866928	Pass	SS6
8/10/2021	KM	J65614	135.53	3.572	7.1439588	Pass	SS6
9/13/2021	SB	J65966	140.66	3.626	7.25248	Pass	SS6
10/25/2021	SB	J67027	137.85	3.004	6.0076617	Pass	SS6
11/17/2021	SB	J67186	150.15	4.003	8.0053786	Pass	SS6
12/9/2021	SB	J67299	140.2	4.004	8.0077133	Pass	SS6
1/3/2022	SB	J67369	144.97	4.265	8.5308585	Pass	SS6
2/3/2022	SB	J67541	142.99	4.373	8.745869	Pass	SS6
3/8/2022	SB	J67769	138.18	4.282	8.5645252	Pass	SS6
4/1/2022	SB	J67942	136.91	4.147	8.294545	Pass	SS6
5/3/2022	SB	J68144	136.56	4.153	8.3069693	Pass	SS6
6/2/2022	SB	J68180	135.28	4.148	8.2969496	Pass	SS6
7/7/2022	SB	J68793	131.67	4.345	8.6894199	Pass	SS6
8/1/2022	SB	J68933	131.98	4.440	8.8804542	Pass	SS6
9/6/2022	SB	J69237	135.19	4.437	8.8748718	Pass	SS6

HITACHI MnKa Peak Resolution Calibration

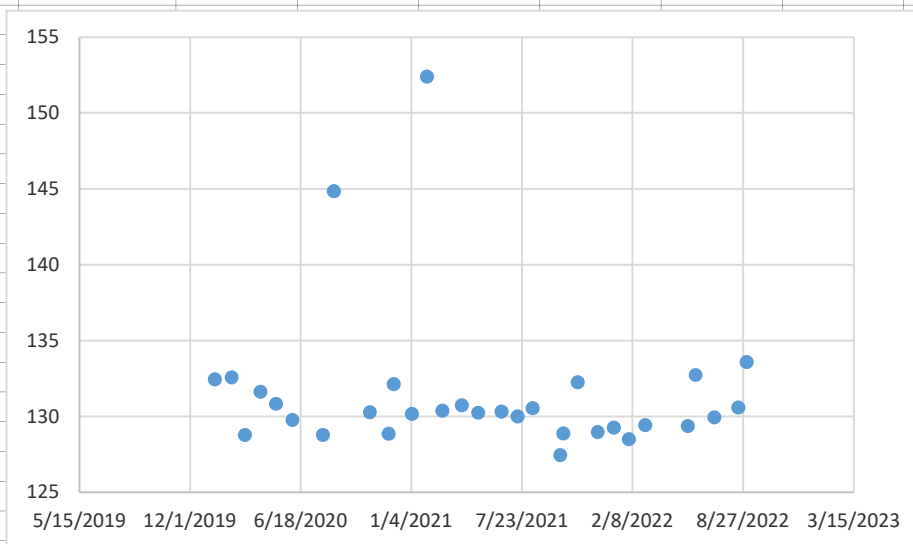
** - New Thermo SDD detector installed ~ Feb 20 2013

New Thermo CDD detector installed 1/15/2020						
Date	Analyst	EDS	Resolution (eV)	Std Dev	Std Dev (2s)	Pass/Fail
1/15/2020	SH	F60017	132.46	2.086577	4.173153	Pass
2/14/2020	SH	F60159	132.58	2.031132	4.062264	Pass
3/9/2020	SH	F60413	128.79	2.046026	4.092053	Pass
4/6/2020	SH	F60514	131.64	2.066108	4.132216	Pass
5/4/2020	SH	F60732	130.84	2.017057	4.034115	Pass
6/3/2020	SH	F60945	129.77	1.962931	3.925862	Pass
7/28/2020	SH	F61667	128.8	1.977813	3.955626	Pass
8/17/2020	SH	F61853	144.84	3.467225	6.93445	Pass
10/21/2020	SH	F62253	130.29	3.438849	6.877698	Pass
11/24/2020	SH	F62503	128.87	3.462649	6.925297	Pass
12/3/2020	SH	F62542	132.14	3.460268	6.920536	Pass
1/5/2021	SH	F62646	130.17	3.462384	6.924768	Pass
2/1/2021	SH	F62646	152.4	5.408987	10.81797	Pass
3/1/2021	SH	F63039	130.39	5.397716	10.79543	Pass
4/5/2021	SH	F63512	130.75	5.382383	10.76477	Pass
5/5/2021	SH	F63711	130.26	5.390103	10.78021	Pass
6/16/2021	SH	F64396	130.32	5.395624	10.79125	Pass
7/15/2021	SH	F65354	130.01	5.392039	10.78408	Pass
8/11/2021	SH	F65626	130.56	5.372882	10.74576	Pass
9/30/2021	SH	F66293	127.46	5.42901	10.85802	Pass
10/6/2021	SH	F66529	128.89	5.437738	10.87548	Pass
11/1/2021	SH	F67095	132.26	5.427418	10.85484	Pass
12/7/2021	SH	F67275	128.99	5.431401	10.8628	Pass
1/5/2022	SH	F67387	129.26	5.30568	10.61136	Pass
2/1/2022	SH	F67525	128.5	5.339062	10.67812	Pass
3/3/2022	SH	F67744	129.43	5.297283	10.59457	Pass
5/19/2022	KM	F68264	129.38	5.310871	10.62174	Pass
6/2/2022	KM	F68461	132.73	5.509366	11.01873	Pass
7/6/2022	KM	F68773	129.95	5.517374	11.03475	Pass
8/18/2022	KM	F69021	130.6	5.508539	11.01708	Pass
9/2/2022	KM	F69192	133.59	5.491239	10.98248	Pass

Date	Resolution (eV)
5/15/2019	132.46
6/18/2020	128.79
7/23/2021	128.8
8/27/2022	144.84
2/1/2021	152.4

AAF

Spot



Na Crocidolite Std. Calibration

Date	Analyst	EDS #	Fiber Size >5.0um	Peak Counts**	Background Counts***	Signal/ Nositie Ratio	Signal/ Nositie Min. Limit	Pass/Fail	
4/21/2020	KM	J60609	8 * .35	606	106	5.72	2.00	Pass	SS5
5/19/2020	KM	J60877	14 * 0.25	303	54	5.61	2.00	Pass	SS5
6/18/2020	KM	J61221	6 * 0.26	1424	280	5.09	2.00	Pass	SS5
7/21/2020	KM	J61633	12 * .15	290	58	5.00	2.00	Pass	SS5
8/24/2020	KM	J61909	18 * 0.1	111	12	9.25	2.00	Pass	SS6
9/17/2020	KM	J62054	13 * 0.3	238	29	8.21	2.00	Pass	SS6
10/19/2020	KM	J62227	4 * 0.3	242	47	5.15	2.00	Pass	SS6
11/20/2020	KM	J62473	8 * 0.2	94	13	7.23	2.00	Pass	SS6
12/10/2020	KM	J62573	9 * 0.2	843	184	4.58	2.00	Pass	SS6
1/15/2021	KM	J62693	22 * .4	98	11	8.91	2.00	Pass	SS6
2/5/2021	KM	J62801	25 * 0.28	359	76	4.72	2.00	Pass	SS6
3/23/2021	SB	J63392SP	12.5 * 0.5	252	37	6.81	2.00	Pass	SS6
5/4/2021	KM	J63701	5.3 * 0.2	180	38	4.74	2.00	Pass	SS6
6/8/2021	KM	J64221	5.1 * 0.2	269	59	4.56	2.00	Pass	SS6
7/12/2021	KM	J65112	8 * 0.2	112	38	2.95	2.00	Pass	SS6
8/10/2021	KM	J65616	20 * 0.2	79	12	6.58	2.00	Pass	SS6
9/13/2021	SB	J65965	40 *0.12	312	39	8.00	2.00	Pass	SS6
10/25/2021	SB	J67029	40 *0.12	69	12	5.75	2.00	Pass	SS6
11/17/2021	SB	J67192	40 *0.12	93	23	4.04	2.00	Pass	SS6
12/9/2021	SB	J67298	40 *0.12	93	12	7.75	2.00	Pass	SS6
1/3/2022	SB	J67371	40 *0.12	70	14	5.00	2.00	Pass	SS6
2/3/2022	SB	J67543	40 *0.12	96	10	9.60	2.00	Pass	SS6
3/8/2022	SB	J67770	40 *0.12	123	17	7.24	2.00	Pass	SS6
4/1/2022	SB	J67944	40 *0.12	99	12	8.25	2.00	Pass	SS6
5/4/2022	SB	J68160	40 *0.12	80	11	7.27	2.00	Pass	SS6
6/2/2022	SB	J68451	40 *0.12	44	15	2.93	2.00	Pass	SS6
7/7/2022	SB	J68794	40 *0.12	117	18	6.50	2.00	Pass	SS6
8/1/2022	SB	J68935	40 *0.12	58	11	5.27	2.00	Pass	SS6
9/6/2022	SB	J69239	40 *0.12	77	17	4.53	2.00	Pass	SS6

*ND - Not Done

** Peak count is the maximum Na peak count

***Background peak count is the base, right of the Na peak

Na Crocidolite Std. Calibration								
Date	Analyst	EDS #	Fiber Size >5.0um	Peak Counts**	Background Counts***	Signal/ Nosie Ratio	Signal/ Nosie Min. Limit	Pass/Fail
3/9/2020	SH	F60415	Y	569	101	5.633663366	2	Pass
4/7/2020	SH	F60531	Y	1369	229	5.978165939	2	Pass
5/5/2020	SH	F60754	Y	1497	189	7.920634921	2	Pass
6/3/2020	SH	F60950	Y	1457	220	6.622727273	2	Pass
7/28/2020	SH	F61679	Y	494	64	7.71875	2	Pass
8/17/2020	SH	F61855	Y	730	91	8.021978022	2	Pass
10/21/2020	SH	F62252	Y	503	62	8.112903226	2	Pass
11/24/2020	SH	F62505	Y	429	67	6.402985075	2	Pass
12/9/2020	SH	F62566	Y	310	40	7.75	2	Pass
1/5/2021	SH	F62654	Y	1801	251	7.175298805	2	Pass
2/1/2021	SH	F62780	Y	1290	368	3.505434783	2	Pass
3/1/2021	SH	F63041	Y	1947	207	9.405797101	2	Pass
4/5/2021	SH	F63517	Y	858	115	7.460869565	2	Pass
5/5/2021	SH	F63718	Y	654	71	9.211267606	2	Pass
7/15/2021	SH	F65357	Y	1111	147	7.557823129	2	Pass
8/11/2021	SH	F65628	Y	1334	240	5.558333333	2	Pass
9/30/2021	SH	F66302	Y	1751	284	6.165492958	2	Pass
10/6/2021	SH	F66544	Y	1945	220	8.840909091	2	Pass
11/1/2021	SH	F67097	Y	2005	279	7.186379928	2	Pass
12/7/2021	SH	F67277	Y	2231	241	9.257261411	2	Pass
1/5/2022	SH	F67388	Y	1084	165	6.56969697	2	Pass
2/1/2022	SH	F67527	Y	1650	189	8.73015873	2	Pass
3/3/2022	SH	F67749	Y	1879	229	8.205240175	2	Pass
5/19/2022	KM	F68271	Y	924	130	7.107692308	2	Pass
6/2/2022	KM	F68463	Y	691	101	6.841584158	2	Pass
7/7/2022	KM	F68784	Y	919	96	9.572916667	2	Pass
8/18/2022	KM	F69027	Y	552	60	9.2	2	Pass
9/2/2022	KM	F69194	Y	631	67	9.417910448	2	Pass
	*ND - Not Done							
	** Peak count is the maximum Na peak count							
	***Background peak count is the base, right of the Na peak							

JEOL SR 1200 Quarterly Beam Dose Check

Check that each fibril diffraction pattern visible for 15 seconds (Y/N in each column)

Mg:Si Res Check

Date	Analyst	Fibril 1 Visible?	Fibril 2 Visible?	Fibril 3 Visible?	Fibril 4 Visible?	Fibril 5 Visible?	Fibril 6 Visible?	Fibril 7 Visible?	Fibril 8 Visible?	Fibril 9 Visible?	Fibril 10 Visible?	Diff. #	Mg:Si Ratio (P/F)	Spectra #
2/5/2016	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J46737DF	P	J46449SP
4/4/2016	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J48218DF	P	J48218SP
7/7/2016	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J51065DF	P	J51065SP
10/7/2016	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J51768DF	P	J51768SP
1/11/2017	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J52360DF	P	J52360SP
4/13/2017	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J53020DF	P	J53020SP
7/19/2017	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J53753DF	P	J53753SP
10/26/2017	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J54565DF	P	J54565SP
1/11/2018	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J55356DF	P	J55356SP
4/13/2018	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J55881DF	P	J55882SP
7/11/2018	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J56550DF	P	J56550SP
10/3/2018	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J57216DF	P	J57216SP
1/11/2019	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J57798DF	P	J57798SP
4/24/2019	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J58489DF	P	J58489SP
7/9/2019	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J59208DF	P	J59208SP
10/2/2019	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J59595DF	P	J59595SP
1/15/2020	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J60013DF	P	J60013SP
4/21/2020	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J60607DF	P	J60607SP
7/28/2020	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J61672DF	P	J61672SP
10/20/2020	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J62232DF	P	J62232SP
1/18/2021	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J62697DF	P	J62697SP
5/4/2021	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J63702DF	P	J63702SP
7/12/2021	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J65117DF	P	J65117SP
11/1/2021	SB	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J67091DF	P	J67091SP
1/5/2022	SB	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J67379DF	P	J67379SP
4/1/2022	SB	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J67949DF	P	J67949SP
7/14/2022	SB	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	J68842DF	P	J68843SP

Hitachi 7000FA Quarterly Beam Dose Check

Check that each fibril diffraction pattern visible for 15 seconds (Y/N in each column)

Mg:Si Res Check

Date	Analyst	Fibril 1 Visible?	Fibril 2 Visible?	Fibril 3 Visible?	Fibril 4 Visible?	Fibril 5 Visible?	Fibril 6 Visible?	Fibril 7 Visible?	Fibril 8 Visible?	Fibril 9 Visible?	Fibril 10 Visible?	Diff. #	Mg:Si Ratio (P/F)	Spectra #
1/7/2016	JH							Y	Y	Y	Y	F46498DF	P	F46499SP
4/29/2016	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F48754DF	P	F48753SP
7/27/2016	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F51291DF	P	F51292SP
10/7/2016	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F51779DF	P	F51779SP
1/9/2017	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F52341DF	P	F52340SP
6/13/2017	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F53476DF	P	F53477SP
7/27/2017	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F53848DF	P	F53849SP
11/3/2017	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F54696DF	P	F54696SP
1/4/2018	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F55276DF	P	F55276SP
4/3/2018	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F55788DF	P	F55788SP
7/2/2018	SL	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F56422DF	P	F56422SP
10/8/2018	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F57246DF	P	F56422SP
1/11/2019	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F57807DF	P	F57807SP
4/1/2019	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F58406DF	P	F58406SP
10/14/2019	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F59661DF	P	F59661SP
2/18/2020	SH	Y	Y	Y	Y	Y	Y	Y	Y	y	Y	F60173DF	P	F60173SP
4/8/2020	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F60538DF	P	F60538SP
11/24/2020	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F62511DF	P	F62511SP
1/5/2021	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F62657DF	P	F62657SP
4/5/2021	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F63520DF	P	F63520SP
7/15/2021	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F65359DF	P	F65359SP
10/6/2021	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F65545DF	P	F65545SP
1/5/2022	SH	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F67389DF	P	F67389SP
5/19/2022	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F68272DF	P	F68272SP
7/7/2022	KM	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	F68786DF	P	F68786SP

k-factor Calibration						
SRM 2063a (Revision# 9)						
			Signature:		Date:	
Date:	7/25/2022		Microscope:	JEOL 1200EX		
Analyst:	SB					
Fill in Shaded Cells ONLY! Just record the Peak Area of each peak of interest. Instrument automatically subtracts the background.						
Spectra Number	Mg	Si	Ca	Fe		
1	1.07	1.00	1.26	1.74		
2	1.08	1.00	1.26	1.70		
3	1.07	1.00	1.25	1.72		
4	1.05	1.00	1.21	1.63		
5	1.09	1.00	1.26	1.75		
Average	1.07	1.00	1.25	1.71		
Standard Deviation	0.02	0.00	0.02	0.05		
2s	0.03	0.00	0.04	0.09		
STDEV Pass/Fail	Pass	Pass	Pass	Pass		
Sensitivity (Mg:Fe)	0.63					
Pass/Fail	PASS		PASS			
Relative Limits	Mg		Ca	Fe		
	Pass		Pass	Pass		
Sensitivity (Mg:Fe) values greater than 1.5 are failed. Instrument must be taken out of operation, serviced and k-factor calibrations redone before instrument may be place back into service.						

SRM 2063a Raw data					
Spectra Number		Mg	Si	Ca	Fe
1	Background	0	0	0	0
J68917SP	Net Area	26472	89820	33228	22595
SS5	Counts - Background	26472	89820	33228	22595
	Isi/Ia	3.393019	1	2.7031419	3.9752158
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.07	1.00	1.26	1.74
2	Background	0	0	0	0
J68918SP	Net Area	27857	95216	35357	24473
SS5	Counts - Background	27857	95216	35357	24473
	Isi/Ia	3.4180278	1	2.6929887	3.890655
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.08	1.00	1.26	1.70
3	Background	0	0	0	0
J68919SP	Net Area	10043	34120	12695	8662
SS6	Counts - Background	10043	34120	12695	8662
	Isi/Ia	3.3973912	1	2.6876723	3.9390441
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.07	1.00	1.25	1.72
4	Background	0	0	0	0
J68920SP	Net Area	9753	32405	12515	8689
SS6	Counts - Background	9753	32405	12515	8689
	Isi/Ia	3.3225674	1	2.5892928	3.729428
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.05	1.00	1.21	1.63
5	Background	0	0	0	0
J68921SP	Net Area	28521	99169	36773	24754
FL5	Counts - Background	28521	99169	36773	24754
	Isi/Ia	3.477052	1	2.6967884	4.0061808
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.09	1.00	1.26	1.75

k-factor Calibration						
SRM 2063a (Revision# 9)						
		Signature:		Date:		
Date:	7/26/2022	Microscope:		H7000FA		
Analyst:	KM					
Fill in Shaded Cells ONLY! Just record the Peak Area of each peak of interest. Instrument automatically subtracts the background.						
Spectra Number	Mg	Si	Ca	Fe		
1	1.05	1.00	1.23	1.65		
2	1.04	1.00	1.22	1.67		
3	1.02	1.00	1.17	1.57		
4	1.03	1.00	1.19	1.61		
5	1.08	1.00	1.28	1.69		
Average	1.04	1.00	1.22	1.64		
Standard Deviation	0.02	0.00	0.04	0.05		
2s	0.05	0.00	0.08	0.10		
STDEV Pass/Fail	Pass	Pass	Pass	Pass		
Sensitivity (Mg:Fe)	0.64					
Pass/Fail	PASS		PASS			
Relative Limits	Mg		Ca	Fe		
	Pass		Pass	Pass		
Sensitivity (Mg:Fe) values greater than 1.5 are failed. Instrument must be taken out of operation, serviced and k-factor calibrations redone before instrument may be place back into service.						

