FINAL Site Inspection Report Big Blue Mill Site

Kern County, California

June 2021

Prepared By:



Prepared for:

United States Department of Agriculture Forest Service Southern California Service Area 1839 South Newcomb Street Porterville, California

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ACRONYMS AND ABBREVIATIONS

ABA Acid-Base Accounting
AGP Acid-Generation Potential
amsl Above Mean Seal Level
ANP Acid-Neutralization Potential

AOC Area of Concern BC BC Laboratories

bgs Below Ground Surface

BLM Bureau of Land Management

CCR Resource Conservation and Recovery Act
CDFG California Department of Fish and Game

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

cfs Cubic Feet per Second
COC Chemical of Concern
C-O-C Chain-of-Custody

COPC Chemical of Potential Concern

COPEC Chemical of Potential Ecological Concern

CNPS California Native Plant Society

CTR California Toxics Rule
DI Deionized Water

DTSC Department of Toxic Substances Control

DQO Data Quality Objective ECM ECM Consultants

Eco-SSL Ecological Screening Level (EPA)

EPA United States Environmental Protection Agency

EPC Exposure Point Concentration
ESV Ecological Screening Value

°F Degrees Fahrenheit

GPS Global Positioning System

ID Identification

IPaC Information, Planning, and Conservation

IVBA In vitro bioaccessibility

LANL Los Alamos National Laboratories
MCL Maximum Contaminant Level

MDL Method Detection Limit

µg/L micrograms per liter

mg/kg milligrams per kilogram

mg/L milligrams per liter

MVA Mercury Vapor Analyzer
mya Millions of Years Ago
NCP National Contingency Plan

NIOSH National Institute for Occupational Safety and Health

NNP Net Neutralization Potential

ORNL Oak Ridge National Laboratories
PAH Polycyclic Aromatic Hydrocarbon

PEL Permissible Exposure Limit

% percent

PRP Potential Responsible Party

ppm Parts Per Million PWP Project Work Plan

PQL Practical Quantitation Limit

QA Quality Assurance
QC Quality Control

RBA Relative Bioavailability

RBSL Risk-Based Screening Level

RCRA Resource Conservation and Recovery Act

RSL Regional Screening Level
RPD Relative Percent Difference
SAP Sampling and Analysis Plan

SCEM Site Conceptual Exposure Model

SI Site Inspection

SRA Streamline Risk Assessment SRM Standard Reference Material

SSL Soil Screening Level

STLC Soluble Threshold Limit Concentration
TCLP Toxicity Characteristic Leaching Procedure

TTLC Total Threshold Limit Concentration

UCL Upper Confidence Level

USACE United States Army Corps of Engineers

USFS United States Department of Agriculture, Forest Service

UTL Upper Tolerance Limit

VOA Volatile Organic Analysis

VOC Volatile Organic Compound

XRF X-ray Fluorescence
WET Waste Extraction Test

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1 INTRODUCTION

On behalf of the United States Department of Agriculture, Forest Service (USFS), ECM Consultants (ECM) prepared this Site Inspection (SI) Report for the Big Blue Mill site on the Sequoia National Forest, Kern County, California (**Figure 1**). The site is under the jurisdiction of the USFS Kern River Ranger District. The SI was performed to determine the nature and extent of soil contamination, including an estimate of volumes and quantities, on behalf of the USFS under its delegated Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) lead agency authority as specified by work elements for Activity 1, Task 1 of the USFS Region 5 CERCLA Environmental Response ID/IQ contract (#1291S818D0001 and modifications).

All work was performed in accordance with CERCLA; the National Contingency Plan (NCP), including 40 Code of Federal Regulations (CFR) 300.400 through 300.440 (in particular, 300.410 and 300.415); USFS Order Number 129JGP20F0058 and associated modification requirements; and the following United States Environmental Protection Agency (EPA) guidance documents:

- Improving Site Assessment: Integrating Removal and Remedial Site Evaluations, EPA-540-F-99-006. April 2000a.
- Improving Site Assessment: Combined PA/SI Assessments, EPA-540-F-98-038. October 1999.
- Guidance for Performing Site Inspections (SI) Under CERCLA, EPA-540-R-92-021, Interim Final. September 1992a.

1.1 Project Objectives

Site-specific information and data were collected to satisfy USFS requirements presented in the Project Work Plan (PWP) (ECM, 2020a) and Sampling and Analysis Plan (SAP) (ECM, 2020b). The primary objectives were:

- Assess the general nature of any discolored or variant-textured site tailings or mill
 processing deposits, or indicators of environmental releases or erosion of waste materials
 into nearby soil or surface water.
- Document site accessibility, general topography, access restrictions, nearby structures, evidence of public visitation, remaining mill features, proximity to river features, sensitive environments, and drainage characteristics by collecting Trimble Global Positioning System (GPS) points and developing a photographic log of site features, as well as field notes.
- Collect X-ray fluorescence (XRF) and laboratory surface and near-surface samples of soil
 and waste material to establish background and evaluate the distribution of metals on
 USFS-administered land and determine whether contamination is present up to the private
 property boundary and likely extends onto private property.
- Assess surface water and sediment impacts in the North Fork Kern River.
- Provide USFS with sufficient information to characterize the nature and extent of contamination.
- Estimate the volumes of impacted soil/waste.
- Assess whether mercury vapor emissions are present given the proximity to residences.
- Analyze bioavailability of chemicals of concern (COCs).
- Analyze metals leachability to evaluate threat to surface water and support California mining waste classification.

- Determine whether industrial activities have impacted the Site with volatile organic compounds (VOCs) and semivolatile organic compounds (polycyclic aromatic hydrocarbons [PAHs]).
- Develop a site Conceptual Exposure Model (SCEM) that illustrates potential receptors and exposure pathways.
- Develop a Streamlined Risk Assessment (SRA) to characterize risk and hazards to Residents, Recreational Visitors, and ecological receptors.
- Evaluate the need for further study and recommend an approach that is consistent with CERCLA.

2 SITE BACKGROUND

2.1 Location

The Big Blue Mine site is approximately 2 miles south of the town of Kernville, California (**Figure 1**), and is about 4.1 acres in size. The former mills lie directly on the western bank of the North Fork Kern River in the northeast ¼ of Section 27, Township 25 South, Range 33 East. The North Fork Kern River is a tributary feeding into the head of Lake Isabella.

2.2 Current Conditions

Figure 2 depicts the approximate site boundary (pink dashed line), residences, mill foundation area, floodplain, shoreline, and downriver sand bar along the North Fork Kern River. The only physical evidence at the site of the former mill structures are concrete foundations and retaining walls, which were recorded during field activities in October 2020. Approximate locations of additional buildings associated with the mill complex estimated from an undated survey drawing of Kernville and surrounding area from Kern County Engineering, Surveying, and Permits Services are shown on **Figure 2** for reference. Copies of the historical drawings and aerial photographs provided by USFS and referenced in the potential responsible party (PRP) search report for the site are presented in **Appendix A**.

Tailings and mineral processing wastes from former mill operations are prominent along a section of the river shoreline. These are evidenced by very fine brown materials, rust colored formations, and white powdery and large clast deposits. Metals contamination is associated with an area of cemented tailings deposited along the riverbank from the mill foundation downriver approximately 300 feet. There is evidence that recreational visitors use the site for dumping. Modern trash was found mixed with remnants of the historic mining structures.

The Kern River is a popular rafting and fishing corridor, and a worn fisherman's trail runs parallel to the river along the shoreline. The former mill site is also used as a rest area for those rafting on the river. The west bank of the North Fork Kern River near the former site is heavily eroded, although pockets of tailings remain. The North Fork Kern River is the dominant riverine system in the project area. The river has a defined bed and bank, with sediment-deposited sand bars and a developing riparian community. Near the confluence with Isabella Lake, the North Fork Kern River is braided, with intermittent freshwater emergent and forested/shrub wetlands. The area contains driftwood and other river debris that indicate the site is subject to periodic flooding. The floodplain on the north side of the Kern River extends north, northeast, and east of the former mill area.

2.3 Area Population

Based on the 2010 census (American Fact Finder, www.factfinder.census.gov), the total

population of Kern County was 839,631. The populations of the nearest populated areas to the site are listed below:

- Kernville population of 1,395 (2 miles north)
- Wofford Heights population of 2,200 (2.2 miles southwest)
- Bakersfield population of 347,483 (50 miles southwest)

The locations of the Big Blue Mine, the mill site, and Kernville and Wofford Heights population centers are shown on **Figure 1**. Kernville, the closest population center to the site, has a population density of 613 people per square mile (City Data, www.city-data.com). The nearest city with a population greater than Bakersfield is Los Angeles, California, located approximately 170 miles south.

2.4 Site History

The Big Blue Mill site, also referred to as the "Sumner Mill" in some historical reports, is a former gold ore processing facility dating to the mid-1860s. The former mill site is associated with the nearby historic Big Blue and Sumner group of mines, which were part of the Cove Mining District. The mines are located southwest of the site on the west side of the Kern River Valley. The September 15, 1896, Thirteenth Report of the State Mineralogist (for the California State Mining Bureau), indicates there were multiple mining claims associated with the mill site, including the Big Blue, Commonwealth, Content, Nelly Dent, Nelly Dent Extension, Sumner, and Sumner 5 Extensions. According to the January 1940, Volume 36, California Journal of Mines and Geology, the gold vein mined by these operations was first discovered in 1860. Historical records from the California State Division of Mines indicate at least four different mineral processing operations were conducted: a 16-stamp mill from approximately 1867 through the mid-1870s, an 80-stamp mill from 1875 through 1883, a 10-stamp mill from approximately 1901 through 1932, and a 150ton flotation plant and ball mill from 1934 to 1943. Records stated that the 80-stamp mill was the largest of its kind at the time. Historical drawings and aerial photographs of the site provided by USFS were used to approximate the locations of historical buildings identified with the Big Blue Mill. Some of the drawings included cadastral information for reference; however, the historical records do not include scaled drawings or geo-referenced locations, resulting in uncertainty regarding the actual locations of the mill facilities and associated operations buildings (Appendix **A**).

According to several Annual Reports of the State Mineralogist, up until the 1930s, tailings and other materials from the mill operations were dumped into the North Fork Kern River and most washed down stream. After the flotation plant and ball mill was installed at the site (1934 30th Annual Report of the State Mineralogist), tailings from the processing operations were pumped across the North Fork Kern River and deposited into a tailings pond. Tailings deposits attributed to historical milling operations for the Big Blue Mine on the eastern floodplain are associated with the Kern Floodplain CERCLA site. The Big Blue Mill operated until 1943, when it was shut down during World War II per Order L208 of the War Production Board. The report Mines and Mineral Resources of Kern County, California (California Division of Mines and Geology, 1962) states that Order L208 caused the permanent shutdown of the mine.

In 1948, the U.S. Army Corps of Engineers (USACE) began construction of the Lake Isabella Dam and reservoir project. In 1954, to complete the reservoir project, the USACE acquired all land below elevation 2,617 feet. This included the Big Blue Mill site, which was at a lower elevation than the spillway of Lake Isabella dam. In 1957, the mill was sold at auction, and removed to New Mexico (California Division of Mines and Geology, 1962). In 1991, to ensure ongoing public access to recreational activities along the river, the land was exchanged from the USACE to USFS.

As indicated in the *Removal Preliminary Assessment* (USFS, 2020a), included in **Appendix A**, portable field XRF and confirmatory laboratory data collected by USFS staff during a site reconnaissance in January 2020 revealed arsenic, lead, mercury, and zinc concentrations exceeding background levels in previously unknown mine tailings between occupied single-family housing units and the shoreline of the North Fork Kern River on USFS land. Concentrations of arsenic, lead, and mercury exceeded EPA Regional Screening Levels (RSLs) for potential Residential and Industrial receptors and soil screening levels (SSLs) for Recreational Visitors developed by the Bureau of Land Management (BLM) for metals typically found in soils at Abandoned Mine Lands sites. In accordance with a Time-Critical Removal Action Memorandum (USFS, 2020b) (**Appendix A**), USFS staff implemented institutional controls to restrict public entry to the site and prevent human exposure to elevated concentrations of arsenic, lead, and mercury in soil, waste, and sediments while the USFS conducts additional site investigation activities and related actions needed to implement a response action.

2.5 Surrounding Land Use

The land surrounding the site is used for recreation such as hiking, camping, fishing, rafting, horseback riding, off-road driving, mountain biking, and water activities at Lake Isabella. Rock-climbing, snowmobiling, grazing, and hunting occur within Sequoia National Forest as permitted by the USFS. Site visitors include recreational users, USFS personnel/workers, and nearby residential users. Remnants of the mill foundation and tailings material are found within 100 feet of an occupied residence that was constructed up to the USFS property boundary in the early 2000s and within 500 and 1,000 feet of two additional occupied residences (**Figure 2**). Residents can walk their dogs or hike through this location and access fishing areas along the river. Potential future land uses for the surrounding area include wildlife and recreational uses as allowed by the USFS and Sequoia National Forest policies and procedures.

2.5.1 Wilderness Areas

There are six wilderness areas within Sequoia National Forest that are part of the National Wilderness Preservation System. Some of these extend into neighboring national forests. The Monarch Wilderness is shared with the Sierra National Forest, and the Golden Trout Wilderness and the South Sierra Wilderness are shared with Inyo National Forest. Domeland Wilderness and Kiavah Wilderness extend onto land that is managed by the BLM. Within the Giant Sequoia National Monument are the western third of the Golden Trout Wilderness and the Monarch Wilderness located adjacent to Sequoia and Kings Canyon National Park. The site is not located within wilderness area.

2.5.2 Wild and Scenic Rivers

Over 151 miles of the North and South Forks of the Kern River above Lake Isabella were designated part of the National Wild and Scenic River system in 1987. The Upper Kern River flows between Lake Isabella and the Johnsondale Bridge and is part of the North Fork of the Kern Wild and Scenic River. The upper reaches of the North Fork are remote and accessed only by hiking and horseback. The North Fork upstream of Johnsondale Bridge, which is about 20 miles north of Kernville, was designated a Heritage Trout Stream in 1999. This 4-mile section is a catchand-release wild trout fishery managed under special angling regulations. Deep pools and fast runs characterize this part of the river, which has good trail access. This stream is within the Golden Trout Wilderness in the Sequoia National Forest and Sequoia National Park.

2.6 Beneficial Uses of the Kern River

The Water Quality Control Plan for the Tulare Lake Basin (Tulare Lake Basin Plan) (Central Valley Regional Water Quality Control Board, 2018) has identified the following Designated Uses for the Kern River above Lake Isabella: MUN (municipal and domestic supply, including drinking water supply), POW (hydropower generation), REC-1 (water contact recreation such as swimming and fishing where ingestion of water is reasonably possible, especially for children), REC-2 (noncontact water recreation such as hiking and boating), WARM (warm freshwater habitat), COLD (cold freshwater habitat), WILD (wildlife habitat), RARE (rare, threatened, or endangered species), SPWN (spawning, reproduction, and/or early development), and FRSH (freshwater replenishment).

2.7 Geologic Setting

The site is in the southern part of the Sierra Nevada geomorphic province, which lies between the Basin and Range geomorphic province to the east, the Great Valley to the west, and the Mojave Desert to the south (**Exhibit 1**). The Sierra Nevada forms a mountain chain more than 400 miles long and 60 miles wide. The Sierra Nevada batholith is one of the world's largest and was assembled by multiple intrusive plutonic events, largely during Cretaceous time. Tectonically, the Sierra Nevada has been tilted westward by rapid uplift along the Sierra Nevada Fault Zone, which forms the eastern escarpment and gentle west-sloping foothills.

2.7.1 Regional Geology

The site is in the Kern River Valley within the Sierra Nevada range. The following description of the historical geology of the Sierra Nevada has been excerpted from the Draft Kern River Valley Specific Plan Environmental Impact Report (County of Kern, 2011a). At the outset of its formation, the ancestral Sierra Nevada was a folded range uplifted out of a deep sedimentary marine basin to form mountains only a few thousand feet high. During the 75 million years that followed, they were reduced by erosion to flat land. In Early Triassic time, a series of five deep-seated intrusive periodic pulses started the building of the new Sierra. During each pulse, igneous melts penetrated the thick original sedimentary cover creating zones of metamorphic rocks. At most other places, the melts solidified and crystallized as granitic rocks. In the intervals between pulses, the elevated land was reduced by erosion until some portions were lowered below sea level and sediments were again deposited. The fifth and last pulse of deep-seated igneous activity terminated in Late Cretaceous about 80 million years ago (mya).

Beginning with the Tertiary period, the development of the Sierra Nevada was essentially caused by fault movements. Sediments were deposited along the shoreline of the westerly lying ocean near the present western base of the mountains. At the end of the Miocene Epoch, uplift on the eastern Sierra Nevada fault produced the first tilt toward the west and Mount Whitney was a small hill about 500 feet above a land surface of low relief. Toward the end of the Pliocene, volcanic activity started with the extrusion of lava flows, then through several discontinuous pulses, ultimately ending about the middle of the Pleistocene (1.0 to 1.5 mya), the Sierra Nevada had reached approximately its present elevation.

The Sierra Nevada has an asymmetric form with the crest of the range near the abrupt slope of the eastern face terminated by the Sierra Nevada Fault, which on its downthrown side, shows a vertical displacement of several thousand feet. In contrast, the western flank has a relatively gentle slope. The western slope consists of a series of north-northwest to south-southeast trending crustal blocks limited by faults. One of the most notable of these faults within the Southern Sierra Nevada is the Breckenridge-Kern Canyon Fault. At the western edge of the mountain range, near

the point where the granitic mass becomes overlapped by sediments of the San Joaquin Valley, the upthrown eastern escarpment of the Kern Gorge Fault is exposed intermittently for several miles along its northwesterly trace. No evidence of movement during Holocene time (last 11,000 years) has been noted along this fault. The known active faults in the region are discussed below.

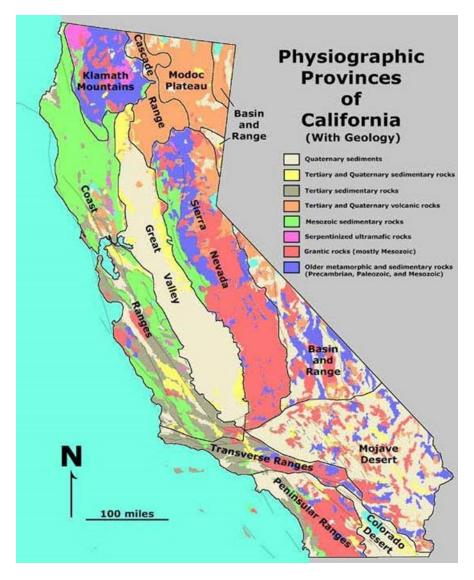


Exhibit 1: Physiographic Provinces of California

The ancestral Sierra Nevada at the time of the Pliocene uplift existed as a low range in the north but a higher range in the south, shown to be about 6,000 to 8,000 feet high in the Tuolumne and San Joaquin River areas and presumably similar or perhaps higher south of there. Remnants of the oldest landscape in the Sierra Nevada are preserved as the plateau in the headwaters of the upper Kern River north of Isabella Reservoir. When the ancestral Kern River and its tributaries had eroded into this old landscape and by the start of the current phase of uplift in the Pliocene, the relief was considerable. In response to the uplift, the Kern River and its tributaries have incised deeper into the range, creating the dramatic inner gorges along the larger water courses.

Superimposed on the uplifted block are relatively minor fault movements that generally occur on ancient major bedrock fault zones, similar to the low activity faults along the Foothills fault system that have been documented in many places in the northern Sierra Nevada. In particular, the overall geomorphology of the area around the Kern Canyon fault indicates active tectonics, but of moderate to low activity. Specifically, the two intermountain basins, South Fork Valley and Walker Basin, and the smaller Havilah Valley, are sediment traps that appear similar to "drowned valleys," filled with sediment accumulations during the Quaternary. Sediments are 1,000 feet or more deep in the South Fork Valley, hundreds of feet deep in the Walker Basin, and less than 100 feet in the Havilah Valley, all fed with sandy gravelly materials by tributaries that were also choked with alluvium. None of the basins have terraces, except the upper part of the South Fork Valley. These basins are bounded on their western outlet sides by mountain fronts and the outlet rivers are incised into narrow canyons on the west side of the Kern Canyon Fault and Breckenridge Fault. These features indicate reactivation of the fault with up-on-the-west displacement in response to the regional uplift of the Sierra Nevada that started about 5 mya. Similarly, but at a much smaller scale, the Kern Canyon Fault between Kernville and the Little Kern River is marked by small alluvial basins along a prominent alignment of hillside saddles on the east side of the Kern Canyon.

The Sierra Nevada is composed primarily of crystalline rocks composed largely of dark hornblende-biotite quartz diorite (a coarse-grained rock closely related to granite), granite, and quartz monzonite of Jurassic or early Cretaceous age, which have been thoroughly metamorphosed to schist, quartzite, and marble.

2.7.2 Local Geology

The rocks in the Isabella Lake area belong to the Sierra Nevada Basement complex and consist of sedimentary rocks that have been metamorphosed during emplacement of the igneous rocks of the Sierra Nevada batholiths (USACE, 2012). The age of the igneous rocks is late Jurassic. In the Kernville area, the igneous rocks are divided into Isabella granodiorite, Sacater quartz diorite, and Summit gabbro. Kern River Granite bounds the Kern Canyon Fault to the east and granodorite of Alta Sierra to the west. Numerous dikes and veins of quartz pegmatite, apatite, and calcite intrude the igneous formations.

The metamorphic rocks have been referred to as the Kernville Series and are interpreted to be undivided pre-Cenozoic metasedimentary and metavolcanic rocks of great variety, mostly slate, quartzite, hornfels, chert, phyllite, mylonite, schist, gneiss, and minor marble (California Geological Survey, 2010). Hydrothermal alteration is prominent along the Kern Canyon Fault Zone with the development of secondary silica and calcite deposits. Nearly vertical and steeply dipping fracture and shear planes developed during deformation, accelerating weathering to great depths. The metamorphic rocks have weathered to a clayey soil with schist fragments. Where schistose structure is present, weathering has further softened and decomposed the underlying schist to considerable depths. Below the zone of weathering, the metamorphic rocks are unweathered and the joint fractures remain close.

Areas in the vicinity of the site contain ultramafic rocks and soils derived from ultramafic rocks, such as serpentine and amphibole. Ultramafic rocks are known to bear naturally occurring asbestos. Naturally occurring asbestos occurs in many forms in a variety of minerals and rocks. Asbestos is a mineral known to cause certain forms of cancer. These minerals are generally ubiquitous in rock in low concentrations. However, these minerals can be concentrated in certain rock types. Asbestos in California is principally associated with the serpentine located in the Coast Ranges and soils derived from the serpentine.

Soil

Site soils are classified as Aquents-Aquolls-Riverwash complex, 0 to 5 percent slopes and Stineway-Kiscove association, 30 to 60 percent slopes (United States Department of Agriculture, Natural Resources Conservation Service, 2021; **Exhibit 2** and **Appendix B**). The area surrounding the site is composed of approximately 40% Aquents and similar soils, 35% Aquolls and similar soils, 15% Riverwash, and 10% minor unspecified components. The Vock and similar soils are alluvial material derived from granite parent rock formed on flood plains, mountain valleys, channels, or depressions. These soils are characterized by a surficial cover of loamy fine sand (0 to 7 inches) that overlies fine sandy loam (7 to 18 inches) and loamy fine sand subsoils to a depth of 18 to 60 inches. These soils are very poorly drained with moderately high to high capacity to transmit water. Runoff is high; however, ponding is frequent. Soils are nonsaline to slightly saline.

The Aquolls and similar soils are alluvial material derived from granitoid parent rock-types. Soils are formed on 0 to 5 percent slopes in flood plains, mountain valleys, and channels. Aquolls soils are very poorly drained, with moderately high to high capacity to transmit water. These soils typically have a 0 to 3-inch surficial cover of silt loam that overlies subsoils consisting of very fine sandy loam to a depth of 12 inches and loamy fine sand from 12 to 60 inches. Runoff is high but ponding is frequent. Soils are nonsaline to slightly saline.

The Riverwash and similar soils are alluvial material derived from granitoid parent rock-types. Soils are formed on 0 to 2 percent slopes in mountain valleys, channels, drainageways. Depth to the water table is 0 to 12 inches. Runoff is high and ponding is occasional.

The northern area of the site includes slopes between 30 to 60 percent. This area is composed of approximately 50% Stineway and similar soils, 30% Kiscove and similar soils, and 20% minor unspecified components. The Stineway and similar soils are residuum weathered from schist and/or residuum weathered from metamorphic rock formed on mountain slopes. These soils are characterized by a 0 to 4-inch surficial cover of very gravelly sandy loam that overlies two horizons (4 to 10 inches and 10 to 13 inches) of very gravelly loam that sits on bedrock that occurs at depths between 13 and 23 inches. These soils are well drained with very low to low capacity to transmit water. Runoff is very high. Ponding does not occur. Soils are nonsaline to very slightly saline.

The Kiscove and similar soils are residuum weathered from metamorphic rock. Soils are formed on 30 to 60 percent slopes mountain slopes. Kiscove soils typically have a 0 to 3-inch surficial cover of gravelly loam that overlies gravelly clay loam to a depth of 9 inches. Weathered bedrock occurs at depths between 9 and 12 inches and bedrock is present between 12 and 22 inches. These soils are well drained, with very low to low capacity to transmit water. Runoff is very high and ponding occurs. Soils are nonsaline to slightly saline.

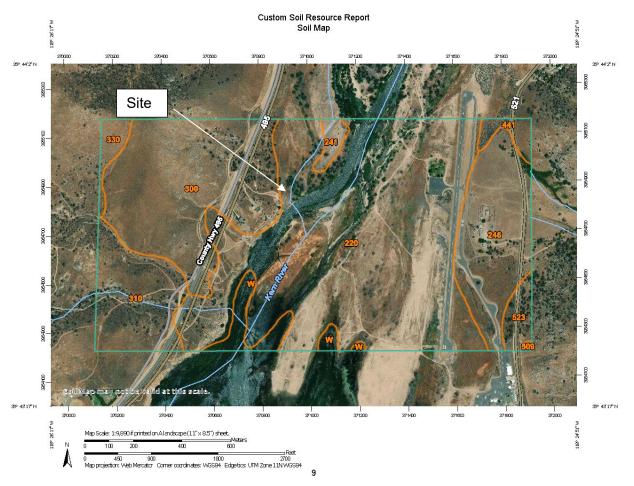


Exhibit 2: Soil Units in the Vicinity of Big Blue Mill

2.7.3 Seismicity

The project area is influenced by active seismic zones (USACE, 2012). The fault classification criteria adopted by the California Geological Survey (formerly the California Division of Mines and Geology) defines Earthquake Fault Zones along active or potentially active faults. An active fault is one that has ruptured during Holocene time (roughly within the last 11,000 years). A fault that has ruptured during the last 1.8 million years (Quaternary time) but has not been proven by direct evidence to have not moved within Holocene time, is considered to be potentially active. A fault that has not moved during both Pleistocene and Holocene time (no movement within the last 1.8 million years) is considered inactive.

The southern Sierra Nevada is bisected by a system of faults that form a zone nearly 100 miles long—the White Wolf Fault Zone, including the Breckenridge fault, to the south of the lake, and the Kern Canyon Fault Zone, which extends through the Isabella Lake Dam site to the north (**Exhibit 3**). Other major active faults in the project's vicinity are the Garlock Fault (50 miles south), the San Andreas Fault (70 miles west), and the Sierra Nevada Fault (60 miles east). **Exhibit 4** indicates the known active and potentially active faults in the general area of the site.

Delano McFarland Ridgecrest Kern River Valley Specific Plan Area Bakersfield Tehachapi Calfornia Cit San Andreas Fau

Exhibit 3: Active Faults in the Vicinity of the Site

After Kern River Valley Specific Plan, 2011a.

Liquefaction of saturated non-cohesive soil due to the build-up of excess pore pressure has been a major cause of damage during past earthquakes. Liquefaction occurs due to a cyclic loading or vibration when an increase of pore fluid pressure in the soil leads to a lower effective confining pressure. The occurrence and severity of this phenomenon depend on many variables, such as the level and the duration of vibration, the relative density or looseness of the soil, previous strain history, grain characteristic, aging under sustained load, lateral earth pressure or stress state of soil elements, over consolidation of soil, and boundary conditions of soil layers. Liquefaction more often occurs in earthquake-prone areas underlain by young alluvium where the groundwater table is less than 50 feet below the ground surface. The site and low-lying areas adjacent to the South Fork of the Kern River and within the Hot Springs Valley have conditions of younger alluvial soils and shallow groundwater, which together have the potential to result in liquefaction during a seismic event.

Exhibit 4: Summary of Faults within 70 Miles of the Site

Fault	Age	Approximate Distance from Site (miles)	Maximum Earthquake Magnitude	Maximum Credible Bedrock Acceleration (g)*		
Active Faults						
Kern Canyon Fault	Holocene	0	7.0	1.11		
Breckenridge Fault	Quaternary	5	7.3	0.63		
White Wolf Fault	Historic	30	7.5	0.22		
Pleito Fault	Holocene	40	7.3	0.22		
Garlock Fault	Holocene	50	7.6	0.28		
Sierra Nevada Fault	Quaternary	60	6.5	0.23		
San Andreas Fault (Mojave Segment)	Historic	70	8.0	0.25		
Potentially Active Faults						
Goat Ranch Fault	N/A	0	N/A	N/A		
Pinyon Peak Fault	N/A	10	N/A	N/A		

Notes:

N/A - Not known

Historic: displacement has occurred within the last 200 years Holocene: displacement has occurred during the past 11,700 years Quaternary: displacement has occurred within the Quaternary (1.8 my)

2.8 Hydrogeology

The site is in the Kern River Valley Groundwater Basin (**Exhibit 5**) in the southern Sierra Nevada Mountains at elevations ranging from 2,500 to 7,100 feet above mean sea level (amsl). It is irregularly shaped, reflecting the drainage pattern of the North and South Forks of the Kern River, Kelso Creek, Tillie Creek, Erskine Creek, and other smaller tributary creeks. The basin is bounded by the Dome Lands Wilderness Area to the north, Piute and Kiavah Mountains to the south and east, and the Greenhorn Mountains and Kern Canyon Fault to the west. The southern portion of the basin is dominated by the Isabella Reservoir, from which the lower Kern River flows towards the San Joaquin Valley.