SRM 2063a Raw data					
Spectra Number		Mg	Si	Ca	Fe
1	Background	0	0	0	0
F68923	Net Area	25804	86346	32868	22797
AAF	Counts - Background	25804	86346	32868	22797
	Isi/Ia	3.3462254	1	2.6270537	3.7876036
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.05	1.00	1.23	1.65
2	Background	0	0	0	0
F68924	Net Area	25423	83804	31931	21857
AAF	Counts - Background	25423	83804	31931	21857
	Isi/Ia	3.2963852	1	2.6245342	3.834195
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.04	1.00	1.22	1.67
3	Background	0	0	0	0
F68925	Net Area	20705	67171	26762	18625
AAF	Counts - Background	20705	67171	26762	18625
	Isi/Ia	3.2441922	1	2.5099395	3.6064966
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.02	1.00	1.17	1.57
4	Background	0	0	0	0
F68926	Net Area	17586	57476	22582	15620
Spot	Counts - Background	17586	57476	22582	15620
	Isi/Ia	3.2682816	1	2.545213	3.6796415
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.03	1.00	1.19	1.61
5	Background	0	0	0	0
F68927	Net Area	23738	81696	29751	21042
Spot	Counts - Background	23738	81696	29751	21042
	Isi/Ia	3.4415705	1	2.7459917	3.8825207
	Ca/Csi	0.3145225	1	0.4664562	0.4364641
	k-factor	1.08	1.00	1.28	1.69

Job Number	Orig Sample Num	ImageID	ItemType	Analyte ID ISO	Analyte Description	Description	Comment	Verif. Complete	Analyst Init	Analyst Date
220805	S8	F69236BF	Brightfield	NAS	Non Asbestos Structure	220805-S8-G1-ST31-F69236BF			KM	9/6/2022
220805	S8	F69236SP	Spectra	NAS	Non Asbestos Structure	220805-S8-G1-ST31-F69236SP		TRUE	KM	9/6/2022
220805	S14	F69261SP	Spectra	ADQ	Anthophyllite	220805-S14-G2-ST21-F69261SP		TRUE	KM	9/12/2022
220805	S14	F69261DF	Diffraction	ADQ	Anthophyllite	220805-S14-G2-ST21-F69261DF	0.53nm ROW SPACING	TRUE	KM	9/12/2022
220805	S14	F69261BF	Brightfield	ADQ	Anthophyllite	220805-S14-G2-ST21-F69261BF			KM	9/12/2022
220805	S27	J69293SP	Spectra	AZQ	Actinolite	220805-S27-G1-ST121-J69293SP		TRUE	KM	9/16/2022
220805	S27	J69293DF	Diffraction	AZQ	Actinolite	220805-S27-G1-ST121-J69293DF	ZONE AXIS [3 -1 4]	TRUE	KM	9/16/2022
220805	S27	J69293BF	Brightfield	AZQ	Actinolite	220805-S27-G1-ST121-J69293BF			KM	9/16/2022
220805	S27	J69294BF	Brightfield	CMQ	Chrysotile	220805-S27-G1-ST126-J69294BF			KM	9/16/2022
220805	S27	J69294SP	Spectra	CMQ	Chrysotile	220805-S27-G1-ST126-J69294SP		TRUE	KM	9/16/2022
220805	S27	J69295DF	Diffraction	CDQ	Chrysotile	220805-S27-G2-ST16-J69295DF	0.53nm ROW SPACING	TRUE	KM	9/16/2022
220805	S27	J69295BF	Brightfield	CDQ	Chrysotile	220805-S27-G2-ST16-J69295BF			KM	9/16/2022
220805	S27	J69295SP	Spectra	CDQ	Chrysotile	220805-S27-G2-ST16-J69295SP		TRUE	KM	9/16/2022
220805	S28	J69296SP	Spectra	ADQ	Actinolite	220805-S28-G2-ST36-J69296SP		TRUE	KM	9/16/2022
220805	S28	J69296DF	Diffraction	ADQ	Actinolite	220805-S28-G2-ST36-J69296DF	0.53nm ROW SPACING	TRUE	KM	9/16/2022
220805	S28	J69296BF	Brightfield	ADQ	Actinolite	220805-S28-G2-ST36-J69296BF			KM	9/16/2022
220805	S29	J69297SP	Spectra	NAS	Non Asbestos Structure	220805-S29-G1-ST26-J69297SP		TRUE	KM	9/16/2022
220805	S29	J69297DF	Diffraction	NAS	Non Asbestos Structure	220805-S29-G1-ST26-J69297DF	Both Hexagonal and 0.53nm ROW SPACING present.	TRUE	KM	9/16/2022
220805	S29	J69297BF	Brightfield	NAS	Non Asbestos Structure	220805-S29-G1-ST26-J69297BF			KM	9/16/2022
220805	S30	J69298BF	Brightfield	ADQ	Tremolite	220805-S30-G1-ST36-J69298BF			KM	9/17/2022
220805	S30	J69298SP	Spectra	ADQ	Tremolite	220805-S30-G1-ST36-J69298SP		TRUE	KM	9/17/2022
220805	S30	J69298DF	Diffraction	ADQ	Tremolite	220805-S30-G1-ST36-J69298DF	0.53nm ROW SPACING	TRUE	KM	9/17/2022

Project: JEOL-SR 1200EX Data

220805-S8

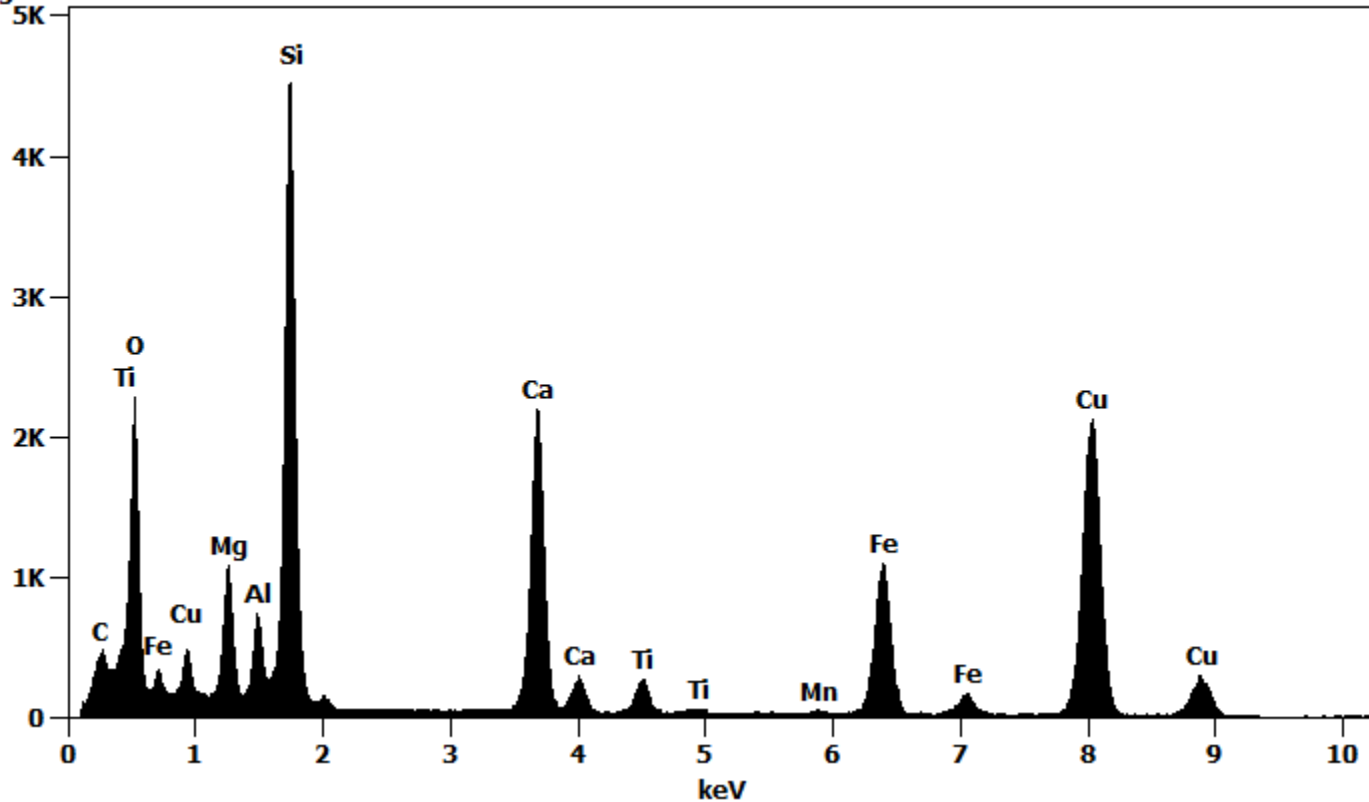
Company Name: LabCor, Inc

Title: Spectra Files

Full scale counts: 4601

F69236SP

Integral Counts: 254705



Live Time: 16.9 sec.

Quantitative Results for: F69236SP

Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	8959	1.087	MgO	7.86
Al	4478	1.034	Al2O3	4.26
Si	47431	1.000	SiO2	49.36
Ca	31002	0.916	CaO	19.33
Ti	3845	1.033	TiO2	3.22
Mn	417	1.157	MnO	0.30
Fe	19031	1.184	Fe2O3	15.67
Total				100.00

Project: JEOL-SR 1200EX Data

Company Name: LabCor, Inc

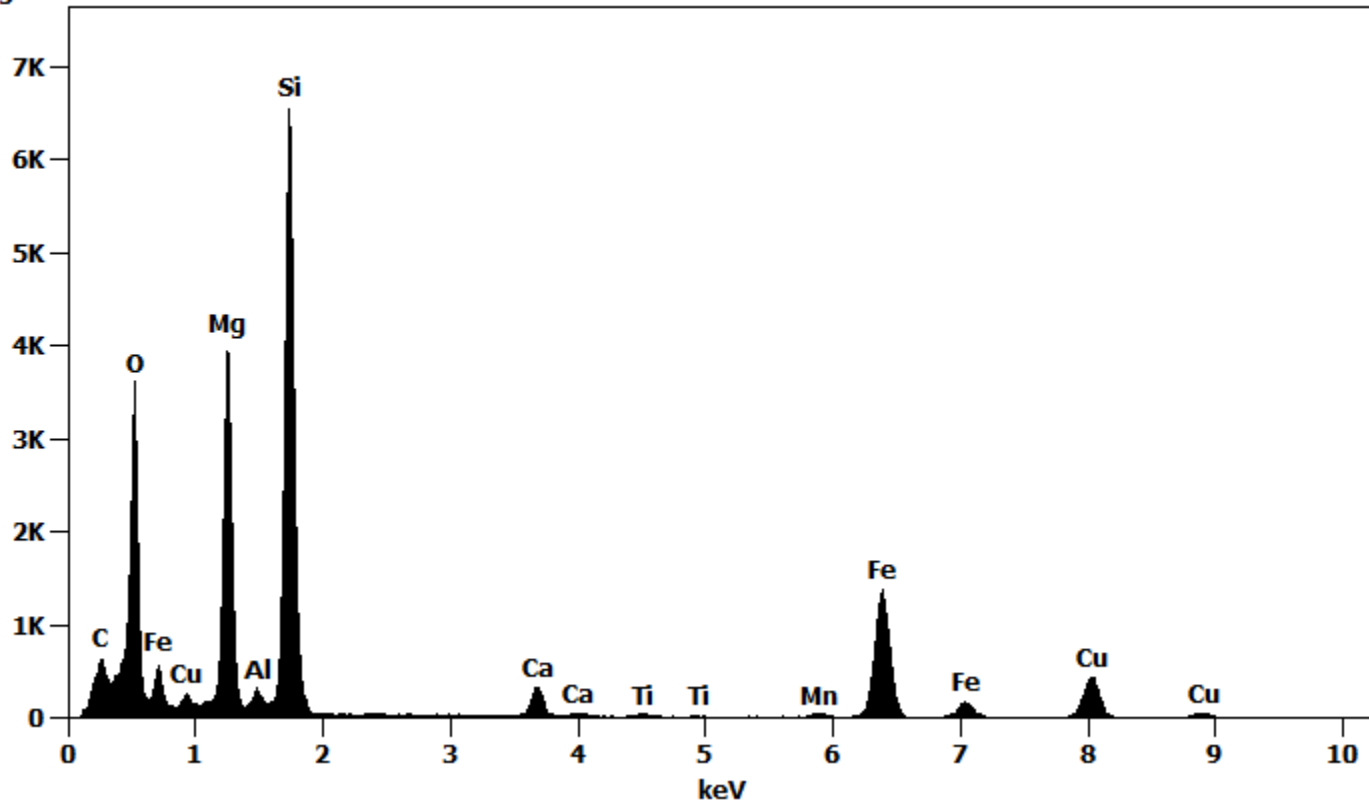
Title: Spectra Files

Full scale counts: 6597

Integral Counts: 220388

220805-S8

F69261SP



Live Time: 32.6 sec.

Quantitative Results for: F69261SP

Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	34820	1.087	MgO	25.10
Al	1252	1.034	Al2O3	0.98
Si	64627	1.000	SiO2	55.29
Ca	4428	0.916	CaO	2.27
Ti	396	1.033	TiO2	0.27
Mn	672	1.157	MnO	0.40
Fe	23180	1.184	Fe2O3	15.69
Total				100.00

Project: JEOL-SR 1200EX Data

Company Name: LabCor, Inc

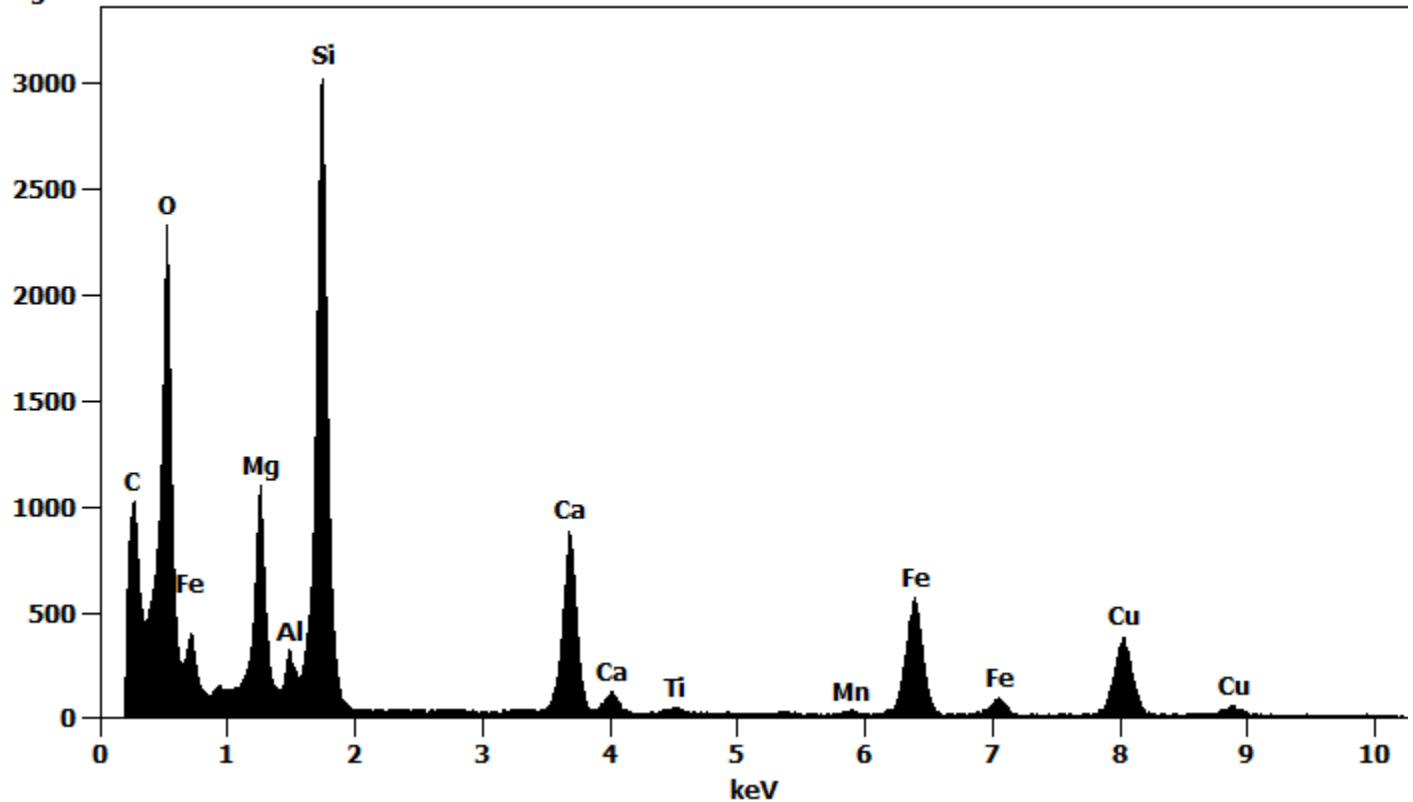
Title: Spectra Files

Full scale counts: 3056

Integral Counts: 160112

220805-S27

J69293SP



Live Time: 15.2 sec.