Groundwater in the Kern River Valley occurs in alluvium, a sedimentary material deposited by rivers and streams that derives from the granite and metamorphic bedrock surrounding the basin (County of Kern, 2011b). Alluvium consists of coarse deposits, such as sand and gravel, and finergrained deposits such as clay and silt. The coarse sand and gravel deposits usually have the best water storage capability and are termed aquifers. The finer-grained clay and silt deposits that have relatively poor water storage capability are called aquitards. Most of the basin is characterized by alluvial aquifers except for aquitards found in the northern and southwestern portions of the Kern River Valley groundwater basin.

^{*} The maximum credible earthquake magnitude and bedrock acceleration are calculated at the Isabella Dam (USACE, 2012).

Groundwater pumped from the basin is the primary water supply source for the Kern River Valley. However, groundwater rights in the Kern River Valley groundwater basin are not adjudicated and there is no established groundwater management plan for the basin. Groundwater producers generally pump as much water needed to meet demands until water levels drop to a point of declining production. Consequently, the Kern River Valley has been subject to various moratoria due to groundwater quality and quantity issues.

Groundwater recharge is defined as the natural or intentional infiltration of water from the surface into groundwater reservoirs. Groundwater recharge in the Kern River Valley occurs through direct precipitation and infiltration along the Valley's margins. Recharge also occurs along the North and South Forks of the Kern River, and along tributaries such as Kelso, Tillie, and Erskine Creeks. A study of the sources of the shallow groundwater in the Hot Springs Valley conducted by the firm KOMEX in 2003 used a chloride mass balance approach to estimate that 7 percent of the average annual precipitation of 13.6 inches per year infiltrates into the groundwater basin. This equates to a groundwater recharge from precipitation on the order of 8,766 acre-feet per year in the vicinity of Lake Isabella (County of Kern, 2011b). Inflows to the groundwater basin may be on the order of 8,000 to 10,000 acre-feet per year on average but may vary significantly with local hydrologic conditions. Existing production could potentially consume most of this inflow, exclusive of other losses from the basin such as evapotranspiration and subsurface outflow.

The groundwater system beneath the area surrounding Lake Isabella has been subdivided into four alluvial groundwater basins as well as a fractured granitic groundwater aquifer that underlies the entire area (County of Kern, 2011b). The alluvial groundwater basins are generally similar in geologic setting and composition. Estimated total volume of groundwater in storage in the vicinity of Lake Isabella is approximately 1,224,300 acre-feet. This estimate does not include the saturated alluvial aquifer of the North and South Forks of the Kern River that is currently submerged beneath the Isabella Reservoir which contains an additional 247,600 acre-feet of storage.

The Big Blue Mill site is in the North Fork of the Kern River Groundwater Basin (5-25; **Exhibit 5**), which follows the trend of the Kern Canyon Fault to the north of Isabella Reservoir (County of Kern, 2011b). The alluvial aquifer material within the North Fork of the Kern River Groundwater Basin is composed of alluvial fan and flood plain deposits from the North Fork of the Kern River and other intermittent streams. The grain size distribution across the basin appears typical for alluvial basins. In general large cobbles and boulders are confined to the edges of the basin with sediments fining toward the middle of the basin. The majority of the sediments in the basin consist of sands and gravels. The estimated average porosity of the alluvium is 30%.

The basin is approximately one-half mile wide to the north of the Kern River Bridge in Kernville and expands to over one mile wide south of the Kern River Bridge downstream until the North Fork of the Kern River drains into Isabella Reservoir. The alluvium is underlain by granitic bedrock and varies in thickness from only a few feet to a maximum thickness of approximately 50 feet in the southern portion of the basin. The depth to groundwater is very shallow throughout the alluvial basin; the thickness of saturated soils north of the Kern River Bridge is estimated to average 10 feet and south of the Kern River Bridge is estimated to average 30 feet. Underflow potentially enters the alluvium beneath the surface water drainages, principally the North and South Forks of the Kern River, as well as from fractured bedrock in the higher elevations of the Sierra Nevada Mountains. Similarly, underflow leaves the area in alluvium, principally the lower Kern River, as well as fractured bedrock at lower elevations of the Sierra Nevada.

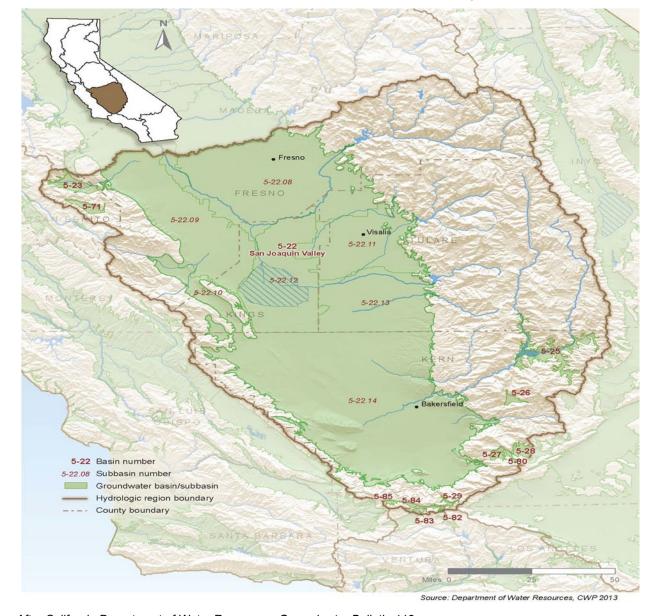


Exhibit 5: Alluvial Groundwater Basins in the Vicinity of the Site

After California Department of Water Resources, Groundwater Bulletin 118.

2.9 Hydrology

The site lies in the Kern River Basin, which contains the North and South Forks of the Kern River (County of Kern, 2011b). **Figure 1** indicates the location of the site at the entrance of the North Fork Kern River into Lake Isabella. Water, sediment, and other materials in the Kern River Valley drain into the Kern River. The drainage area of the Kern River from its headwaters (originating near Mt. Whitney, the tallest peak in California) to Isabella Dam is approximately 2,300 square miles. USACE completed construction of Isabella Dam in 1953 and the Isabella Dam holds Kern River water in what is known as Isabella Reservoir (also referred to as Lake Isabella), a reservoir with a maximum water storage capacity of 568,000 acre-feet (County of Kern, 2011b). The primary purpose of the dam and reservoir is flood control and water supply regulation. The total water storage capacity of Isabella Reservoir is reserved for downstream water rights holders, except for

a 30,000 acre-feet pool. The minimum pool volume cannot be utilized by the downstream water users and must remain in Isabella Reservoir.

The North Fork Kern River begins at over 10,000 feet in elevation along the Kings-Kern Divide, Junction Peak, and Triple Divide Peak, which separate the south-flowing North Fork Kern River from the headwaters of the Kings River and the west-flowing Kaweah River. The North Fork Kern River tributary system flows over 400 miles from its headwaters to Lake Isabella (USFS, 2012).

Water chemistry has pH values from 6.0 to 9.0 in this watershed basin. Temperature ranges from data that was taken at a point during summer months from 6 to 19 °C. Alkalinity values range from 16 to 140 parts per million (ppm). The Upper Kern Basin was rated as a category II in the Unified Watershed Assessment. A category II rating describes watersheds with good water quality that through regular program activities can be sustained and improved. Category II watersheds currently meet clean water and other natural resource goals and standards and support healthy aquatic ecosystems.

2.10 Climate, Vegetation and Wildlife

2.10.1 Climate

The climate in the Upper Kern Watershed of the Tulare Lake Basin is typical Mediterranean with distinct wet and dry seasons. The intensity, duration, and timing of precipitation have the most substantial effect on the area (USACE, 2012). Annual precipitation ranges from 25 to 50 inches with most accumulation as snow in December through March. Snow accumulation averages 100 to 300 inches depending in part on elevation. Snow accumulates from approximately 4,000 feet amsl in elevation and above; then it will fall and stick at lower elevations for one to several days. Substantial rain-on-snow events occur approximately at 10- to 20-year intervals in the south to 20- to 30-year intervals in the north. Late summer thunderstorms with intense rainfall for short durations often cause heavy erosion on potentially hydrophobic soils, due, in part, to dry conditions. In addition, summer thunderstorms associated with lightning are a major source of wildfire ignition. Rainfall at lower elevations is less than at higher elevations due to adiabatic effects. Lower elevations are subject to thick fog layers from November through January affecting air quality at lower elevations more so than at higher elevations due to inversion.

Annual precipitation in the Upper Kern River watershed over the last five years ranged from 15 to 45 inches. Most occurs in the form of rain from January-March, and results in an annual average snowpack of approximately three feet at higher elevations of the watershed. Peak flows for the North Fork Kern River occur in April, May, and June with historic flows being highest in May. Monthly stream flow ranges from 17 to 600 cubic feet per second (cfs) with a mean annual flow of 329 cfs. Recorded peak flows ranged from 22,000 cfs in 1963 to 60,000 cfs in 1969, substantial rain-on-snow events occur roughly on a 10- to 20-year cycle. Major floods occurred in 1951, 1956, 1963, 1967, 1969, 1980, 1982, and 1996. Ambient summer temperatures recorded at District weather stations range from 60-90 degrees Fahrenheit (°F) and winter temperatures from 35-70 °F.

Climate conditions in the vicinity of the site are typified by warm summers and moderately cold winters. Temperatures range from 100 °F or greater during the summer months to as low as subzero temperatures in the winter. Precipitation varies widely, with an annual average of approximately 13.6 inches. Annual precipitation is greatest in the Greenhorn Mountains with an annual average of almost 2 feet. The least amount of precipitation occurs near the eastern side of Lake Isabella with an annual average of 6 inches. Snow is common to the highland areas, but most precipitation falls as rain. The prevailing wind is from the west to southwest. Kernville,

California, receives approximately 13 inches of precipitation a year with the summer (May through October) months being very dry. Temperatures range from an annual high of 77.3°F to an annual low of 45°F (US Climate Data, http://www.usclimatedata.com/climate/kernville/california/unitedstates/usca1430). Much precipitation (approximately 10.9 inches) at the site occurs from November to March; rain in summer is rare.

2.10.2 Vegetation

Lake Isabella and much of the Kern River are in the foothills of Sequoia National Forest. Hydrologic features, such as natural springs, hot springs, tributaries of the Kern River, and the Kern River itself, dominate the surrounding landscape and support extensive areas of riparian and limnetic habitat, as well as some fringing wetland habitat, flanked by upland that is dominated by oak and pine woodlands or patches of sagebrush-scrub uplands. Vegetation present at the site is generally representative of riparian woodland and disturbed herbaceous woody shrub cover with local freshwater emergent wetlands.

<u>Riparian woodlands (Salix gooddingii, Populus fremontii, and S. laevigata Woodland Alliances)</u>

Riparian woodlands are common in the proposed project area upstream of the limnetic zone of Lake Isabella along the North Fork Kern River (**Exhibit 6**). The riparian woodland cover type is dominated by Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), and red willow (*S. laevigata*). Also common in some areas are Pacific willow (*S. lasiandra*), yellow willow (*S. lutea*), narrowleaf willow (*S. exigua*), shining willow (*S. lucida ssp.*), boxelder (*Acer negundo*), California buckeye (*Aesculus californica*), and white alder (*Alnus rhombifolia*) (USACE, 2012). Black elderberry (*Sambucus nigra*) is also found in this vegetation type. Tree canopy height can be up to 80 feet and is open to continuous. Common shrubs in the riparian woodlands include mule-fat (*Baccharis salicifolia*), coyote brush (*B. pilularis*), and redosier dogwood (*Cornus sericea*), which also form an open to continuous cover. The herbaceous layer is variable and is often dominated by primary colonizers such as rough cocklebur (*Xanthium strumarium*), stinging nettle (*Urtica dioica*), goosegrass (*Elusine indica*), common rush (Juncus effusus), common knotweed (*Polygonum lapathifolium*), common plantain (Plantago major), and cress (*Cardamine sp.*) (USACE, 2012).

<u>Sagebrush-scrub upland (Ericameria nauseosa Shrubland Alliance) (Disturbed</u> herbaceous Woody Shrub)

The shrub and herbaceous layers are open to intermittent and host a diversity of species common to grasslands or other upland plant communities, disturbed areas, or riparian buffers. This cover type occurs on upland slopes, valley bottoms, or on terraces with soils that are shallow and moderately to excessively drained (USACE, 2012). The sagebrush-scrub upland cover type is dominated by rubber rabbitbrush with other species including big sagebrush (Artemisia tridentata), yellow rabbitbrush (Chrysothamnus viscidiflorus), Mormon tea, California buckwheat (Eriogonum fasciculatum), western juniper, and antelope bitterbrush (Purshia tridentata); immature junipers or pine may also be present at low cover (USACE, 2012). The shrub canopy is typically less than 10 feet high and is open to continuous (USACE, 2012). The herbaceous layer is sparse or grassy and primarily includes annual grasses and herbs, such as Bromus spp., California poppy (Eschscholzia californica), longbeak stork's bill (Erodium boytrys), red-stemmed filaree (E. cicutarium), perennial goldfields (Lasthenia californica), miniature lupine (Lupinus bicolor), slender oat (Avena barbata), wild oat (A. fatua), mustards (Brassica spp.), owl's-clover (Castilleja exserta), Italian rye grass, and yellow star-thistle (Centaurea solstitialis) (USACE, 2012). Sagebrush-scrub upland is found in all topographic settings, especially in disturbed settings.

2.10.2.1 Wetlands

Within the site area, riverine, freshwater emergent wetlands and freshwater forested/shrub wetlands are present. Dominant forested/shrub and emergent wetlands species may include: *J. balticus, Distichlis spicata* (FACW), *Salix laevigata* (FACW), *Scirpus americanus* (OBL), and *Polygonum lapathifolium* (OBL). *Salix gooddingii* (OBL), *Urtica dioica* (FACW), *Eleocharis macrostachya* (OBL) may also be present. **Exhibit 6** shows the locations of wetlands in the vicinity of the site based on the National Wetlands Inventory (U.S. Fish & Wildlife Service, 2021).

U.S. Fish and Wildlife Service
National Wetlands Inventory

Big Blue Mill Site

L2USCh

Exhibit 6: Wetlands in the Vicinity of the Site

2.10.3 Wildlife

The diversity of habitats around Lake Isabella attracts a variety of wildlife species, including many residents and abundant migrants. The extensive riparian areas found in the deltas of the North Fork Kern River are the most substantial habitat for wildlife found in the vicinity of the lake. These areas host expanses of mature riparian woodland growing in braided stream channels, pools, and wetlands.

Common birds include passerines such as flycatchers, warblers, kinglets, chickadees, thrushes, jays, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. Other common birds are hummingbirds, woodpeckers, water birds, waders, and various raptors such as owls, buteos, and smaller accipiters (USACE, 2012). Wildlife species common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted skunk, raccoon, Virginia

opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and valley garter snake (USACE, 2012). Many invertebrates live on and in the soils of this area and provide the dietary basis for the high densities seen in some wildlife species.

Much of the upland habitat around Isabella Lake hosts species adapted to arid environments. Common reptiles include side-blotched lizard, southern alligator lizard, western fence lizard, California kingsnake, Pacific gopher snake, and Northern Pacific rattlesnake (USACE, 2012). Common upland bird species include California quail, scrub jay, goldfinches, wrentit, and acorn woodpecker. Mammals that are expected to be in the area include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and a diversity of bats. Isabella Lake and the Kern River host a variety of waterfowl, including migratory and resident waterfowl such as American coot, grebes, cormorants, gulls, and waders (USACE, 2012).

The open water of Lake Isabella and the Kern River hosts a variety of aquatic species, including native fishes (*e.g.*, Sacramento pikeminnow, hardhead, Sacramento sucker, Kern River rainbow trout), and introduced fishes (*e.g.* smallmouth bass, rainbow trout, redear sunfish, spotted bass, crappie, bluegill, brown bullhead, brown trout) (**Appendix C**). Lake Isabella has been managed as both a coldwater and warmwater fishery since the 1950s (USACE, 2012).

2.10.3.1 Special Status Species

General information regarding threatened, endangered, or sensitive species potentially present within the Sequoia National Forest and Kern County, California, was obtained via a search of the United States Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation (IPaC) database. The USFWS IPaC database identifies one mammal (fisher), four birds (California condor, least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo), one amphibian (California red-legged frog), and one fish (delta smelt) as federally endangered or threatened species that potentially occur within the project area. Bald eagles and 11 migratory birds of conservation concern could be present. No critical habitat is present on site.

During the preparation of the Isabella Lake Dam Safety Modification Project Environmental Impact Statement (USACE, 2012), 45 special status species (USFWS, USFS, California Department of Fish and Game [CDFG], and California Native Plant Society [CNPS]) with the potential (low, medium, or high) to occur in or near the Isabella Dam Safety Modification Project area were identified. Following the removal of species with low potential for occurrence, the USFS Sequoia National Forest lists five plant species and nine animal species as sensitive within the forest. CNPS lists level 1, 2, and 3 Threat Rank plants near Isabella Lake. CDFG lists two rare and five endangered plant species and six threatened, four endangered, and one fully protected animal species (**Appendix C**). Excerpted information providing more detail regarding special status species that may be found in the vicinity of Lake Isabella is presented in **Appendix C**.

3 SI FIELD INVESTIGATION

Based on the history of the site and the results of screening and sampling conducted during the Removal Preliminary Assessment (USFS, 2020a), USFS determined that potential adverse impacts to human health and the environment would likely result from exposure to elevated metals concentrations in impacted soil/tailings, with potential impacts to river sediment and surface water. USFS identified additional data needs to provide conclusive evidence on which to base further action. ECM completed an SI field investigation to characterize contamination at the site. The following activities were performed:

Characterize the lateral extent of chemicals of potential concern/chemicals of potential ecological concern (COPCs/COPECs) in mill waste using XRF and laboratory data.

- Characterize the vertical extent of COPCs/COPECs in test pits installed in two areas of elevated surface concentrations using XRF and laboratory data.
- Characterize metals in river sediment and surface water at locations upriver, adjacent to the site, and downriver to evaluate impacts from off-site and site sources and assess potential for contaminant migration downriver.
- Refine background concentrations for soil.
- Characterize the fraction of respirable metals in dust.
- Characterize leachability, potential to generate acid mine drainage, and bio-accessibility.
- Conduct air sampling using mercury vapor analyzer (MVA).
- Quantify the amount of material exceeding regulatory criteria.
- Assess risks to human health and the environment.

3.1 Sampling and Analysis Approach

ECM conducted sampling activities from October 19 to 23, 2020, to document current conditions at the Big Blue Mill site and potential impacts related to former operations. Field personnel collected XRF and laboratory samples to characterize contaminants in surface and subsurface soil/mill wastes; dry sediment, including the downriver sand bar; dust/air particulates; surface water; and river sediment. ECM also photographed site features and documented the remains of the former mill foundation and associated structures using the Trimble GPS. Field notes and forms completed during the site visit are presented in **Appendix D**. Photographs documenting site features and showing sampling locations are presented in **Appendix E**. ECM removed and disposed of equipment, personal protective equipment, and unused materials off site. No investigation-derived wastes were generated during the site visit. All sampling activities were performed in accordance with the PWP (ECM, 2020a) and SAP (ECM, 2020b).

Table 1 summarizes the sampling program for the SI. ECM collected metals data from 200 surface samples within the investigation boundary on a 27-foot, on-center grid layout using a Vanta VMR-CXX portable XRF unit. While in the field, the ECM crew relocated select surface sample locations to areas of higher interest identified by USFS to more accurately delineate suspected impacted media. Twenty-eight subsurface soil samples were analyzed at seven locations to characterize the vertical distribution of metals to depths up to 5 feet below ground surface (bgs) and 10 surface samples were collected from downriver locations on a sand bar to evaluate off-site migration of metals. XRF readings of 20 subsamples and one composite sample were collected at a background location upgradient of the site. Laboratory data were collected for correlation with co-located XRF soil/waste samples (21 surface, 5 subsurface, and 1 composite background sample). Laboratory analyses were also performed for four sediment samples and three co-located surface water samples collected from the Kern River. One duplicate sample each was collected for soil/mill waste and surface water. Twelve samples were submitted to evaluate the respirable fraction of metals in dust and the area was screened using a Jerome 431X MVA. Acid-Base Accounting (ABA) (four samples) and Waste Extraction Test (WET) performed with deionized water (DI WET) (three samples) were analyzed to evaluate the potential to generate acid-mine drainage.

Samples were submitted to BC Laboratories (BC) in Bakersfield, California. Soil, sediment, and surface water samples were analyzed for CAM-17 metals using EPA Methods 6010/6020/7471, including total and dissolved fractions of surface water. Four samples were also analyzed for volatile organic compounds (VOCs) using EPA Method 8260B and PAHs using EPA Method

8270C SIM, and two samples (four metals) were evaluated for bio-accessibility using EPA Method 1340. Air samples were analyzed for Total Dust (National Institute for Occupational Safety and Health [NIOSH] 0500), Respirable Dust (NIOSH 0600), and metals (NIOSH 7303). One sample was analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) (EPA Method 1311) for four metals to evaluate off-site disposal alternatives. The laboratory analytical reports and chain-of-custody records (C-O-C) are presented in **Appendix F**.

Tables 2 through **6** summarize the analytical results for metals, PAHs, VOCs, and particulates in environmental media at the site, including background. Concentrations are color-coded to show exceedances of ecological screening levels (green shading), Residential screening criteria (orange shading), and BLM Recreational Visitor SSLs (rose shading). Bolded values identify results that exceed the three-times background screening criteria. **Exhibits 9** through **11** summarize the results for TCLP, ABA/WET, and bio-accessibility analyses.

All sample locations were documented using a Trimble GPS unit with sub-meter accuracy. **Figure 2** shows soil/mill waste, sediment, surface water, and MVA sample locations and corresponding sample identification numbers (IDs). XRF and laboratory data were plotted onto site maps to show the distribution of arsenic, lead, and mercury in surface soil/waste (**Figures 4A** through **4C**) and delineate exposure units for risk assessment.

3.2 Mercury Vapor Analyzer Sampling

Areas with documented XRF mercury readings, such as AOC 3 (process area) and AOC 5 (cemented layered tailings), were field screened within the breathing zone using a Jerome J431-X MVA at the 12 locations shown on **Figure 2**. The MVA did not detect mercury in any sample except BB-MV-11, collected near BB-54. MVA sample results are provided in **Appendix D**.

3.3 Site Survey

Identification and marking the site boundary and visible historical features was performed in two phases of work. The first task involved a boundary survey of the existing property to identify the lateral extent of investigation. The ECM Field Manager directed a survey crew of two licensed surveyors from August 10 to August 13, 2020. The work included locating monuments and placing boundary posts and signs. The data were used to plot the pink hatched investigation boundary shown on the site figures.

During the second mobilization between October 19 and 23, 2020, ECM field personnel documented site accessibility, general topography, access restrictions, nearby structures, evidence of public visitation, remaining mill features, proximity to river features, sensitive environments and drainage characteristics by collecting GPS points and developing a photographic log of site features, as well as field notes. ECM searched the site for remaining mill features and recorded all observed mill foundations and associated retaining walls using GPS with submeter accuracy. Field personnel surveyed the perimeter of each mill foundation and retaining wall by slowly walking the outer boundary while recording the path with GPS. ECM collected georeferenced photographs at each location to document the condition and approximate relative age of the structures. Points of interest such as the fishing platform noted in the PA (USFS, 2020a) were also photographed and located using GPS to show evidence of public access. The mill foundation and wall segments are plotted in **Figure 2**.

3.4 Quality Control XRF Results

XRF samples were analyzed for detector accuracy and reliability. Blanks were collected to ensure that detector drift was minimized. A quality control (QC) sample with known concentrations

provided with the XRF instrument was analyzed to determine relative repeatability of detections. The results are provided below in **Exhibit 7**.

QC results for XRF data collection are summarized in **Exhibit 7** in accordance with the following QC procedure. Prior to the start of XRF monitoring each day, field personnel analyzed a blank standard to identify whether the XRF instrument has any problems with false positives or if there might be contamination on the analysis window or on the detector. Additional readings in the middle of the day after lunch and at the end of the day were also collected as indicated. The resulting data from a blank standard contain only trace amounts of the elements of interest. In addition to blank standard, field personnel analyzed a known standard that includes targeted elements close to the range of the action level and note the accuracy and precision of the result. Results for the analysis of standards throughout the field effort were logged and compared against the certified values of the standard for arsenic, lead and mercury, identified as relevant COPC/COPEC for the project. The XRF was professionally calibrated by Olympus America in accordance with the manufacturer's recommendations. Field personnel collected QC readings against the blank and National Institute of Standards and Technology Standard Reference Material (SRM) 2711A standard.

Sample ID Pb Date As Hg Units ppm ppm ppm BLANK 10/19/2020 0 0 0 BLANK 0 0 10/19/2020 0 BLANK 0 0 10/19/2020 0 0 0 0 BLANK 10/20/2020 0 0 2 **BLANK** 10/21/2020 0 0 0 BLANK 10/22/2020 **BLANK** 3 0 0 10/22/2020 **BLANK** 3 0 0 10/22/2020 2 0 0 **BLANK** 10/23/2020 46 1572 10 SRM2711A 10/19/2020 SRM2711A 1564 11 10/19/2020 38 SRM2711A 10/19/2020 51 1592 3 SRM2711A 10/19/2020 47 1588 3 SRM2711A 10/19/2020 53 1580 12 47 1586 12 SRM2711A 10/20/2020 SRM2711A 10/21/2020 38 1565 10 SRM2711A 10/21/2020 47 1600 11 10/22/2020 38 1561 9 SRM2711A 12 SRM2711A 10/22/2020 38 1578 SRM2711A 10/22/2020 49 1580 10 SRM2711A 10/23/2020 45 1585 12

Exhibit 7. Quality Control XRF Results

3.5 Correlation Between XRF Data and Laboratory Results

A total of 27 confirmation soil samples were collected and submitted to the fixed laboratory for

CAM 17 metals analysis to verify the quality of the XRF data. Per EPA Method 6200 (EPA, 2007) the confirmatory samples were selected from the lower, middle, and upper range of the XRF data. The confirmatory soil samples and XRF results (approximately 12%) were evaluated using a least squares linear regression analysis. **Table G1** summarizes the statistical correlation data between the XRF and laboratory confirmatory samples and correlation graphs are included in **Appendix G**.

Non-detect values were not used in the correlation analysis and individual metals with an incomplete data set were not evaluated. Antimony, arsenic, chromium, copper, lead, mercury, nickel, vanadium, and zinc had a full data set of XRF values and lab values to graph and perform the correlation analysis. The linear correlation coefficient (r) and the coefficient of determination (R²) were used to quantify the accuracy of XRF data compared with laboratory analytical results.

The linear correlation coefficient measures the strength and direction between two variables. The r value is such that $-1 \le r \le +1$, with the plus or minus signs representing positive or negative correlations.

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2}} \sqrt{n(\sum y^2) - (\sum y)^2}$$

Where:

n = number of values or elements

x = XRF value

y = lab value

 $\sum xy$ = Sum of the product of XRF and lab values

 $\sum x$ = Sum of the XRF values

 $\sum y$ = Sum of the lab values

 $\sum x^2$ = Sum of square XRF values

 $\sum y^2$ = Sum of square lab values

Based on 27 XRF and laboratory sample pairs, the calculated r values for antimony, arsenic, chromium, copper, lead, mercury, and zinc were 0.7540, 0.9808, 0.6761, 0.7987, 0.9410, 0.8398, and 0.9411, respectively. Correlation coefficients (r) exceeding approximately 0.7 indicate XRF results for the metal may be used for quantitative evaluation (EPA, 2007). The r values for nickel (0.3416) and vanadium (0.3365) were below 0.7, so these data are considered screening level. Screening level data are useful to delineate areas containing metals at concentrations exceeding screening criteria. Characterization of barium, beryllium, cadmium, cobalt, selenium, and thallium was largely based on laboratory results. The XRF analyzer may not provide reliable concentrations for these metals due to limitations of the instrument, or the sample-specific LODs for a majority of locations may be elevated above screening criteria. Where available, XRF data were used to characterize nature and extent of contamination, since these data were collected from a site-wide grid. Samples from 12% of the XRF locations were submitted for laboratory analysis to provide data used to confirm XRF results and fill data gaps. The laboratory data are limited in extent and may not provide representative concentrations for an investigation area. Uncertainty resulting from use of XRF and laboratory data for nature and extent characterization is discussed in Section 4.6.4.

The R² is a measure of how well the regression line predicts the data.

$$R^2 = 1 - \frac{SS_{err}}{SS_{tot}}$$

Where:

$$SS_{err} = \sum (y_i - f_i)^2$$
 – the sum of squared errors
 $SS_{tot} = \sum (y_i - y)^2$ – the total sum of squares

Regression data were used as a factor to identify COPCs/COPECs for risk assessment (**Section 3.11**). XRF metal R² values exceeding approximately 0.8 (EPA, 1995), as reported for arsenic (0.9621), lead (0.8855), and zinc (0.8858), are considered suitable to support quantitative risk assessment. XRF metals with R² values greater than 0.5 (antimony, chromium, copper, and mercury) may be used for screening level assessment on a case-by-case basis. R² values for cadmium and silver were not calculated due to the high number of sample pairs containing non-detect concentrations. However, detected cadmium and silver values were determined to be suitable as potential screening level COPCs/COPECs. R² values for XRF data sets less than 0.2 (nickel and vanadium) and were not considered for risk assessment. XRF metals identified as quantitative and screening level COPCs/COPECs were evaluated using the same risk assessment procedures. Limitations related to the use of screening level metals for assessment are discussed in **Section 4.6.4**.

All laboratory data were considered valid for quantitative risk assessment purposes. However, these data may not be representative of conditions site wide or over an investigation area since they were only collected from AOCs 4 through 7 and represent a small number of samples (approximately 12% of XRF data). For example, in some AOCs where laboratory data were analyzed, the maximum detected concentrations of metals were used as EPCs due to sample size compared to 95% UCL values calculated for corresponding XRF data collected from a sample grid. Because of the site-wide coverage, nature and extent evaluations and risk characterization were performed using quantitative and screening level XRF data, as available. To fill data gaps and evaluate potential bias in XRF results, the XRF characterization results were also compared to results using laboratory data as confirmation. The text identifies how the XRF and laboratory data supported project objectives.

Potential uncertainties affecting the risk assessment from use of XRF and laboratory data sets are discussed in **Section 4.6.4**.

3.6 Deviations from PWP and SAP

The following deviations to the SAP were noted:

- 1. A single sample was analyzed for TCLP. The laboratory reported insufficient sample volume to perform the TCLP analysis on the second sample submitted due to required volume needed for the other requested analyses.
- 2. No sample for hardness for surface water was requested from the laboratory. A hardness of 100 milligrams per liter (mg/L) was assumed for hardness-dependent metals screening criteria.

3.7 Environmental Media Screening Levels

Soil screening levels (SSLs) are concentrations of chemicals intended to be protective of human health and/or the environment under a defined exposure setting. Screening levels are not cleanup goals and exceedances do not automatically indicate that a response action is warranted. The SI used risk-based screening levels (RBSLs) and other criteria to identify preliminary

COPCs/COPECs for risk assessment and determine whether a release of contaminants to the environment has occurred or is occurring. These criteria were established in the SAP (ECM, 2020b) and are referenced in **Tables 2** through **6**. Site analytical data were compared with the RBSLs to evaluate Residential, Recreational Visitor, and ecological receptor exposures to contaminants identified in site media.

The following human health screening criteria and ecological screening values (ESVs) were identified for soil, sediment, and surface water:

- Soil/Waste/Upland Sediment. Residential exposures to impacted soil/waste and dry sediment deposits for metals, PAHs, and VOCs were evaluated using EPA (2020b) Residential RSLs. For some chemicals, such as arsenic, lead, and mercury (Table 3A), risk assessment guidance provided in Department of Toxic Substances Control (DTSC) Note 3 (2020) provides more conservative SSLs that should be used instead of the EPA RSLs. Recreational Visitor SSLs developed by the BLM (2017) for metals commonly found at abandoned mine land sites were used to evaluate potential exposures to child and adult visitors to the site. ESVs for plants, invertebrates, mammals, and birds were selected from EPA Ecological Soil Screening Levels (Eco-SSLs) (EPA ECOTOX website, 2020a). If an Eco-SSL was not available, peer-reviewed benchmarks from Los Alamos National Laboratory (LANL) ECORISK Database Release 3.2 (2017) or Oak Ridge National Laboratory (ORNL) Toxicological Benchmarks (2018) were selected to evaluate soil impacts. The selected criteria for soil and tailings/waste are shown on Tables 3A and 3B for metals, Table 3C for PAHs, and Table 3D for VOCs.
- <u>River Sediment</u>. Investigation results were compared to EPA RSLs or DTSC Note 3 SSLs (EPA, 2020b; DTSC, 2020) and BLM screening criteria for child/adult Recreational Visitors (BLM, 2017) to evaluate potential impacts to human receptor groups from exposure to metals in river sediment. California has not established numerical benchmarks to evaluate exposure of aquatic organisms to metals in river or stream sediment. Ecological no-effect benchmarks for river sediment were selected from peer-reviewed studies (MacDonald *et al.* [2000], Long *et al.* [1995], and Thompson *et al.* [2005]) to evaluate potential impacts to ecological receptors from exposure to metal contaminants in the Kern River. The selected sediment screening criteria are shown on **Table 4**.
- Surface Water. SI analytical results for metals in samples collected from the Kern River were compared to water quality standards protective of the Kern River above Lake Isabella. Beneficial uses for human and ecological receptors and water quality standards are described in the Tulare Lake Basin Plan (Central Valley Regional Water Quality Control Board, 2018). Designated uses include MUN (municipal and domestic water supply), REC-1 (water contact recreation), REC-2 (noncontact water recreation), and ecological habitat protection. According to USFS, the North Fork Kern River immediately adjacent to the site is only used for recreational purposes. No drinking water intakes are present and water is not used for drinking water along the reach of the river adjacent to the site. Potential water quality standards include California Toxics Rule (CTR) criteria for inland surface waters (human consumption of water and organism and acute/chronic ecological criteria) (EPA, 2000b), and National Recommended Water Quality Criteria (formerly National Ambient Water Quality Criteria) for human consumption of water and organism and acute/chronic ecological exposure (EPA, 2020c). The selected screening criteria are shown on Table 5.
- <u>Air.</u> Exposures to metals in dust/particulates within the breathing zone were evaluated using EPA (2020b) Residential and Industrial RSLs. For some chemicals, screening levels provided in DTSC Note 3 (2020) that were more stringent than the RSLs were used. For

metals, criteria from Table AC-1 Permissible Exposure Limits (PELs) for Chemical Contaminants, including Particulates not otherwise regulated for zinc and respirable and total dust (California Department of Industrial Relations, current version) were considered. The PEL is the 8-hour time-weighted average concentration limit for exposure during a 40-hour work week. Screening criteria for particulates are shown in **Table 6**.

3.7.1 Soil Background Screening Levels

Under CERCLA, concentrations of contaminants below naturally occurring background levels are not generally subject to removal or remedial actions. Historical aerial photographs were reviewed to verify no activity had occurred in the area selected as background. The area was topographically higher than the site, so it appeared to be above the floodplain. Surface soil samples were collected from an area upgradient of the site that appeared visually undisturbed as determined by the appearance and presence of the soil and vegetation. These samples were analyzed to establish background concentrations of metals in soil for comparison to site analytical data (such as impacted soil/tailings) to determine whether a release has occurred and delineate areas of impact.

Three-times background screening criteria were developed using the site-specific background concentrations in surface soil. In accordance with EPA guidance (EPA, 1995), a release at the site is documented when a hazardous substance (e.g., a metal such as mercury potentially associated with processing gold ore) was detected at a concentration equal to, or greater than, three times the background concentration, and the release was at least partially attributable to the site under investigation. If an analyte was not detected in background samples, then a release was established when the reported concentration was equal to or exceeded the detection limit (40 Code of Federal Regulations [CFR] Part 300, Appendix A, Table 2-3). The results of the background characterization and release evaluation are presented in **Section 3.8** and **Section 3.9**, respectively. Exceedances of background screening criteria do not automatically indicate that a response action is warranted because the concentration may not exceed a RBSL for that chemical.

3.8 Background Characterization

Site-specific background concentrations for metals in soil were established by analyzing a composite sample collected northwest of the site, about 100 feet below Highway 495 (**Figure 2**). Twenty-four subsamples were screened in the field using the XRF instrument before compositing. Four of the subsamples, BB-B-01, BB-B-02, BB-B-03, and BB-B-04, were not included in the composite sample. Subsamples BB-B-01 and BB-B-02 contained elevated arsenic concentrations indicating potential impacts due to former operations, and subsamples BB-B-03 and BB-B-04 were located topographically higher and in disturbed soil not similar to the site conditions. The resulting 20-point composite sample was screened using XRF and submitted to BC in Bakersfield, California, for analysis of CAM-17 metals using EPA Methods 6010/6020/7471. **Table 2** summarizes the background concentrations established for the SI using XRF and laboratory analytical data.

3.9 Release Determination

Surface and subsurface site soil data were compared to the three-times background screening criteria identified in Tables **3A** and **3B** using background concentrations summarized in **Table 2**. Bolded values in **Table 3A** for surface soil/waste and **Table 3B** for subsurface samples indicate that the concentrations of several metals exceeded background screening criteria. For the XRF dataset, antimony, arsenic, cadmium, copper, lead, mercury, selenium, silver, and zinc

concentrations exceeded the XRF three-times background criteria in one or more surface samples, indicating a potential release to the environment. Laboratory concentrations of antimony, arsenic, cadmium, copper, lead, mercury, molybdenum, selenium, silver, and zinc also exceeded the laboratory background screening criterion. In subsurface soil/mill waste (**Table 3B**), XRF concentrations of antimony, arsenic, cadmium, lead, mercury, selenium, silver, and zinc exceeded the background screening criteria, indicating a potential release. Laboratory concentrations of antimony, arsenic, cadmium, copper, lead, mercury, molybdenum, selenium, silver, and zinc concentrations in subsurface soil also exceeded the applicable background screening criteria.

3.10 Investigation Areas of Concern

The SI dataset collected by ECM was used to identify source and potential migration areas and characterize the distribution of contaminants. For this objective, the site was divided into seven Areas of Concern (AOCs) (Figure 3) for calculation of exposure point concentrations (EPCs). AOC delineation was based on a weight-of evidence evaluation of factors that include the SCEM; distribution of elevated concentrations of metals in surface and subsurface soil; historical uses of the site; observations of tailings, debris, foundations, and historical walls during site visit; and proximity to site features, source areas, and/or occupied residences. Evaluating the site by AOC provides USFS flexibility in developing a plan to respond to impacted areas. For example, AOCs containing metals at background concentrations may not require cleanup under CERCLA, while those AOCs reporting the highest concentrations of metals may be prioritized for further action. The boundaries of the AOCs are shown on Figure 3.

The following AOCs are identified for the SI:

- AOC 1 Northeastern Floodplain Area. This AOC is located upriver of the former mill
 foundation and incorporates the floodplain on the west bank of the Kern River, northeast
 of the mill process AOC (AOC 3). This area is characterized by metals at concentrations
 generally consistent with background levels.
- AOC 2 North Area. This exposure area is located west of AOC 1 and north and northwest of the mill process AOC. This floodplain area rises in elevation to the west and contains a ditch that traverses the site; the western boundary of this AOC coincides with the sloped area west of the ditch. The AOC was delineated based on the distribution of metals concentrations in floodplain deposit material above background levels. Elevated mercury concentrations and slag remnants along a north-oriented trail extending from the mill process area (AOC 3) may indicate impacts from an unknown gold processing area.
- AOC 3 Mill Process Area. This exposure area contains debris, mill foundations, and
 old retaining wall remnants associated with former operations of the mill facilities. Elevated
 concentrations of arsenic, lead, and mercury likely associated with mill process activities
 are present within this AOC.
- AOC 4 Area Adjacent to Residence. This exposure area is located between the private property boundary and USFS land near the former mill foundation. The AOC contains elevated metals concentrations in surface and subsurface soil near a private residence.
- AOC 5 Cemented Tailings Area. This exposure area is characterized by deposits of
 exposed and buried cemented tailings and extends downriver approximately 300 feet
 along the shoreline from the area downgradient of the former mill foundation to the location
 of sample BB-123. Arsenic, lead, and mercury concentrations in the tailings materials are
 among the highest observed at the site.

- AOC 6 Downriver Distributed Mill Material. This AOC extends downriver from the former mill site but lies north of the cemented tailings deposits that characterize AOC 5. Elevated metals concentrations in impacted soil observed in the AOC may derive from dispersed mill tailings that have been relocated from the former mill site by operational procedures or river processes.
- AOC 7 Downriver Sand Bar. This AOC includes the sediment samples collected from the sand bar downriver of the site. The sand bar is accessible from the north bank of the Kern River but, at times, may be surrounded by river flow. Metals concentrations are generally below background levels in this AOC.

The color that outlines each AOC on **Figures 3**, **4A**, **4B**, and **4C** corresponds to the shading for each AOC used in **Tables 3A** and **3B**.

3.11 Selection of COPCs/COPECs

XRF and laboratory analytical data for soil/waste were evaluated to determine COPCs and COPECs for risk assessment. Due to limitations detecting barium, beryllium, and thallium using the XRF method and potential for sample-specific XRF detection limits to exceed RBSLs for metals such as antimony, cadmium, cobalt, mercury, and silver, both XRF and laboratory data were evaluated for COPC/COPEC selection. XRF data included antimony, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, and zinc. The CAM-17 metals list was analyzed for a small subset of site locations (12% of XRF samples) to confirm the useability of the XRF data. Thallium was not detected in the laboratory samples and was not evaluated. PAHs and VOCs were analyzed at four locations. Additionally, XRF data are not available for the co-located sediment and surface water samples; therefore, laboratory data were used to determine COPCs/COPECs for these media.

The selection criteria for identification of metal, PAH, and VOC COPCs and COPECs for soil/waste in order of application are:

- 1. The number of detections for a metal is greater than 5%;
- 2. The maximum metal concentration exceeds the background screening criterion (3 times background), or method detection limit (MDL), if the analyte was not detected in the background sample; and
- 3. The maximum metal, PAH, or VOC analyte concentration exceeds a human health or ecological screening value.

Tables H1-1 through **H1-5** summarize the COPCs and COPECs for each medium based on the results of the application of the selection criteria to laboratory and XRF data sets, as applicable.

3.11.1 Soil

The maximum analyte concentrations reported for surface soil/waste material were compared to background screening criteria developed for XRF and laboratory metals datasets and the most stringent human health and ecological screening levels for the SI. Screening criteria were the lowest values for Residential exposure selected for metals, PAHs, and VOCs between the EPA RSLs (November 2020) and DTSC Note 3 Residential SSLs (2020) for human health. For ecological exposure, the most stringent ESV for each metal was selected among the four receptor groups (plants, invertebrates, mammals, and birds). Only analytes with a reported detection frequency exceeding 5% were considered.

Five metals were identified as COPCs for the laboratory dataset (antimony, arsenic, cadmium, lead, and mercury) and four metals were identified as COPCs for the XRF dataset (antimony, arsenic, lead, and mercury). Eleven metals were selected as COPECs for laboratory data

(antimony, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, silver, selenium, and zinc) and seven metals were selected as COPECs for the XRF dataset (antimony, arsenic, copper, lead, mercury, silver, and zinc). These metals were retained for further evaluation in the SI and risk assessment (**Section 4.0**).

VOC and PAH concentrations in soil were less than the screening levels for all receptors and these analytes were not retained as either a human health COPC or an ecological COPEC. These constituents were not further evaluated in the risk assessment.

3.11.2 River Sediment

Metals reported in river sediment were compared to screening levels identified for the SI. The human health screening levels were the same as those developed for soil. No-effect screening criteria for aquatic organisms were applied. To evaluate the potential effects of milling activity on sediment quality at the site, samples were collected upriver, immediately adjacent to the site, and downriver (two locations). The upriver sample was used as the background comparison sample to identify COPCs or COPECs in sediment for risk assessment.

Arsenic was identified as a COPC, and arsenic, mercury, and selenium were selected as COPECs. These metals were retained for further evaluation in the SI and risk assessment (**Section 4.0**).

3.11.3 Surface Water

Metals reported in surface water collected from the Kern River were compared to screening levels identified for the SI. The human health and ecological screening levels were developed to protect the beneficial uses and water quality of the Kern River. The most stringent numeric values (human health and aquatic organism) among the potentially applicable water quality standards for each metal were used to identify COPCs and COPECs. To evaluate the potential effects of milling activity on surface water quality at the site, samples were collected at locations upriver, immediately adjacent to the site, and downriver. These samples were co-located with river sediment. The upriver sample was used as the background comparison sample to identify COPCs or COPECs in surface water for risk assessment.

Two COPCs, arsenic and mercury, were retained for further evaluation in the SI and risk assessment. No COPECs were identified.

3.12 Field XRF and Laboratory Metals Sample Results

Data collected during the SI were used to characterize contaminant distribution (**Section 3.13**) and risk (**Section 4**) for site media including (1) surface and subsurface soil, (2) cemented tailings, (3) dispersed tailings, and (4) particulates. The potential for off-site migration was evaluated for river sediment and surface water through comparison of upriver and downriver results. COPCs and COPECs were identified for metals constituents based on comparing site data (maximum concentration for each metal) with background screening criteria and screening levels. The following sections describe the data trends for metal COPCs and COPECs, PAHs, and VOCs in environmental media for the seven soil/tailings AOCs, river sediment, and surface water. Evaluating the site by AOC and medium helps delineate higher and lower areas of risk and determine migration pathways.

The metals background results are summarized in **Table 2**; surface and subsurface metals results are in **Table 3A** and **3B**, **and Tables 3C** and **3D** summarize PAH and VOC data. **Tables 4** and **5** present sediment and surface water results for metals, and **Table 6** summarizes results for particulates. **Exhibits 9**, **10**, and **11** summarize analytical results for ABA/WET, TCLP, and bio-

accessibility. All laboratory analyses were conducted by BC in Bakersfield, California. The laboratory analytical report and C-O-C records are presented in **Appendix F**. The laboratory data quality review is presented in **Section 3.26**.

3.13 Source, Nature, and Extent of Contamination

This section describes the source, nature, and extent of contamination based on SI data. Data summary tables use color and bolding to delineate AOCs and highlight samples with exceedances of background screening criteria, ESVs, and Residential RSLs or Recreational Visitor SSLs. Review of the surface and subsurface soil summary tables (**Tables 3A** and **3B**) identified antimony, arsenic, lead, and mercury as the drivers for site characterization. Antimony, arsenic, and lead concentrations are related to the ore and mining operations, while mercury occurrence is associated with gold processing. These four metals are also COPCs. Other metals are discussed but their distributions are not plotted.

Figures 4A, **4B**, and **4C** illustrate the distribution of arsenic, mercury, and lead using bubble plots. The bubble dot color shown at each sample location corresponds to a concentration range for the respective metal. Green or blue dots show areas where concentrations are below the metal's background concentration, yellow or orange dots mark areas where Residential screening levels are exceeded, and red dots demonstrate areas where concentrations exceed the Recreational Visitor SSLs. The seven AOCs are outlined using colored borders that match the hue used in the summary table to shade the different regions. The use of color facilitates interpretation of site characteristics and trend analysis within and between the AOCs. The following subsections describe the distribution of those CAM-17 metals that were identified as COPCs and/or COPECs.

3.13.1 **Arsenic**

Arsenic is a human health COPC and a COPEC. Arsenic was reported in all surface samples analyzed during the SI. Arsenic detection trends show the most elevated concentrations occur in the mill process area (AOC 3), on USFS land adjacent to the residence that is located closest to the mill foundation (AOC 4), and area containing cemented tailings (AOC 5). The arsenic Residential RSL is 0.11 and the Recreational Visitor SSL is 30.6 mg/kg. The arsenic ESV is 18 mg/kg. Background concentrations determined based on XRF and laboratory analysis were similar (19 and 20 mg/kg). Arsenic concentrations for XRF surface samples are shown on **Figure 4A**.

<u>AOC 3</u>. Arsenic concentrations in the vicinity of the former mill exceeded the Residential RSL in all 25 XRF samples and the Recreational Visitor SSL and ESV in 24 samples. At the former mill foundation, arsenic concentrations were as high as 483 ppm at BB-022. Arsenic concentrations increased to the northwest of the former mill foundation, ranging from 941 ppm at BB-026 and 699 ppm at BB-033, to 1,105 ppm at BB-032 and 1,314 ppm at BB-095, to 2,183 ppm at BB-093. This area of elevated arsenic extends along a pathway into AOC 2 and may indicate the presence of a process area, since mercury concentrations are also elevated. Concentrations decrease to the north and northwest toward the floodplains (toward AOC 2), and northeast (toward AOC 1), but increase to the west near the residence (AOC 4) and within the cemented tailings (AOC 5).

<u>AOC 4</u>. Arsenic concentrations are elevated on USFS land up to the private property boundary west of the former mill foundation. The AOC borders an occupied residence and a former mill building may have been located within 100 feet of the USFS property boundary on what is currently private land. The distribution of elevated arsenic along the western boundary of AOC 4 indicates that the extent of arsenic to the west of AOC 4 is not defined by the private property boundary. Arsenic concentrations exceeded the Recreational Visitor SSL, Residential RSL, and ESV in all 15 XRF samples and both laboratory samples. Arsenic concentrations show an

increasing trend on USFS land between the former mill area and the private property boundary to the west. The highest XRF concentrations are 10,929 ppm at BB-025, 8,226 ppm at BB-106, 4,678 ppm at BB-025-SO-01, and 2,997 ppm at BB-020. Laboratory concentrations ranged from 7,100 to 7,400 mg/kg.

<u>AOC 5</u>. Arsenic concentrations in this AOC are associated with the occurrence of buried and exposed cemented tailings. Concentrations exceeded the Recreational Visitor SSL, Residential RSL, and ESV in all 15 XRF samples and all 8 laboratory samples. The highest concentrations reported at the site are observed in this AOC. The northeast surface extent of the tailings deposit is on the beach immediately downgradient of the mill foundation at BB-023 (31,092 ppm), BB-116 (1,833 ppm), and BB-116-SO-01 (9,270 ppm). The tailings are present downriver along the shoreline as far southwest as BB-123 (27,168 ppm). The highest XRF arsenic concentration in the very fine-grained brown to rust colored cemented tailings deposit described in **Section 2.2** (**Appendix E**, Photo 16) was observed at BB-127 (90,189 ppm). Laboratory concentrations ranged from 1,100 to 88,000 mg/kg. No observable trend in the concentration distribution along the shoreline was evident. This may be due to incomplete exposure or mixing with other material along the bank of the Kern River during high flow events.

<u>AOC 6</u>. Although arsenic concentrations are lower in AOC 6 compared to concentrations reported at bordering AOCs, the distribution of elevated arsenic along the northwestern boundary of AOC 6 indicates that the extent of arsenic is not confined to USFS land. This area contains distributed tailings and mill waste on USFS land downriver of the mill process area and upgradient of the cemented tailings along the shore of the Kern River. The highest concentrations in AOC 6 are within the southwestern portion of the AOC at BB-002 (265 ppm) and BB-005 (369 ppm). Generally, arsenic concentrations decrease downriver with distance from the mill source area. Arsenic concentrations exceed the Residential RSL and Recreational Visitor SSL in the laboratory sample and in 13 of 16 XRF samples. Arsenic exceeded the ESV in three additional samples.

<u>AOC 7</u>. XRF arsenic concentrations in the downriver sand bar within AOC 7 are at or below the XRF background level (19 ppm), ranging from 4 ppm at BB-M1-03 to 26 ppm at BB-M1-09. Laboratory sample results were less than the laboratory background value (20 mg/kg) in the 10 samples within the AOC, ranging from <1.7 mg/kg to 17 mg/kg.

<u>AOC 2</u>. Arsenic concentrations are relatively consistent over most of the floodplain contained within AOC 2. Some isolated areas of higher concentration are observed, such as 249 ppm at BB-124, 297 ppm at BB-107, and 368 ppm at BB-088. A localized area of elevated arsenic is present along the trail that extends north from AOC 3. This area may represent a process area since mercury concentrations are also elevated and the footprint of an historical building may be located here (**Figure 4A**). Arsenic concentrations decrease to the north and northwest of the process area. The remaining arsenic concentrations in this area range from 12 ppm to 200 ppm.

<u>AOC 1</u>. This floodplain area adjacent to the North Fork Kern River contains arsenic concentrations that are consistently below background levels at most surface locations. Concentrations range from 6 to 25 ppm except for location BB-038 (37 ppm) along the North Fork Kern River.

3.13.2 Mercury

Mercury is a human health COPC and a COPEC. The distribution of mercury is shown on **Figure 4B**. Mercury concentrations in surface samples are most elevated in the cemented tailings (AOC 5) and are also elevated in a localized area northwest of the former mill foundation in AOC 3. Isolated occurrences of elevated mercury concentrations are also observed in other AOCs, but no distribution trends were noted. The XRF background concentration of mercury is 3 ppm (at the limit of detection) and the laboratory background is 0.62 mg/kg. The Recreational Visitor SSL is 271 mg/kg, the Residential RSL is 1 ppm, and the ESV is 0.013 mg/kg.

- <u>AOC 5.</u> Elevated XRF mercury concentrations are present in cemented tailings located downgradient of the former mill foundation on the beach (108 ppm at BB-023 and 19 ppm at BB-116) and at isolated downriver locations (BB-127 [1,458 ppm], BB-007 [275 ppm], and BB-123 [693 ppm]). Concentrations at 13 locations exceeded the Residential RSL and the detections at BB-007, BB-123, and BB-127 exceeded the Recreational Visitor SSLs. Concentrations in laboratory samples exceeded the Residential RSL in eight samples and the Recreational Visitor SSL in one sample (BB-123). All detected XRF and laboratory values exceeded the ESV. The cemented tailings contain the highest mercury concentrations on site.
- <u>AOCs 2 and 3.</u> All detected XRF mercury concentrations exceeded the Residential RSL. Concentrations show decreasing trends in AOC 2 toward the north and northeast (approaching AOC 1). Elevated mercury concentrations were observed in the northwest corner of AOC 3 at BB-053 (76 ppm) and BB-054 (47 ppm) with lower concentrations at or near background present to the south.
- <u>AOCs 1, 4, 6, and 7.</u> XRF mercury concentrations (3 to 4 ppm) range from non-detect to concentrations in the range of background in AOCs 1 and 7. Mercury concentrations in AOCs 4 and 6 were slightly higher. The highest concentrations were reported at BB-016 in AOC 4 (16 ppm) and at BB-112 (17 ppm) in AOC 6 (**Figure 4B**). Laboratory results exceeded the Residential RSL at sample BB-M1-03 (4.3 mg/kg) in AOC 7 and samples BB-020 (2 mg/kg) and BB-025 (3 mg/kg) in AOC 4. Laboratory concentrations exceeded the ESV in 17 samples in AOCs 4, 6, and 7.

3.13.3 Lead

Lead is a human health COPC and a COPEC. The distribution of lead concentrations is shown on **Figure 4C**. Lead detection trends in surface soil show concentrations are highest in the cemented tailings (AOC 5), in the area north and northwest of the former mill foundation (AOCs 3 and 2), and on USFS land between the mill foundation and private property boundary (AOC 4). The distribution and trends of elevated lead are similar to those of arsenic. The DTSC Modified Screening Level is 80 mg/kg, the Recreational Visitor SSL is 800 mg/kg, and the ESV is 11 mg/kg, which is below the site background value of 43 mg/kg.

- <u>AOC 5</u>. The highest lead levels were reported at this AOC. XRF concentrations exceeded the Recreational Visitor SSL in 11 samples, the Residential RSL in 3 samples, and the ESV in 14 samples. Lead concentrations in the cemented tailings range from 3,162 ppm (BB-023), 1,002 ppm (BB-116), and 1,229 ppm (BB-116-SO-1) at the northeastern extent of the deposit on the beach downgradient of the mill foundation, to 6,956 ppm downriver of the foundation at BB-018, 1,685 ppm at BB-007, and 1,801 ppm at the southwestern extent of the tailings at BB-123. Laboratory lead concentrations ranged from 66 mg/kg to 13,000 mg/kg and exceeded the Recreational Visitor SSL at seven locations. This AOC contains the highest concentrations of lead reported at the site.
- <u>AOC 4</u>. Lead concentrations increase on USFS land from the mill foundation toward the residence near the private property boundary. Concentrations exceeded the Residential RSL in 8 samples, and the Recreational Visitor SSL at BB-025. The area adjacent to the private property boundary contained elevated XRF lead readings exceeding the Residential RSL at concentrations ranging from 87 ppm at BB-060 to 891 ppm at BB-025. Laboratory lead concentrations were reported at 520 mg/kg and 610 mg/kg at BB-020 and BB-025, above the Residential RSL.
- <u>AOCs 3 and 2</u>. Lead concentrations exceeded the Residential RSL in 18 samples within AOC 2 and 12 samples in AOC 3. Concentrations in all samples exceeded the ESV. Elevated lead concentrations are present at the mill foundation (264 ppm [BB-022]), northeast of the mill foundation (480 ppm at BB-073), and in an area of elevated concentrations northwest of the

former mill foundation including BB-026 (272 ppm) and BB-095 (172 ppm), BB-054 (435 pm), and BB-053 (282 ppm), and extending into AOC 2 at BB-069 (234 ppm) and BB-070 (280 ppm), which are located on either side of the legacy road in the vicinity of the gate posts. Lead concentrations slowly decrease toward AOC 1; however, isolated areas of elevated lead concentrations persist farther north into AOC 2.

AOCs 1, 6, and 7. – Lead concentrations in these areas are generally consistent at concentrations less than background levels and the Residential RSL. XRF lead concentrations at sand bar locations within AOC 7 ranged from 6 to 10 ppm and laboratory concentrations were non-detect, below the ESV of 11 mg/kg. In AOC 6, concentrations ranged from 6 ppm at BB-006 to 56 ppm at BB-112. Lead concentrations in AOC 1 were consistently less than background across the area, ranging from 3 to 21 ppm, and exceeded the ESV in 12 samples.

3.13.4 Antimony

Antimony is a human health COPC and a COPEC. XRF surface sample concentrations exceeded the BLM Recreational Visitor SSL in AOC 4 and the Residential RSL in AOCs 4 and 5 and at isolated locations in AOC 2 and AOC 3. Antimony in laboratory samples exceeded the Residential RSL in AOC 4 and AOC 5. ESV exceedances in XRF surface samples were reported in AOCs 2, 3, 4, and 5. The Residential RSL is 31 ppm and the Recreational Visitor SSL is 782 mg/kg. The ESV is 0.27 mg/kg.

<u>AOC 4</u>. The highest antimony concentrations were observed on USFS land between the private property boundary and the mill foundation area. XRF antimony levels exceeded the Recreational Visitor SSL at BB-020 (8,764 ppm) and BB-106 (1,172 ppm), and the Residential RSL at BB-025 (414 ppm)/step-out sample BB-025-SO-01 (224 ppm), and at BB-055 (142) along the property boundary. ESV exceedances were also reported at BB-079 and BB-058. The laboratory concentrations of antimony confirmed the XRF data in samples BB-020 and BB-025, exceeding the Residential RSL.

<u>AOC 5</u>. Antimony XRF concentrations exceeded the Residential RSL in the cemented tailings located downgradient of the mill foundation on the beach (BB-023 [79 ppm] and BB-116-SO-01 [95 ppm]) and farther downriver at BB-135 (32 ppm) and BB-127 (91 ppm). Antimony also exceeded the ESV in two samples (BB-116 and BB-007). Concentrations of antimony in laboratory confirmation samples exceeded the ESV in all eight samples and the Residential RSL in one sample. Concentrations ranged from 0.83 mg/kg at BB-012 to 74 mg/kg at BB-127.