Quantitative Results for: J69293SP

Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	9354	1.111	MgO	14.15
Al	624	1.059	Al2O3	1.03
Si	32335	1.000	SiO2	56.84
Ca	12846	0.937	CaO	13.84
Ti	504	1.059	TiO2	0.73
Mn	383	1.187	MnO	0.48
Fe	10065	1.215	FeO	12.92
Total				100.00

Project: JEOL-SR 1200EX Data

Company Name: LabCor, Inc

Title: Spectra Files

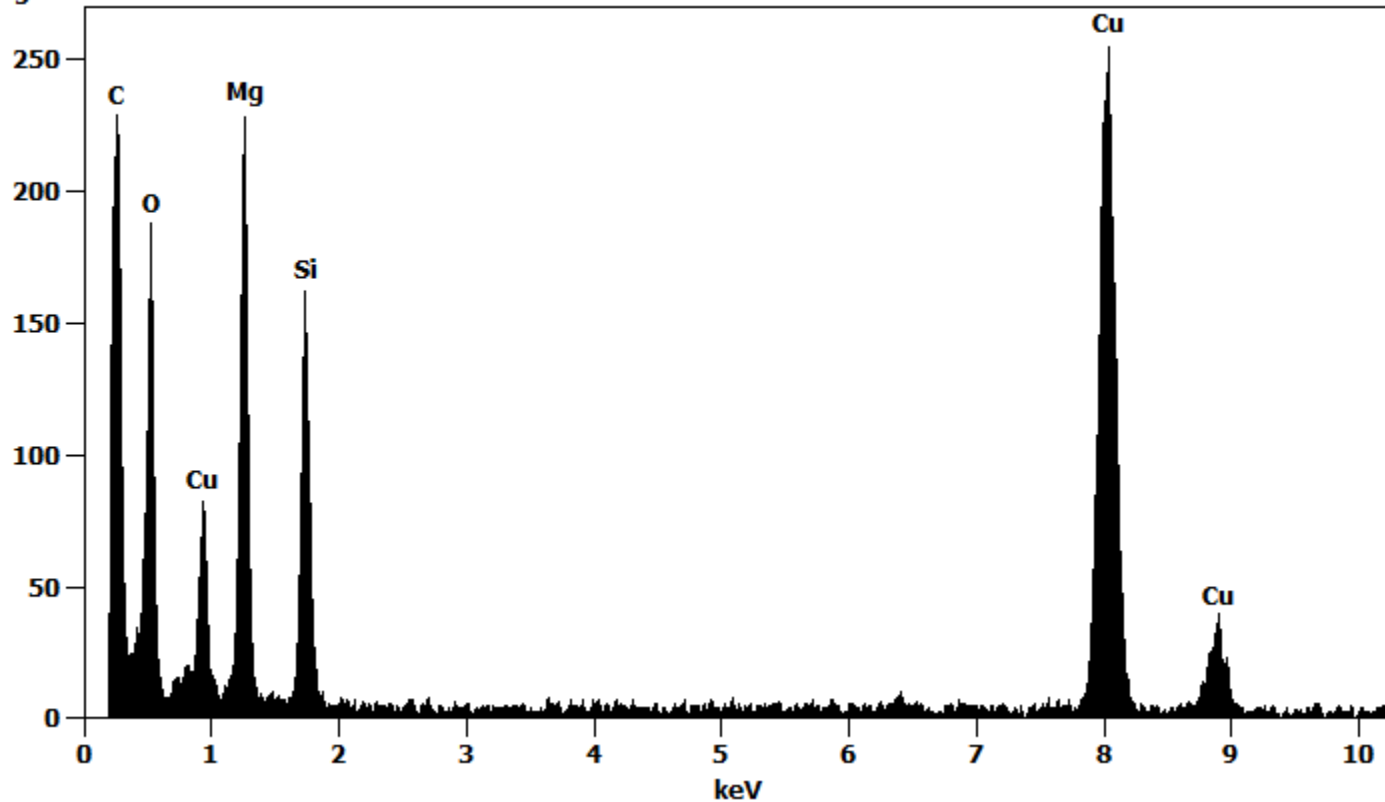
220805-S27



Full scale counts: 257

J69294SP

Integral Counts: 17508



Live Time: 31.9 sec.

Quantitative Results for: J69294SP

Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	1813	1.111	MgO	52.20
Si	1429	1.000	SiO2	47.80
Total				100.00

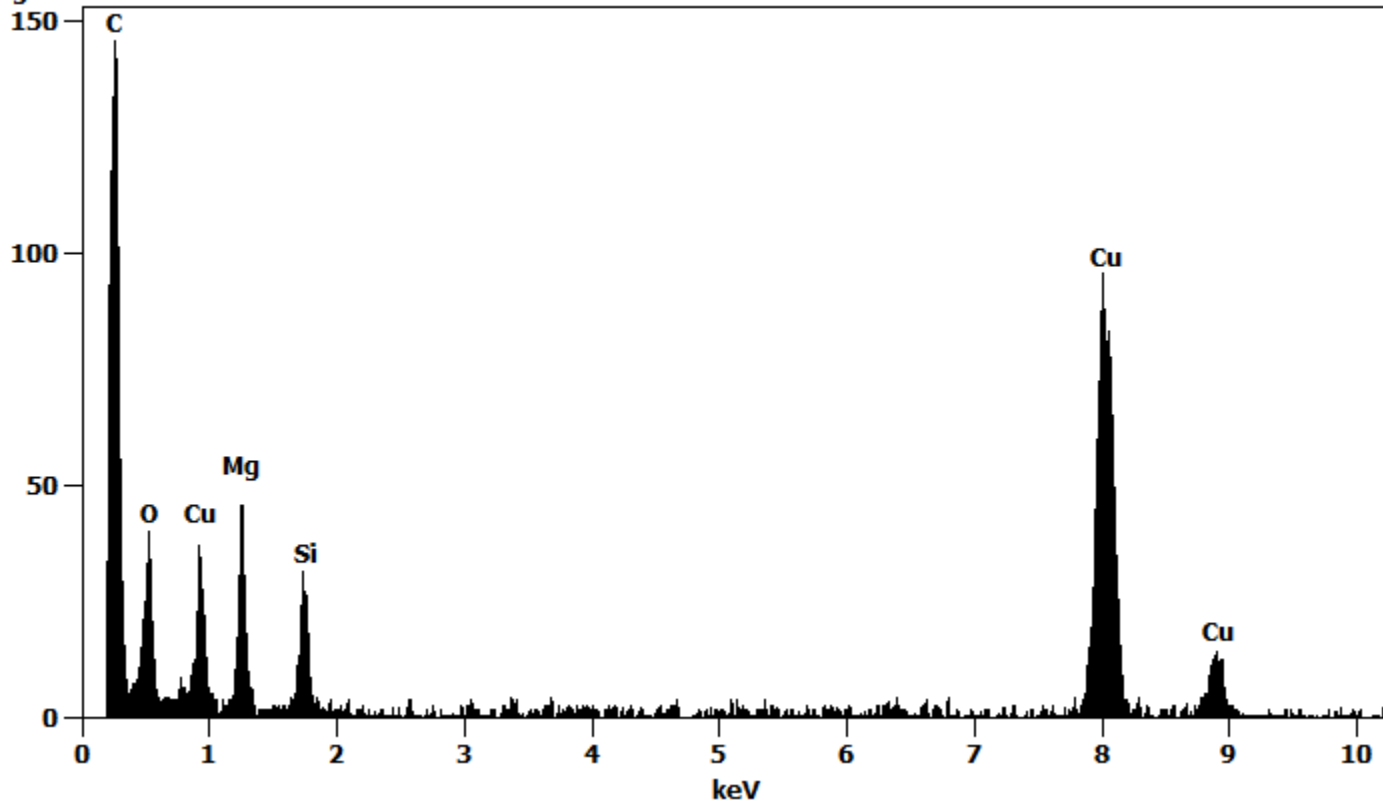
Project: JEOL-SR 1200EX Data
 Company Name: LabCor, Inc
 Title: Spectra Files

220805-S27



Full scale counts: 147
 Integral Counts: 6506

J69295SP



Live Time: 23.5 sec.

Quantitative Results for: J69295SP

<i>Element</i>	<i>Net Counts</i>	<i>K-Factor</i>	<i>Formula</i>	<i>Compnd %</i>
<i>O</i>	0	---	(null)	---
<i>Mg</i>	336	1.111	MgO	54.45
<i>Si</i>	242	1.000	SiO2	45.55
<i>Total</i>				100.00

Project: JEOL-SR 1200EX Data

220805-S28



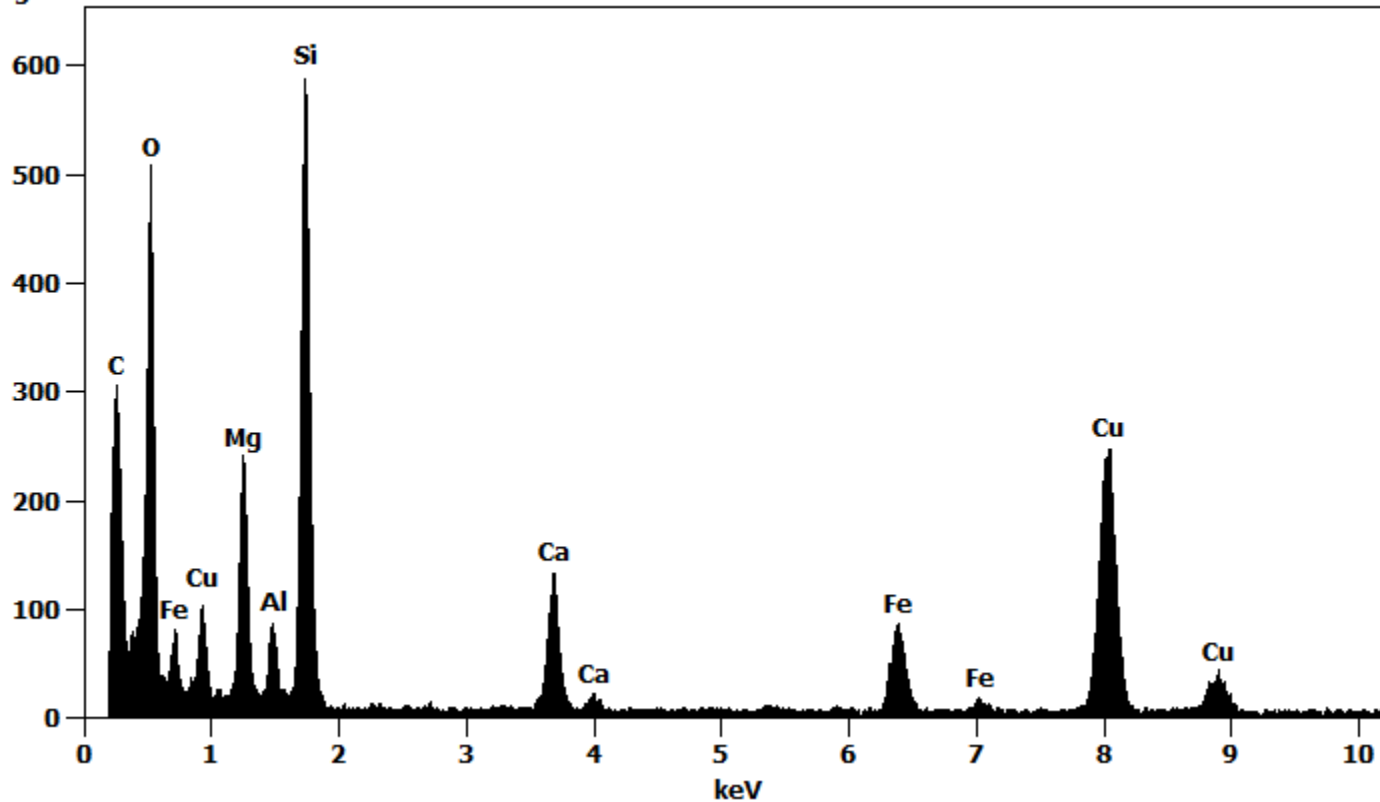
Company Name: LabCor, Inc

Title: Spectra Files

Full scale counts: 595

J69296SP

Integral Counts: 34845



Live Time: 53.6 sec.

Quantitative Results for: J69296SP

Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	1867	1.111	MgO	16.56
Al	606	1.059	Al2O3	5.84
Si	5610	1.000	SiO2	57.80
Ca	1554	0.937	CaO	9.82
Fe	1328	1.215	FeO	9.99
Total				100.00

Project: JEOL-SR 1200EX Data

Company Name: LabCor, Inc

Title: Spectra Files

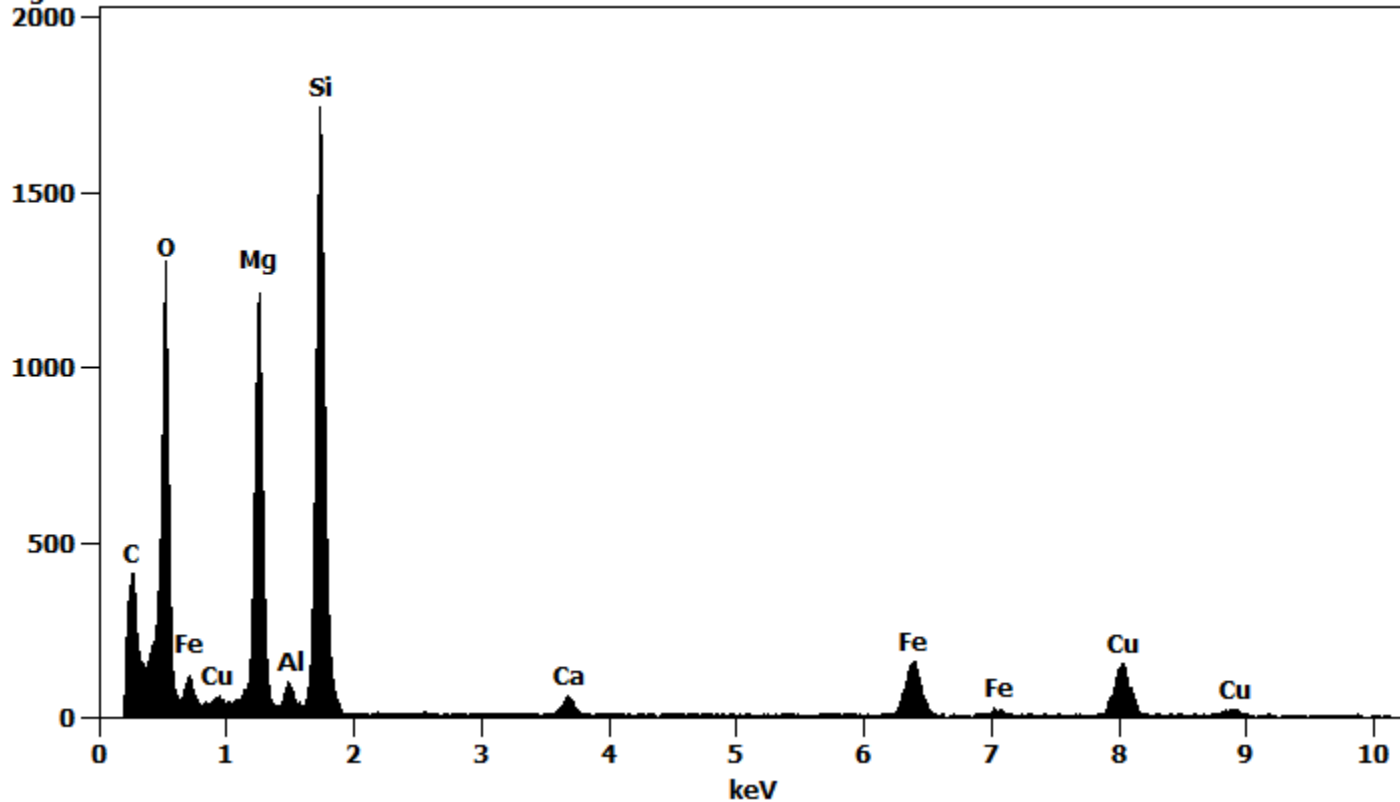
220805-S29



Full scale counts: 1753

J69297SP

Integral Counts: 66604



Live Time: 59.1 sec.

Quantitative Results for: J69297SP

Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	10599	1.111	MgO	31.71
Al	570	1.059	Al2O3	1.85
Si	16648	1.000	SiO2	57.85
Ca	712	0.937	CaO	1.52
Fe	2788	1.215	FeO	7.08
Total				100.00