AOCs 1, 2, 3, 6, and 7. Elevated antimony concentrations exceeding the Residential RSL were reported in AOC 3 at BB-095 (69 ppm) and in AOC 2 at BB-073 (33 ppm). Concentrations in BB-139 (22 ppm), BB-032 (22 ppm), and BB-053 (23 mg/kg) exceeded the ESV. Antimony was not detected in XRF samples in AOC 1, and was reported below the limit of detection in most XRF samples within AOC 2, AOC 3, AOC 6, and AOC 7. Laboratory concentrations in AOC 6 and AOC 7 were at non-detect levels.

3.13.5 **Cadmium**

Cadmium is a human health COPC and a COPEC. The distribution of this metal was evaluated based on laboratory analytical results reported in AOC 4, AOC 5, and AOC 6. XRF results were largely reported below the sample-specific LOD. Cadmium concentrations exceeded the Residential RSL (71 mg/kg) in AOC 5. All detected concentrations within the three AOCs exceeded the ESV (0.36 mg/kg). Cadmium was not detected in samples collected from the downriver sand bar (AOC 7).

AOC 4. Cadmium concentrations exceeded the Residential RSL in samples BB-020 (60 ppm)

and BB-025 (51 ppm). Both concentrations exceeded the ESV.

<u>AOC 5</u>. Cadmium exceeded the Residential RSL in five cemented tailings samples along the beach at concentrations ranging from 91 to 630 mg/kg. The highest concentrations were reported in sample BB-127 (630 ppm) along the trail and in BB-023 (210 ppm) downgradient of the former mill foundation. Cadmium exceeded the ESV in all laboratory samples analyzed in AOC 5.

AOC 6, cadmium exceeded the ESV in the laboratory sample collected at BB-011.

3.13.6 Chromium

Chromium is a COPEC. XRF concentrations exceeded the ESV of 0.4 mg/kg in all seven AOCs. XRF and laboratory chromium concentrations were generally consistent across the site, ranging from not detected to 51 ppm for XRF data. Laboratory concentrations ranged from not detected to 12 mg/kg. Most laboratory concentrations were less than 10 mg/kg for laboratory background. The chromium ESV is likely overly conservative, as it is based on toxicity data for chromium VI, the more toxic form of chromium.

3.13.7 Copper

Copper is a COPEC at the site. Concentrations exceed the ESV of 28 mg/kg in a limited number of samples in AOCs 1 through 6. All but one XRF sample result and two laboratory results are within the range of background concentrations. Concentrations range from non-detect to 88 ppm for XRF data (BB-053 in AOC 3) and from non-detect to 87 ppm in laboratory samples (BB-018 in AOC 5). The lowest concentrations in both XRF and laboratory data were reported in the downriver sand bar deposits (AOC 7). These concentrations ranged from 11 to 23 ppm for XRF results and from 6.1 to 13 mg/kg for laboratory samples.

3.13.8 Molybdenum

Molybdenum is a COPEC. Molybdenum concentrations were generally consistent across the site, ranging from non-detect to 18 ppm. All detected XRF and laboratory concentrations exceeded the ESV of 0.52 mg/kg, and XRF concentrations were within the range of background (18 mg/kg for XRF data). The highest concentrations were reported in cemented tailings in AOC 5. Molybdenum was not detected in the laboratory samples collected from the downriver sand bar.

3.13.9 Selenium

Selenium was identified as a COPEC in laboratory data. Concentrations exceeded the ESV of 0.52 mg/kg in six XRF samples and five laboratory samples collected from AOC 5, AOC 6, and AOC 7. Detected XRF concentrations ranged from 2 to 4 ppm and from 1.6 to 3.9 mg/kg in laboratory samples, with the highest concentration (3.9 mg/kg) reported in AOC 6 at BB-011. No detection trends were observed.

3.13.10 Silver

Silver is a COPEC at the site. Detections exceeded the ESV of 4.2 mg/kg at two locations each in AOC 1 and AOC 2 and three locations each in AOC 3 and AOC 4. Concentrations ranged from 9 to 26 ppm. The highest XRF concentrations were reported in AOC 5, where eight sample concentrations (10 to 190 ppm) exceeded the ESV. The highest concentration was reported in the cemented tailings at BB-127. Laboratory results in AOC 4 exceeded the ESV in two samples (8.5 and 11 mg/kg) and AOC 5 exceeded the ESV in six of eight samples at concentrations ranging from 4.6 to 45 mg/kg.

3.13.11 **Vanadium**

Vanadium was detected in all but three XRF samples at concentrations exceeding the ESV of 2 mg/kg. Detected concentrations across all AOCs ranged from 98 ppm at BB-123 (AOC 5) to 365 ppm at BB-M1-06 (AOC 7). All reported concentrations were below the background screening criterion for vanadium based on XRF data (627 mg/kg). Vanadium concentrations in laboratory samples exceeded the ESV in all samples collected from AOC 4, AOC 5, and AOC 6. Concentrations ranged from 3.3 to 65 mg/kg, below the background screening criterion of 90 mg/kg and were highest in AOC 7.

3.13.12 Zinc

Zinc was identified as a COPEC. Zinc was detected in all XRF samples and exceeded the ESV of 46 in all but nine samples. Detected concentrations were similar across all AOCs and exceeded the background screening criterion in only two samples (BB-016 in AOC 4 and BB-015 in AOC 5). Zinc concentrations in laboratory samples exceeded the ESV in eight of ten samples collected from AOC 4 and AOC 5, and one sample in AOC 7. The concentration reported at BB-025 in AOC 4 (360 mg/kg) exceeded the background screening criterion.

3.14 PAH Results

Soil samples collected at BB-022, BB-043, BB-097, and BB-116-SO-01 were submitted for PAH analyses. Low-level concentrations were reported in all samples (**Table 3C**). The total low molecular weight concentrations ranged from 0.00061 mg/kg (BB-097) to 0.01297 mg/kg (BB-022) and the total high molecular weight concentrations ranged from 0.0111 mg/kg (BB-097) to 0.0734 mg/kg (BB-043). All concentrations were below human health and ecological screening criteria.

3.15 VOC Results

Soil samples collected at BB-022, BB-043, BB-097, and BB-116-SO-01 were submitted for VOC analysis (**Table 3D**). Toluene (0.0014J mg/kg) was reported in sample BB-043. Benzene (0.0011 mg/kg) and toluene (0.0012) were present in sample BB-022. All concentrations were below human health and ecological screening criteria.

3.16 River Sediment Results

Sediment samples were collected upriver (BB-SW-01-SED), adjacent to the site (BB-SW-02-SED), at the sand bar (BB-SW-03-SED), and downriver of the site (BB-M1-SED-01) (**Figure 2**). All samples were taken from dry areas immediately adjacent to the river. Sediment samples were analyzed for CAM-17 metals at BC, located in Bakersfield, California. Arsenic concentrations exceeded the Recreational Visitor SSL in on-site sample BB-SW-02-SED (32 mg/kg), and exceeded the EPA Residential RSL (EPA, 2020b) in upriver sample BB-SW-01-SED (2.7 mg/kg), in downriver sand bar sample BB-SW-03-SED (13 mg/kg), and in downriver sample BB-M1-SED-01 (22 mg/kg) (**Table 4**). Arsenic, mercury, and selenium concentrations exceeded ESVs in on-site sample BB-SW-02-SED, and arsenic and selenium concentrations exceeded ESVs in downriver sand bar sample BB-SW-03-SED. Only arsenic exceeded the ESV in sample BB-M1-SED-01.

With the understanding that the site boundaries are approximate, the upriver sample location appears to be outside the site boundary. Sediment at this location appears related to deposition of material derived from non-site sources during natural river processes. Therefore, the data indicate that metals may have an upriver source. Arsenic is present above screening criteria in

the upriver sample, and although concentrations of barium, chromium, cobalt, copper, nickel, vanadium, and zinc are below screening levels in upriver sample BB-SW-01-SED, concentrations of these metals in this sample are higher than concentrations in on-site sample BB-SW-02-SED and downriver sample BB-SW-03-SED. Mercury and arsenic concentrations decreased downriver compared to the on-site concentrations, indicating off-site migration in sediment is not occurring.

3.17 Surface Water Results

Co-located surface water samples were collected with sediment samples at locations upriver (BB-SW-01), adjacent to (BB-SW-02), and downriver (BB-SW-03) of the site (**Figure 2**). Samples were analyzed for CAM-17 metals at BC, located in Bakersfield, California. **Table 5** summarizes the sampling results for metals and the surface water screening levels for human and ecological receptors. Arsenic, cadmium, lead, and mercury concentrations showed slightly increasing trends downriver compared to upriver levels. Total and dissolved arsenic and mercury concentrations in all samples exceeded the most-stringent human health screening criteria developed for surface water based on current use of the North Fork Kern River, including those collected upriver of the site. No metal concentration exceeded ESVs.

3.18 Particulate Results

Vapor and dust were analyzed to determine the risk posed to humans by milling-related contamination at the site. Metals in respirable dust are typically associated with Industrial Hygiene and worker monitoring samples. To collect data for metals in the respirable dust fraction, ECM personnel wore personal sampling pumps equipped with filter cartridges, while performing sampling activities for at least 2 hours for each sample set. Four samples were submitted for Total Dust (National Institute for Occupational Safety and Health [NIOSH] 0500), Respirable Dust (NIOSH 0600), and metals (NIOSH 7303).

CAM 17 metals, including arsenic, lead, and mercury, were analyzed. Arsenic exceeded industrial particulate screening criteria in samples BB-D-4.1 and BB-D-4.2; lead exceeded residential particulate criteria in sample BB-D-4.2 (**Table 6**). Respirable Dust and Total Dust concentrations were below the California Department of Industrial Relations 8-hour time weighted average PELs.

3.19 Vertical Delineation Metals Results

To evaluate the distribution of metals in soil/waste with depth, subsurface data were evaluated in AOCs 4 and 5 (**Table 3B**). Vertical profiles were sampled at five locations in the cemented tailings at AOC 5 (BB-116/116-SO, BB-123, BB-129, BB-023) and two locations in AOC 4 (BB-025/025-SO) on USFS land adjacent to the residential property boundary west of the former mill foundation.

Results of XRF field screening for arsenic and lead for the samples from the AOC 5 locations indicated:

- Arsenic at BB-116-SO was 9,270 ppm at the surface, 33,372 ppm at 0.5 feet bgs, 15,474 ppm at 1 foot bgs, 6,260 ppm at 1.5 feet bgs, 3,997 ppm at 2 feet bgs, and 5,954 ppm at 2.5 feet bgs. Lead at BB-116-SO was 1,229 ppm at the surface, 2,459 ppm at 0.5 feet bgs, 1,289 ppm at 1 foot bgs, 566 ppm at 1.5 feet bgs, 129 ppm at 2 feet bgs, and 298 ppm at 2.5 feet bgs.
- Arsenic at BB-123 was 27,168 ppm at the surface, 11,670 ppm at 0.5 feet bgs, 5,632 ppm at 1 foot bgs, 1,097 ppm at 2 feet bgs, 1,086 ppm at 3 feet bgs, and 3,186 ppm at 4 feet bgs. Lead at BB-123 was 1,801 ppm at the surface, 1,276 ppm at 0.5 feet bgs, 313 ppm at 1 foot bgs, 38 ppm at 2 feet bgs, 59 ppm at 3 feet bgs, and 62 ppm

at 4 feet bgs.

- Arsenic at BB-129 was 19,793 ppm at the surface, 13,786 ppm at 0.5 feet bgs, 10,103 ppm at 1 foot bgs, 9,430 ppm at 2 feet bgs, 8,493 ppm at 3 feet bgs, 4,822 ppm at 4 feet bgs, and 10,622 ppm at 5 feet bgs. Lead at BB-129 was 874 ppm at the surface, 237 ppm at 0.5 feet bgs, 154 ppm at 1 foot bgs, 50 ppm at 2 feet bgs, 62 ppm at 3 feet bgs, 22 ppm at 4 feet bgs, and 38 ppm at 5 feet bgs.
- Arsenic at BB-023 was 31,092 ppm at the surface, 15,526 ppm at 0.5 feet bgs, 40,262 ppm at 1 foot bgs, 25,511 ppm at 2 feet bgs, 13,761 ppm at 3 feet bgs, 4,647 ppm at 4 feet bgs, and 1,105 ppm at 5 feet bgs. Lead at BB-023 was 3162 ppm at the surface, 884 at 0.5 feet bgs, 2287 ppm at 1 foot bgs, 902 ppm at 2 feet bgs, 375 ppm at 3 feet bgs, 172 ppm at 4 feet bgs, and 24 ppm at 5 feet bgs.

XRF field screening of the samples from the AOC 4 locations indicated:

Arsenic at BB-025 was 10,929 ppm at the surface, 24,390 ppm at 0.5 feet bgs, 3,179 ppm at 1 foot bgs, and 546 ppm at 1.5 feet bgs. Lead at BB-025 was 891 ppm at the surface, 1,757 ppm at 0.5 feet bgs, 131 ppm at 1 foot bgs, and 59 ppm at 1.5 feet bgs.

For AOC 5, arsenic and lead reached maximum concentrations at 1 foot (BB-023), 0.5 foot (BB-116), 0.5 foot (BB-129) and 0.5 feet (BB-123), and then generally decreased with depth (5 feet, 2.5 feet, 5 feet, and 4 feet respectively) since a slight increase was observed in the deepest sample at several locations. Arsenic and lead maximum concentrations occurred at 0.5 feet in BB-025 in AOC 4 and then decreased with depth (1.5 feet). Arsenic concentrations at all depths exceeded the BLM Recreational Visitor SSL and Residential RSL in AOC 4 and AOC 5. Lead concentrations typically exceeded the BLM Recreational Visitor SSL in the upper 0.5 feet. Lead concentrations in cemented mine waste samples near the river (BB-123 and BB-129) exceeded the Residential RSL between 0.5 feet bgs and 1 foot bgs. Samples southeast of the mill foundation (BB-116 and BB-023) exceeded the Residential RSL to depths between 2.5 feet bgs and 4 feet bgs.

Arsenic, chromium, copper, lead, mercury, molybdenum, vanadium, and zinc concentrations exceeded ESVs in samples collected to depths of 5 feet bgs. Antimony, cadmium, and silver concentrations above ESVs were typically reported at depths from 0.5 to 1.5 feet bgs.

3.20 Total Threshold Limit Concentrations

As indicated in **Section 3.13**, ECM sampled tailings and site media to assess the distribution of elevated metals attributed to historical milling activities. Total concentrations of CAM-17 metals were analyzed using EPA Methods 6010B and 6020 and total mercury using EPA Method 7471A. The CAM-17 metals are heavy metals whose Total Threshold Limit Concentrations (TTLCs) are used in California hazardous waste classification by virtue of the total metals concentrations. The TTLCs are listed in California Code of Regulations (CCR) Title 22 Chapter 11, Article 3, Table 2. As shown in **Tables 3A** and **3B**, concentrations of arsenic, cadmium, lead, and mercury exceeding the TTLCs (500 mg/kg, 100 mg/kg, 1,000 mg/kg, and 20 mg/kg, respectively) were reported for laboratory samples collected from cemented tailings in AOC 5 (**Exhibit 8**).

Exhibit 8: TTLC and STLC Results for Select COCs

Sample Date	Sample ID	Location	Depth (ft)	Waste Extraction Test	Arsenic leachate (mg/L)	Arsenic soil (mg/kg)	Cadmium leachate (mg/L)	Cadmium soil (mg/kg)	Lead leachate (mg/L)	Lead soil (mg/kg)	Mercury leachate (mg/L)	Mercury soil (mg/kg)
10/22/20	BB-023-1	Mill foundation	1	Deionized Water Extraction Solution	3.2	52,000	0.041	350	<0.050	2,300	<0.0020	21
10/22/20	BB-025- 0.5	Bench area adjacent to the residence	0.5	Deionized Water Extraction Solution	3.8	26,000	0.045	160	0.0095	1,800	0.020	7.5
10/20/20	BB-123	Cemented mine waste	0	Deionized Water Extraction Solution	17	15,000	0.21	110	0.50	1,200	0.069	350
Soluble Threshold Limit Concentration (STLC) ^{1,2}			5		1		5		5			
Total Thre	shold Limit (Concentration	(TTLC) ¹	,3		500		100		1,000		20

Notes:

mg/kg – milligrams per kilogram

mg/L - milligrams per liter

bold – bold text indicates an exceedance of a regulatory limit

¹ STLC and TTLC are used for California regulated hazardous waste. Source is California Code of Regulations, Title 22, Chapter 11, Article 3

² If a substance is 10 times the STLC value found in the TTLC, the Waste Extraction Test (WET) is indicated. If any substance in the waste extract is equal to or greater than the STLC value, it is considered a hazardous toxic waste.

³ If a substance in a waste is equal to or greater than the TTLC level, it is considered a hazardous toxic waste.

Ordinarily, samples that exceed the TTLCs are defined as a non-Resource Conservation and Recovery Act (RCRA), California-regulated hazardous waste; however, CCR Title 22 exempts mining wastes meeting specified criteria from classification as hazardous wastes. The California Soluble Threshold Limit Concentration (STLC) is required if the TTLC result equals or exceeds STLC by a factor of 10 or more. To evaluate STLC, three representative samples, BB-023-1, BB-025-0.5, and BB-123, were analyzed with the Waste Extraction Test (WET) to compare results to STLC (see **Section 3.21**).

3.21 Acid-Base Accounting/Waste Extraction Test Results

ECM performed ABA analyses on samples with high metals concentrations collected near the mill foundation (BB-023 and BB-116-SO-01-0.5) and from cemented tailings along the North Fork Kern River southwest of the former mill location (BB-123). ABA testing evaluates the amount of acid generating or acid neutralizing potential in a sample as an indication of whether the residual waste material is likely to produce acidic drainage in the environment. ABA analyses involve determinations of the acid-generation potential (AGP) and acid-neutralization potential (ANP) according to EPA method 600/2-078-54. The AGP was evaluated by the modified Sobek method, which provides the sulfur forms (non-extractable, pyritic, and sulfate sulfur) including total sulfide sulfur.

A ratio of ANP to AGP of less than 3 to 1 (<3:1) indicates the waste sample may form an acidic leachate, while a ratio of greater than 3 to 1 (>3:1) conservatively indicates the waste will not form acidic leachate. Interpretation of results is based on the net neutralization potential (NNP). The NNP is equal to the difference between the ANP and AGP:

NNP=ANP-AGP

If this difference results in a positive number, the mine waste is predicted to produce alkaline drainage that is less likely to leach metals. A negative NNP value indicates the waste is potentially acid generating. **Exhibit 9** presents net negative ABA results and an estimated ratio of less than 3:1 for all samples, indicating mill waste is predicted to produce acid drainage that may leach metals from wastes and surrounding soils. A total sulfur content of greater than 0.5% is generally considered indicative of acid generating potential. Although ABA results were slightly negative, total sulfur and slightly negative NNP do not indicate strong evidence for metals leaching.

Exhibit 9: Acid-Base Accounting Analytical Results

Sample ID	Sample Date	AGP tCaCO₃/Kt	ANP tCaCO₃/Kt	ABA tCaCO₃/Kt	Sulfur Sulfide (%)	Sulfur Sulfate (%)	Total Sulfur (%)
BB-023	10/20/20	0.8	<0.3	-0.3	0.03	0.08	0.102
BB-023-1	10/22/20	0.3	<0.3	-0.3	0.01	0.08	0.0902
BB-116-SO-01-	10/22/20	1.5	<0.3	-1.5	0.05	0.16	0.206
0.5							
BB-127	10/20/20	0.4	< 0.3	-0.4	0.01	0.23	0.257

Notes:

tCaCO₃/Kt = tons calcium carbonate per kiloton

ANP = acid-neutralization potential

AGP = acid-generation potential

ABA = acid-base accounting

ABA is ANP – AGP; if the ABA is negative, then the mill waste may produce acid mine drainage.

The DTSC developed the WET method to simulate waste in a landfill setting with simulated landfill leachates. The WET uses a 10-fold dilution of the solid waste versus waste extract fluid, and requires 48 hours to complete the extraction. Typically results of the WET analysis are compared

to California STLC limits to determine if the material is a California hazardous waste. Future evaluation of the results of the WET analysis will enable the USFS to classify mining waste under the California Mining Waste Regulations (Title 27 CCR, Division 2, Subdivision 1, Chapter 7, Subchapter 1, Section 22480). Certain wastes qualify for exclusion as hazardous waste under Title 27 CCR.

When performing the WET method for mining/milling waste, a deionized water (DI) solution is appropriate for any waste with an ANP to AGP ratio of >3:1. Since all ANP results were below the reporting limit (<0.3 tCaCO3/Kt), WET analysis was performed using a DI solution on the 1-foot sample BB-023-1 (arsenic soil concentration of 40,262 mg/kg) near the mill foundation, on the 0.5-foot sample BB-025-0.5 from the bench area adjacent to the residence (arsenic soil concentration of 26,000 mg/kg), and on the surface sample from BB-123 from cemented mine waste. Samples were selected based on TTLC concentrations of arsenic, cadmium, lead, and mercury above 10 times the STLC levels.

The WET results for samples BB-023-1, BB-025-0.5, and BB-123 yielded arsenic concentrations of 3.2 mg/L, 3.8 mg/L, and 17 mg/L, respectively, compared to a STLC of 5 mg/L (**Exhibit 8**). Cadmium results for samples BB-023-1, BB-025-0.5, and BB-123 were 0.041 mg/L, 0.045 mg/L, and 0.21 mg/L, respectively, or less than the STLC of 1 mg/L. Lead and mercury results for samples BB-023-1 (<0.050 mg/L and <0.002 mg/L, respectively), BB-025-0.5 (0.0095 mg/L and 0.020 mg/L, respectively), and BB-123 (0.5 mg/L and 0.069 mg/L, respectively) were also less than the STLC for lead and mercury (5 mg/L).

3.22TCLP Results

TCLP results are used to determine whether the soil would be characterized as a hazardous waste under RCRA, if removed. Arsenic, cadmium, lead, and mercury TCLP concentrations for sample BB-123 collected from cemented mine waste along the North Fork Kern River downriver from the former mill area (soil concentrations 15,000 mg/kg, 110 mg/kg, 1,200 mg/kg, and 350 mg/kg, respectively) were 2.2 mg/L for arsenic, 0.0034 mg/L for cadmium, 0.047 mg/L for lead, and 0.015 mg/L for mercury (**Exhibit 10**). The results did not exceed the RCRA threshold limit concentration of 5 mg/L for arsenic, 1 mg/L for cadmium, 5 mg/L for lead, or 0.2 mg/L for mercury.

TCLP uses an extraction method that simulates leaching through a landfill and can act as a proxy for the process of leaching metals from wastes left onsite. Comparison to water quality criteria may also illustrate the potential for a metal in the waste to generate leachate at concentrations that could impair surface or groundwater quality through overland flow of leachate or leaching to groundwater. Comparison of water quality criteria to the TCLP threshold limit concentration does not consider contaminant fate mechanisms such as dilution and adsorption during contaminant transport.

TCLP extraction results for arsenic, cadmium, lead, and mercury were compared to the surface and groundwater quality criteria protective of beneficial uses specified in the Tulare Lake Basin Plan (Central Valley Water Board, 2018). TCLP concentrations of arsenic and mercury exceeded the EPA National Recommended Water Quality Criteria for human health (**Exhibit 10**). Screening levels for cadmium and lead are not established. Exceedance of a TCLP threshold limit concentration based on comparison to a water quality screening level does not necessarily indicate the need for remedial action. All analytical laboratory reports are presented in **Appendix F**.

Exhibit 10: TCLP Analytical Results

Sample ID	Arsenic mg/L	Cadmium mg/L	Lead mg/L	Mercury mg/L
BB-123	2.2	0.0034J	0.047J	0.015
EPA TCLP Limit	5	1	5	0.2
Screening Level				
EPA Regional Screening Level for Water ¹	0.000018	NE	NE	0.00005

Notes:

mg/L - milligrams per liter

EPA - United States Environmental Protection Agency

NE - not established

3.23 Field Quality Control Samples

To assist with the analytical data review, field duplicate samples were collected and analyzed. Field duplicate samples were collected to determine the degree of mutual agreement between or among independent measurements of a similar property (reported as a standard deviation or relative percent difference [RPD]). An RPD of less than 25% for soil samples, depending upon the chemical being analyzed, is generally acceptable. The equation for calculating RPD is provided below:

3.23.1 Field Duplicate Samples

Duplicate samples were collected to evaluate the precision of the field collection procedures by calculation of an RPD between the original and duplicate samples as described above. One duplicate total and dissolved surface water sample pair, BB-SW-02 and Dup-01, was collected to support the SI field investigation. The duplicate sample was assigned a separate sample identification. The duplicate sample was preserved, packaged, and sealed in the same manner as the other waste source samples collected. The RPD for the duplicate sample was within acceptable ranges with the exception of cadmium.

The RPD values for total antimony (53.3%) and mercury (55.7%) were above 25% RPD. All other pairs for which both samples reported concentrations above the practical quantitation limit (PQL) were at or below 25% RPD.

3.23.2 Rinseate Blank and Trip Blank Samples

Three equipment rinseate blanks were collected during the investigation to evaluate decontamination of reusable equipment. Concentrations of antimony, barium, chromium, copper, and molybdenum were present in the Rinseate-Blank-01 at levels above the MDL but below the PQL. A concentration of mercury (0.26 micrograms per liter [μ g/L]) above the PQL was reported in the rinseate blank. Concentrations of antimony, barium, chromium, copper, mercury, and nickel were present in the Rinseate-Blank-02 at levels above the MDL but below the PQL.

¹ EPA 2020c.

Concentrations of antimony, chromium, copper, and molybdenum were present in the Rinseate-Blank-03 at levels above the MDL but below the PQL. A concentration of barium above the PQL and concentrations of lead and mercury slightly above the PQL were reported in the rinseate blank. Low-level concentrations did not revise concentrations reported in the field samples, since field sample concentrations were greater than 5 times the concentration in the blank sample.

Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. The trip blank consists of a volatile organic analysis (VOA) sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site with the empty VOA vials, handled like an environmental sample, and returned to the laboratory with sample shipment (generally daily) for analysis. Trip blanks are not opened in the field. Since VOC analyses were performed on site samples, one trip blank for VOC analysis was submitted with the site samples. All analyzed VOCs were below their PQL.

3.24 Bioaccessibility and Bioavailability

The bioavailability of metals in soil and, consequently, the corresponding potential for exposure vary widely depending upon the physical, chemical, and biological conditions under which a receptor is exposed. Measurements of the bioavailability of metals, in particular arsenic and lead, have been shown in numerous studies and at many sites to be lower than the default assumption for risk assessment. Therefore, the site-specific bioavailability data provided here are available for future incorporation into a more robust risk assessment than required for the purposes of a SI.

Bioavailability is defined as the fraction of a compound that is ingested, inhaled, or applied on the skin that is actually absorbed and reaches the circulatory system in the body. It is expressed as the ratio of an absorbed dose to an administered dose and is described as "absolute bioavailability." The relative bioavailability of a chemical or metal, defined as the difference in extent of absorption among two or more forms of the same chemical or different vehicles (*i.e.*, food, soil or water), accounts for the differences in the bioavailability of a chemical in soil relative to the dosing medium used in the critical toxicity study. Toxicity tests are usually designed using dosing media with high bioavailability. In contrast, the bioavailability of chemicals in soil can vary depending on several factors, including form of chemical present, physical form in the soil, length of time chemical has been present (*i.e.*, aging and weathering), and soil characteristics.

The EPA recommends that site-specific assessments of soil metals relative bioavailability (RBA) be performed for improving the characterization of risk at the site. RBA is the ratio of the absolute bioavailability of the contaminant in the medium of interest to that of the same contaminant in the medium used to dose the test organism in the oral toxicity studies. EPA has validated an *in vitro* bioaccessibility (IVBA) assay for predicting soil arsenic and lead RBA for use in risk assessment and recommends using the IVBA assay for characterizing site-specific soil arsenic or lead RBA. IVBA results represent the fraction of total amount of metal in a soil sample that is soluble in a low pH extraction medium. RBA is predicted from IVBA using a regression model. The bioavailable arsenic would be calculated by multiplying the appropriate total arsenic concentration by the *in vivo* RBA. This concentration would become the EPC for risk evaluation.

IVBA data for samples from BB-116-SO-01-05 and BB-127 are presented in **Exhibit 11**. The data indicate that arsenic risk and hazard are likely overestimated in the SI SRA, but unacceptable risk would likely remain after adjustment given the high concentrations. For contaminants other than lead, RBA can be used to adjust EPC or daily oral intake for the next phase of CERCLA work at the site. For example, the adjusted EPCs could be used to delineate the extent of arsenic exceeding screening criteria for target populations, refine risk characterization, calculate the arsenic 95-95UTL value to develop cleanup goals, and estimate exceedance volumes for removal or remediation.

Exhibit 11: Bioavailability Results

	Sample ID	BB-116-SO-01-0.5	BB-127
	Sample Date	10/22/20	10/20/20
Metal	Analysis Type	Result	Result
	Total Metal (mg/kg)	76.1	47.8
Antimony	IVBA (mg/kg)	2.06	0.43
	Bioaccessibility (%)	2.7	<1.0
	Total Metal (mg/kg)	35200	58800
Arsenic	IVBA (mg/kg)	1120	109
	Bioaccessibility (%)	3.2	<1.0
	Total Metal (mg/kg)	3220	2250
Lead	IVBA (mg/kg)	510	2080
	Bioaccessibility (%)	15.8	92.4
	Total Metal (mg/kg)	67.6	956
Mercury	IVBA (mg/kg)	<0.40	10.8
•	Bioaccessibility (%)	<1.0	1.1

3.25 Volume Estimates

An initial review of the data indicated impacts to surface soils were primarily from lead, arsenic, and mercury sources. Multiple sources may have impacted site areas, as indicated by the presence of mercury at isolated locations north of the former mill as compared to more extensive lead and arsenic concentrations (**Table 3A**). Because arsenic impacts are more extensive throughout the site as shown in **Figure 5** and include areas of mercury and lead impacts, the volume of material will be defined by concentrations of arsenic above the SSL and background (**Exhibit 12**). Estimated thicknesses were assumed based on field observations and require additional vertical delineation during subsequent field investigations.

Exhibit 12: Estimated Volume of Material Exceeding Screening Levels

Location	Estimated Area of AOC (ft²)	Estimated Upslope Thickness (ft)	Estimate Downslope Thickness (ft)	Average Thickness (ft)	Estimated Volume (ft ³)	Estimated Volume (yd³)
AOC 2	90,400	1	1	1	90,400	3,348
AOC 3	49,973	1	7	4	199,892	7,403
AOC 4	8,669	1	3	2	17,338	642
AOC 5	13,176	1	3	2	26,352	976
AOC 6	8,600	1	1	1	8,600	318

3.26 Laboratory Data Review and Evaluation

ECM reviewed the analytical results to ensure the laboratory met data quality objectives (DQOs) as defined in the project SAP (ECM, 2020b). Analytical data evaluation included sample results/detection limits, quality assurance (QA)/QC sample analyses, and review of qualifiers applied to data by the laboratory. Results were reported on a dry-weight basis. All analyses requested on the C-O-C forms were present in the data packages and copies of the C-O-C records were included in the laboratory data packages. Extraction and holding times were met by the laboratory. The laboratory data package included a case narrative that identified data

qualifiers applicable to the report. The laboratory data package also included information summarizing recoveries for the following analytical QA/QC criteria:

- Method blanks;
- Matrix spike and matrix spike duplicates; and
- Laboratory control sample and laboratory control sample duplicate.

In general, all of the laboratory Measurement Quality Objectives stipulated for the project were met by the data, with specific qualifications as noted in the laboratory reports.

Although some qualifiers were assigned to selected data, the data are considered acceptable for use and satisfy the DQOs described in the SAP (ECM, 2020b).

4 STREAMLINED RISK ASSESSMENT

The SRA evaluates potential risk to ecological and human receptors exposed to site-related contaminants in impacted surface/subsurface soil and tailings, river sediment, and surface water associated with the Big Blue Mill site. The multiple lines-of-evidence approach to characterize contamination and risk incorporates a site-specific risk assessment intended to justify a removal action and develop appropriate alternatives to reduce risk.

The SRA characterized the site using XRF and laboratory data collected during the SI. Screening criteria were selected for human and ecological receptors in the SAP (ECM, 2020b) and are discussed in **Section 3.7**. These screening levels are used to characterize risk and noncancer hazards and support volume estimates and recommendations of the SI.

Following SI data review, the site was divided into seven AOCs to determine impacts to environmental media. Evaluating the site by AOC will help delineate higher and lower areas of risk and determine migration pathways. The potential risks and hazards were evaluated by comparing site-specific metals concentrations to established human health and ecological RBSLs for selected (complete) exposure pathways. PAHs and VOCs were also analyzed but were not identified as COPCs or COPECs.

As detailed in **Section 3.11** and summarized in **Appendix H**, Tables H1-1 and H1-2, antimony, arsenic, cadmium, lead, and mercury were retained as human health soil COPCs based on laboratory results, and antimony, arsenic, lead, and mercury were identified as soil COPCs based on XRF results. Antimony, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, selenium, silver, and zinc were retained as soil COPECs for ecological receptors based on laboratory data. Using XRF results, antimony, arsenic, copper, lead, mercury, silver, and zinc were selected as soil COPECs. For river sediment (**Appendix H**, Table H1-3), arsenic was identified as the human health COPC and arsenic, mercury, and selenium were selected as COPECs. Total arsenic and mercury were identified as human health COPCs in surface water (**Appendix H**, Table H1-5) from exposure to total metals concentrations in river water. No COPECs were identified for ecological receptors exposed to dissolved metals (**Appendix H**, Table H1-4).

The SRA follows generally accepted risk assessment policies, procedures, and guidance. The human health risk assessment was conducted in accordance with EPA guidance documents (1989, 1991a, 1991b, 2004, and 2009); EPA soil screening guidance documents (1996 and 2002b); and EPA background guidance (2002a). The ecological risk assessment was conducted in general conformance with EPA guidance (1997, 1998, 2001, and 2005-2008).

4.1 Exposure Point Concentrations

The risk and hazard characterization of XRF metals within each AOC (EPA, 1992b) is based on

EPCs calculated as the average concentration of each analyte (95% UCL) using ProUCL (EPA, 2015). 95% UCL values were also calculated for laboratory results for AOC 5 and AOC 7. An estimate of the average concentration is used because carcinogenic and chronic non-carcinogenic toxicity criteria are based on lifetime average exposures. In addition, the average concentration is most representative of the concentration that would be contacted by ecological receptors foraging at the site. EPCs for laboratory results at AOC 4 and AOC 6 were the maximum concentration of each metal, since there were an insufficient number of samples to calculate 95% UCLs.

4.2 Updated Site Conceptual Exposure Models

The SI results have been integrated into SCEMs that represent how metals can migrate through various media-related pathways (soil, air, and water) to vulnerable receptors, such as humans or wildlife. The SCEMs describe potential source areas, release and transport mechanisms, and complete and incomplete exposure pathways. They also identify potentially exposed receptors under the current and reasonably anticipated future land uses. **Exhibit 13** outlines the proposed complete exposure pathways for adult/child Recreational Users and Residents who will be evaluated in the SRA. **Exhibit 14** identifies the potentially exposed community-level receptor groups (e.g., plants, invertebrates) and wildlife receptors.

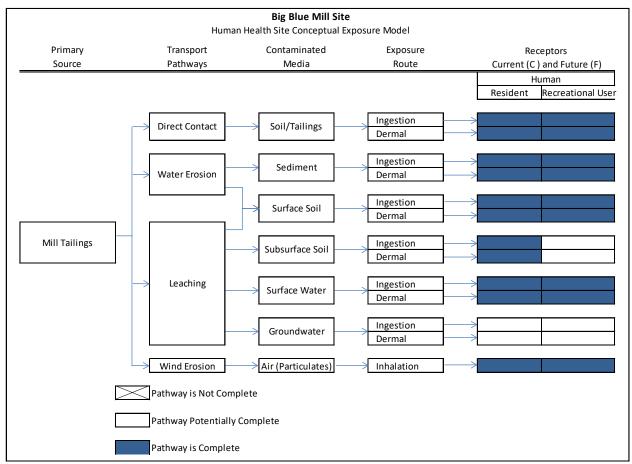


Exhibit 13: Human Health Site Conceptual Exposure Model

4.2.1 Identification of Human Receptors

Exposure of human receptors was assessed using conservative default exposure parameters for conditions supportive of current and anticipated future uses. Human receptors include Residents and Recreational Visitors.

4.2.1.1 Future Residents

Residential RSLs (EPA, 2020b/DTSC, 2020) were selected as the most-stringent human screening criteria for the SRA. Remnants of the mill foundation and tailings material are found within 100 feet of an occupied residence that was constructed up to the USFS property boundary in the early 2000s and within 500 and 1,000 feet of two additional occupied residences (**Figure 2**). In addition, COPC concentrations exceeding the Residential RSLs have implications for determining cleanup goals and future site use, as they define the level of cleanup at which all pathways present an acceptable level of risk for all land uses (*i.e.*, unlimited use/unrestricted exposure). The RSLs for soil, river sediment, and surface water are summarized on **Tables 3A** through **3D**, **4**, and **5**, and risk tables in **Appendix H2**.

The soil screening levels for adult and child Residents are based on default exposure factors that represent reasonable maximum exposure under specified long-term conditions. Future Residents were evaluated consistent with EPA default exposures of 24 hours per day, 350 days per year, for 26 years (child 6 years and adult 20 years). The Residential RSLs are assumed to be protective at a target excess lifetime cancer risk of 1 x 10⁻⁶ (one in a million) for carcinogenic chemicals and a target non-carcinogenic hazard quotient (HQ) of 1.0 for non-cancer chemicals for human exposures.

4.2.1.2 Child and Adult Recreational Visitors

The adult and child Recreational Visitors were also identified as a primary receptor group for evaluation. BLM has developed a set of Recreational screening levels as requirements for metals most commonly found at abandoned mine land sites (BLM, 2017). BLM's Recreational screening levels are derived from Residential RSLs and account for the limited exposures associated with most recreational activities. The primary exposure routes for Recreational Visitors are ingestion of soil, dermal contact with the contaminants, and inhalation of dust and particulates. The Recreational Visitor SSLs are protective of adult/child visitors enjoying recreational pursuits.

The yearly Recreational exposure frequency is assumed to be 14 days/year, based on the assumption that individuals are unlikely to spend more time at an individual site on an annual basis. The exposure duration assumed for Recreational Visitors, 26 years, is the default exposure duration recommended by EPA for residents and is assumed to be relevant for Recreational screening levels. Note that the exposed population is combined child/adult. BLM's Recreational Visitor SSLs assume that an older child (5-6 years of age) could participate in the recreational activities for 2 years and for 24 years as an adult. The soil Recreational Visitor SSLs are summarized on **Tables 3A** and **3B** and presented on the **Appendix H2** risk tables.

4.2.2 Identification of Ecological Receptors

An organism may be at risk from exposures to COPECs, if there is a complete exposure pathway between the COPEC source (environmental media) and the organism. Plants and animals contacting the contaminated media may serve as conduits for exposure to higher trophic level organisms to site-related chemicals via food-web transfer. As described below, the project area supports resident plants, invertebrates, and animals (birds and mammals), and provides foraging habitat for them (Section 2.10).

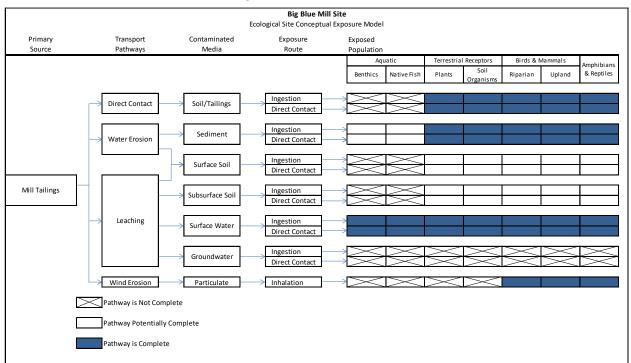


Exhibit 14: Ecological Site Conceptual Exposure Model

The selected receptor groups for this SRA are:

- Plants Vegetation present at the site is generally representative of riparian woodland and disturbed herbaceous woody shrub cover with local freshwater emergent wetlands. Riparian woodlands are common upstream of the limnetic zone of Lake Isabella along the North Fork Kern River. The riparian cover is dominated by Goodding's willow, Fremont cottonwood, and red willow. Tree canopy height can be up to 80 feet and is typically open in the project area (USACE, 2012). Common shrubs include mule-fat, coyote brush, and redosier dogwood, which can form open to continuous cover. The herbaceous layer is variable and can contain rough cocklebur, stinging nettle, goosegrass, common rush, common knotweed, common plantain, and cress (USACE, 2012). Well-drained sand and gravel soils support sagebrush-scrub cover, especially in disturbed settings. This cover type is characterized by rubber rabbitbrush, Mormon tea, California buckwheat, western juniper, and bitterbrush. The herbaceous layer is sparse or grassy and supports annual grasses and herbs.
- Invertebrates There are a multitude of invertebrates living on and in soils. The most exposed invertebrates are likely to be insects such as ants and termites (and similar biota), in direct contact with the soil. As terrestrial soil invertebrates burrow through soils, their cuticle is in direct contact with the surrounding material, which may permit the uptake of contaminants. Additionally, terrestrial invertebrates may ingest soils along with their food. Therefore, both the dermal and ingestion pathways were considered complete for invertebrates.
- Wildlife The broad floodplain along the river is frequently inundated, contributing to regeneration of Goodding's willow and maintenance of the riparian forest at the site. These characteristics serve to maintain diverse species composition and forest structure necessary for federally listed species such as southwestern willow flycatchers and least Bell's vireos. Upland habitat in the Lake Isabella area hosts species adapted to arid

environments, such as lizards and snakes. Bird species may include California quail, scrub jay, goldfinches, and wrentits. Mammals include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and bats. The Kern River supports a variety of aquatic species, including native and introduced fishes. The USFWS IPaC database identifies one mammal (fisher), four birds (California condor, least Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo), one amphibian (California red-legged frog), and one fish (delta smelt) as federally endangered or threatened species that potentially occur within the project area. Bald eagles and 11 migratory birds of conservation concern could be present. No critical habitat is present on the site.

Incidental ingestion of surface soil during foraging and grooming activities was assumed to be a complete exposure pathway for birds and mammals. Bioaccumulation and ingestion of COPECs in food items (*i.e.*, plants, invertebrates, and smaller birds and mammals) that have been exposed to contaminants from the site were assumed to be a complete exposure pathway for birds and mammals. Direct contact and inhalation of particulates are assumed to be insignificant and were not quantitatively evaluated. Specific screening levels for reptiles, amphibians, and fish are not readily available. These species will be evaluated qualitatively using mammal and bird criteria.

4.3 Exposure Pathways

During precipitation or flood events in this arid area, arsenic (dissolved phase or sorbed to sediment particles) and other metals may potentially be transported in storm water runoff and deposited in floodplain sediments. Waste materials are now largely eroded and locally washed downriver, buried or comingled with alluvial deposits, or present as cemented tailings. No specific data are available indicating that surface water or sediments in Lake Isabella have been impacted. In addition to water erosion and potential leaching pathways, direct contact with tailings, soil, and sediment, as well as wind erosion of particulates are pathways that could result in the exposure to human and ecological receptors. The following sources, potentially impacted media, transport mechanisms, and exposure pathways are considered for the site:

- The SI data indicate that historical mining and milling activities have released metals to the environment. The sources of contamination at the site include the former mill foundation and associated remnants of walls and former structures. Cemented tailings are present near the former mill foundation and downriver along the bank of the Kern River. Cemented tailings are eroding at some locations and dispersed tailings have impacted soil downriver of the former process area. Possible source areas are shown on Figure 2.
- Constituents can migrate from a source area via a variety of mechanisms. Transport mechanisms include aeolian processes, potential leaching, surface water runoff, and associated erosion during storm events. Storm water flows during infrequent precipitation events have eroded and mobilized finer-grained materials, resulting in potential elevated metals concentrations in wash sediments and low-lying areas. Storm water may also transport dissolved metals leached from waste materials into subsurface soil and shallow groundwater at the site or downgradient of the source features. Exposed fine-grained material is subject to wind erosion and strong winds may potentially cause migration of metals via airborne dust in areas with limited vegetation.
- Secondary sources include impacted surface soil, sediments, and airborne particulates.
 Subsurface soil is a potential source of contamination for residents depending on the
 activity. Airborne particulates could be produced during activities that disturb potentially
 impacted surficial material in the former processing, stockpile, and wash areas as
 demonstrated by the dust/particulate sample results. Storm water flows and flood events

- may have resulted in erosion and transport of fine-grained materials. Leaching of metals to surface water or into the subsurface during flood events may occur.
- Mobility of arsenic in the environment depends on several factors (Agency for Toxic Substances and Disease Registry, 2016). These include arsenic species, oxidation state of the arsenic, oxidation/reduction conditions, presence of metals such as iron and magnesium, presence of anions such as nitrate and sulfate, and pH. Arsenic tends to be less mobile (leachable) in oxidizing environments and weakly acidic soil, suggesting that slightly acidic storm water may mobilize dissolved arsenic for transport to surface water or groundwater. Evaluation of TCLP and WET results indicates there is some potential for leaching to occur. Sufficient generation of leachate could potentially impact surface water and groundwater.

The following complete, potentially complete, and incomplete pathways have been identified:

- Air Pathway: This pathway is complete; human and ecological receptors may be exposed
 to dust generated from impacted soils, sediment, or processed/unprocessed ore and
 tailings/mill-related waste. Based on the extent of ground surface covered with vegetation
 versus loose fine-grained material and particulate/dust sample results collected during
 field work, disturbance of surface materials may generate dust.
- Waste Rock/Tailings/Process Waste: This pathway is complete with human and ecological receptors exposed to potentially impacted materials. The magnitude of contamination in source media was assessed to determine risk to receptors and quantities that exceed regulatory criteria. The cemented tailings present onsite contain elevated metals concentrations.
- Surface and Subsurface Soil: The surface soil pathway is complete as human and
 ecological receptors may be exposed to impacted surficial materials. Residents may be
 exposed to COPCs in subsurface soil during gardening or landscaping activities and
 recreational users may be exposed to subsurface soil when digging. Plants and burrowing
 wildlife could also contact COPECs in potentially impacted subsurface soil. Subsurface
 profiles were evaluated at seven locations to depths between 2 and 5 feet bgs. Elevated
 metals are present to depth at each profile location. Arsenic TCLP and WET results
 indicate a potential for leaching is present, but no additional data are available.
- Surface Water: The surface water pathway is complete for human and ecological receptors due to proximity to the Kern River. The river flows year-round. Beneficial uses of the North Fork Kern River are discussed in **Section 2.6**.
- Sediment: Storm water flows over the source areas have likely transported contaminated sediments into the Kern River and dispersed material downriver of the site. The exposure pathway is considered complete for human and ecological receptors.
- Groundwater: The groundwater exposure pathway evaluates the likelihood that sources at a site have released, or potentially could release, hazardous substances to groundwater. Although the site is in a heavily mineralized and mined area with multiple sources of contamination that could impact groundwater, no well is present at the site; therefore, this pathway is considered potentially complete. According to USFS there is a well on private land adjacent to the site; however, no information regarding the well was available in the PA.

4.4 Exposure Routes

COPCs were identified to address the Residential scenario and activities of adult/child Recreational Visitors. The following exposure routes are assumed to be complete for these receptor groups:

- Inhalation of dust in outdoor air:
- Incidental ingestion of milling-related material; and
- Dermal contact with milling-related material.

Lack of habitat in the disturbed areas of the site, including flood plains, and high metals concentrations in impacted surface and near-subsurface soil and cemented tailings may significantly limit the diversity of ecological receptors in some areas. However, the site supports terrestrial plants, soil invertebrates, birds, and mammals adapted to a desert environment. Wildlife may be exposed to metal contamination via several environmental pathways. The potential exposure routes for ecological receptors include:

- Uptake or dermal contact with soil (plants and invertebrates);
- Uptake or dermal contact with waste (plants and invertebrates); and
- Ingestion of impacted prey, soil, and mine waste (birds and mammals).

4.5 Evaluating Risk and Hazard

Hazard and risk were evaluated for metals at the Big Blue Mill site in each AOC. Potential human and ecological non-carcinogenic hazards for individual COPCs/COPECs are expressed as Hazard Quotients (HQs). HQs are calculated for each complete pathway by dividing the exposure point concentrations (average concentration) for each analyte by the receptor-specific RBSL. Hazard indices (HIs) are developed by summing the individual HQs for each COPEC. HIs represent the cumulative non-carcinogenic hazard of all detected compounds based on non-carcinogenic effects, and accounts for all metals evaluated. HIs can be used to compare characterization results of AOCs for priority ranking.

The HIs for each receptor group are compared to the EPA acceptable hazard levels. A HI of 1 is used as a threshold to indicate whether adverse health effects are likely to occur from exposure to COPCs. HIs greater than 1 indicate that adverse noncarcinogenic health effects may occur, whereas HIs equal to or less than 1 indicate that adverse noncarcinogenic health effects are unlikely. EPA considers HIs of 1 or lower as acceptable.

Theoretical excess lifetime cancer risk for receptors is expressed as the estimated upper-bound probability of additional lifetime cancer risk due to exposure to site-related COPCs. Site-Specific cancer risks for the Resident and Recreational Visitor are calculated based on the analyte EPC and RBSL. The total excess cancer risk estimates are compared to the point of departure of 10^{-6} . In general, total risks greater than 10^{-4} (e.g., 10^{-3} or 10^{-2}) require action; risks between 10^{-6} and 10^{-4} are in the risk management range and require the stakeholders to discuss and decide whether the risk estimates are acceptable; risks less than 10^{-6} (e.g., 10^{-7} and 10^{-8}) are unconditionally acceptable.

4.6 Risk Characterization

Tables H2-1 through H2-9 (**Appendix H**) present estimated arsenic risks, and antimony, arsenic, cadmium (laboratory data), lead, and mercury HQs/HIs for Residents and Recreational Visitors exposed to surface and subsurface soil. Plant, invertebrate, mammal, and avian HQs/HIs are

presented for antimony, arsenic, copper, lead, mercury, silver, and zinc (based on XRF and laboratory EPCs) and cadmium, chromium, molybdenum, and selenium based on laboratory EPCs. **Table 7** (XRF data) and **Table 8** (laboratory data) summarize cancer risks and HQs/HIs for human and ecological receptor groups exposed to metals in surface soil. **Table 9** describes risks associated with exposure to metals in subsurface soil. **Appendix H**, Table H2-10 and **Table 10** present estimated risks for human and ecological receptors exposed to metals in river sediment and **Appendix H**, Table H2-11 and **Table 11** summarize risks associated with surface water exposures. Arsenic, mercury, and lead are the main risk drivers. Risks and hazards are summarized for human and ecological receptors in the following sections.

4.6.1 Soil

4.6.1.1 Human Receptors – Surface Soil

Antimony, arsenic, cadmium, lead, and mercury were identified as COCs for Residential and Recreational Visitor receptor groups. XRF data for antimony, arsenic, lead, and mercury were used to characterize risk site wide (**Table 7**). Limited laboratory data collected from the background area and AOCs 4 through 7 were used to estimate cadmium HQs and confirm XRF characterization results (**Table 8**). Risk characterization results for surface soil are described below:

- Estimated Residential cancer risks for exposure to arsenic based on XRF results exceeded the target risk of 1 x 10⁻⁶ in background samples and in all seven AOCs. Risks ranged from 1 x 10⁻⁴ to 1 x 10⁻¹ site wide. Residential arsenic risk in the background area was 2 x 10⁻⁴. Estimated XRF risk estimates in AOCs 4 through 7 were 2 x 10⁻⁴ to 1 x 10⁻¹.
- Arsenic risks were within the EPA's risk management range of 1 x 10⁻⁶ to 1 x 10⁻⁴ for the Recreational Visitor at AOCs 2, 3, 4, 5, and 6 using XRF data. Risks were highest at AOC 5 (1 x 10⁻³) and AOC 4 (3 x 10⁻⁴), exceeding the upper bound risk range.
- The highest risks were reported for AOCs 4 and 5, where the estimated Residential arsenic cancer risks based on XRF EPCs (1 x 10⁻¹ and 3 x 10⁻¹) exceeded the upper bound risk management range of 1 x 10⁻⁴. Arsenic Residential risks in AOCs 2, 3, 6, and 7 also exceeded the upper bound risk management range based on XRF data, ranging from 2 x 10⁻⁴ to 6 x 10⁻³.
- The lowest XRF arsenic risks were reported for background, AOC 1, and AOC 7, where Recreational Visitor risks were less than the target risk (4 x 10⁻⁷ to 6 x 10⁻⁷). For the Resident, estimated arsenic risks using XRF results met or exceeded 1 x 10⁻⁴ for background (2 x 10⁻⁴), AOC 1 (1 x 10⁻⁴) and AOC 7 (2 x 10⁻⁴).
- Estimated Residential and Recreational Visitor cancer risks based on arsenic laboratory results confirmed the XRF results.
- Residential arsenic cancer risk in AOCs 4, 5, and 6 ranged from 1 x 10⁻³ to 4 x 10⁻¹ based on laboratory EPCs compared to 1 x 10⁻³ to 3 x 10⁻¹ using XRF EPCs. Arsenic risk based on laboratory data at AOC 7 was 1 x 10⁻⁴ similar to risk based on XRF results (2 x 10⁻⁴). The estimated Residential risk for laboratory background was 2 x 10⁻⁴, the same as for XRF data.
- Estimated cancer risk for exposure of Recreational Visitors to arsenic exceeded 1 x 10⁻⁴ in AOCs 4 and 5 and exceeded the target risk of 1 x 10⁻⁶ in AOC 6. At AOC 4, the risk was 2 x 10⁻⁴ compared to 3 x 10⁻⁴ for XRF data. At AOC 5, Recreational Visitor risk was 1 x 10⁻³ based on laboratory and XRF data. Recreational Visitor risks based on laboratory data were lowest in AOC 7 (4 x 10⁻⁷) and in background (7 x 10⁻⁷), which confirms XRF risk results (6 x 10⁻⁷ in AOC 7 and 6 x 10⁻⁷ in background).

HIs exceeding the threshold of 1 for potential noncarcinogenic adverse effects for human receptor groups exposed to surface soil (presented in **Appendix H**, Tables H2-1 through H2-8 and summarized in **Tables 7** and **8**), are described below:

- HIs for Residential exposures exceeded the threshold of 1 in all AOCs, including background, based on XRF results. HIs were highest in AOC 4 (26,304) and AOC 5 (89,748) and lowest in AOCs 1 (35) and 7 (45). Recreational Visitor HIs exceeded 1 at AOC 4 (24) and AOC 5 (50).
- Residential arsenic HQs based on XRF results ranged from 31 to 46 in background soil, AOC 1, and AOC 7. Intermediate arsenic HQs were reported at AOC 2 (189) and AOC 3 (1,579). The highest HQs for arsenic were reported in AOC 4 (26,007) and AOC 5 (88,334). Arsenic HQs for Recreational Visitors exceeded 1 at AOC 4 (12) and AOC 5 (41) based on XRF results.
- XRF mercury HQs for human receptors exceeded the threshold of 1 at all AOCs, ranging from 3 to 34 in background soil and AOCs 1 through 4, 6, and 7. The mercury HQ was highest in the AOC 5 cemented tailings (1,373). Mercury HQ for Recreational Visitors exceeded 1 at AOC 5 (5).
- Lead HQs calculated using XRF data exceeded 1 for Residential exposure in AOCs 3, 4, and 5. Lead HQs associated with Recreational Visitor exposure exceeded 1 only in AOC 5 based on XRF results.
- Antimony HQs exceeded 1 based on XRF data for Residential exposure in AOC 4 (283) and AOC 5 (3). Antimony HQs for Recreational Visitor exposure exceeded 1 at AOC 4 (11).
- HIs and HQs calculated for metals based on laboratory data confirmed the XRF results.
 Residential HIs ranged from 50 in background soil, to 106 and 270 in AOC 7 and AOC 6,
 and 18,065 and 99,233 in AOCs 4 and 5. Recreational Visitor HIs were 64 in AOC 5 and
 9 in AOC 4. Differences between the laboratory HIs and XRF HIs are related to the limited
 laboratory data sets, high bias of XRF compared to laboratory data, and use of the
 maximum concentration as the EPC for some AOCs.
- Similar to XRF results, the highest laboratory HQs were for arsenic (ranging from 98,720 in AOC 5 to 27 in AOC 7 for Residential exposure and equal to 46 in AOC 5 and 8 in AOC 4 for Recreational Visitors). Residential lead HQs were 157 in AOC 5 and 8 in AOC 4; the Recreational Visitor lead HQ exceeded 1 in AOC 5 (16). Residential antimony HQs were equal to 5 at AOC 4 and 2 at AOC 5. Residential mercury HQs were 3 for AOC 4, 350 for AOC 5, and 4 for AOC 7. Antimony and mercury HQs did not exceed 1 for Recreational Visitor exposures.
- Cadmium HQs calculated using laboratory data exceeded 1 for Residential exposure in AOC 5.

4.6.1.2 Ecological Receptors

Eleven metals were identified as COCs for the four ecological receptor groups. Risk characterization results for surface soil are presented in the tables in **Appendix H2** and summarized in **Tables 7** and **8**. HQs exceeded 1 for one or more ecological receptors in the following AOCs:

- The largest hazards were associated with exposure to metals in AOCs 5 and 4, followed by AOC 3, AOC 2, and AOC 6. The lowest hazards were calculated for exposure to metals in AOC 1, AOC 7, and background soil.
- Mercury HQs for XRF data exceeded 1 for all receptor groups in all AOCs and were highest for birds. The largest mercury HQ was reported in AOC 5 (105,615), followed by

AOC 3 (2,600), AOC 2 (751), AOC 4 (624), AOC 6 (538), AOC 1 (300), and AOC 7 (269). site wide, HQs ranged from 2 for mammals (background and AOC 1) to 105,615 for birds (AOC 5). The laboratory results confirmed the XRF results in AOCs 4, 5, 6, and 7; mercury HQs were highest for birds, exceeding 1 for all AOCs sampled. Mercury HQs also exceeded 1 for plants, invertebrates, and mammals in AOCs 4, 5, and 7, and plants and invertebrates in background soil and AOC 6.