Project: JEOL-SR 1200EX Data

220805-S30

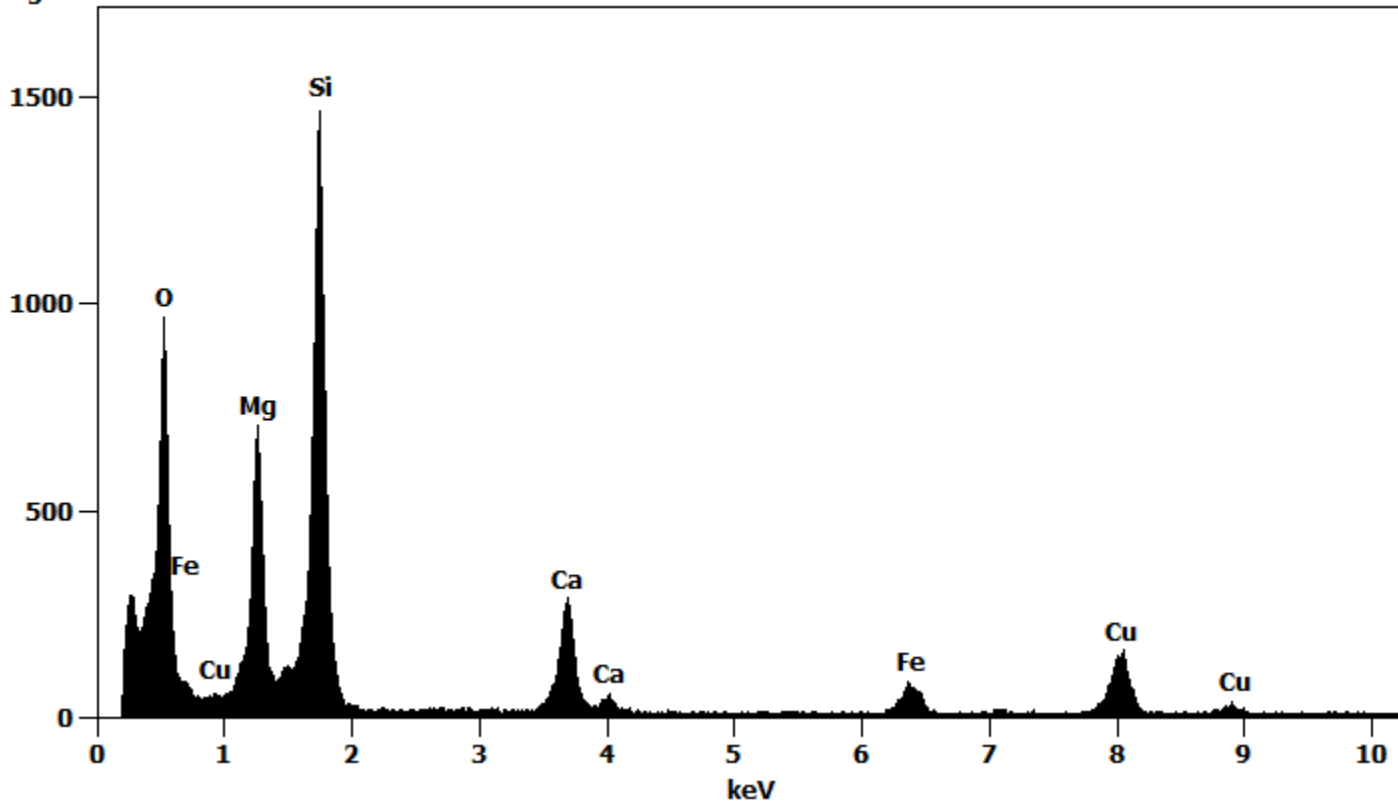
Company Name: LabCor, Inc

Title: Spectra Files

Full scale counts: 1483

J69298SP

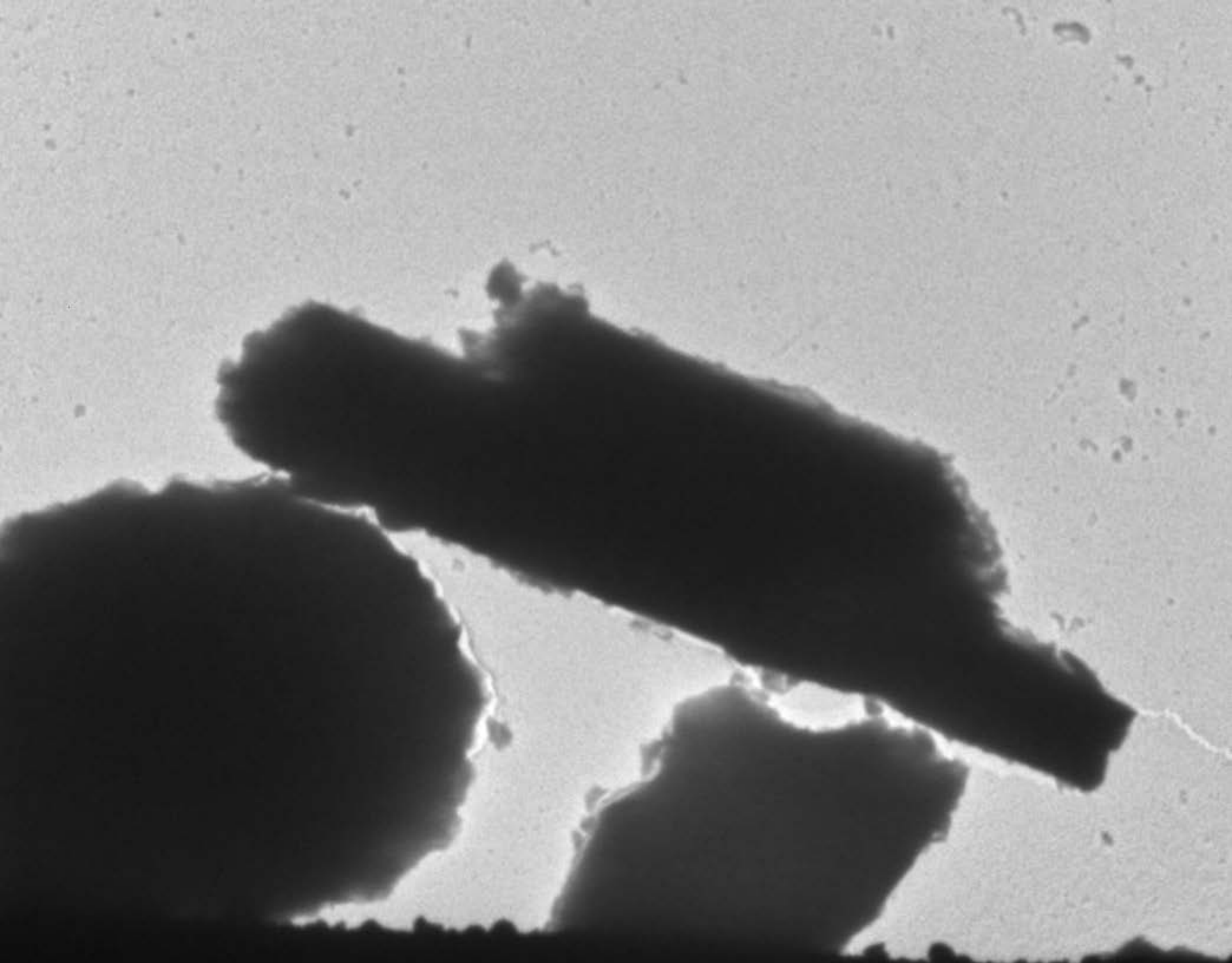
Integral Counts: 75778

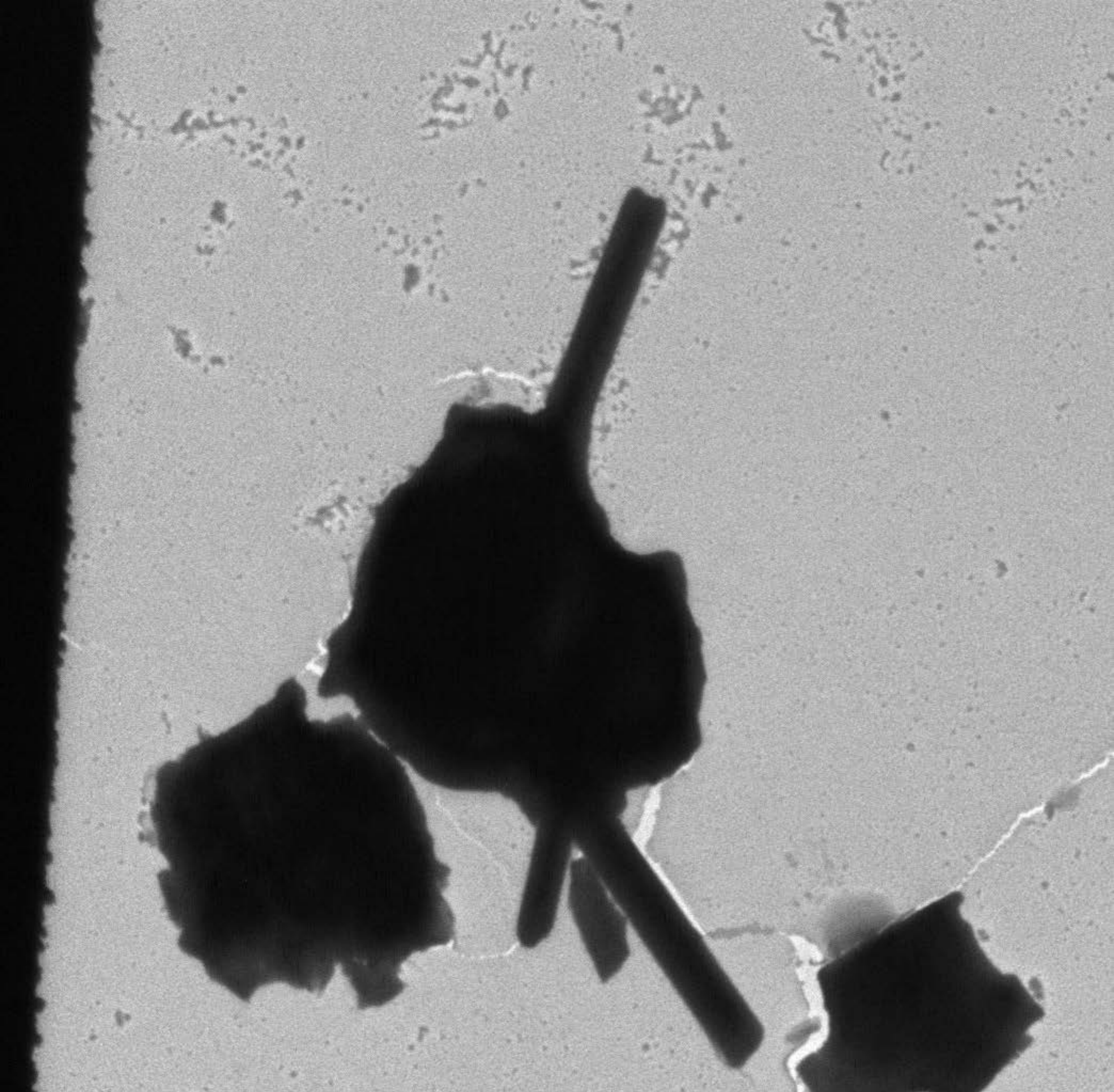


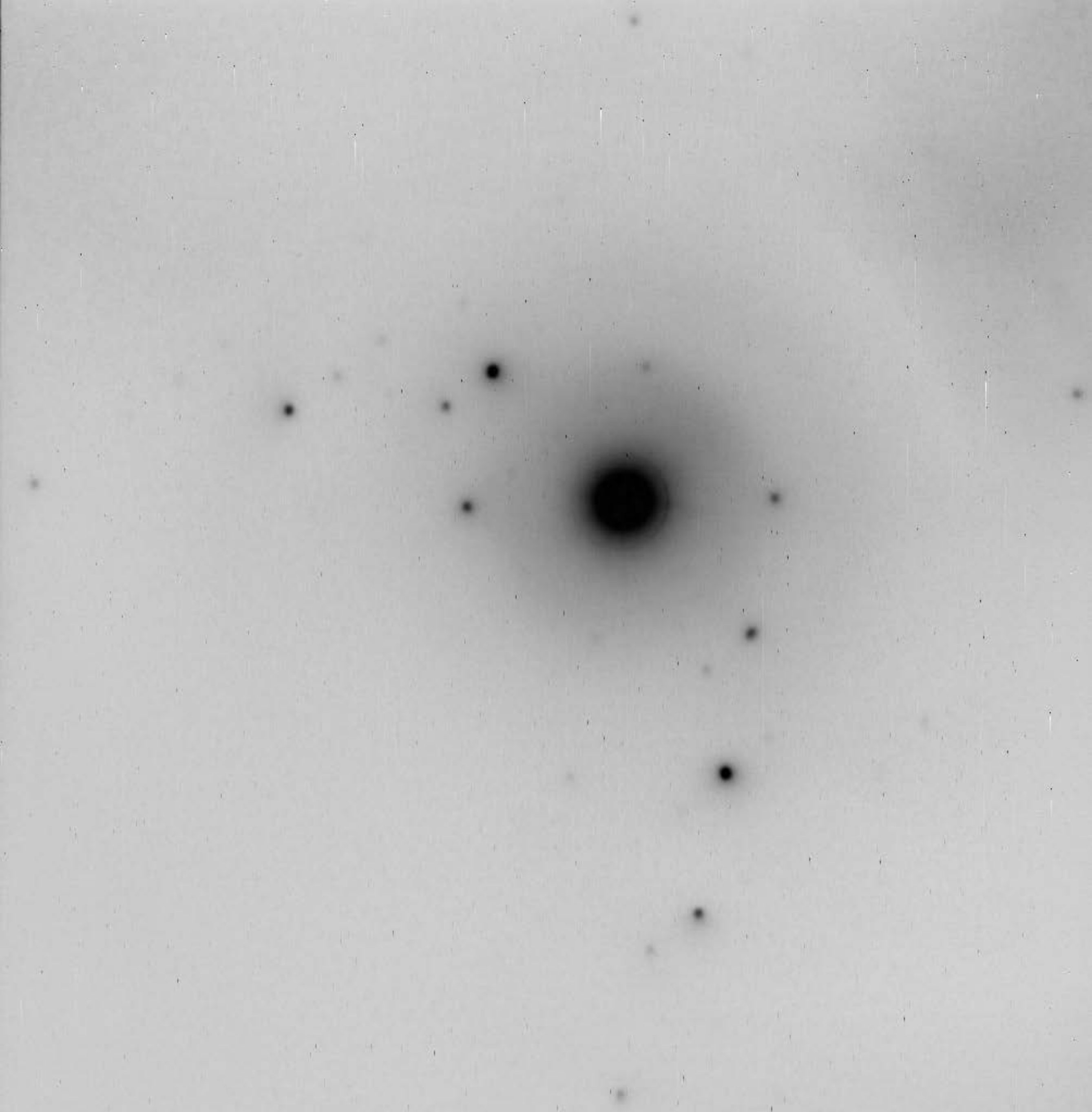
Live Time: 11.1 sec.

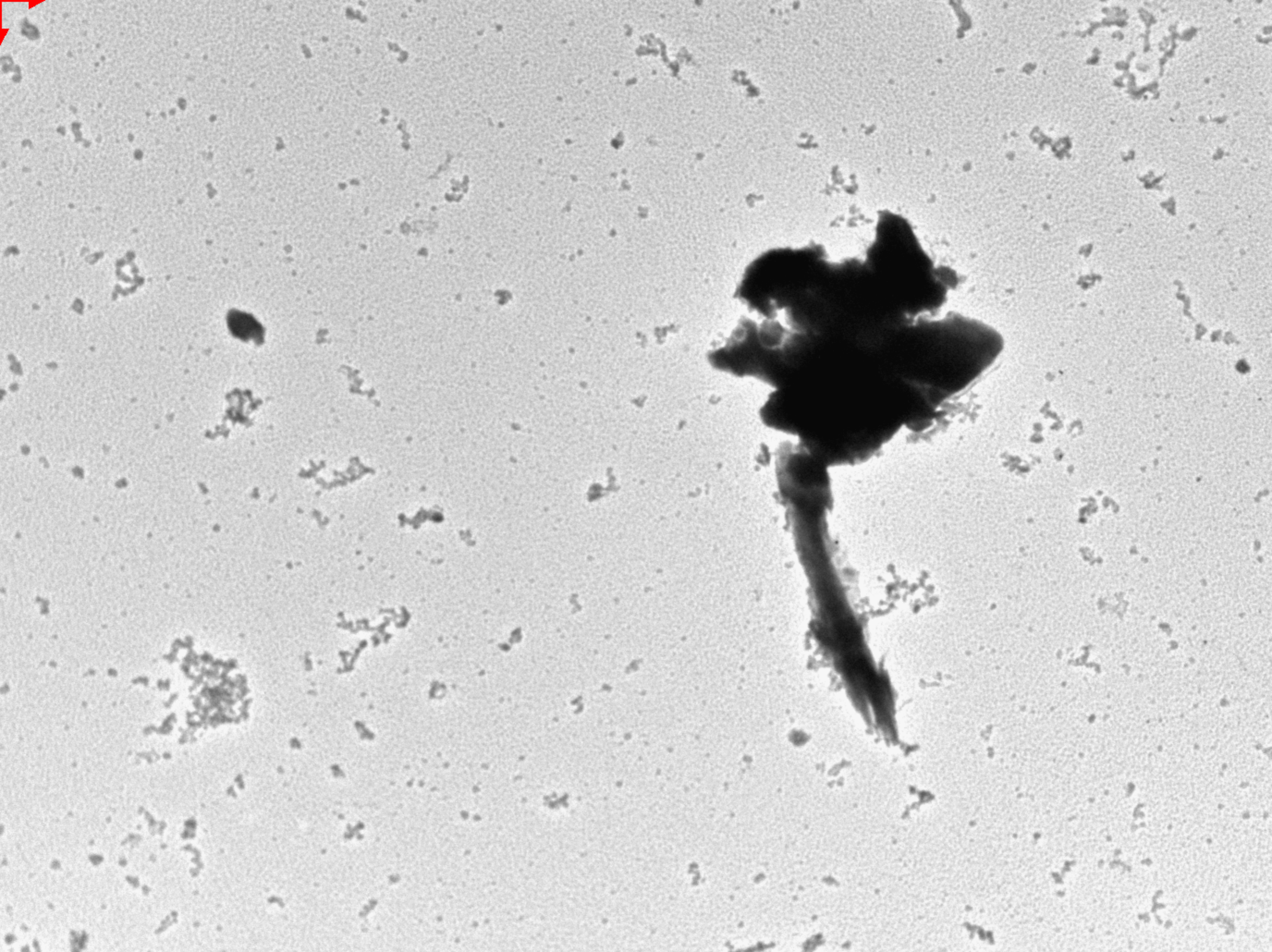
Quantitative Results for: J69298SP


Element	Net Counts	K-Factor	Formula	Compnd %
O	0	---	(null)	---
Mg	7020	1.111	MgO	23.62
Si	15906	1.000	SiO2	62.17
Ca	4094	0.937	CaO	9.81
Fe	1540	1.215	FeO	4.40
Total				100.00