- Arsenic HQs exceeded 1 for plant, invertebrate, mammal, and avian receptors in AOCs 3, 4, 5, and 6, with the highest arsenic values reported in AOCs 4 and 5. In AOC 2, arsenic HQs exceeded 1 for plants, mammals, and birds. For laboratory data, arsenic HQs exceeded 1 for all receptor groups in AOCs 4, 5, and 6, with the highest values in AOC 5. Arsenic values were less than 1 in background and AOC 7.
- Lead HQs exceeded 1 for one or more ecological receptors in background soil and in AOCs 2, 3, 4, 5, and 6 based on XRF data. Avian HQs exceeded 1 in background soil, and AOCs 2 through 6; mammal HQs exceed 1 in AOCs 2, 3, 4, and 5. Plant HQs also exceeded 1 in AOCs 4 and 5. The laboratory results confirm the XRF data; lead HQs exceeded 1 for at least one receptor group in background soil and in AOCs 4, 5, and 6, with the highest values reported in AOC 5.
- Antimony was evaluated using both XRF and laboratory results in AOCs 4 through 7, since
 the XRF LODs were elevated for some samples. The laboratory results confirmed the XRF
 data trends. HQs calculated based on XRF and laboratory data exceeded 1 for plants
 and mammals in AOCs 4 and 5 and invertebrates in AOC 4.
- Laboratory results were used to estimate cadmium risk to ecological receptors, since the XRF LODs were elevated above screening criteria and cadmium was not selected as a COPEC. Laboratory results for cadmium were only available for AOCs 4 through 7. Cadmium HQs exceeded 1 for plants, invertebrates, mammals, and birds in AOC 5; plants, mammals, and birds in AOC 4; and mammals and birds in AOC 6.
- Laboratory data were used to estimate chromium risk to ecological receptors, since XRF concentrations did not exceed the XRF background value and chromium was not selected as a COPEC. Laboratory data are limited in extent and were only collected in AOCs 4, 5, 6, and 7, and the background area. Chromium HQs exceeded 1 for plants and invertebrates for background soil and AOCs 4, 5, 6, and 7.
- Copper was identified as a COC based on XRF and laboratory results. Based on the 95% UCL EPCs for XRF concentrations, copper HQs were less than 1 in background soil and at all AOCs. Copper 95% UCLs were also calculated using laboratory data at AOCs 4, 5, 6, and 7. The avian HQ at AOC 5 exceeded the threshold value of 1 for potential adverse effects.
- Laboratory results were used to estimate molybdenum risk to ecological receptors, since XRF concentrations did not exceed the XRF background value and molybdenum was not selected as a COPEC. Laboratory data are limited in extent and were only collected in the background area and in AOCs 4, 5, 6, and 7. Molybdenum HQs exceeded 1 for plants and mammals in AOC 5.
- Silver HQs were developed based on XRF data and confirmed by evaluating laboratory results, since silver data may be biased high. HQs based on XRF and laboratory data exceeded 1 for mammals and birds in AOC 5 and birds in AOC 4.

- Selenium HQs were determined by evaluating laboratory data, since this metal was not identified as a COC for XRF data based on low rate of detection. Selenium HQs exceeded 1 for plants, mammals, and birds in AOC 6.
- Zinc HQs calculated using XRF data exceeded 1 for mammals and birds in background and AOCs 2, 3, 4, and 5. Zinc HQs also exceeded 1 for birds in AOCs 1 and 6, and invertebrates in AOCs 4 and 5. For laboratory data, zinc HQs exceeded 1 for birds in background soil, all receptor groups in AOC 4, and mammals and birds in AOC 5. The differences between the XRF and laboratory results are due to the small sample size of laboratory data compared to representative zinc levels based on gridded sample collection using XRF.

4.6.1.3 Human Receptors – Subsurface Soil

Subsurface soils were evaluated from 0 to 1.5 feet bgs in AOC 4 and from 0.5 to 5 feet bgs in AOC 5 to determine whether risks from exposure to metals in tailings varied with depth. Two locations in AOC 4 (BB-025 and BB-025-SO) and five locations in AOC 5 (BB-123, BB-129, BB-116, BB-116-SO, and BB-023) were selected for vertical delineation and sampled using XRF at the surface and 0.5- to 1-foot intervals to native material, refusal, or depth. The soil results are provided in **Table 3B**. Mean metals concentrations were calculated for each sample interval (surface; 0-1 foot bgs; 1.5-2 feet bgs; 2.5-3 feet bgs; 4 feet bgs; and 5 feet bgs) to represent EPCs for risk characterization (**Appendix H**, Table H2-9; **Table 9**). The SI results indicate a range of metals are present in exposed and buried tailings at elevated concentrations.

- Arsenic is the risk driver. Arsenic occurs naturally at the site, with background concentrations (19 mg/kg laboratory) that exceed the Residential RSL (0.1 mg/kg). Arsenic concentrations exceeded background and screening criteria in AOC 4 and AOC 5.
- Arsenic risk estimates for Residential exposure to surface and subsurface soil for test pits in AOCs 4 and 5 exceeded the upper bound risk management range of 1 x 10⁻⁴. For Recreational Visitors, estimated arsenic risk exceeded 1 x 10⁻⁴ for all sampled intervals at AOC 5 and the surface and 0-1 foot interval at AOC 4. Arsenic risk for the 1-2 foot interval at AOC 4 exceeded the target cancer risk of 1 x 10⁻⁶.
- Residential arsenic HQs for subsurface soil in AOC 4 increased from 19,033 at the surface to 25,289 for the 0-1 foot interval and decreased to 1,332 for the interval from 1-2 feet bgs. For Recreational exposures, a similar pattern occurred. HQs increased from 9 in surface soil to 12 for the 0-1 foot interval and decreased to 1 for the 1-2 foot interval; the increase in estimated risk for shallow soil/tailings compared to results for surface soils is expected since the EPCs for surface soil included data from mixed soil-tailings material.
- Residential arsenic HQs for subsurface soil at AOC 5 showed a similar trend. HQs increased from the surface (43,491) to 57,051 for the 0-1 foot interval and then decreased with depth. The HQ at 4 feet bgs was 10,289 and at 5 feet bgs was 14,301. For Recreational exposures, arsenic HQs increased from 20 at the surface to 27 in the 0-1 foot interval and decreased to 5 at 4 feet bgs and 7 at 5 feet bgs.
- Decreasing trends were observed for Residential antimony and lead HQs in subsurface soil at AOC 4 (surface to 2 feet bgs) and AOC 5 (surface to 5 feet bgs). At AOCs 4 and 5, antimony and lead HQs exceeded 1 at the surface and 0-1 foot interval. Lead HQs at AOC 5 also exceeded 1 from 1-2 feet bgs and 2-3 feet bgs. For Recreational Visitors, lead HQs were less than 1 in subsurface samples at AOC 4, and exceeded 1 in the surface sample and 0-1 foot interval in AOC 5 (HQ = 2).

 Mercury HQs for Residential exposure exceeded 1 at the surface (7) and 0-1 foot interval (15) at AOC 4. At AOC 5, mercury HQs decreased from 170 at the surface and 103 at 0-1 feet bgs to 38 at 4 feet bgs, and less than 1 at 5 feet bgs. For Recreational Visitors, mercury HQs were below 1 in all depth intervals at both AOCs.

4.6.1.4 Ecological Resources – Subsurface Soil

The following is a summary of metals with HQs/HIs that exceed 1 for one or more ecological receptors in subsurface soil:

- At AOC 4, HIs increased from 3,109 at the surface to 3,671 for tailings at 0-1 feet bgs, followed by 145 at 1-2 feet bgs. At AOC 5, HIs decreased from 18,647 at the surface to 702 at 5 feet bgs. The lower risk for surface soil at AOC 4 compared to shallow subsurface soil may reflect tailings mixed with soil. At AOC 5, less mixing of material is expected in the cemented tailings.
- At AOC 4, antimony, arsenic, cadmium, lead, mercury, silver, and zinc HQs exceed 1 at the surface and 0-1 foot interval for one or more receptor groups. At 1-2 feet bgs, arsenic, cadmium, lead, and zinc HQs exceed 1 for one or more receptor groups.
- At AOC 5, antimony, arsenic, cadmium, lead, mercury, silver, and zinc HQs exceeded 1
 at the surface and 0-1 foot interval. Cadmium HQs were less than 1 below 1 feet bgs and
 silver and antimony HQs were below 1 at depths greater than 2 feet. Lead and mercury
 HQs were less than 1 below 4 feet bgs, but the copper HQ exceeded 1.
- HQs for arsenic were highest for plants, HQs for lead and antimony were highest for mammals and birds, and mercury HQs were highest for birds.
- The highest HQs for ecological receptors were reported for exposure to mercury. Mercury
 HQs for birds varied from 538 to 1,154 from 0 to 2 feet at AOC 4 and from 2,885 to 13,108
 from 0 to 5 feet bgs at AOC 5. Lead HQs were also most elevated for birds, ranging from
 5 to 67 at AOC 4 and from 3 to 153 at AOC 5.

4.6.2 Sediment

Sediment was analyzed at four locations (Appendix H, Table H2-10; Table 10), including upriver (BB-SW-01-SED), adjacent to the site (BB-SW-02-SED), downriver at the sand bar (BB-SW-03-SED), and downriver of the site (BB-M1-SED-01) (Figure 2). Arsenic was identified as a COPC and arsenic, mercury, and selenium were identified as COPECs in river sediment. Estimated Residential arsenic cancer risks for stream sediment increased from 2 x 10⁻⁵ at the upriver location to 3 x 10⁻⁴ adjacent to the site. At the sand bar location, the estimated cancer risk decreased to 1 x 10⁻⁴ and was 2 x 10⁻⁴ downriver of the site. The estimated risk for Recreational Visitor exposure to arsenic is less than or equal to the target risk of 1 x 10⁻⁶ at all locations. The arsenic HQs in river sediment ranged from 7 upriver of the site to 78 adjacent to the site and decreased to 32 and 54 downriver. HQs were less than 1 for Recreational Visitor exposure for all metals. For ecological receptors, arsenic, mercury, and selenium HQs were equal to or less than 1 at the upriver and downriver locations. Adjacent to the site, the HI exceeded the threshold of 1 for potential adverse effects due to arsenic (HQ=3), mercury (HQ=3), and selenium (HQ=2). At the downriver location, mercury and selenium HQs were less than 1, and arsenic HQs were less than 1 in one sample and slightly elevated (HQ=2) in the field duplicate. The data indicate that arsenic concentrations are elevated upriver of the site and are generally lower downriver from the site with the exception of the slight increase in the downriver sandbar. Therefore, impacts to sediment under flow conditions experienced during the sampling event are likely minor.

4.6.3 Surface Water

Surface water samples co-located with sediment samples (Appendix H, **Table H2-11**; **Table 11**) were collected at locations upriver (BB-SW-01), adjacent to (BB-SW-02), and downriver (BB-SW-03) of the site (**Figure 2**). Arsenic and mercury were identified as COPCs. No COPECs were identified. Typically, arsenic occurrence in water is caused by the weathering and dissolution of arsenic bearing rocks, minerals and ores, but arsenic contamination in water is also caused by its use in industrial and agricultural applications; mining and smelting also contribute to arsenic release.

Total arsenic and mercury concentrations exceeded the most-stringent human health screening criteria developed for surface water based on beneficial use of the Kern River, including the sample collected upriver of the site. Arsenic cancer risks were 3×10^{-4} at the locations upriver and adjacent to the site and slightly higher (4×10^{-4}) at the locations adjacent to and downriver of the site. The mercury HQ was equal to 4 in the sample collected upriver of the site and 8 in the sample collected adjacent to the site. The mercury HQ decreased to 3 downriver of the site, less than the value for the upriver sample.

The EPA promulgated the CTR in April 2000 (EPA, 2000b). The CTR contains a water quality criterion of 0.05 µg/L total recoverable mercury for freshwater sources of drinking water. The CTR criterion protects humans from exposure to mercury in drinking water and contaminated fish. Although the North Fork Kern River is not a drinking water source at the site, the CTR criterion is enforceable for all waters with a municipal and domestic water supply beneficial use designation, including the Kern River. The CTR should be compared with averages of aqueous concentrations of total recoverable mercury occurring over 30-day periods. While the federal rule did not specify duration or frequency terms, the Water Board has previously employed a 30-day averaging interval with an allowable exceedance frequency of once every three years for protection of human health. For the SI, the mercury concentrations represent a snapshot in time, as samples have not been collected continuously. Data therefore do not exist to show whether the CTR is exceeded. Concentrations of mercury in North Fork Kern River could exceed the CTR during periods with high runoff events. However, since mercury concentrations are elevated upriver of the site, non-site-related impacts are reflected in surface water quality at the site.

4.6.4 Streamlined Risk Assessment Uncertainty Analysis

Several potential sources of uncertainty may affect human health risk estimates in an SRA. Uncertainties that may have been introduced into the risk calculations are discussed below.

Protective Nature of Risk Assessments. The screening levels used to estimate risks are based on upper-bound values for soil ingestion, and other parameters that are meant (in general) to be protective of the reasonable maximum exposure. Thus, the risk estimates presented likely overestimate risks for the non-Residential users, but are unlikely to underestimate the upper-bound risks.

Use of Conservative Human Health RBSLs. Recreational exposures are based on 14-day exposures for children over 6 years and adults for 20 years. Actual exposures of visitors to contaminants at the site is likely to be much less. This has the effect of overestimating risk when compared to exposure concentrations, and so comparisons under the industrial exposure scenario are conservative. The industrial RSLs are expected to be protective of all human receptors who are routinely exposed to contamination at the site, including children and adults in the vicinity of the site for recreation.

Exposure Point Concentrations. The use of maximum concentrations as the EPCs for laboratory data could over or underestimate risk compared to EPCs established as 95% UCLs

based on gridded data collected across an AOC. Separate EPCs were calculated for XRF and laboratory metals datasets in AOCs 4 through 7 for risk assessment because the XRF analyzer may not provide reliable measurements of barium, beryllium, cadmium, cobalt, selenium, and thallium due to limitations of the method or sample-specific LODs for these metals may exceed relevant screening criteria. While XRF data were intended to characterize nature and extent and risk assessment, laboratory data collected to satisfy EPA method 6200 (12 percent of XRF samples) were used to confirm XRF results and evaluate risk where XRF data are not available. As shown in Appendix H2, 95% UCLs were calculated for XRF metals at AOCs 1 through AOC 7. 95% UCLs were calculated for laboratory metals detected at AOC 5 and AOC 7. EPCs were the maximum reported value for laboratory metals reported at AOCs 4 and 6. Since the XRF data were collected from a randomized grid and laboratory samples were analyzed for a small percent of samples, the maximum concentration based on limited laboratory samples likely will not represent average concentrations within an AOC. The laboratory data do provide information for a weight-of-evidence evaluation of contamination extent and risk information for metals not recorded using XRF. As-reported concentrations were used as EPCs to evaluate sediment and surface water data, which were divided into upstream, on-site, and downstream segments.

Background Metal Concentrations. A 20-point composite sample collected upgradient of the site was used to establish XRF and laboratory background concentrations. SI results were compared to background screening criteria (developed as three times background) to confirm releases and identify COPCs and COPECs for risk assessment. Soil background values were used to evaluate dry sediment. Upgradient/upriver co-located sediment and surface water samples were used as background samples to evaluate impacts to these media from site operations. Since concentrations below background are not subject to removal actions, using background screening criteria to select COCs and delineate areas of the site where metals concentrations are less than background levels will allow the AOCs to be prioritized for remediation and could decrease cleanup costs and complexity. This evaluation is possible for metals with detection limits that are less than natural background and applicable screening levels (Residential RSLs, Recreational SSLs, or ESVs).

A single set of background values (*i.e.*, laboratory background) was not used to identify COPCs/COPECs. XRF field data were compared to the XRF background values and laboratory data were compared to laboratory background concentrations. Comparing XRF metals data to corresponding laboratory background values would be overly conservative for COC identification since the XRF dataset is biased high compared to the laboratory dataset for measurements above the LOD. Evaluation of additional XRF COPCs/COPECs would add complexity to the risk assessment. Therefore, XRF COPCs/COPECs were used to characterize risk for all AOCs. Laboratory COPCs/COPECs were evaluated to confirm XRF characterization results and evaluate metals not reported using XRF. The laboratory data are quantitative but may not represent average conditions throughout an AOC since they are of limited extent.

Uncertainty was introduced since background concentrations for some XRF metals were reported as elevated LODs that exceed one or more screening criteria. Examples include antimony (<376 ppm), cadmium (<164 ppm), cobalt (<80 ppm), mercury (<3 ppm), selenium (<3 ppm), and silver (<131 ppm). This introduced uncertainty into the characterization. Three-times background screening criteria could not be established for these metals, and all detected values were therefore considered releases. Detected concentrations of these XRF metals can be used to characterize nature and extent of contamination, but delineation was not possible at locations with non-detects. For this reason, laboratory confirmation data, where available, was used to refine the nature and extent and risk characterizations.

Mercury is a primary COC at the site due to processing of gold ore. The elevated mercury LOD of 3 ppm exceeds both the Residential RSL and most stringent ESV. Therefore, mercury XRF data only partially delineate areas where concentrations potentially exceed the RSL and ESV. Nature and extent characterization for mercury, and estimated risk, were augmented using laboratory data in AOCs 4 through 7. However, use of the maximum mercury concentration or 95% UCL based on limited data could result in an over or underestimate of risk.

Use of Conservative ESVs. The ESVs were derived to clearly identify concentrations of contaminants that may result in adverse ecological impacts due to exposures to site-related materials and are purposely conservative. The models used to derive the ESVs were developed using primarily conservatively skewed parameter values. This inherently conservative approach makes them inappropriate to be used as cleanup standards and should only be used to support the SI and the decision to conduct further assessment or non-time-critical removal action.

Use of No-effect Screening Levels. The ESVs used here are generally based on no-effect toxicity data, with actual effects being expected at higher concentrations. An exceedance of the ESVs used in this risk assessment does not necessarily indicate that adverse effects will occur; however, these effect levels do represent the highest concentration at which adverse effects are not expected. Thus, the screening levels should be regarded as highly protective. However, as noted above, no-effect screening levels and toxicity values should be used to evaluate the potential risks to listed species to ensure that no adverse effects occur.

Lack of Chromium VI Data. Chromium in the natural environment occurs as two oxidation (valence) states: chromium III and chromium VI. Chromium VI, the more toxic form, is not anticipated to be present at the site based on site history and conditions, and only total chromium analyses were performed. Since chromium VI is more toxic than chromium III, and the typical ratio of chromium III to chromium VI in the natural environment is approximately 90% chromium III to 10% chromium VI, using chromium VI screening criteria overestimates risk for ecological receptors.

Lack of Habitat. The site lacks favorable habitat for wildlife, plants, and invertebrates in areas containing high concentrations of heavy metals, especially mercury. The ecological component of the SRA assumes that site conditions support viable ecological receptor populations. If diversity of plants, invertebrates, mammals, and birds is limited by the presence of mercury, then overall risk may be overestimated considering that many species may be absent from the local ecosystem.

Correlation Between XRF and Laboratory Data. XRF samples were submitted for laboratory analysis at a rate of 12% to confirm usability of the XRF data. Correlation coefficients between the XRF and laboratory data sets indicate that arsenic, lead, and zinc R² values exceed 0.8, indicating suitability to support quantitative risk evaluation. Antimony, chromium, and copper R² values support screening level assessments and are appropriate for the SRA. Cadmium and silver R² values could not be calculated due to non-detect concentrations in XRF-laboratory sample pairs, but are appropriate for screening level assessment. Risks estimated based on screening level data may be over or underestimated but positive correlations suggest data trends will be representative of conditions. Nickel and vanadium R² values did not meet project DQOs and these metals were not selected as COCs.

Risk/hazards Estimated from Co-Located XRF and Laboratory Data Sets. XRF data were intended to characterize the nature and extent of metals site wide. Sample locations were gridded to reduce bias and ensure data represented conditions within each AOC. XRF samples were submitted for laboratory analysis at a rate of 12% in accordance with EPA method 6200 to confirm usability of the XRF data. The distribution of these samples was limited to the background area

(one composite sample) and AOCs 4 through 7 and included XRF-laboratory pairs in areas with low, medium, and high concentration ranges to improve statistical evaluation. The laboratory data may, therefore, overestimate or underestimate concentrations of metals in soil and bias EPCs due to the small sample size. For this reason, risk and hazard were estimated in AOCs 1, 2, and 3 based on XRF data. In AOCs 4, 5, 6, and 7, risk and hazard were estimated using XRF data and confirmed using laboratory data. Laboratory data were also used to characterize risk for metals not recorded using XRF, or for specific samples reporting concentrations as elevated LODs.

5 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this investigation was to characterize the site for potential threats posed to human health and the environment and to determine the need for additional CERCLA or other appropriate action.

5.1 Summary

XRF Metals Results for Surface Soil/Mill Waste

The XRF data for each AOC were compared to Residential criteria and the 2017 BLM Recreational Visitor SSLs. Site-wide, antimony, arsenic, lead, and mercury exceeded one or both human health screening levels in one or more XRF samples. In addition to these metals, cadmium also exceeded the Residential human health screening level in laboratory samples. Several metals were detected in surface soil/mill waste at concentrations that exceed the ESVs and were identified as potential COCs. The exceedances were wide-spread, with arsenic, chromium, lead, mercury, molybdenum, vanadium, and zinc concentrations reported above ecological screening criteria in one or more samples in all seven AOCs.

The highest metals concentrations were observed in AOC 3, AOC 4, and AOC 5 (**Figures 4A**, **4B**, and **4C**). Arsenic in AOC 3; antimony, arsenic, and lead in AOC 4; and arsenic, lead, and mercury in AOC 5 exceeded the BLM Recreational Visitor SSLs (**Table 3A**). XRF concentrations of arsenic ranging from 250 ppm to 8,226 ppm are present at the USFS boundary with private property (**Figure 5**) in AOC 4. The highest arsenic and lead concentrations on site are observed in surface samples from the cemented tailings of AOC 5 (**Figures 4A** and **4C**). Arsenic and lead concentrations are lower in the distributed tailings and mill waste of AOC 6 than in the cemented tailings of AOC 5. Generally, arsenic and lead concentrations in AOC 6 show a decreasing trend downriver with distance from the mill source area (**Figure 4A**) and lead concentrations are at or near background levels (**Figure 4C**). Lead and arsenic concentrations in AOC 1 and AOC 7 surface soils are generally at or below background.

Arsenic concentrations in AOC 2 decrease north and northwest of AOC 3 except at locations along the trail bisecting the AOC (249 ppm at BB-124, 297 ppm at BB-107, and 368 ppm at BB-088; **Figure 4A**). In AOC 2, elevated lead concentrations are present along and west of the trail (BB-083 [193 ppm] and BB-084 [202 ppm]; **Figure 4C**). Deposits of slag were observed in this area.

The distribution of mercury is shown on **Figure 4B**. Mercury concentrations in surface samples are elevated in the cemented tailings (AOC 5) and area northwest of the former mill foundation in AOC 3. Elevated mercury concentrations as isolated occurrences are present in other AOCs, but no distribution trends were obvious. The distribution of mercury is not expected to align with other metals since it was used to process the gold ore.

Exhibit 15: Summary of XRF Metal Exceedances for Subsurface Samples by AOC

	Antimony	Arsenic	Lead	Mercury				
	<u> </u>	AOC	24	l				
Depth (ft bgs)	BB-025							
0	414	10929	891	<52				
0.5	157	24390	1757	<64				
1	27	3179	131	<34				
1.5	<396	546	59	<30				
		AOC	5					
Depth (ft bgs)		BB-1	23					
0	<272	27168	1801	693				
0.5	<343	11670	1276	346				
1	<376	5632	313	79				
2	<396	1097	38	17				
3	<373	1086	59	51				
4	<368	3186	62	40				
Depth (ft bgs)		BB-129						
0	<306	19793	874	21				
0.5	<343	13786	237	8				
1	<368	10103	154	<52				
2	<366	9430	50	<50				
3	<372	8493	62	<47				
4	<389	4822	22	<40				
5	<343	10622	38	<47				
Depth (ft bgs)		BB-116	6-SO	•				
0	95	9270	1229	11				
0.5	152	33372	2459	<71				
1	58	15474	1289	12				
1.5	40	6260	566	47				
2	<367	3997	129	8				
2.5	<353	5954	298	65				
Depth (ft bgs)		BB-0	23					
0	79	31092	3162	108				
0.5	42	15526	884	72				
1	<10	40262	2287	<79				
2	<295	25511	902	156				
3	<307	13761	375	40				
4	<343	4647	172	35				
5	<375	1105	24	<29				

XRF Metals Results for Subsurface Soil/Mill Waste

Subsurface concentrations were evaluated in AOCs 4 and 5 (**Table 3B**). For AOC 5, arsenic and lead reached maximum concentrations at 1 foot (BB-023), 0.5 foot (BB-116), 0.5 foot (BB-129) and 0.5 feet (BB-123), and then decreased with depth (5 feet, 2.5 feet, 5 feet, and 4 feet

respectively). Arsenic and lead maximum concentrations occurred at 0.5 feet in BB-025 in AOC 4 and then decreased with depth (1.5 feet). Concentrations of antimony, arsenic, lead, and mercury for the vertical profile locations in AOC 4 and AOC 5 are summarized in **Exhibit 15**.

Arsenic, chromium, copper, lead, molybdenum, vanadium, and zinc concentrations exceeded ESVs in samples collected to depths of 5 feet bgs; mercury exceeded the ESV at 4 feet bgs. Antimony, cadmium, and silver concentrations above ESVs were typically reported at depths from 0.5 to 1.5 feet bgs. Arsenic and lead concentrations exceeded human health Residential and Recreational Visitor screening levels in both AOC 4 and AOC 5 and mercury concentrations exceeded Residential RSLs in AOC 5. Antimony exceeded residential SSLs in AOC 4 at BB-025 and BB-025-SO and in AOC 5 at BB-116 and BB-023.

Laboratory Results for Surface Soil/Mill Waste

Samples co-located with XRF measurement locations within AOCs 4, 5, 6, and 7 were submitted to BC, located in Bakersfield, California, for analysis of CAM-17 metals. Laboratory analytical results indicate arsenic in AOCs 4, 5, and 6 and lead and mercury in AOC 5 exceed the BLM Recreation Visitor SSLs. Arsenic and mercury in AOC 7; antimony, lead, and mercury in AOCs 4 and 5; and cadmium in AOC 5 exceed the Residential RSLs. Based on limited laboratory data, distributions of Laboratory and XRF data for metals were consistent (**Exhibit 16** and **Exhibit 17**).

Exhibit 16: Summary of XRF Metal Exceedances by AOC

	Antimony	Arsenic	Lead	Mercury		
AOC1		Total 72 s	samples			
Concentration Range - XRF	ND	5 – 37 ppm	ND – 21 ppm	ND – 5 ppm		
> Background	0	7	0	11		
> Residential RSL	0	72	0	36		
> Recreational SSL	0	1	0	0		
> Most Stringent ESV	0	7	12	36		
AOC2		Total 49 s	amples	•		
Concentration Range - XRF	ND – 33 ppm	12 – 368 ppm	12 – 480 ppm	ND – 31 ppm		
> Background	2	42	24	30		
> Residential RSL	1	49	18	44		
> Recreational SSL	0	29	0	0		
> Most Stringent ESV	2	42	49	44		
AOC3	Total 25 samples					
Concentration Range - XRF	ND – 69 ppm	13 – 2183 ppm	12 - 435	ND – 76 ppm		
> Background	3	24	15	15		
> Residential RSL	1	25	12	17		
> Recreational SSL	0	24	0	0		
> Most Stringent ESV	3	24	25	17		
AOC4	Total 15 samples					
Concentration Range - XRF	ND – 8764 ppm	35 – 10929 ppm	10 – 891 ppm	ND – 16 ppm		
> Background	7	15	10	9		
> Residential RSL	5	15	9	10		
> Recreational SSL	2	15	1	0		
> Most Stringent ESV	7	15	14	10		
AOC5	Total 15 samples					

	Antimony	Arsenic	Lead	Mercury		
Concentration Range - XRF	ND – 95 ppm	65 – 90,189 ppm	8 – 6956 ppm	ND – 1485 ppm		
> Background	6	15	13	13		
> Residential RSL	4	15	11	13		
> Recreational SSL	0	15	8	3		
> Most Stringent ESV	6	15	14	13		
AOC6		Total 16 s	amples			
Concentration Range - XRF	ND	22 – 369 ppm	6 – 56 ppm	ND – 17 ppm		
> Background	0	16	0	9		
> Residential RSL	0	16	0	13		
> Recreational SSL	0	13	0	0		
> Most Stringent ESV	0	16	14	13		
AOC7	Total 10 samples					
Concentration Range - XRF	ND	4 – 26 ppm	6 – 10 ppm	ND – 4 ppm		
> Background	0	3	0	1		
> Residential RSL	0	10	0	6		
> Recreational SSL	0	0	0	0		
> Most Stringent ESV	0	3	0	6		
Background		Total 20 s	amples			
> Residential RSL	0	20	0	11		
> Recreational SSL	0	1	0	0		
> Most Stringent ESV	0	3	20	11		

Notes:

ND - Not detected above the XRF LOD

Exhibit 17: Summary of Laboratory Metal Exceedances by AOC

	Antimony	Arsenic	Lead	Mercury			
AOC4	Total 2 samples						
Concentration Range - Lab	120–160 mg/kg	7100–7400 mg/kg	520-610 mg/kg	2-3 mg/kg			
> Background	2	2	2	2			
> Residential RSL	2	2	2	2			
> Recreational SSL	0	2	0	0			
> Most Stringent ESV	2	2	2	2			
AOC5	Total 8 samples						
Concentration Range - Lab	0.83 – 74 mg/kg	1100-88000 mg/kg	66-13000 mg/kg	5.7–350 mg/kg			
> Background	8	8	8	8			
> Residential RSL	1	8	7	8			
> Recreational SSL	0	8	7	1			
> Most Stringent ESV	8	8	8	8			
AOC6	Total 1 sample						
Concentration Range - Lab	ND	110 mg/kg	34 mg/kg	0.77 mg/kg			
> Background	0	1	0	1			
> Residential RSL	0	1	0	0			
> Recreational SSL	0	1	0	0			

	Antimony	Arsenic	Lead	Mercury			
> Most Stringent ESV	0	1	1	1			
AOC7	Total 10 samples						
Concentration Range - Lab	ND	ND – 17 mg/kg	ND	ND-4.3 mg/kg			
> Background	0	0	0	1			
> Residential RSL	0	9	0	1			
> Recreational SSL	0	0	0	0			
> Most Stringent ESV	0	0	0	6			

Notes:

ND - Not detected above the XRF LOD

Soil samples collected at BB-022, BB-043, BB-097, and BB-116-SO-01 were submitted for PAH and VOC analyses. Low-level concentrations of PAHs were reported in all samples (**Table 3C**). Toluene (0.0014J mg/kg) was reported in sample BB-043, and benzene (0.0011 mg/kg) and toluene (0.0012) were present in sample BB-022 (**Table 3D**). All PAH and VOC concentrations were below human health and ecological screening criteria.

Particulate Sample Results

Arsenic exceeded industrial particulate screening criteria in samples BB-D-4.1 and BB-D-4.2 and lead exceeded residential particulate criteria in sample BB-D-4.2 (**Table 6**).

ABA, WET, and TCLP Results

Although ABA results were slightly negative, total sulfur and slightly negative NNP does not indicate strong evidence for metals leaching. The DI WET concentration of arsenic at BB-123 exceeded the STLC indicating the possibility for leaching in surface water and to groundwater. None of the remaining WET results exceeded the STLC. The arsenic, cadmium, lead, and mercury concentrations in sample BB-123 did not exceed TCLP thresholds.

Risk Characterization Summary

Human Health Assessment

The SRA documented complete pathways for human exposures to surface soil/waste, river sediments, subsurface soil, windblown particulates, and surface water. Risks and hazards were estimated for Residents and child/adult Recreational Visitors. Arsenic is the driver for cancer risk, and non-cancer hazards exceeding the threshold 1 for potential adverse effects are attributed to antimony, arsenic, cadmium, lead, and mercury. The estimated risks and hazards posed by exposure of human receptors to soil COCs in background samples and AOCs 1 through 7 are summarized in **Appendix H**, Tables H2-1 through H2-8 and **Tables 7** and **8**.

Estimated arsenic risks exceeded the EPA upper bound risk management range of 1 x 10⁻⁴ for Residential exposures. **Figure 6** displays the estimated arsenic risk for assumed Residential exposure. Green indicates arsenic risk below background (2 x 10⁻⁴), blue represents arsenic risk greater than 1 x 10⁻⁴, gold represents arsenic risk greater than 1 x 10⁻³, and red indicates arsenic risk greater than 1 x 10⁻². The highest risks are associated with AOC 5 and AOC 4. AOC 2, AOC 3, and AOC 6 contain areas of elevated risk; however, additional data would be required to refine the exposure area for AOC 2 and AOC 6. Risk at AOCs 1 and 7 from exposure to metals in surface soil are within the range of background.

Arsenic cancer risks to the adult/child Recreational Visitor ranged from 3 x 10^{-6} at AOC 2 to 1 x 10^{-3} at AOC 5, above the target risk of 1 x 10^{-6} . HIs for non-cancer health effects to Residents ranged from 35 at AOC-1 to 89,748 at AOC 5 and HIs for the Recreational Visitor were 24 and 50

for AOC 4 and AOC 5. HIs exceeding 1 indicate potential adverse non-cancer effects could occur based on site-specific exposure factors. HIs exceeding the threshold of 1 for human receptors are driven by exposure to elevated concentrations of antimony, arsenic, lead, and mercury at AOCs 4 and 5; arsenic, lead, and mercury at AOC 3; and arsenic and mercury at AOCs 1, 2, 6, and 7. Arsenic is naturally occurring, and the Residential risk is 2 x 10⁻⁴ for background exposures, with an HI of 50.

To evaluate the distribution of metals in shallow subsurface soil, subsurface samples were evaluated in AOCs 4 and 5 (**Appendix H**, Table H2-9 and **Table 9**). Subsurface soil shows arsenic risks extend to 2 feet bgs at AOC 4 and 5 feet bgs at AOC 5.

Ecological Risk Assessment for Soil and Tailings

The 95% UCLs for each metal in surface soil/mill tailings at seven AOCs were compared to receptor-specific ESVs for plants, invertebrates, mammals, and birds (**Appendix H**, Tables H2-2 through H2-8). The COPECs that exceed the receptor-specific ESVs in surface soil and waste material are presented as HQs and HIs and summarized in **Tables 7** and **8**. The following COPECs were identified for ecological receptors exposed to metals at the AOCs: antimony, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, selenium, silver, and zinc. The calculated HQs are provided for use during evaluation of potential removal action alternatives.

All 12 COPECs exceeded 1 in one or more AOCs at the site. Metal concentrations exceeding ESVs are widespread, but indicator metals vary by receptor. For plants and invertebrates, HIs were most elevated for antimony, arsenic, lead, and zinc. Chromium is also elevated; however, the HQs are based on chromium VI, the most toxic form. Actual risk is likely overestimated. For mammals, the highest HQs were observed for antimony, cadmium, lead, mercury, and molybdenum. Birds were most impacted by exposure to arsenic, cadmium, lead, mercury, and zinc.

Metals in shallow subsurface soil were evaluated to delineate concentration trends with depth. Subsurface concentrations were evaluated in AOCs 4 and 5 (**Appendix H**, Table H2-9 and **Table 9**). Subsurface soil shows arsenic risks extend to 2 feet bgs at AOC 4 and 5 feet bgs at AOC 5.

If potentially toxic chemicals have contaminated or may reasonably be expected to contaminate media that may contact wildlife or wildlife habitats, either on site, or off site, directly or indirectly, the potential for exposure is considered to exist and further action may be warranted. Removal of impacted surface and near-surface waste/soil would mitigate adverse impacts due to exposure of ecological receptors to metals at the site.

River Sediment

Sediment was analyzed at four locations (**Appendix H**, Table B2-10; **Table 10**), including upriver, adjacent to the site, downriver at the sand bar, and downriver of the site (**Figure 2**). Arsenic was identified as a COPC and arsenic, mercury, and selenium were identified as COPECs in river sediment. Estimated Residential arsenic cancer risks for stream sediment were 2 x 10⁻⁵ at the upriver location and ranged from 3 x 10⁻⁴ to 1 x 10⁻⁴ at the site and downriver locations. Arsenic HQs were reported at 7 in the upriver location, exceeding the threshold of 1 for potential adverse effects. At the site and downriver, HQs varied from 78 at the site to 34 and 54 at downriver locations. Hazard to aquatic organisms (HI = 8) resulted from arsenic, mercury, and selenium HQs exceeding 1. The data indicate that arsenic concentrations are elevated upriver of the site, and site-related impacts to sediment are likely minor. There is minimal evidence of migration of metals to downriver sediment.

Surface Water

Surface water samples co-located with sediment samples (**Appendix H**, Table H2-11; **Table 11**) were collected with sediment samples at locations upriver, adjacent to, and downriver of the site (**Figure 2**). Arsenic and mercury were identified as COPCs. Total arsenic and mercury concentrations exceeded the most-stringent human health screening criteria developed for surface water based on Water Quality Control Board beneficial use designations of the Kern River, including the sample collected upriver of the site. Arsenic and mercury exceeded the California Toxic Rule water quality standards at upriver locations, as well as locations adjacent to the site and downriver. The data indicate impacts to the Kern River are present from non-site sources, and significant migration of arsenic or mercury downriver is not expected.

5.2 Conclusions

The following conclusions are based on review and analysis of the SI XRF and laboratory data, past history, and observation of site conditions:

- Antimony, arsenic, cadmium, lead, mercury, molybdenum, selenium, silver, and zinc concentrations exceeded three-times background screening criteria in one or more surface samples, indicating that a release of metals from historical milling operations has occurred
- In addition to these metals, copper concentrations also exceeded the background screening criterion. PAHs and VOCs are not COCs/COPCs at the site.
- The highest XRF field screening and laboratory results occurred in AOC 5 for exposure to cemented tailings, followed by AOC 4 on USFS land near the private property boundary, and AOC 3, the process area. Arsenic concentrations exceeded the Residential RSL in all investigation areas across the site, and arsenic exceeded the BLM Recreational Visitor SSL in AOC 4 and AOC 5. Figure 5 shows the extent of arsenic in surface soils throughout the investigation area at concentrations above the BLM Recreational Visitor SSL.
- Historical records do not include scaled drawings or geo-referenced locations, resulting in uncertainty regarding the actual locations of the mill facilities and associated operations buildings. Some of these historical facilities may be located northeast of the current site Inspection boundary.
- Historical maps and photographs indicate that structures associated with the Big Blue Mill
 may have been located on present day private property. The distribution of elevated
 arsenic along the private property boundary with USFS (western boundary of AOC 4 and
 northwestern boundary of AOC 6) indicates that the extent of arsenic to the west of AOC
 4 and northwest of AOC 6 is not defined and likely extends on private property.
- Mercury characterization using site-wide XRF results was limited since the LOD was elevated at 3 ppm. Mercury extent could not be delineated below 3 ppm, which exceeds human and ecological screening criteria. Partial delineation below 3 ppm was conducted using laboratory data. XRF results in AOCs 2, 3, 4, 5, and 6 indicate some concentrations exceed human health and ecological criteria. Laboratory detections of mercury exceeding screening criteria were reported in AOC 4, 5, 6, and 7.
- Arsenic in river sediment exceeded both human health and ecological screening values in upriver, adjacent to the site, and downriver samples. The data indicate sediment quality is impacted by upriver sources; however, there is minimal evidence of off-site migration downriver.

- In accordance with the approved sample program, vertical delineation samples were limited to locations with the highest surface concentration, location of waste material, proximity to the mill, and knowledge of natural processes that affect material transport in AOC 4 and AOC 5 to assist in preliminary subsurface characterization. No vertical delineation samples were collected in any areas of the remaining AOCs. In areas of the site that may have been inundated during periodic flood events, river sediment may have been deposited over material impacted by historical mill operations.
- The results for AOC 4 and AOC 5 indicate that metals concentrations generally decrease with depth. However, deeper concentrations of select metals still exceeded human health and/or ecological screening values.
- Dust containing arsenic and lead exceeded DTSC modified industrial and residential screening levels at the site.
- Based on the SRA results, several metals are present at the site at concentrations greater than background levels and the conservative RBSLs. The risk characterization results show arsenic is the risk driver, exceeding the target risk level for Residential exposure in all AOCs and Recreational Visitor exposure in five AOCs. HQs exceeding 1 indicate that potential adverse effects may occur to human and ecological receptors from exposure to metals.
- Although other metals contribute risk to the site, remediation of arsenic will largely address
 potential risk to human health and the environment.

5.3 Recommendations

Based on the conclusions of the SI, soil/waste at the site represents a potential threat to public health, welfare, and/or the environment, and further action is recommended to mitigate long-term impacts. ECM recommends conducting an Engineering Evaluation/Cost Analysis to collect additional data to fully evaluate the site. Recommendations include the following:

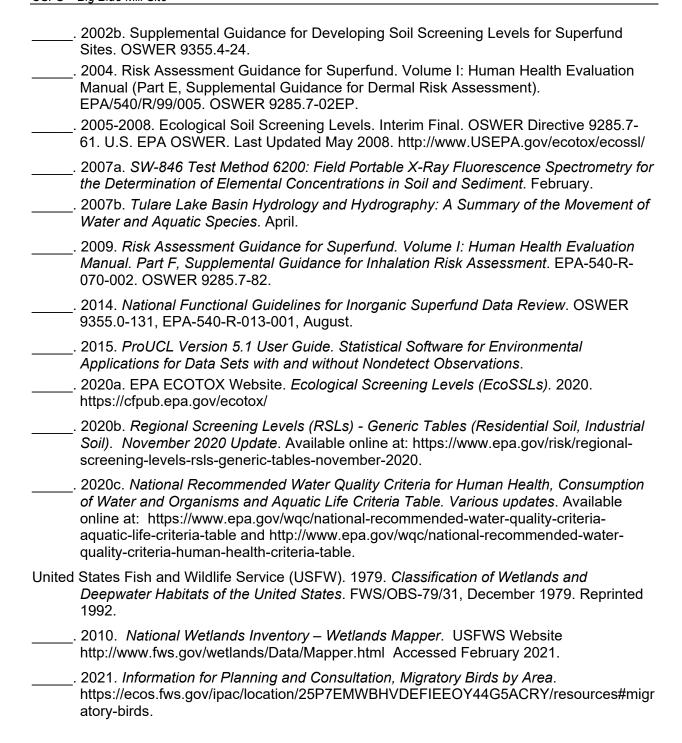
- Additional sampling on the private property west and north-west of the current USFS boundary to determine the nature and extent of arsenic and other metals.
- Surface and subsurface sampling to determine if additional impacts are present outside
 of the current investigation area to the east and northeast. Historical aerial photos and
 engineering drawings provide evidence that mill activities may have occurred in this area.
- Collect data to better define the magnitude and vertical extent of waste material associated with former milling activities and estimate removal volumes throughout the site. Only limited subsurface data were collected from approved locations at two AOCs during the SI. Isolated occurrences of elevated metals in AOC 2 and AOC 6 may require additional sampling to fully characterize areas requiring cleanup. Additionally, impacted material may be present beneath sediment deposited in areas of the site susceptible to flooding such as AOC 1.
- Collect 10 discrete laboratory background samples to calculate 95-95 upper tolerance limit (UTL) values and establish metal background threshold values to refine risk assessment and derive cleanup goals.
- Gauge and sample groundwater from the well on adjacent property to evaluate whether the groundwater pathway is complete.

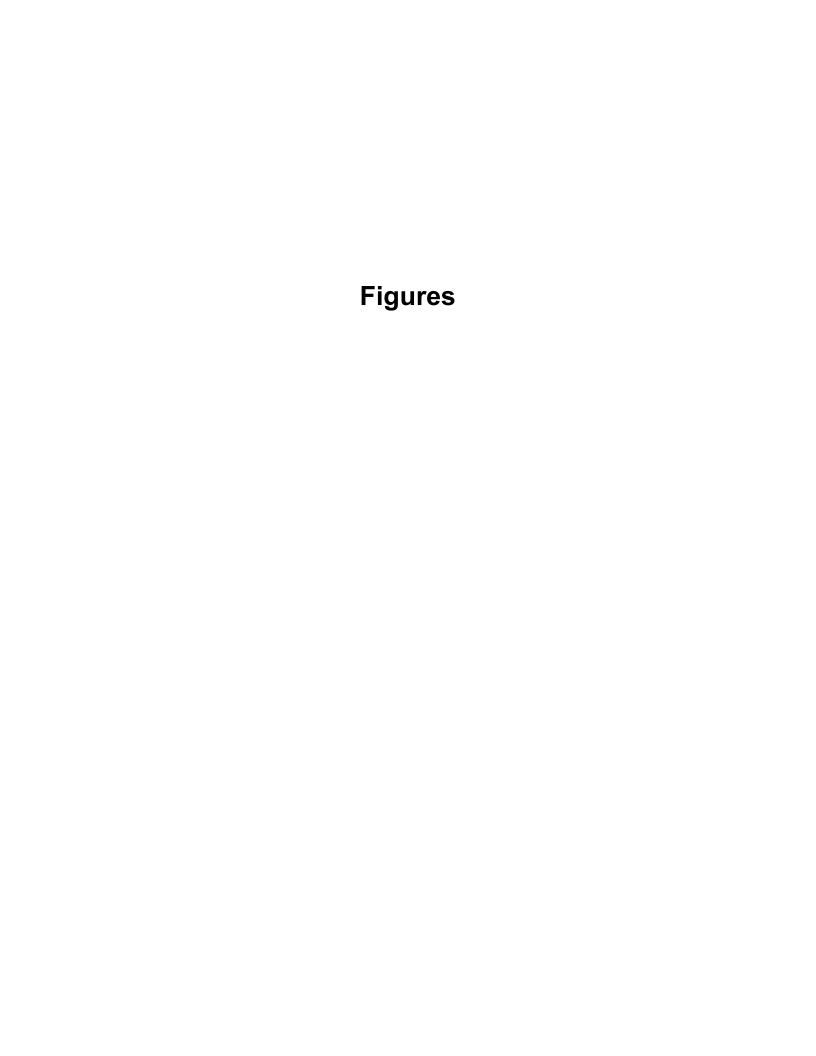
- Conduct additional evaluation (Designated Levels) and sampling to better evaluate leaching conditions and determine whether exceptions to hazardous waste determination are applicable.
- Evaluate whether material can be placed in the associated Kern Floodplain repository if mitigation measures are determined to be necessary at the site.
- Dust monitoring and suppression are recommended during site activities that create dust or when windy conditions are present.
- The site-specific bioavailability data should be incorporated into a future assessment to improve risk characterization at the site.

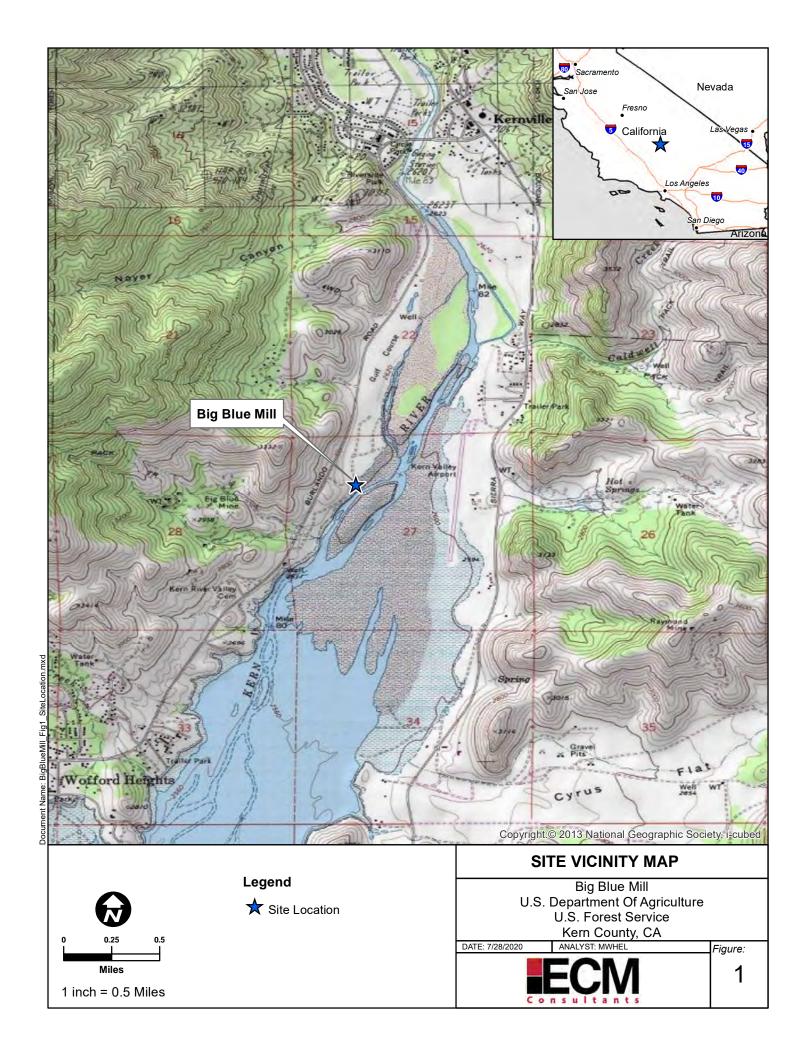
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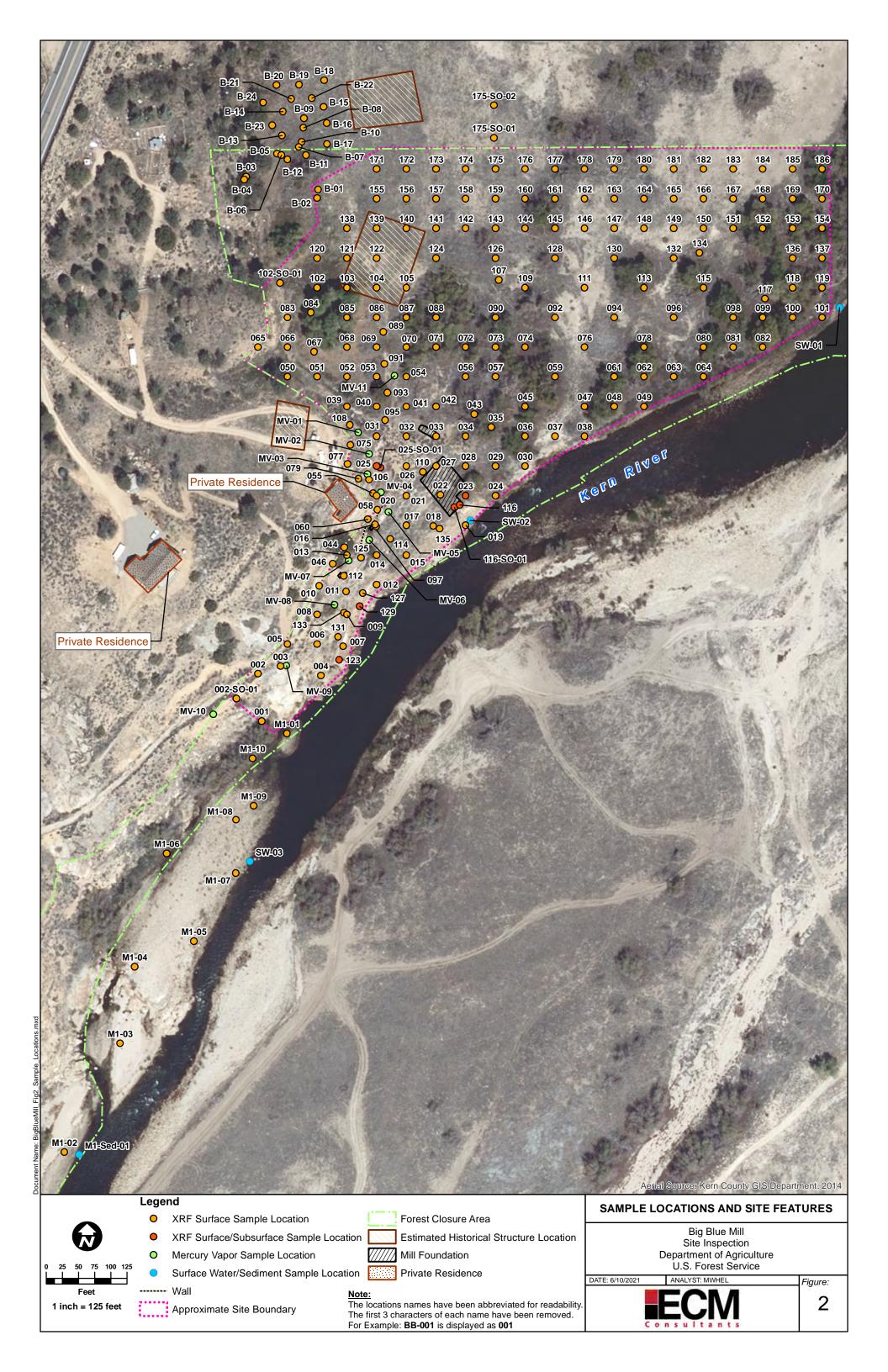
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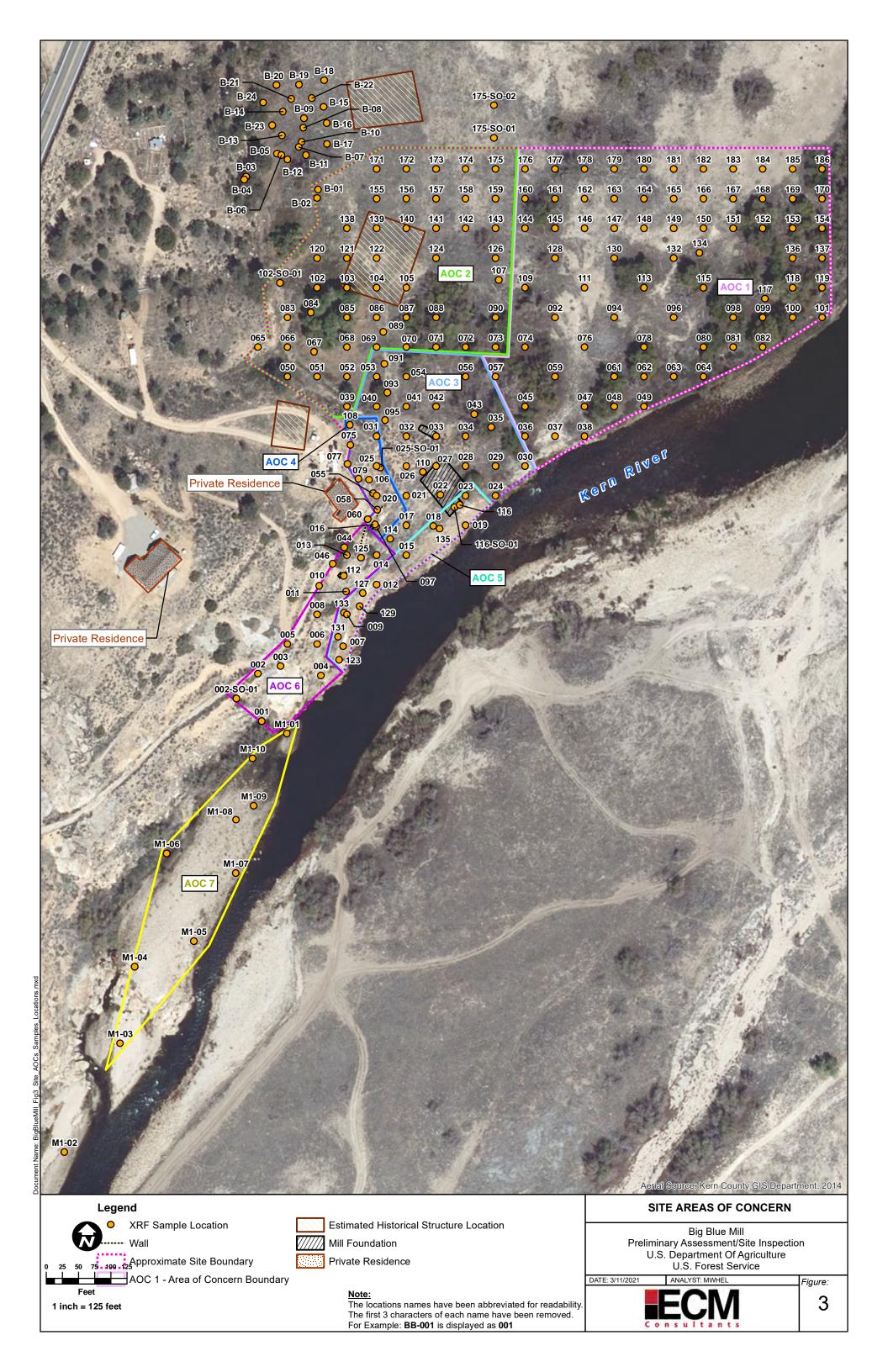
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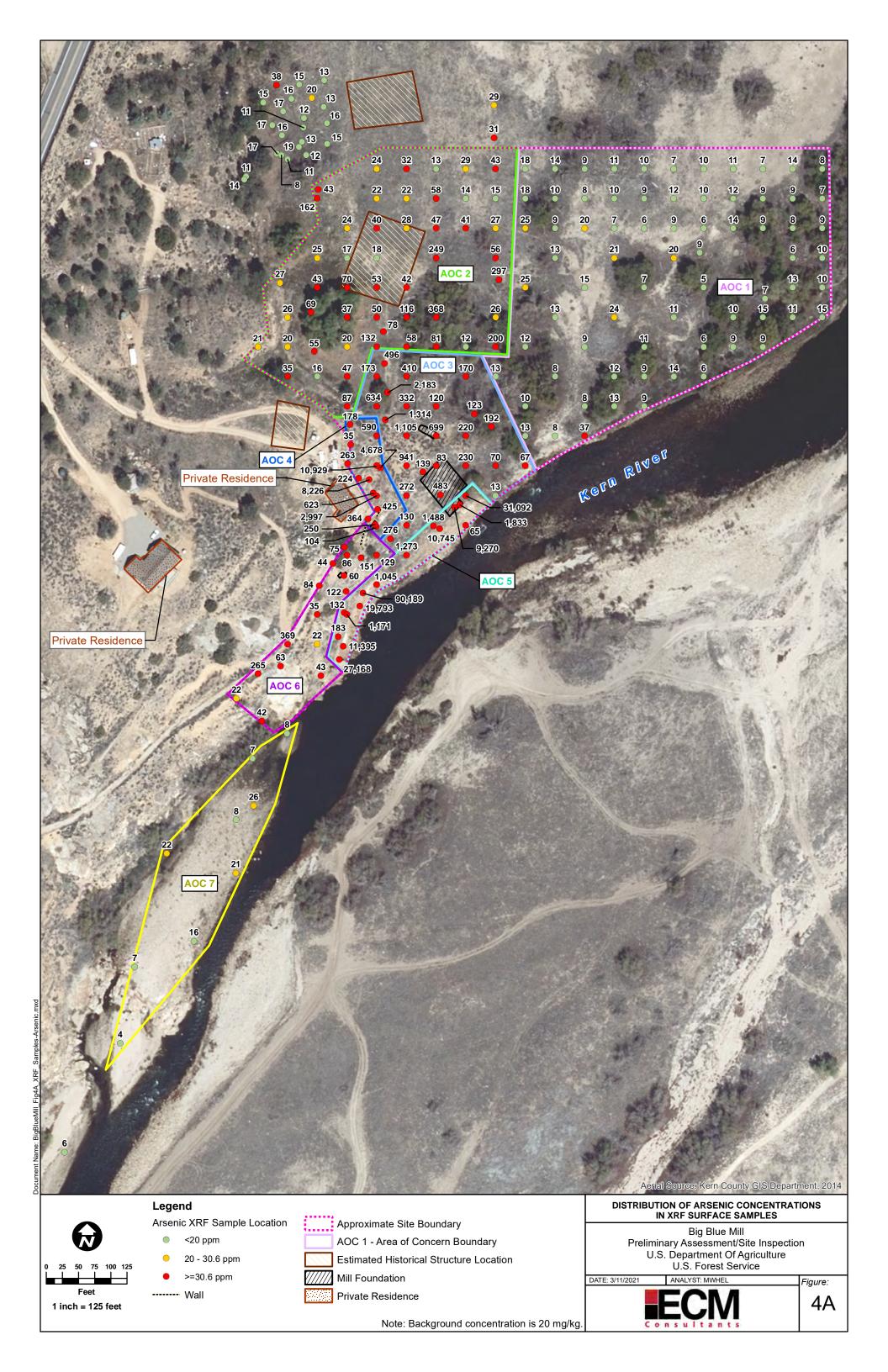