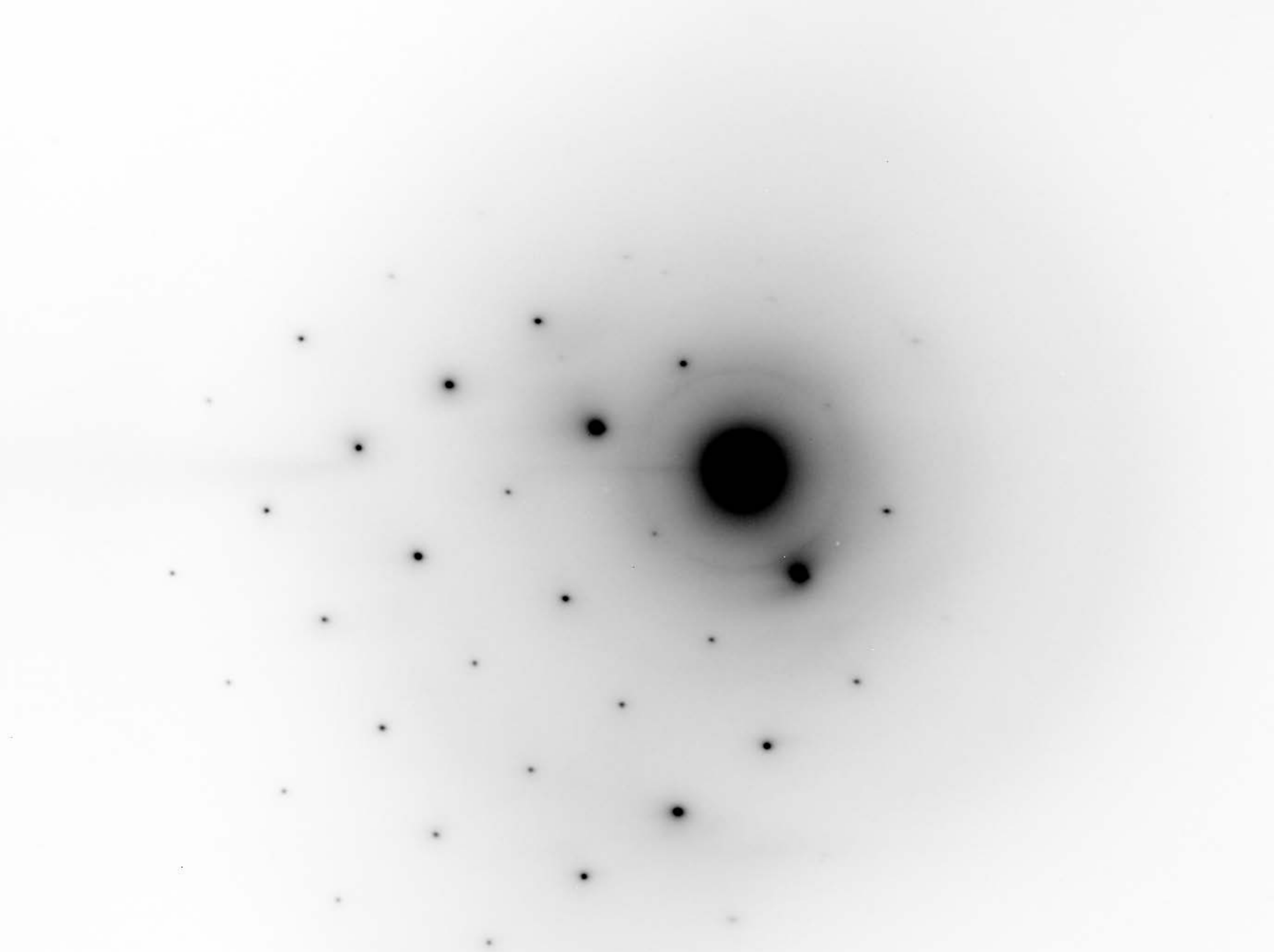






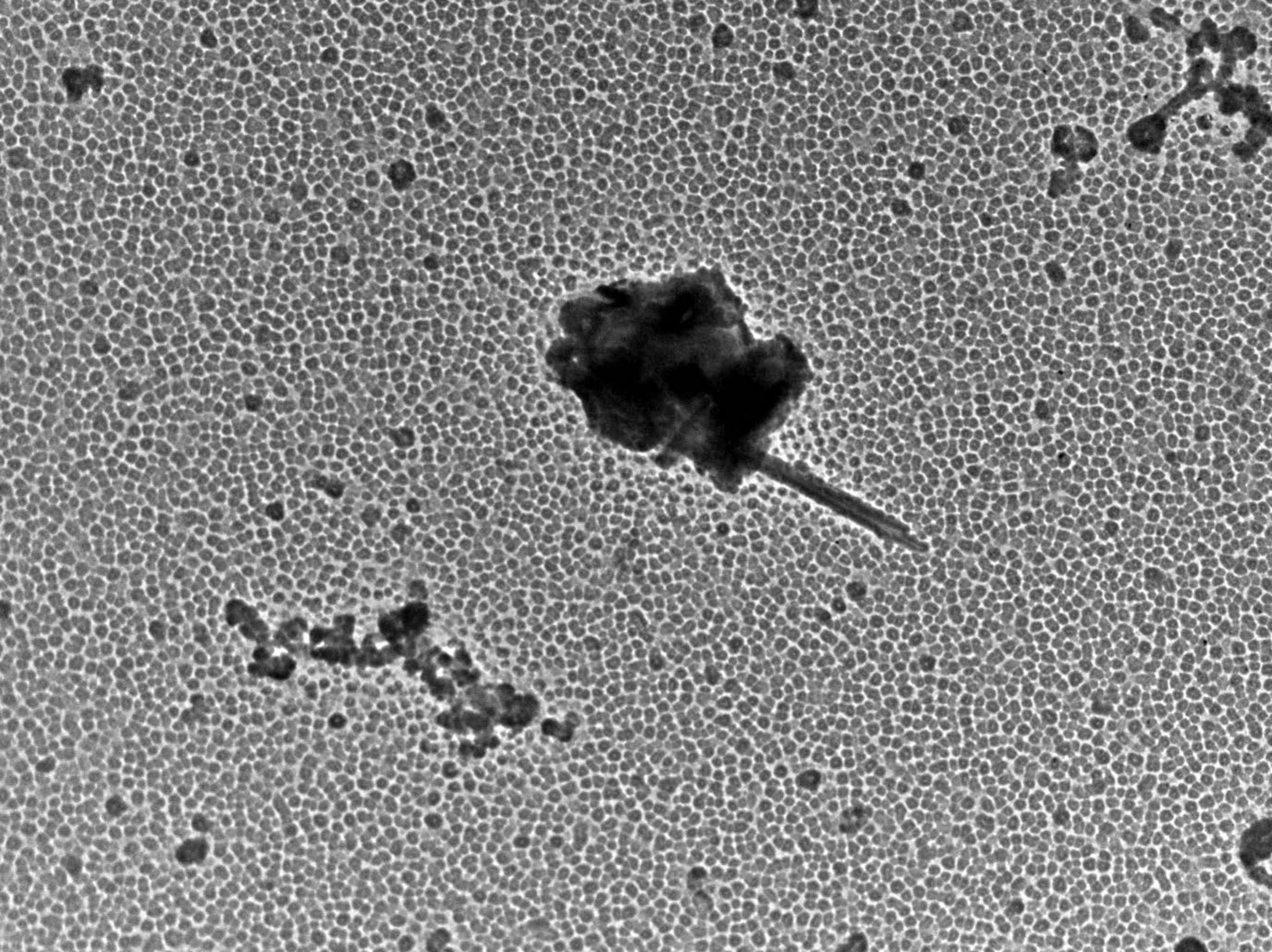






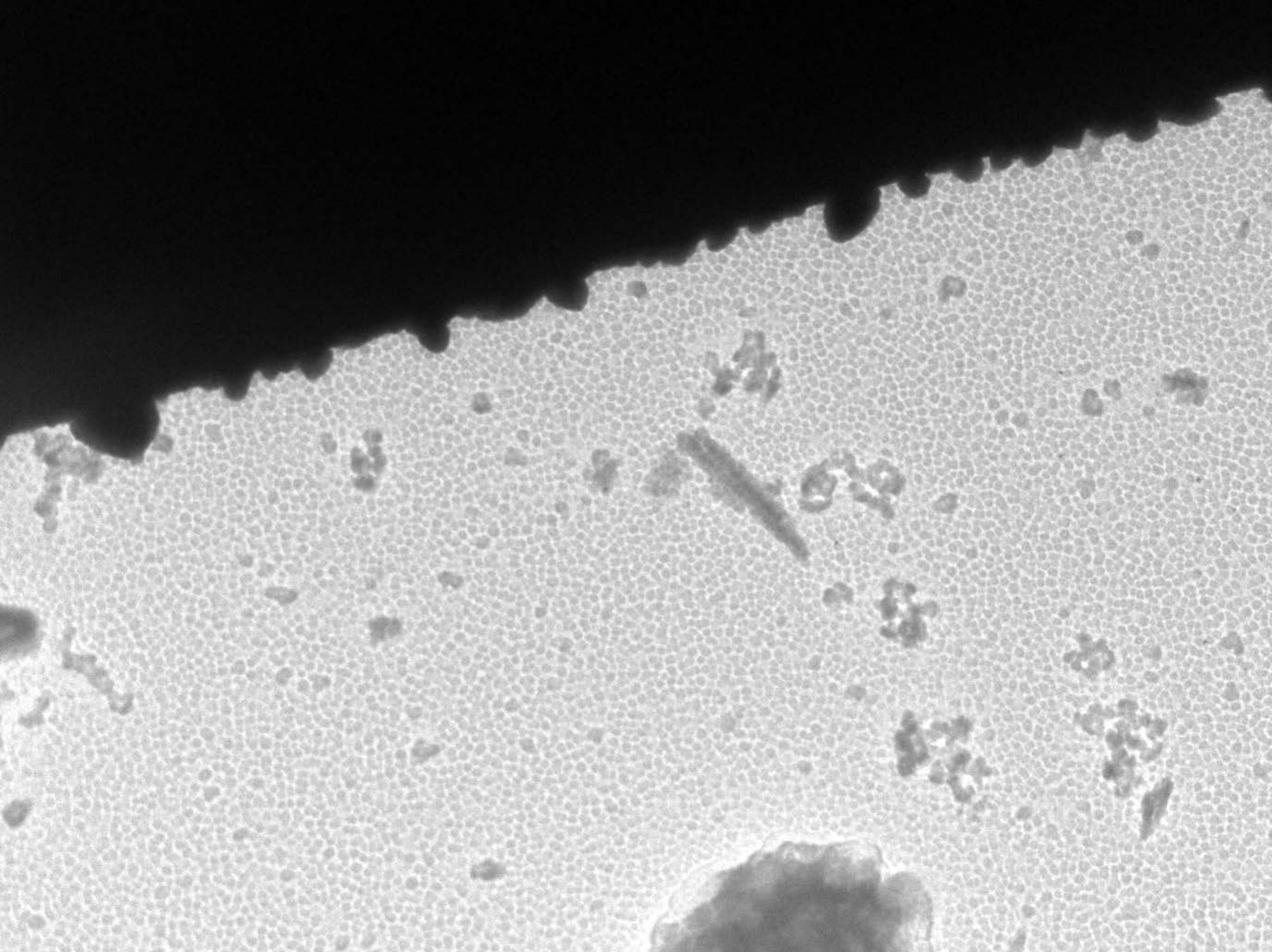
L/C Microscope JEM-1200 EX	Accelerating Voltage 100 kV	Magnification 6000 x	Camera Length 719.195 mm	
				 5 μm



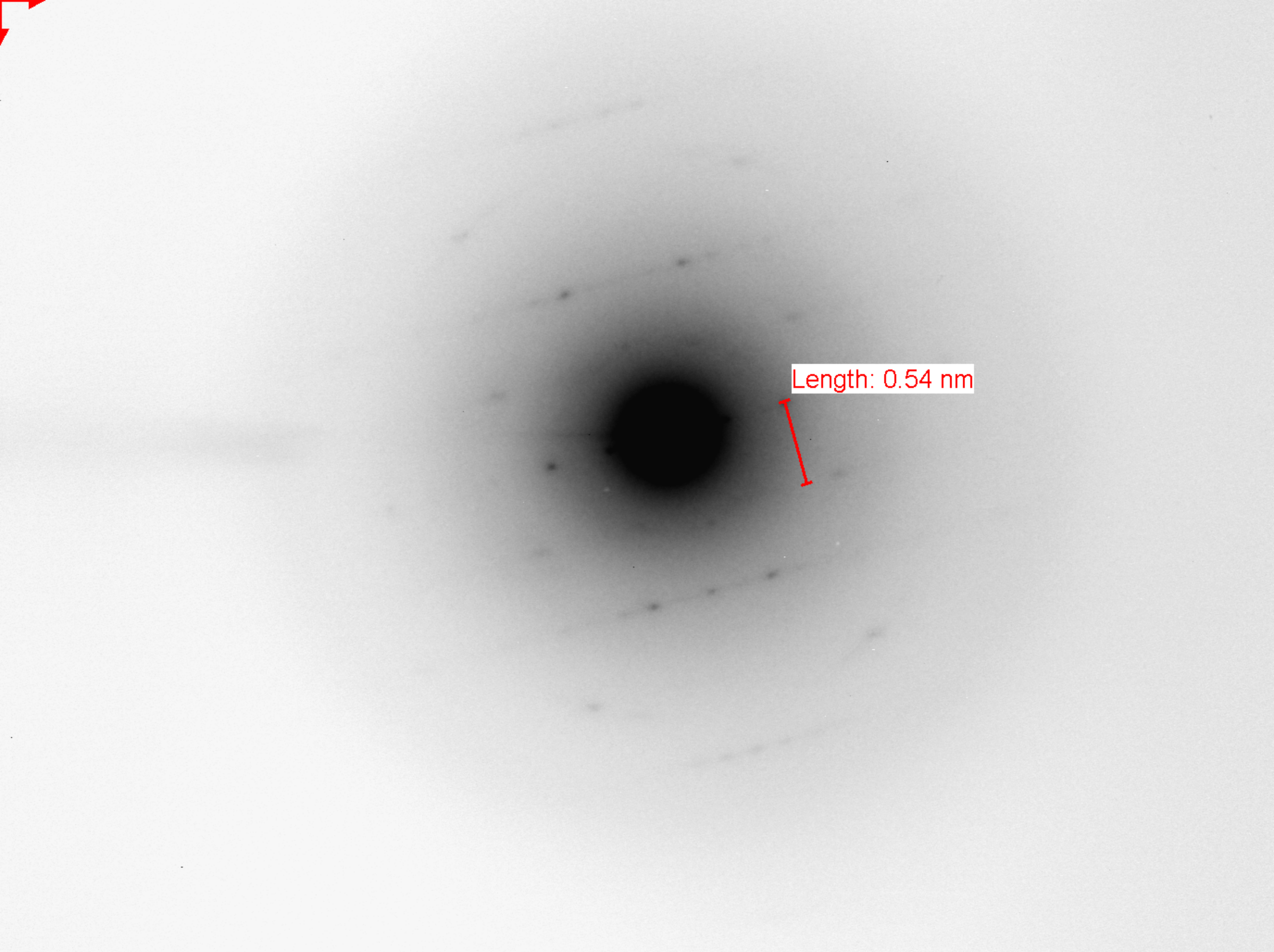
	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	120 x	719.195 mm	 2 nm





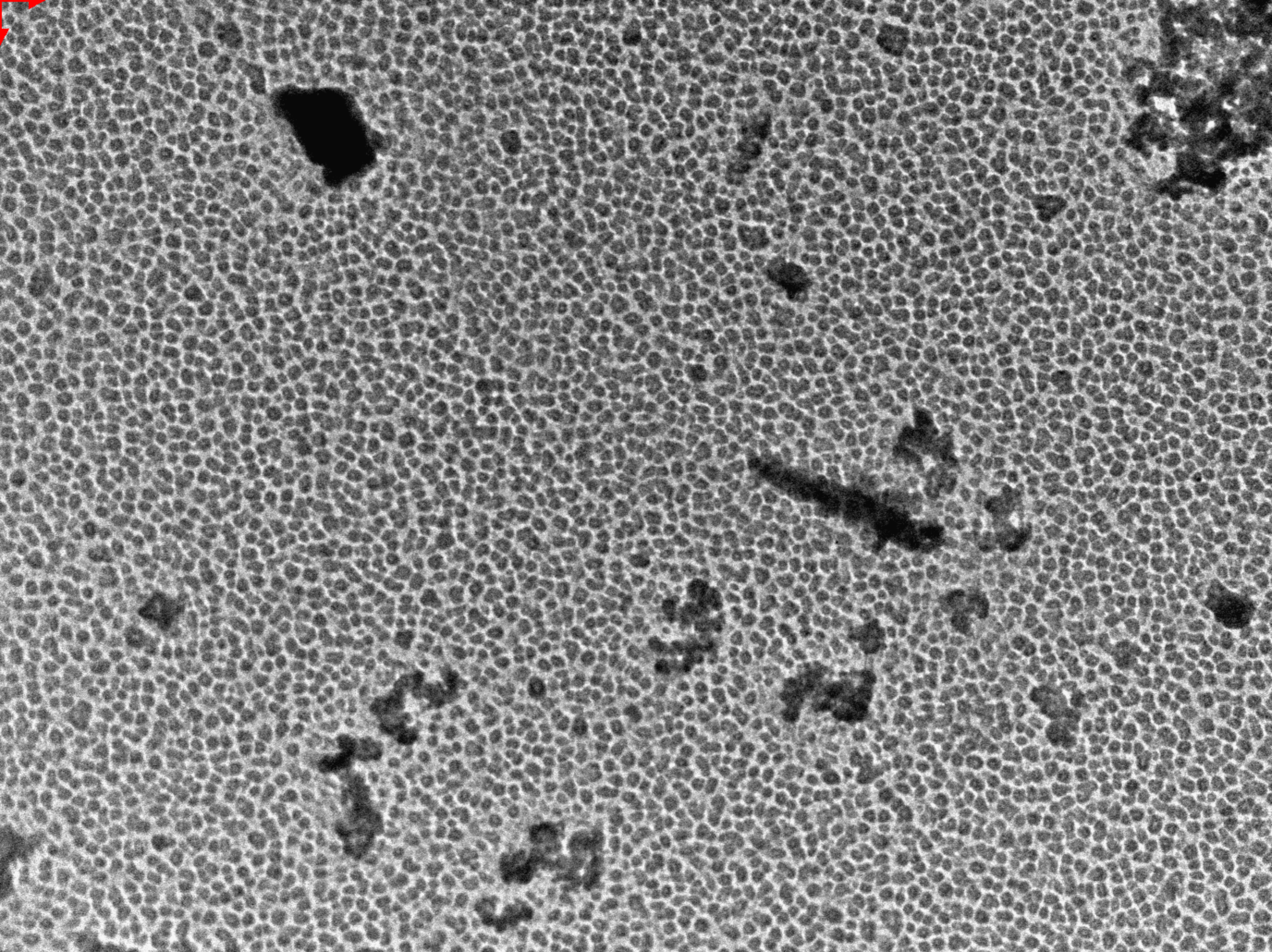
	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	20000 x	719.195 mm	 1 μ m





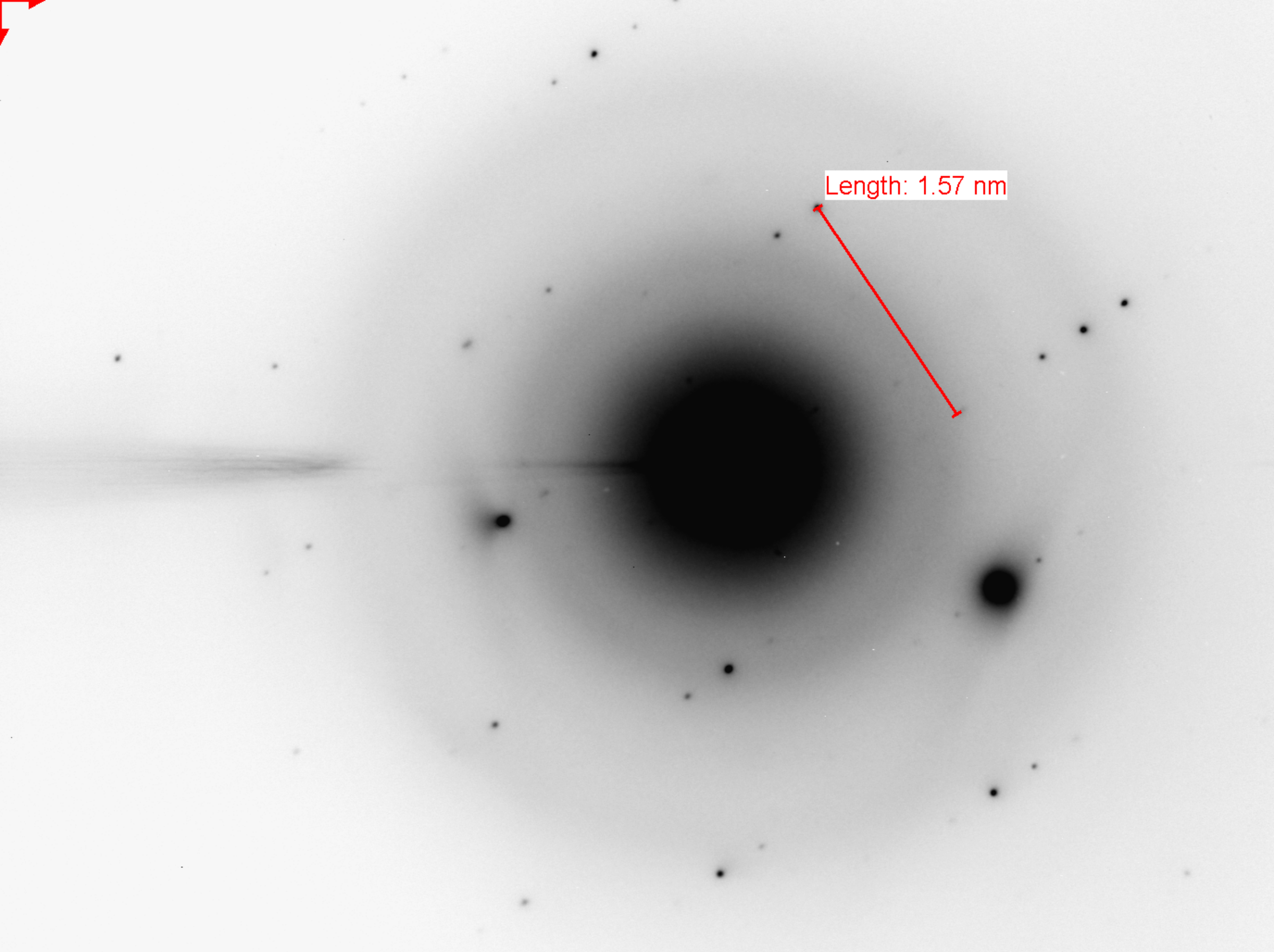
L/C Microscope JEM-1200 EX	Accelerating Voltage 100 kV	Magnification 15000 x	Camera Length 719.195 mm	<div>— 2 μm —</div>
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	Microscope	Accelerating Voltage	Magnification	Camera Length	 2 nm
	JEM-1200 EX	100 kV	120 x	719.195 mm	

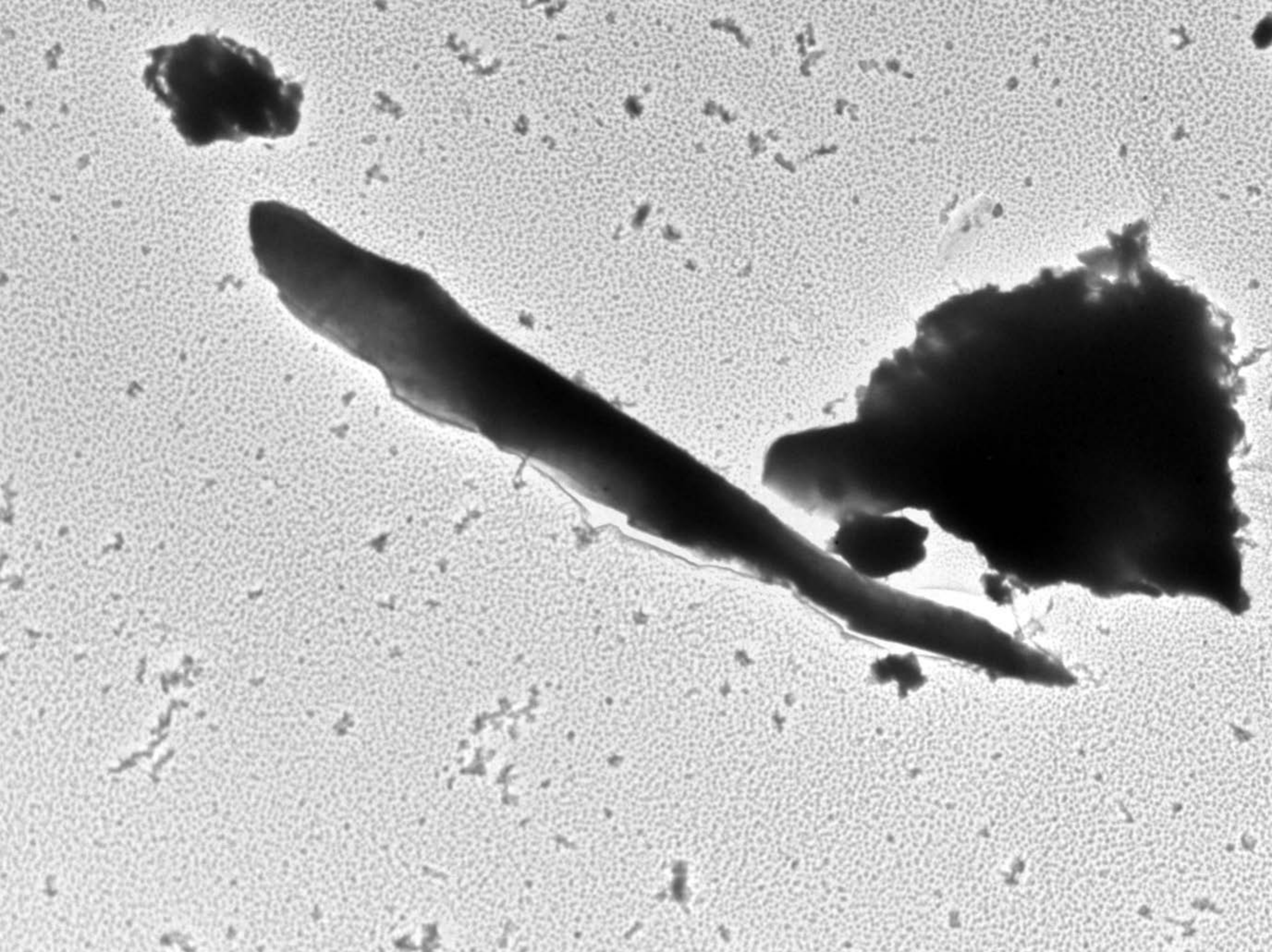



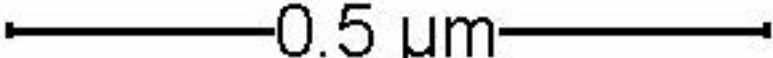
	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	20000 x	719.195 mm	 1 μm

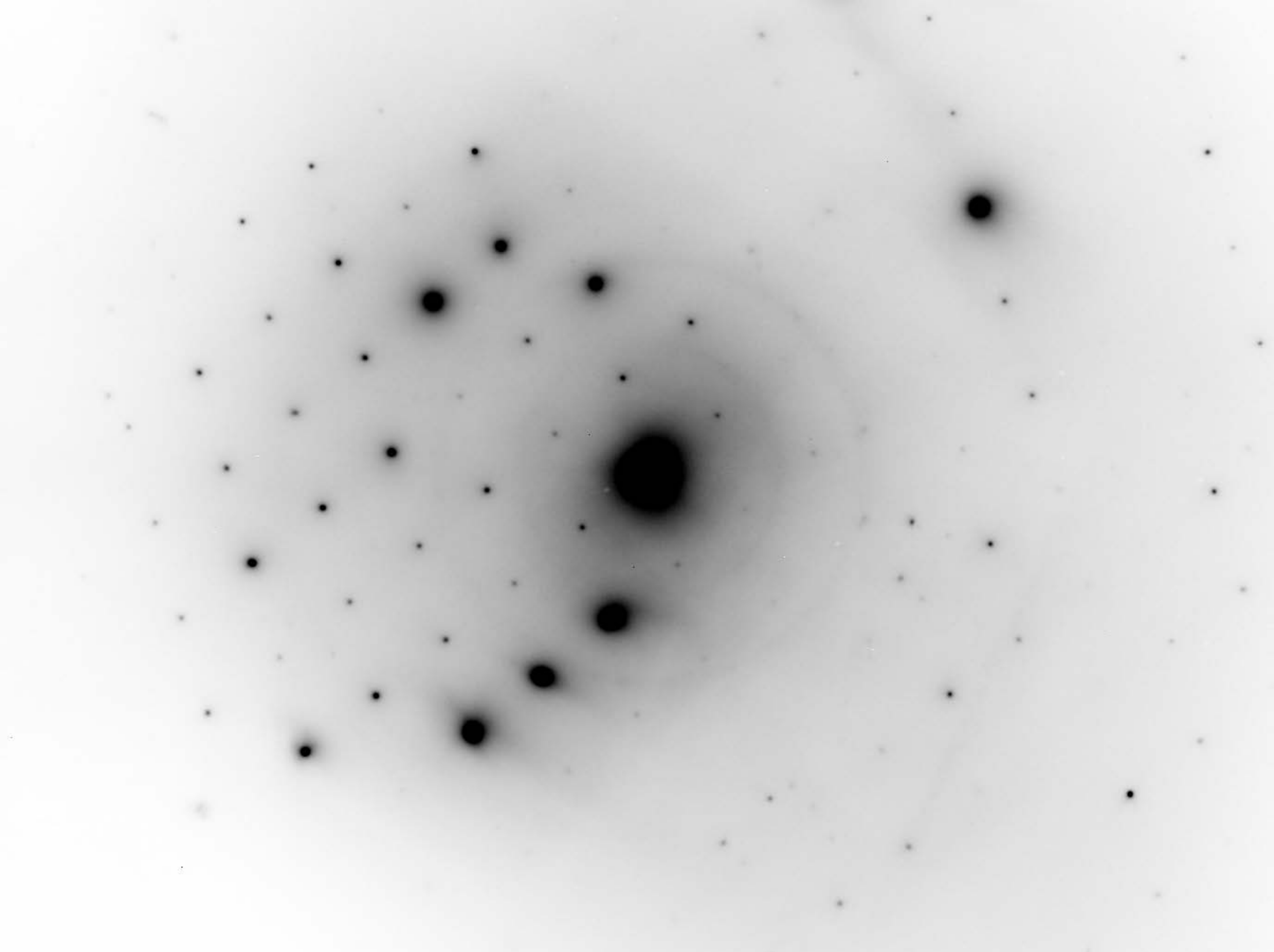




Length: 1.57 nm

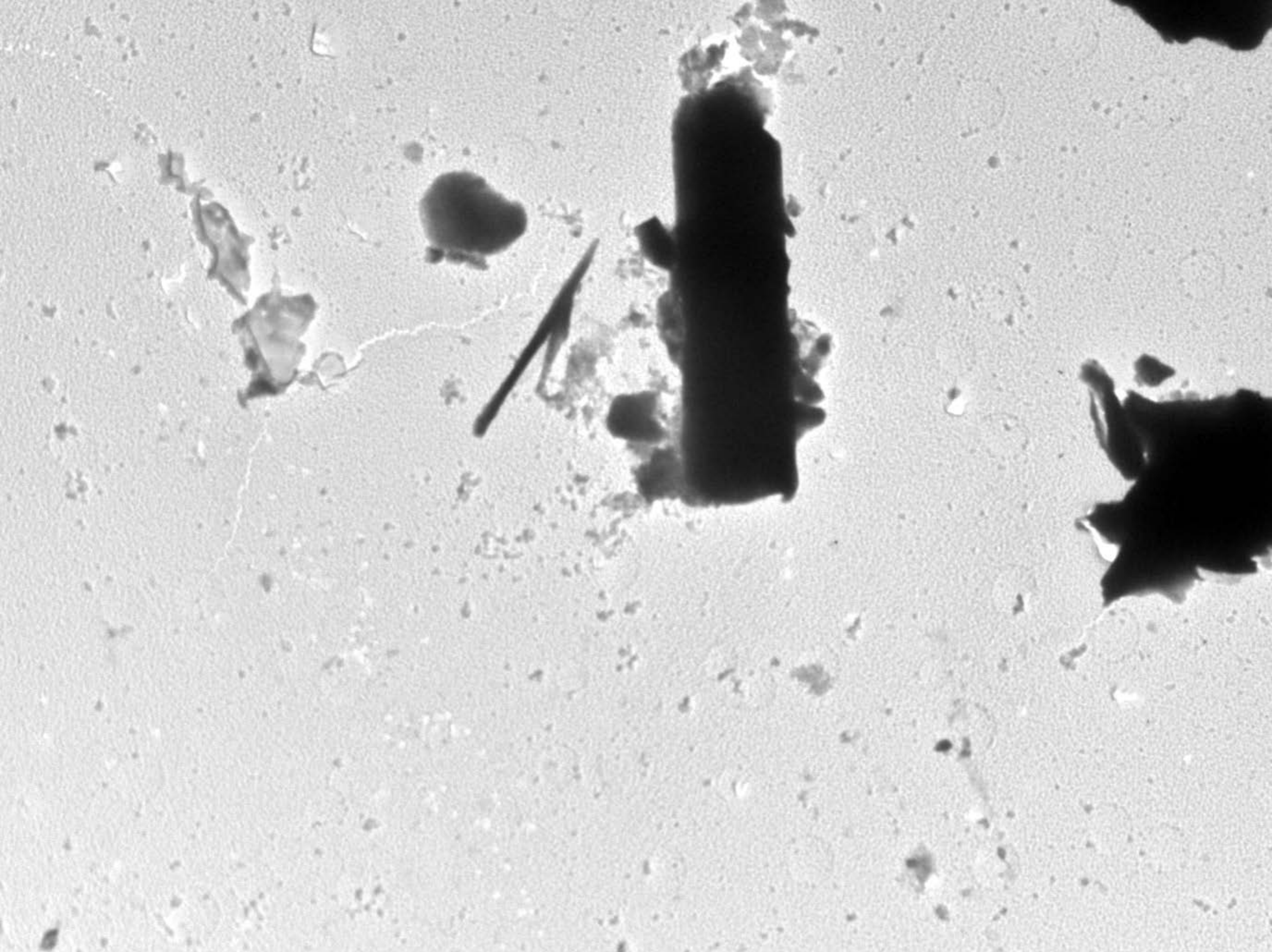
	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	120 x	719.195 mm	 2 nm



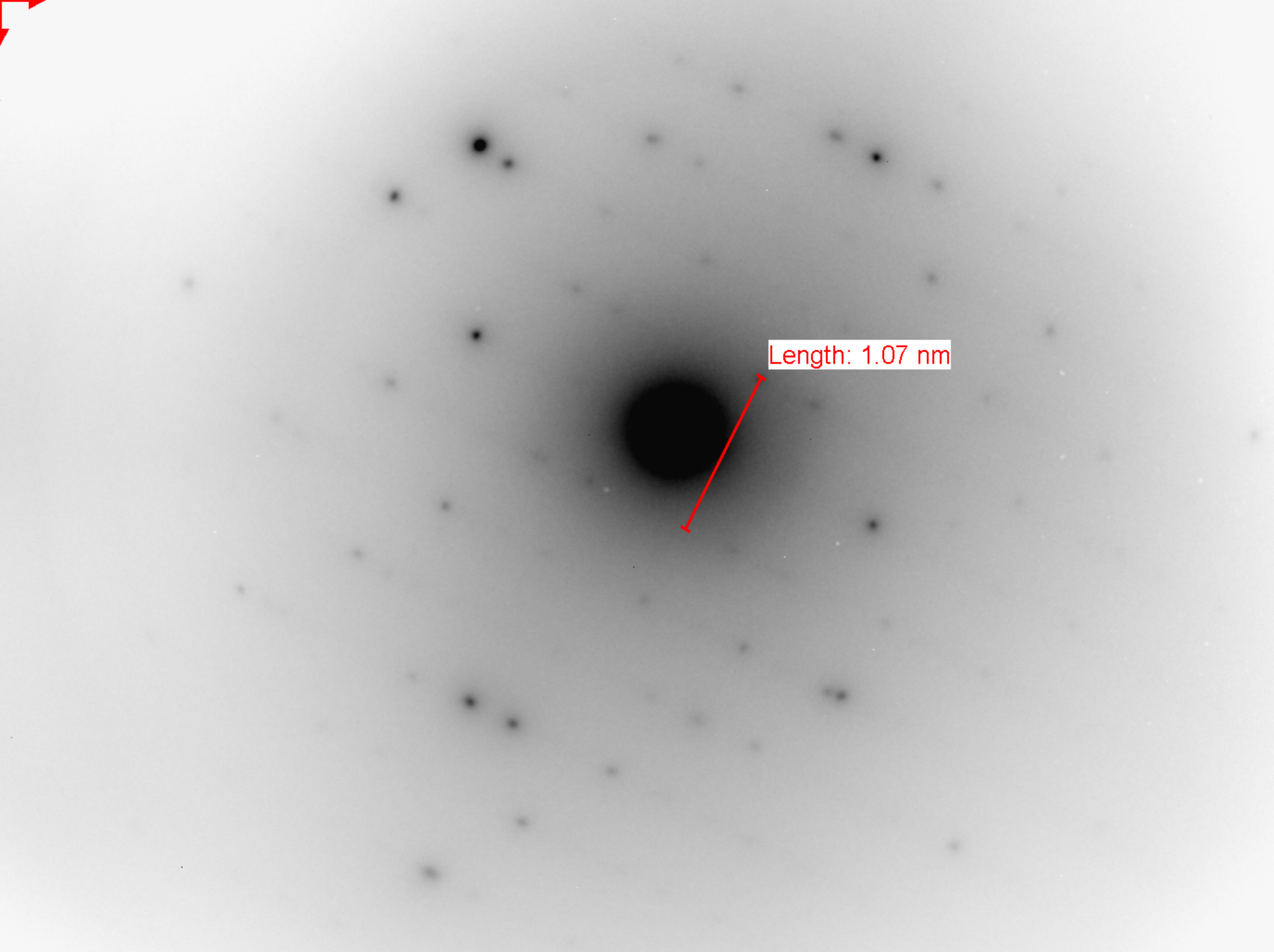
	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	60000 x	719.195 mm	 0.5 μm



	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	120 x	719.195 mm	 2 nm



L/C Microscope JEM-1200 EX	Accelerating Voltage 100 kV	Magnification 6000 x	Camera Length 719.195 mm	<div>5 μm</div>
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Length: 1.07 nm

	Microscope	Accelerating Voltage	Magnification	Camera Length	
	JEM-1200 EX	100 kV	120 x	719.195 mm	

DATA VALIDATION REPORT

**Remedial Investigation and Feasibility Study at North Ridge Estates, Operable Unit 2
Kingsley Firing Range, Klamath County, Oregon
U.S. Environmental Protection Agency Identification No. ORN001002476
August 2022 Air Sampling Event**

Site Name: North Ridge Estates, Operable Unit 2
Kingsley Firing Range
Klamath County, Oregon

Laboratory: Lab/Cor Inc. (LabCor)
Seattle, Washington

QA Reviewer: Christopher Ma
EA Engineering, Science, and Technology, Inc. (EA)

Sample Delivery Group Nos.: 220805

Sample Identification: See Table 1

Matrix: Outdoor Air (Activity-Based Sampling [ABS])

QC Criteria Reviewed: Section 2.0

Laboratory Report Date(s): 20 September 2022

1.0 INTRODUCTION

The air sampling event performed at North Ridge Estates Operable Unit 2, Kingsley Firing Range (site) in support of the Remedial Investigation and Feasibility Study project included the following:

- Outdoor personal air ABS was performed on 15 to 19 August 2022 during ten separate raking scenario events using two different (low and high) flow rates to yield twenty primary ABS samples. Three field replicate samples were also collected.
- Outdoor perimeter air ABS was performed on 15 to 19 August 2022 from three stations from five sample grids using a high flow rate (8.0-9.5 L/min) to yield fifteen primary ABS samples. Two field replicate samples were also collected.
- One filter lot blank sample was collected on 15 August 2022.
- Five field blank samples were collected from 15 to 19 August 2022.

The samples described above were analyzed for asbestos fibers and structures by definitive transmission electron microscopy (TEM) methods: International Organization for Standardization

(ISO) Method 10312, “Ambient Air – Determination of Asbestos Fibres: Direct Transfer Transmission Electron Microscopy Method” and if overloaded, by the indirect method ISO Method 13794, “Ambient air – Determination of asbestos fibres – Indirect-Transfer Transmission Electron Microscopy Method.”

The data were validated in accordance with requirements specified in the following documents:

- *Validation Process Guidelines for Asbestos Data Review* (EPA 2016).
- *TM-500-VO1 Transmission Electron Microscopy Standard Operating Procedures*, Version 1.02 (14 June 2021)
- *Uniform Federal Policy Quality Assurance Project Plan Remedial Investigation/Feasibility Study, North Ridge Estates Operable Unit 2, Kingsley Firing Range, Klamath County, Oregon, Revision 3* (EA 2022), herein referred to as the QAPP.

Section 2.0 of this validation report identifies the criteria reviewed based on EPA guidelines. Section 3.0 contains the definitions of the qualifiers to be applied to the results based on the outcome of the data validation process. Section 4.0 provides an assessment of the overall data quality, and Section 5.0 provides the references to the guidelines and documents used to perform the review of the data.

Table 1 provides a list of the field sample identification (ID), laboratory sample IDs, sample type, sample location, sample collection date, analytical method and parameters, and analytical notes regarding particulate overloading, if applicable. The results of these analyses are discussed in Section 4.0, Data Assessment.

2.0 DATA VALIDATION CRITERIA

The criteria listed below were evaluated as part of the validation process, as applicable to the analytical method.

- Deliverable completeness
- Chain of custody and sample receipt
- Sample preparation
- Microscope alignment
- Instrument/standard calibration
- Analytical sensitivity
- Structure recording and identification
- Blank analysis
- Replicate analysis
- Overall assessment of data.

TABLE 1. SAMPLE CROSS-REFERENCE TABLE

Field Sample ID	Laboratory Sample ID	Sample Type	Sample Location	Date Collected	Analytical Method/ Parameters	Notes
ABS1-01-H	220805-S1	ABS high flow	Grid 1 Event 1	15 August 2022	NA	Overloaded, not prepared
ABS1-01-L	220805-S2	ABS low flow	Grid 1 Event 1	15 August 2022	Asbestos by TEM (ISO 10312)	
ABS1-02-H	220805-S3	ABS high flow	Grid 1 Event 2	15 August 2022	NA	Overloaded, not prepared
ABS1-02-L	220805-S4	ABS low flow	Grid 1 Event 2	15 August 2022	Asbestos by TEM (ISO 13794)	Overloaded, analyzed by indirect
ABS2-01-H	220805-S5	ABS high flow	Grid 2 Event 1	16 August 2022	NA	Overloaded, not prepared
ABS2-01-L	220805-S6	ABS low flow	Grid 2 Event 1	16 August 2022	Asbestos by TEM (ISO 10312)	
ABS2-02-H	220805-S7	ABS high flow	Grid 2 Event 2	16 August 2022	NA	Overloaded, not prepared
ABS2-02-L	220805-S8	ABS low flow	Grid 2 Event 2	16 August 2022	Asbestos by TEM (ISO 10312)	
ABS3-01-H	220805-S9	ABS high flow	Grid 3 Event 1	17 August 2022	NA	Overloaded, not prepared
ABS3-01-L	220805-S10	ABS low flow	Grid 3 Event 1	17 August 2022	Asbestos by TEM (ISO 10312)	
ABS3-02-H	220805-S11	ABS high flow	Grid 3 Event 2	17 August 2022	NA	Overloaded, not prepared
ABS3-02-L	220805-S12	ABS low flow	Grid 3 Event 2	17 August 2022	Asbestos by TEM (ISO 10312)	
ABS4-01-H	220805-S13	ABS high flow	Grid 4 Event 1	19 August 2022	NA	Overloaded, not prepared
ABS4-01-L	220805-S14	ABS low flow	Grid 4 Event 1	19 August 2022	Asbestos by TEM (ISO 10312)	
ABS4-02-H	220805-S15	ABS high flow	Grid 4 Event 2	19 August 2022	NA	Overloaded, not prepared
ABS4-02-L	220805-S16	ABS low flow	Grid 4 Event 2	19 August 2022	Asbestos by TEM (ISO 10312)	
ABS5-01-H	220805-S17	ABS high flow	Grid 5 Event 1	18 August 2022	NA	Overloaded, not prepared
ABS5-01-L	220805-S18	ABS low flow	Grid 5 Event 1	18 August 2022	Asbestos by TEM (ISO 10312)	
ABS5-02-H	220805-S19	ABS high flow	Grid 5 Event 2	18 August 2022	NA	Overloaded, not prepared
ABS5-02-L	220805-S20	ABS low flow	Grid 5 Event 2	18 August 2022	Asbestos by TEM (ISO 10312)	
PM1-UW	220805-S21	Perimeter	Grid 1 Upwind Perimeter	15 August 2022	Asbestos by TEM (ISO 10312)	
PM1-DW	220805-S22	Perimeter	Grid 1 Downwind Perimeter	15 August 2022	Asbestos by TEM (ISO 10312)	
PM1-CW	220805-S23	Perimeter	Grid 1 Crosswind Perimeter	15 August 2022	Asbestos by TEM (ISO 10312)	
PM2-UW	220805-S24	Perimeter	Grid 2 Upwind Perimeter	16 August 2022	Asbestos by TEM (ISO 10312)	
PM2-DW	220805-S25	Perimeter	Grid 2 Downwind Perimeter	16 August 2022	Asbestos by TEM (ISO 10312)	
PM2-CW	220805-S26	Perimeter	Grid 2 Crosswind Perimeter	16 August 2022	Asbestos by TEM (ISO 10312)	
PM3-UW	220805-S27	Perimeter	Grid 3 Upwind Perimeter	17 August 2022	Asbestos by TEM (ISO 10312)	

Field Sample ID	Laboratory Sample ID	Sample Type	Sample Location	Date Collected	Analytical Method/ Parameters	Notes
PM3-DW	220805-S28	Perimeter	Grid 3 Downwind Perimeter	17 August 2022	Asbestos by TEM (ISO 10312)	
PM3-CW	220805-S29	Perimeter	Grid 3 Crosswind Perimeter	17 August 2022	Asbestos by TEM (ISO 10312)	
PM4-UW	220805-S30	Perimeter	Grid 4 Upwind Perimeter	19 August 2022	Asbestos by TEM (ISO 10312)	
PM4-DW	220805-S31	Perimeter	Grid 4 Downwind Perimeter	19 August 2022	Asbestos by TEM (ISO 10312)	
PM4-CW	220805-S32	Perimeter	Grid 4 Crosswind Perimeter	19 August 2022	Asbestos by TEM (ISO 10312)	
PM5-UW	220805-S33	Perimeter	Grid 5 Upwind Perimeter	18 August 2022	Asbestos by TEM (ISO 10312)	
PM5-DW	220805-S34	Perimeter	Grid 5 Downwind Perimeter	18 August 2022	Asbestos by TEM (ISO 10312)	
PM5-CW	220805-S35	Perimeter	Grid 5 Crosswind Perimeter	18 August 2022	Asbestos by TEM (ISO 10312)	
LB-15082022	220805-S36	Lot Blank	Filter Lot Blank	15 August 2022	Asbestos by TEM (ISO 10312)	
COL1-02-H	220805-S37	Field Replicate	Collocated Grid 1 Event 2	15 August 2022	NA	Field duplicate of ABS1-02-H, Overloaded, not prepared
COL2-DW	220805-S38	Field Replicate	Collocated Grid 2 Downwind Perimeter	16 August 2022	Asbestos by TEM (ISO 10312)	Field duplicate of PM2-DW
COL3-01-H	220805-S39	Field Replicate	Collocated Grid 3 Event 1	17 August 2022	NA	Field duplicate of ABS3-01-H, Overloaded, not prepared
COL4-UW	220805-S40	Field Replicate	Collocated Grid 4 Upwind Perimeter	19 August 2022	Asbestos by TEM (ISO 10312)	Field duplicate of FM4-UW
COL5-01-H	220805-S41	Field Replicate	Collocated Grid 5 Event 1	18 August 2022	Asbestos by TEM (ISO 10312)	Field duplicate of ABS5-01-H
FB-15082022	220805-S42	Field Blank	Field Blank	15 August 2022	Asbestos by TEM (ISO 10312)	
FB-16082022	220805-S43	Field Blank	Field Blank	16 August 2022	Asbestos by TEM (ISO 10312)	
FB-17082022	220805-S44	Field Blank	Field Blank	17 August 2022	Asbestos by TEM (ISO 10312)	
FB-18082022	220805-S45	Field Blank	Field Blank	18 August 2022	Asbestos by TEM (ISO 10312)	
FB-19082022	220805-S46	Field Blank	Field Blank	19 August 2022	Asbestos by TEM (ISO 10312)	
ID – identification NA – not analyzed						

3.0 GLOSSARY OF DATA QUALIFIERS

The following definitions provide a brief explanation for the data qualifiers that may be applied to the data during the data review process. The definitions are consistent with EPA guidance (2016).

No Qualifier	Indicates that the data are acceptable both qualitatively and quantitatively.
J	The result is an estimated quantity. The associated analyte identification and/or concentrations may be inaccurate or imprecise due to the quality of the data generated because certain quality control (QC) criteria were not met. The data are valid for project use to achieve project data quality objectives (DQOs).
UJ	The non-detectable result may be inaccurate or imprecise due to the quality of the data generated because certain QC criteria were not met.
R	The sample results are unusable due to the quality of the data generated because certain QC criteria were not met. The analyte may or may not be present in the sample.

4.0 DATA ASSESSMENT

The analytical data in sample delivery group (SDG) 220805 generated by LabCor were reviewed for the criteria listed in Section 2.0. A discussion of the data is presented in this section.

Outdoor air (ABS) and associated QC samples were prepared and analyzed for asbestos using TEM according to the procedures set forth and specified in ISO Methods 13794 and 10312. The data validation findings are summarized in the following sections.

4.1 Deliverable Completeness

The data package and electronic deliverables for this SDG are complete.

4.2 Chain of Custody and Sample Receipt

The samples were received by LabCor under appropriate chain of custody, intact, in good condition, and appropriately packaged.

4.3 Sample Preparation

The samples were prepared using the direct-transfer procedures with appropriate laboratory preparation blanks. The grid specimens evaluated for project samples met the method-specified criteria.

4.4 Microscope Alignment

The laboratory report includes information documenting that the TEM instrument alignment was performed according to the manufacturer's specifications and at the appropriate frequencies. No

qualification of sample results is required based on the review of instrument alignment information.

4.5 Instrument/Standard Calibration

The calibrations of the plasma etcher/asher (monthly), sample specimen grids, TEM screen magnification, camera constant for the selected area electron diffraction (SAED) mode (monthly), and energy dispersive x-ray spectroscopy (EDS) system were performed in accordance with method criteria and at the required frequencies. No qualification of sample results is required based on instrument/standard calibration review.

4.6 Analytical Sensitivity

The project-specific analytical sensitivities in units of phase contrast microscopy equivalent (PCMe) fibers per cubic centimeter (f/cc) for ABS samples (0.03 PCMe f/cc) have been achieved. A sufficient number of grid openings were analyzed to allow reporting of results for project samples below target action levels. Appropriate stopping rules as described in the laboratory SOPs were applied.

4.7 Structure Recording and Identification

Fibrous asbestos structures were properly recorded for project samples as specified within the QAPP: PCMe fibers are those fibers and bundles with a length greater than 5 microns and width between 0.25 and 3 microns inclusive with a 3:1 aspect ratio. The laboratory report contains appropriate documentation supported by diffraction pattern (SAED) photographs and EDXA spectra.

4.8 Blank Analysis

Blanks associated with project samples included laboratory preparation blanks, field blanks, and a filter lot blank. These blanks were prepared at the appropriate frequency as specified within the QAPP. The results for blanks are further discussed below.

Laboratory preparation blanks were prepared at the appropriate frequency for the direct test method with project samples. No asbestos fibers were detected in analyses of these laboratory preparatory blank samples.

Five field blanks were collected. The field blanks are identified as FB-15082022, FB-16082022, FB-17082022, FB-18082022, and FB-19082022. No asbestos fibers were detected in the analysis of these field blank samples.

One filter lot blank, identified as LB-15082022, was analyzed. No asbestos fibers were detected in the analysis of the lot blank sample.

No data required qualification on the basis of laboratory preparation blanks, field blanks, or filter

lot blank results.

4.9 Replicate Analysis

Laboratory replicate analyses were performed using project samples ABS1-01-L, ABS5-02-L, and PM4-DW; the replicate results met the laboratory specified criteria.

Five field replicates were collected within the QAPP specified frequencies. The parent/field replicate sample associations are listed below:

Location	Parent Sample ID	Field Duplicate ID
Grid 1 Scenario 2	ABS1-02-H	COL1-02-H
Grid 2 Downwind Perimeter	PM2-DW	COL2-DW
Grid 3 Scenario 1	ABS3-01-H	COL3-01-H
Grid 4 Upwind Perimeter	FM4-UW	COL4-UW
Grid 5 Scenario 1	ABS5-01-H	COL5-01-H

The results of the original and the field duplicate samples identified were consistent; these sample results were nondetectable.

No data required qualification on the basis of laboratory or field replicates.

4.10 Overall Assessment of Data

Project deliverables were reviewed for completeness and compliance with the project planning documents. Based on the data review, the completeness of deliverables is 100 percent. No data quality criteria exceedances were observed that required qualification of project sample results. No analytical data were R-qualified, which signifies rejected or unusable data. The sample data collected at Kingsley Firing Range in August 2022 are usable to support the project data quality objectives for the Remedial Investigation and Feasibility Study at North Ridge Estates Operable Unit 2.

5.0 REFERENCES

EA Engineering, Science, and Technology, Inc. (EA). 2022. Uniform Federal Policy Quality Assurance Project Plan Remedial Investigation/Feasibility Study, North Ridge Estates Operable Unit 2, Kingsley Firing Range, Klamath County, Oregon. Revision 3.

Lab/Cor, Inc. 2021. Transmission Electron Microscopy SOP. Version 1.02.

U.S. Environmental Protection Agency (EPA). 2016. Validation Process Guidelines for Asbestos Data Review.

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Appendix D

Human Health Risk Assessment Outputs

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Appendix D.1

Interstate Technology and Regulatory Compliance Incremental Sampling Methodology Calculator Output

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Table D.1.2 ITRC ISM Calculator for Fine Fraction Sample Results <0.150 mm

Project ID:	North Ridge Estates OU2
Property/Sample ID:	
Date of calculations:	3/1/2023
Calculator completed by:	CLC
Analyte:	Lead
Analyte units:	mg/kg
DU metric units:	acres
Notes:	Fine Fraction, <0.150 mm

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area
--	------

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	60
-------------------------------------	----

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations						Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL			
			Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6											Student's-t	Chebychev	CV of Increments	95% UCL
1	OU2-RR-BB2	0.23	274	357	309				3	0.33	313.3	41.67	322.77	1.03	1.17	376.14	1.20	24.06	383.6	418.2	Low	383.6
2	OU2-RR-BB3	0.23	33.7	22.1	18				3	0.33	24.6	8.14	63.08	2.56	1.47	92.77	3.77	4.70	38.3	45.1	High	45.1
3	OU2-RR-RF1	0.23	70.7	84.5	58.9				3	0.33	71.4	12.81	99.25	1.39	1.21	120.08	1.68	7.40	93.0	103.6	Med	103.6
10																						
Sum:		1	--	--	--	--	--	--	9	1.00	136.4	14.78	114.51	0.84	NA	135.20	0.99	8.53	161.4	173.6	Low	161.4

df by Welch-Satterthwaite approximation:	2.5
--	-----

Recommended UCL:	161.4	mg/kg	>> Student's t 95% UCL
Note: Student's-t or Chebychev 95% UCL may be appropriate.			

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CV ≤ 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Table D.1.1 ITRC ISM Calculator for Total Sample Results <2 mm

Project ID:	North Ridge Estates OU2
Property/Sample ID:	
Date of calculations:	3/1/2023
Calculator completed by:	CLC
Analyte:	Lead
Analyte units:	mg/kg
DU metric units:	acres
Notes:	Total sample, <2mm fraction

Click in green cell below to select from drop-down menu

DU size metric: area, volume, or depth interval:	Area
--	------

Note: Assumes all replicates have the same number of increments

Number of increments per replicate:	60
-------------------------------------	----

Row #	IDs/Names of the Smaller DUs	DU Area (acres)	Replicate field sample concentrations						Number of Replicates	Weight	Arithmetic Mean	SD of Replicates	calc'd SD of Increments	calc'd CV for the DU	Adj Factor	adj'd SD of Increments	adj'd CV for DU	SE of DU	95% UCL			
			Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6											Student's-t	Chebychev	CV of Increments	95% UCL
1	KFR-RR-IA2	0.17	200	120	220				3	0.12	180.0	52.92	409.88	2.28	1.39	569.97	3.17	30.55	269.2	313.2	High	313.2
2	KFR-RR-IA1	0.17	150	180	170				3	0.12	166.7	15.28	118.32	0.71	1.14	134.87	0.81	8.82	192.4	205.1	Low	192.4
3	KFR-RR-IA3	0.17	130	190	180				3	0.12	166.7	32.15	249.00	1.49	1.23	305.20	1.83	18.56	220.9	247.6	Med	247.6
4	KFR-RR-RF1	0.25	73	72	1900				3	0.17	681.7	1055.11	8172.83	11.99	10.01	81812.21	120.02	609.17	2460.4	3337.0	High	3337.0
5	OU2-RR-BB2	0.23	665	359	316				3	0.16	446.7	190.30	1474.06	3.30	1.73	2542.98	5.69	109.87	767.5	925.6	High	925.6
6	OU2-RR-BB3	0.23	28.8	19.2	16.6				3	0.16	21.5	6.43	49.78	2.31	1.40	69.67	3.24	3.71	32.4	37.7	High	37.7
7	OU2-RR-RF1	0.23	62.3	65.3	46.7				3	0.16	58.1	9.99	77.35	1.33	1.20	92.93	1.60	5.77	74.9	83.2	Med	83.2
9																						
10																						
Sum:		1	--	--	--	--	--	--	21	1.00	261.2	184.56	1429.62	5.47	NA	14111.54	54.03	106.56	572.3	725.7	High	725.7

df by Welch-Satterthwaite approximation:	2.1
--	-----

Recommended UCL:	725.7 mg/kg	>> Chebyshev 95% UCL
-------------------------	--------------------	----------------------

Note: Chebyshev 95% UCL is recommended because the dispersion of the data is elevated.

*Student's t UCL is acceptable if adj'd CV for DU is "Low" (e.g., CVs 1.5). The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.

Notes

adj'd	= adjusted	df	= degrees of freedom	SD	= arithmetic standard deviation
calc'd	= calculated	DU	= decision unit	SE	= standard error
CV	= coefficient of variation	RSD	= relative standard deviation	95% UCL	= 95% upper confidence limit for arithmetic mean

Appendix D.2

Blood Lead Model Outputs

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Table D.2.1 IEUBK Model for Current Child Trespasser

LEAD MODEL FOR WINDOWS Version 2.0

These IEUBK Model results are valid as long as they were produced with an official, unmodified version of the IEUBK Model with a software certificate.

While IEUBK Model output is generally written with three digits to the right of the decimal point, the true precision of the output is strongly influenced by least precise input values.

=====

Model Version: 2.0 Build1

User Name:

Date:

Site Name: North Ridge Estates OU2

Operable Unit: OU2-RR-BB2, <2 mm fraction

Run Mode: Research

=====

***** Air *****

Indoor Air Pb Concentration: 30.000 percent of outdoor.

Other Air Parameters:

Month	Time Outdoors (hours)	Ventilation Rate (m ³ /day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m ³)
6-12	1.000	3.216	32.000	0.100
12-24	2.000	4.970	32.000	0.100
24-36	3.000	6.086	32.000	0.100
36-48	4.000	6.954	32.000	0.100
48-60	4.000	7.682	32.000	0.100
60-72	4.000	8.318	32.000	0.100
72-84	4.000	8.887	32.000	0.100

***** Diet *****

Month	Diet Intake(µg/day)
6-12	2.660
12-24	5.030
24-36	5.210
36-48	5.380
48-60	5.640
60-72	6.040
72-84	5.950

***** Drinking Water *****

Water Consumption:

Month	Water (L/day)
6-12	0.400
12-24	0.430
24-36	0.510
36-48	0.540
48-60	0.570
60-72	0.600
72-84	0.630

Drinking Water Concentration: 0.900 µg Pb/L

***** Soil & Dust *****

Multiple Source Analysis Used

Average multiple source concentration: 322.900 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700

Outdoor airborne lead to indoor household dust lead concentration: 100.000

Use alternate indoor dust Pb sources? No

Month	Soil (µg Pb/g)	House Dust (µg Pb/g)
6-12	447.000	322.900
12-24	447.000	322.900
24-36	447.000	322.900
36-48	447.000	322.900
48-60	447.000	322.900
60-72	447.000	322.900
72-84	447.000	322.900

******* Alternate Intake *******

Month	Alternate (µg Pb/day)
6-12	0.000
12-24	0.000
24-36	0.000
36-48	0.000
48-60	0.000
60-72	0.000
72-84	0.000

******* Maternal Contribution: Infant Model *******

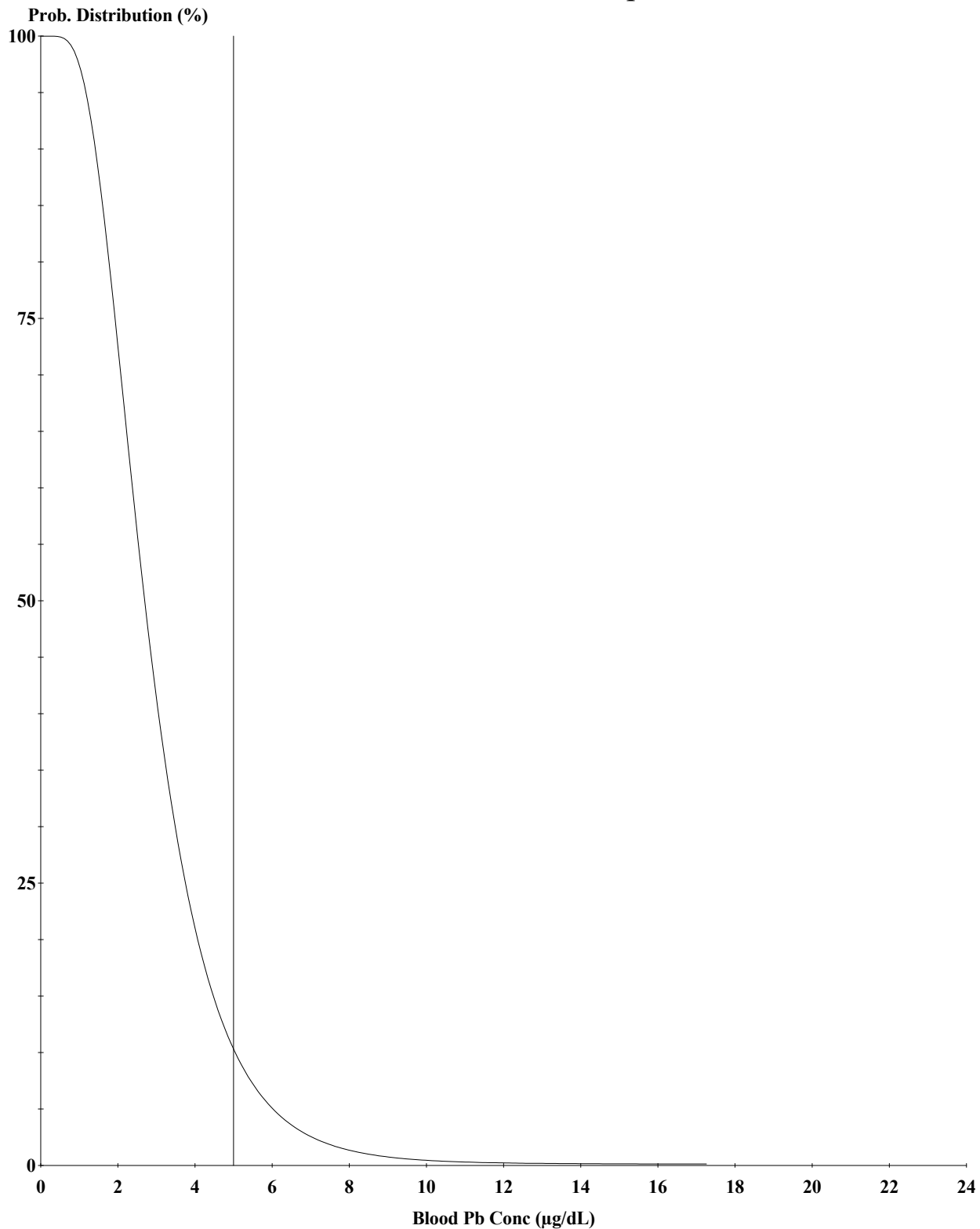
Maternal Blood Concentration: 0.600 µg Pb/dL

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

Month	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
6-12	0.034	1.224	0.000	0.166
12-24	0.057	2.325	0.000	0.179
24-36	0.075	2.466	0.000	0.217
36-48	0.093	2.569	0.000	0.232
48-60	0.102	2.704	0.000	0.246
60-72	0.111	2.921	0.000	0.261
72-84	0.118	2.883	0.000	0.275

Month	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
6-12	5.847	7.271	3.9
12-24	6.419	8.980	3.8
24-36	4.684	7.443	3.0
36-48	4.444	7.338	2.6
48-60	4.744	7.796	2.5
60-72	3.714	7.007	2.3
72-84	3.936	7.212	2.1

OU2-RR-BB2, <2 mm fraction
Current Child Trespasser



Cutoff = 5.000 µg/dl
Geo Mean = 2.823
GSD = 1.600
% Above = 11.198

Age Range = 12 to 72 months

Run Mode = Research

These IEUBK Model results are valid as long as they were produced with an official, unmodified version of the IEUBK Model with a software. While IEUBK Model output is generally written with three digits to the right of the decimal point, the true precision of the output is strong.

Table D.2.2
Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
Future Worker Exposure

Edit Red Cells

Variable	Description of Variable	Units	GSD _I and PbB ₀ from Analysis of NHANES 2009-2014
PbS	Soil lead concentration	µg/q or ppm	447
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4
GSD _I	Geometric standard deviation PbB	--	1.8
PbB ₀	Baseline PbB	µg/dL	0.6
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
IR _{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W _S	Weighting factor; fraction of IR _{S+D} ingested as outdoor soil	--	--
K _{SD}	Mass fraction of soil in dust	--	--
AF _{S, D}	Absorption fraction (same for soil and dust)	--	0.078
EF _{S, D}	Exposure frequency (same for soil and dust)	days/yr	219
AT _{S, D}	Averaging time (same for soil and dust)	days/yr	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	1.0
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.4
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.2%

Version date 06/14/2017

Note:

1) Absorption fraction (AF) is site-specific value based upon RBA of 39%.

Table D.2.3 IEUBK Model for Future Child Receptors**LEAD MODEL FOR WINDOWS Version 2.0**

These IEUBK Model results are valid as long as they were produced with an official, unmodified version of the IEUBK Model with a software certificate.

While IEUBK Model output is generally written with three digits to the right of the decimal point, the true precision of the output is strongly influenced by least precise input values.

=====

Model Version: 2.0 Build1

User Name:

Date:

Site Name: North Ridge Estates OU2

Operable Unit: OU2-RR-BB2, <0.15 mm fraction

Run Mode: Research

=====

***** Air *****

Indoor Air Pb Concentration: 30.000 percent of outdoor.

Other Air Parameters:

Month	Time Outdoors (hours)	Ventilation Rate (m ³ /day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m ³)
6-12	1.000	3.216	32.000	0.100
12-24	2.000	4.970	32.000	0.100
24-36	3.000	6.086	32.000	0.100
36-48	4.000	6.954	32.000	0.100
48-60	4.000	7.682	32.000	0.100
60-72	4.000	8.318	32.000	0.100
72-84	4.000	8.887	32.000	0.100

***** Diet *****

Month	Diet Intake(µg/day)
6-12	2.660
12-24	5.030
24-36	5.210
36-48	5.380
48-60	5.640
60-72	6.040
72-84	5.950

***** Drinking Water *****

Water Consumption:

Month	Water (L/day)
6-12	0.400
12-24	0.430
24-36	0.510
36-48	0.540
48-60	0.570
60-72	0.600
72-84	0.630

Drinking Water Concentration: 0.900 µg Pb/L

***** Soil & Dust *****

Multiple Source Analysis Used

Average multiple source concentration: 229.100 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700

Outdoor airborne lead to indoor household dust lead concentration: 100.000

Use alternate indoor dust Pb sources? No

Month	Soil (µg Pb/g)	House Dust (µg Pb/g)
6-12	313.000	229.100
12-24	313.000	229.100
24-36	313.000	229.100
36-48	313.000	229.100
48-60	313.000	229.100
60-72	313.000	229.100
72-84	313.000	229.100

******* Alternate Intake *******

Month	Alternate (µg Pb/day)
6-12	0.000
12-24	0.000
24-36	0.000
36-48	0.000
48-60	0.000
60-72	0.000
72-84	0.000

******* Maternal Contribution: Infant Model *******

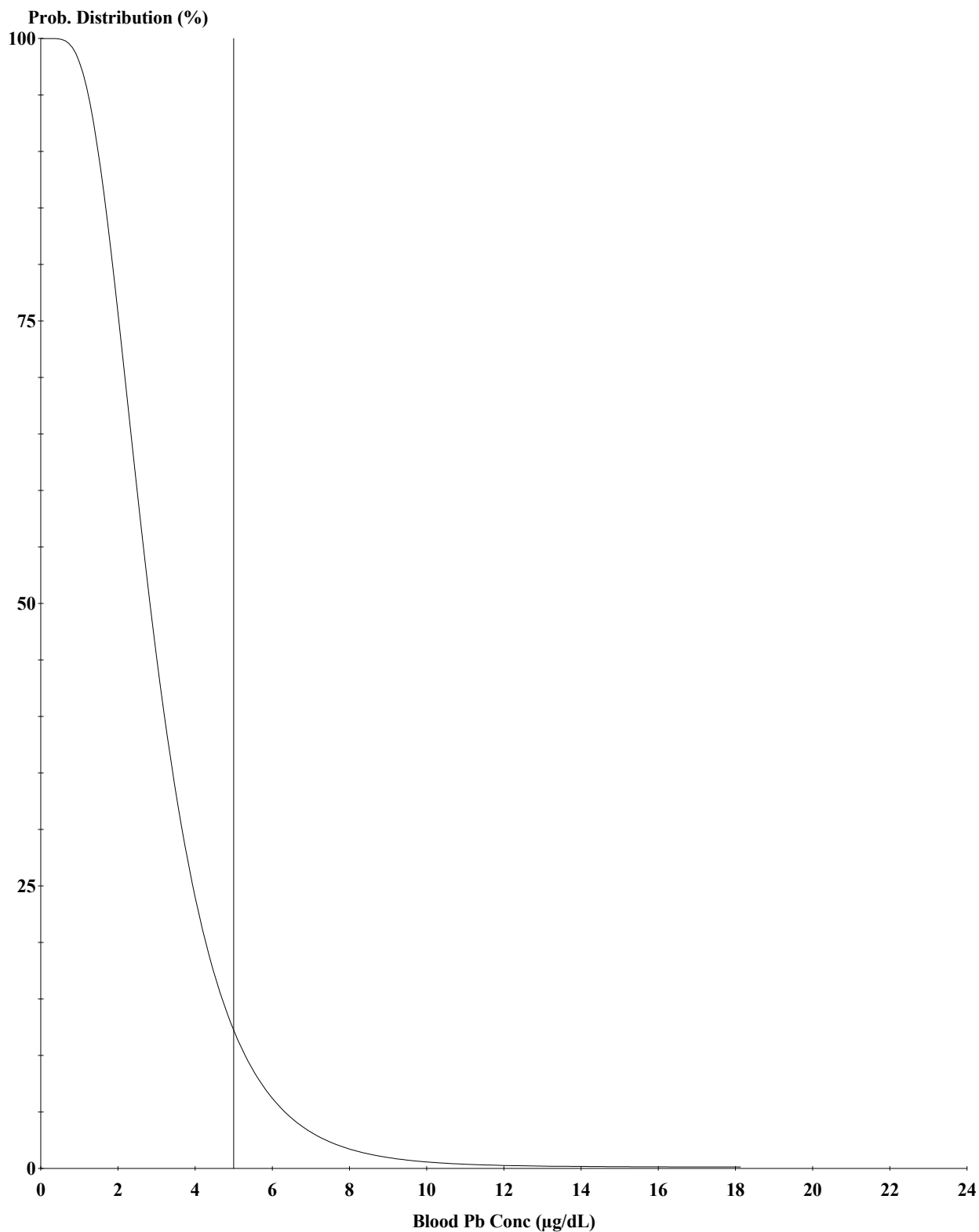
Maternal Blood Concentration: 0.600 µg Pb/dL

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

Month	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
6-12	0.034	1.218	0.000	0.165
12-24	0.057	2.315	0.000	0.178
24-36	0.075	2.459	0.000	0.217
36-48	0.093	2.563	0.000	0.232
48-60	0.102	2.698	0.000	0.245
60-72	0.111	2.916	0.000	0.261
72-84	0.118	2.879	0.000	0.274

Month	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
6-12	6.305	7.721	4.1
12-24	6.927	9.477	4.0
24-36	5.064	7.815	3.1
36-48	4.806	7.694	2.7
48-60	5.132	8.178	2.7
60-72	4.020	7.308	2.4
72-84	4.260	7.532	2.2

OU2-RR-BB2, <0.15 mm fraction
Future Child Trespasser



Cutoff = 5.000 µg/dl
Geo Mean = 2.966
GSD = 1.600
% Above = 13.328

Age Range = 12 to 72 months

Run Mode = Research

These IEUBK Model results are valid as long as they were produced with an official, unmodified version of the IEUBK Model with a software. While IEUBK Model output is generally written with three digits to the right of the decimal point, the true precision of the output is strong.

Find Soil Pb Concentration
×

Select Age Group for Graph

12 to 72 months

▼

Find

Cancel

Help?

Parameter Change

Change Cutoff

5

µg/dl

Change GSD (Geometric Standard Deviation)

1.6

Probability of Exceeding the Cutoff (PC)

5

%

Please note

Depending on the values entered, calculating the PRG may take a few moments.

Soil and/or Dust Concentration

311

PPM

Table D.2.4 IEUBK Soil Lead PRG calculation