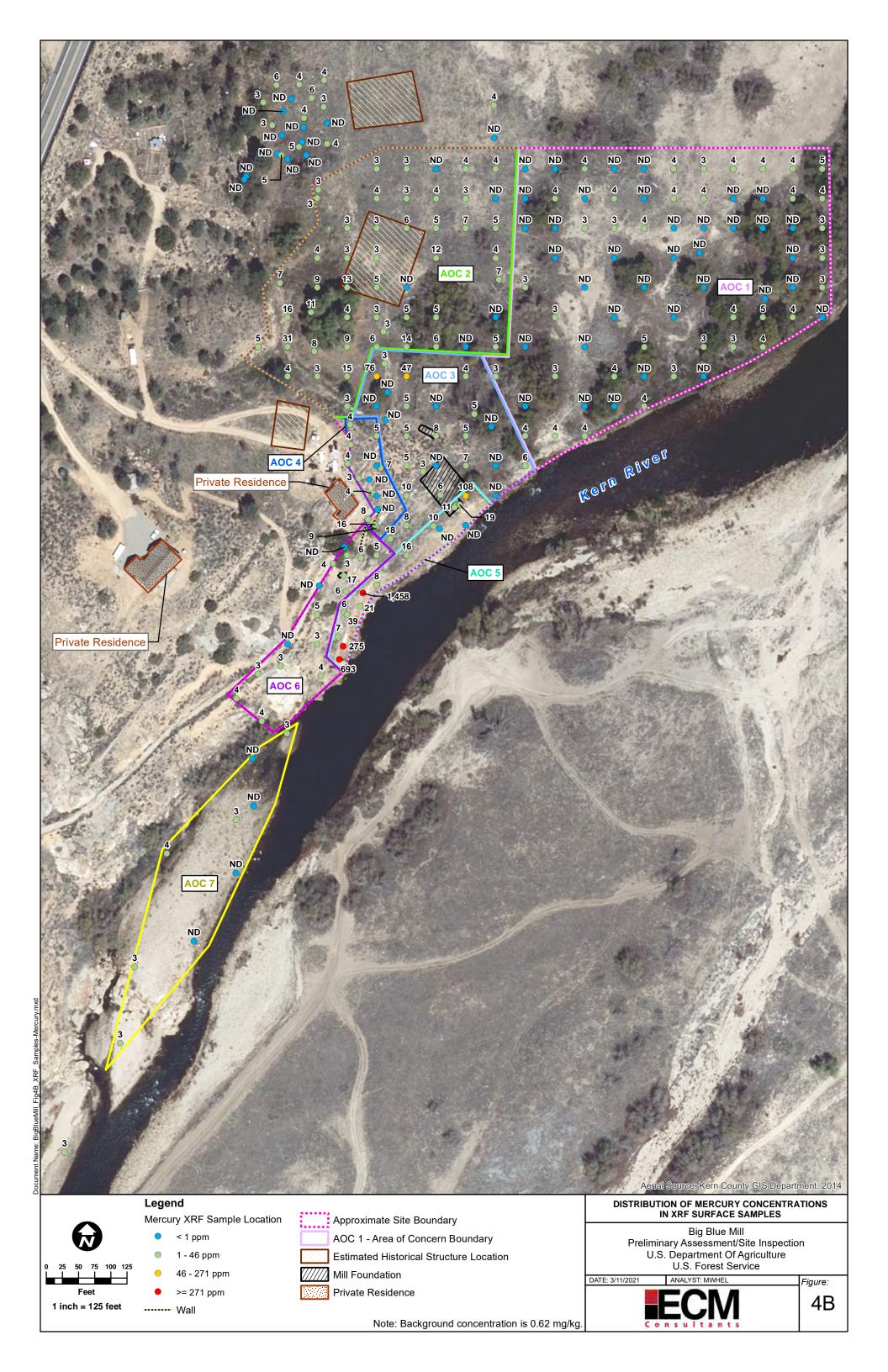


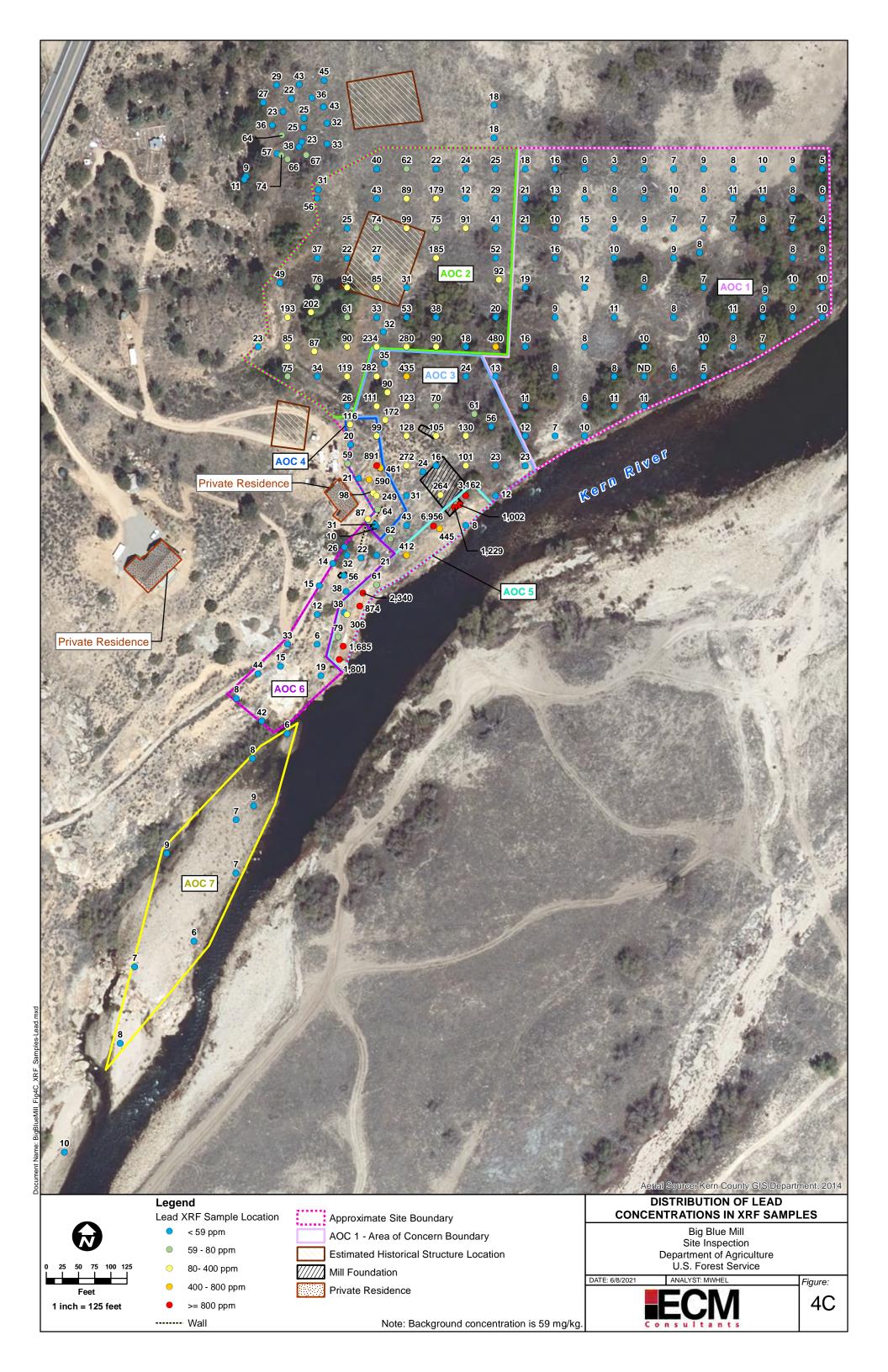


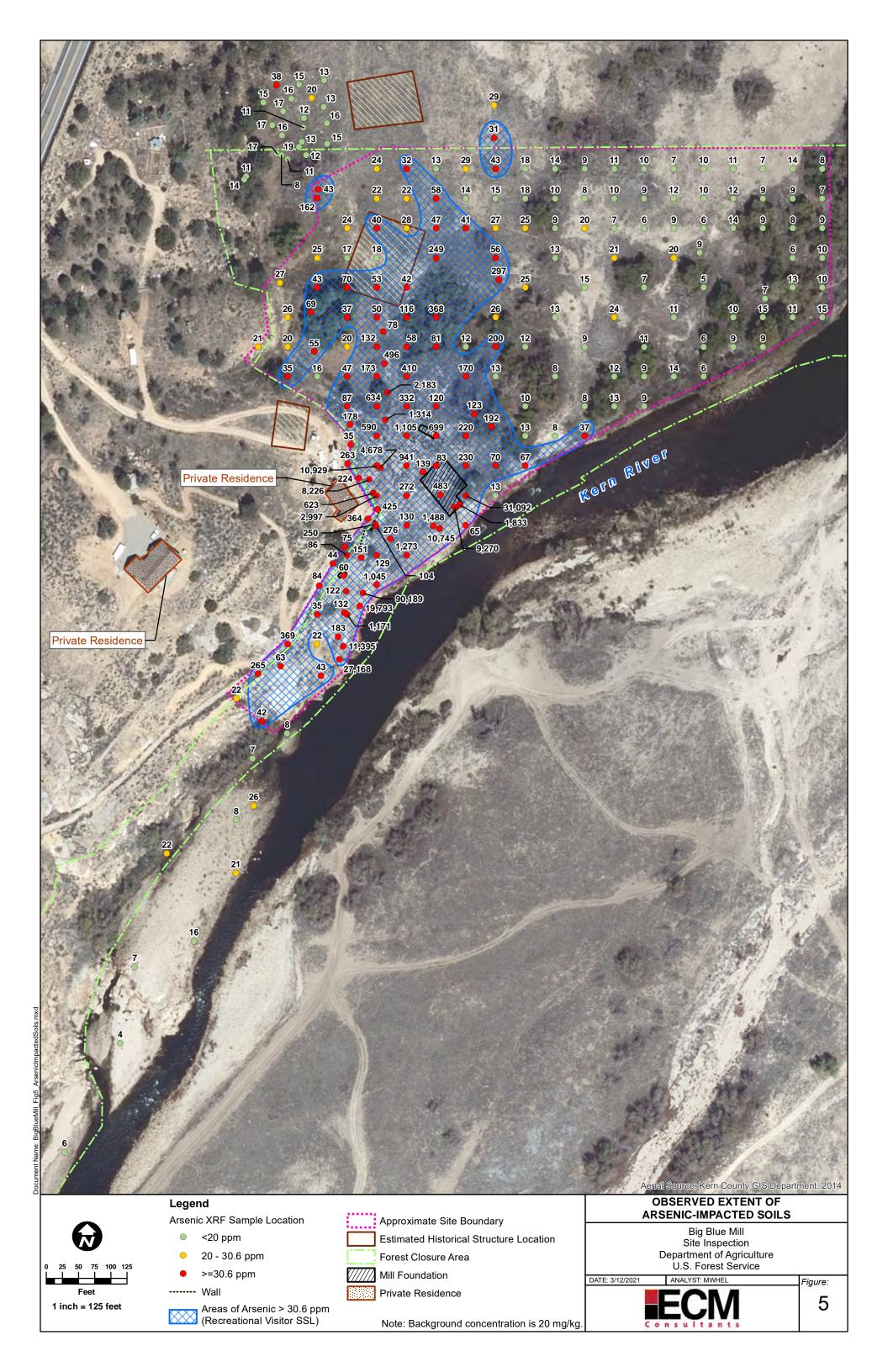


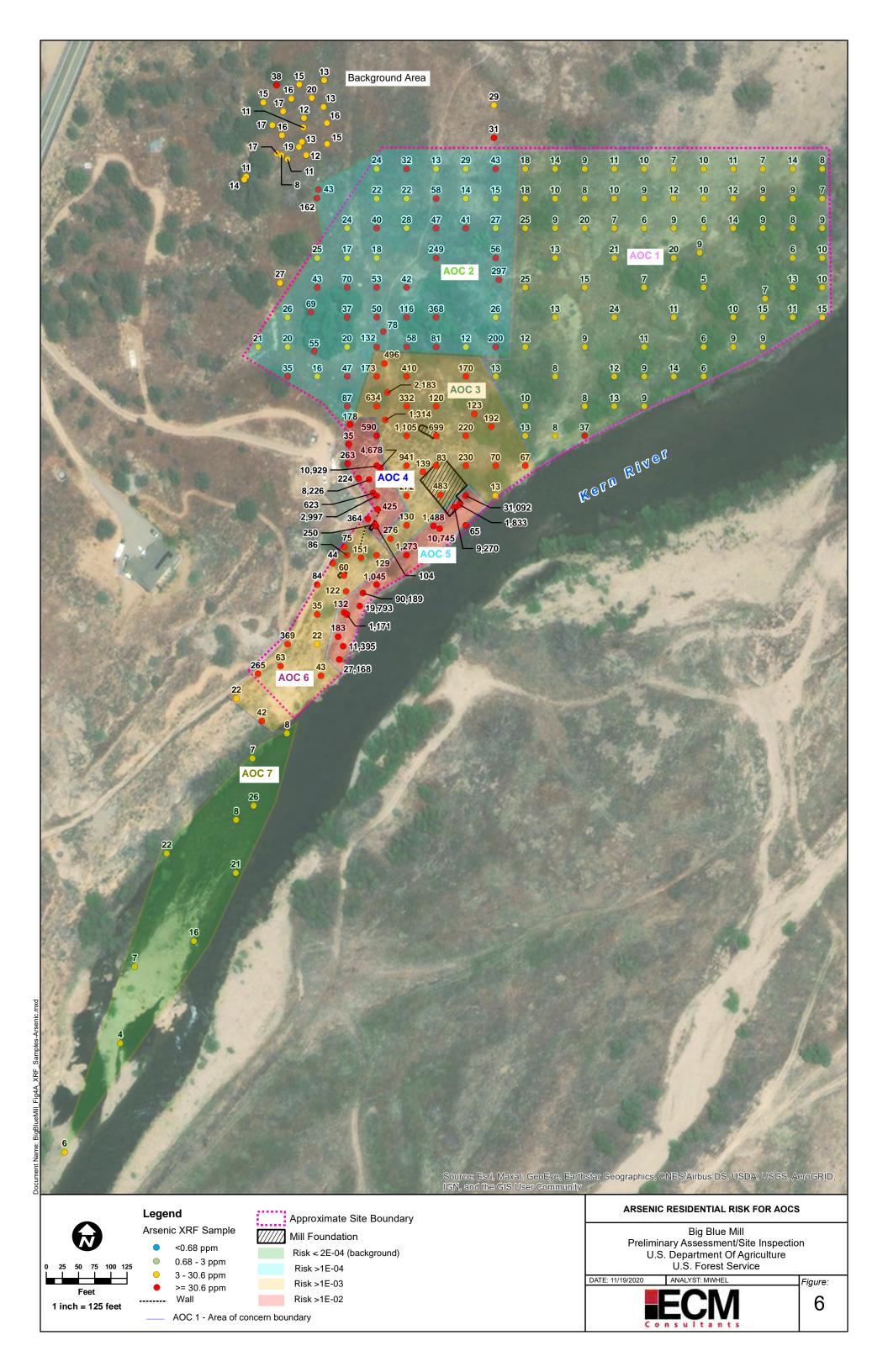


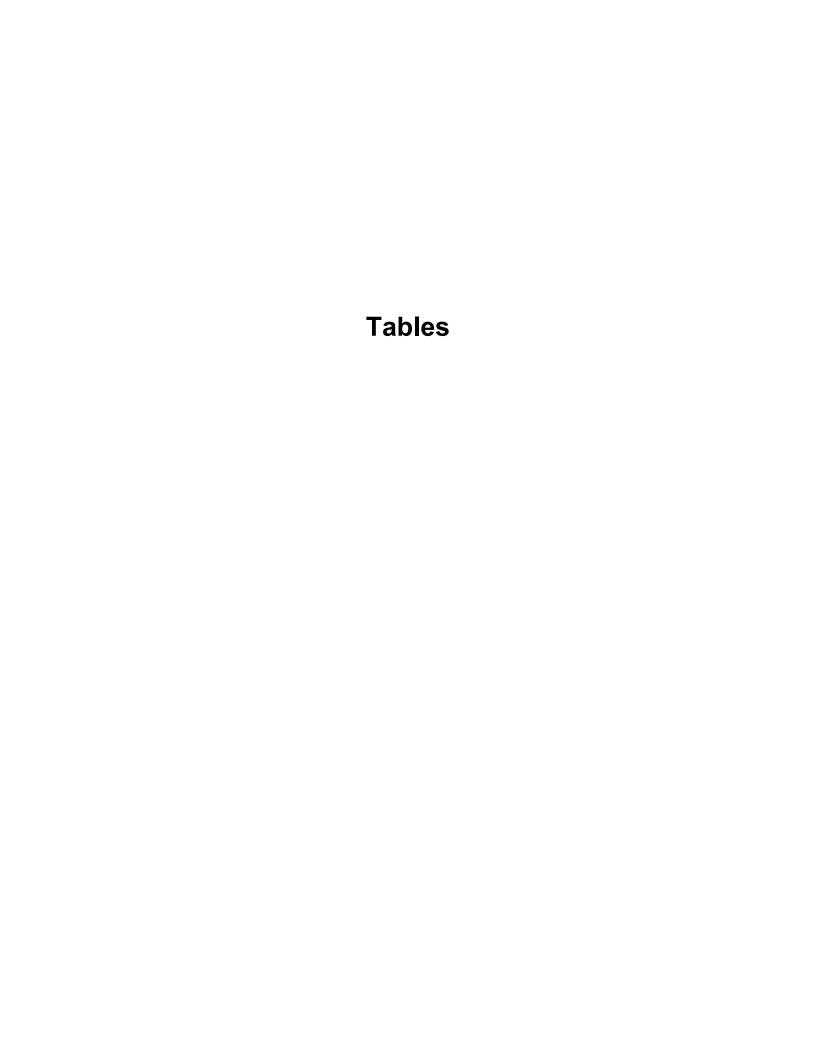












Media	Sample Type	Method	Discrete	Composite	Total
Background	XRF	Metals	24	1	25
0	Lab - Metals	6010/6020/7471		1	1
Downgradient Sand Deposits along River	XRF	Metals	10		10
Bank	Lab - Metals	6010/6020/7471	10		10
Step-Out Soil Samples	XRF	Metals	4		4
(Modification)	Lab - Metals	6010/6020/7471			
	XRF	Metals	191		191
	Lab - Metals	6010/6020/7471	11		11
	Lab - Metals (Duplicate)	6010/6020/7471	1		1
Surface Soil	VOCs	8260B	4		4
	PAHs	8270-SIM	4		4
	TCLP/WET	1311/66700	1		1
	Bioavailability	1340	2		2
Subsurface Soil	XRF	Metals	28		28
Subsurface Soli	Lab - Metals	6010/6020/7471	5		5
Stream Sediment	Metals	6010/6020/7471	4		4
	Total Metals	6010/6020/7470	3		3
	Dissolved Metals	6010/6020/7470	3		3
	Total Metals Duplicate	6010/6020/7470	1		1
Surface Water	Dissolved Metals Duplicate	6010/6020/7470	1		1
	Hardness	SM-2340B			
	Water Quality Parameters	pH, temperature, conductivity	3		3
	T. (15)	NIIOOL: 0700			
	Total Dust	NIOSH 0500	4		4
Site Dust/Air Particulates	Dust in Respirable Fraction	NIOSH 0600	4		4
	Dust - Metals	NIOSH 7307	4		4

Acronyms and Abbreviations:

"--" - not sampled

WET - Waste Extraction Test

TCLP - Toxicity Characteristic Leaching Procedure

VOC - volatile organic compound

PAH - polynuclear aromatic hydrocarbon

XRF - x-ray fluoresence

Description/Location	Sample ID	Sample Date	Sample Method	Antimony	Arsenic		Barium		Beryllium	Cadmium	Chromium		Cobalt		Copper	Lead	Mercury	Molybdenum	Nickel		Selenium	Silver	Thallium	Vanadium	Zinc
Background #1 3	BB-B-01	10/19/2020	XRF	<379	43					<164	26		<77		16	31	3	<29	21		<3	<130		244	139
Background #2 ³	BB-B-02	10/19/2020	XRF	<386	162					<167	28		<75		20	56	3	<30	23		<3	<132		227	106
Background, uphill, disturbed road cut area ³	BB-B-03	10/19/2020	XRF	<415	11					<181	<30		<81		15	9	<27	4	15		<4	<144		191	79
Background, uphill, disturbed road cut area ³	BB-B-04	10/19/2020	XRF	<410	14					<178	26		<82		15	11	<27	4	11		<3	<141		230	76
Background, slightly uphill of flood plain	BB-B-05	10/19/2020	XRF	<372	17					<163	28		<81		27	57	<25	4	23		<3	<129		227	137
Background, slightly uphill of flood plain	BB-B-06	10/19/2020	XRF	<388	8					<168	26		<73		24	74	5	4	15		<3	<134		274	94
Background, slightly uphill of flood plain	BB-B-07	10/19/2020	XRF	<392	19					<170	<29		<84		14	38	5	4	20		<3	<135		242	112
Background flood plain	BB-B-08	10/19/2020	XRF	<418	11					<182	<29		<75		17	25	<28	6	12		<3	<145		133	135
Background flood plain	BB-B-09	10/19/2020	XRF	<393	12					<171	33		<75		20	25	4	4	15		<3	<136		220	112
Background flood plain	BB-B-10	10/19/2020	XRF	<402	13					<176	<28		<70		10	23	<26	7	13		<3	<140		199	84
Background flood plain	BB-B-11	10/19/2020	XRF	<397	12					<174	<28		<68		18	67	<26	3	13		<3	<138		203	88
Background flood plain	BB-B-12	10/19/2020	XRF	<381	11					<169	<28		<81		37	66	<27	11	13		<3	<134		149	172
Background flood plain	BB-B-13	10/19/2020	XRF	<355	16					<160	<27		<83		36	64	<25	16	14		<3	<129		111	236
Background flood plain	BB-B-14	10/19/2020	XRF	<406	17					<178	<28		<76		14	23	<27	7	14		<3	<142		198	103
Background flood plain	BB-B-15	10/19/2020	XRF	<409	13					<177	27		<80		16	43	3	4	13		<3	<141		194	109
Background flood plain	BB-B-16	10/19/2020	XRF	<413	16					<180	<29		<79		16	32	<28	7	14		<3	<143		229	101
Background flood plain	BB-B-17	10/19/2020	XRF	<397	15					<174	<29		<76		17	33	4	6	16		<3	<139		204	115
Background flood plain	BB-B-18	10/19/2020	XRF	<410	13					<181	<31		<90		24	45	4	13	19		<4	<145		214	162
Background flood plain	BB-B-19	10/19/2020	XRF	<383	15					<166	36		<77		19	43	4	4	24		<3	<132		226	109
Background flood plain	BB-B-20	10/19/2020	XRF	<356	38					<163	<39		871		20	29	6	33	<14		<4	<132		114	213
Background flood plain	BB-B-21	10/19/2020	XRF	<406	16					<177	<29		<77		14	22	<27	6	17		<3	<141		163	111
Background flood plain	BB-B-22	10/19/2020	XRF	<388	20					<170	<29		<80		21	36	6	6	16		<3	<135		236	108
Background flood plain	BB-B-23	10/19/2020	XRF	<379	17					<165	25		<77		21	36	3	5	18		<3	<131		199	106
Background flood plain	BB-B-24	10/19/2020	XRF	<397	15					<172	<29		<79		17	27	3	3	14		<3	<137		229	98
Background flood plain composite ³	BB-B-COMP-01	10/19/2020	XRF	<376	19					<164	24		<80		26	59	3	6	13		<3	<131		209	128
Background flood plain composite ³	BB-B-COMP-01	10/19/2020	Lab	<0.8	A07 20	A07	82	A07 <	0.47	(0.52	A07 10	A07	6.3	J,A07	10 A07	43 A	A07 0.62	<0.5 A07	7 4.9	J,A07	<1.1 A07	<0.67 A	.07 <0.49 A07	30 A	07 78 A07
ARAR/TBC			RECEPTOR					•						So	oil and Dry Sedim	ent Scree	ening Criteria (mo	g/kg)							
Three Times Background (L	ahoratory)		All	0.8	60		246).47	0.52	30	1	18.9		30	129	1.86	0.5	14.7		1.1	0.67	0.49	90	234
						-			-	-	 	-			-	+	+ +		+			-		 	
Three Times Background	d (XRF)		All	<376	57					<164	72		<80		78	177	9	18	39		<3	<131		627	384
			Avian	NE	43 ^a		720 ^c		NE	0.77 ^a	26 ^{a,1}		120 ^a		28 ^a	11 a	0.013 ^c	15 ^c	210 ^a		1.2 ^a	4.2 ^a	4.5 ^c	7.8 ^a	46 ^a
Englaciant Sail Saranning La	a,b,c,d		Invertebrates	78 ^a	60 ^b		330 ^a	4	40 ^a	140 ^a	0.4 b,2		NE		80 ^a	1,700 a	0.1 ^b	NE	280 ^a		4.1 ^a	NE	NE	NE	120 ^a
Ecological Soil Screening Le	eveis		Mammals	0.27 a	46 ^a		2,000 a	2	21 ^a	0.36 ^a	34 ^{a,1}		230 ^a		49 ^a	56 ^a	1.7 °	0.52 ^d	130 ^a		0.63 ^a	14 ^a	0.42 ^c	280 ^a	79 ^a
			Plants	5 ^b	18 ^a		110 °	2	2.5 °	32 ^a	1 b,2		13 ^a		70 ^a	120 a	0.3 ^b	2 ^b	38 ^a		0.52 ^a	560 ^a	1 ^b	2 ^b	160 ^a
Preliminary Site Screening Criteria (Most Stringent an Receptors	d Applicable Value	s) for Ecological	Ecological	0.27	18		110		2.5	0.36	0.4		13		28	11	0.013	0.52	38		0.52	4.2	0.42	2	46
EPA Regional Screening Levels - 0	Generic Tables ^e		Residents	31	0.68		15,000		160	71	120,000		23		3,100	400	11	390	1,500		390	390	0.78	390	23,000
DTSC-Modified Screening	Levels [†]		Residents	NE	0.11		NE		16	71	NE		NE		NE	80	1	NE	820		NE	NE	NE	NE	NE
Preliminary Site Screening Criteria (Most Stringe Residential Human Rece		Values) for	Residents	31	0.11		15000		16	71	120,000		23		3100	80	1	390	820		390	390	0.78	390	23,000
BLM Child/Adult Recreationa	l Visitors ^g		Visitors	782	30.6		390,000	3	,910	1,780	1,000,000	1	586		78,200	800	271	9,780	39,000		9,780	9,780	19.60	9,850	587,000
EPA Me	thod			6020	6020		6010B	60	010B	6010B	6010B		6010B		6010B	6010B	7471A	6010B	6010B		6020	6010B	6020	6010B	6010B
Laboratory Method Detection	Limits (Soil/Dry Sec	diment)		0.08	0.17		0.18	C	0.05	0.052	0.05		0.098		0.05	0.28	0.016	0.05	0.15		0.11	0.067	0.49	0.11	0.087
Laboratory Reporting Limi	ts (Soil/Dry Sedime	ent)		0.5	0.5		0.5		0.5	0.5	0.5		2.5		1	2.5	0.16	2.5	0.5		0.5	1	0.25	0.5	2.5

Acronyms and Abbreviations:

ARAR = Applicable or Relevant and Appropriate Requirement

BLM = Bureau of Land Management

DTSC = Department of Toxic Substances Control EcoSSL = Ecological Soil Screening Levels

EPA = United States Environmental Protection Agency

mg/kg = Milligrams per Kilogram NE = Not Established

TBC = To-Be-Considered Requirement

- ^a EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/ecotox/
- b Oak Ridge National Laboratory (ORNL). 2018. RAIS The Risk Assessment Information System Ecological Benchmark Tool. Https://rais.ornl.gov/tools/eco_search.php
- ^c Los Alamos National Laboratory (LANL). 2017. ECORISK Database (Release 4.1), https://www.lanl.gov/envirohment/protection/eco-risk-assessment.php
- d Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. Document ES/ER/TM-86/R3. June.
- ^e EPA. 2020. Regional Screening Levels (RSLs) Generic Tables. May 2020.
- ^f DTSC. 2020. DTSC-modified Screening Levels (DTSC-SLs). HERO HHRA Note Number 3. June.
- ⁹ BLM. 2017. Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites.

² Screening values are for total chromium (underlying toxicity data are for chromium VI).

³ Samples BB-B-01, BB-B-02, BB-B-03, and BB-B-04 were not included in the composite sample because concentrations in BB-B-01 and BB-B-02 did not represent background concentrations for arsenic, and BB-B-03 and BB-B-04 were located in a different depositional environment.

AOC	Description/Location	Sample ID	Sample Date	Sample Method	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Геаф	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	Floodplain	BB-036	10/21/2020	XRF	<384	13			<165	34	<80	15	12	4	<30	29	<3	<131		299	65
	Floodplain	BB-109	10/21/2020	XRF	<369	25			<161	<28	<84	25	19	3	3	25	<3	<128		243	112
	Floodplain Floodplain	BB-111 BB-128	10/21/2020	XRF XRF	<371 <395	15 13			<162 <170	40 <27	<79 <68	23 17	12 16	<25 <26	3	29 24	<3 <3	<128 <135		300	105 72
	Floodplain	BB-130	10/20/2020	XRF	<363	21			<160	<28	<85	35	10	<26	9	29	<3	<128		203	127
	Floodplain	BB-132	10/20/2020	XRF	<352	20			<156	<29	<89	36	9	<25	11	26	<3	<125		219	148
	Floodplain	BB-081	10/22/2020	XRF	<408	9			<176	<27	<63	13	8	3	<31	23	<3	<140		286	55
	Floodplain	BB-082	10/22/2020	XRF	<397	9			<173	<28	<73	20	7	4	4	17	<3	<137		271	73
	Floodplain	BB-092	10/22/2020	XRF	<391	13			<172	<28	<69	15	9	3	7	15	<3	<137		214	70
	Floodplain	BB-094 BB-096	10/22/2020	XRF XRF	<398 <401	24 11			<177 <176	<30 <29	<89 <75	31 16	11 8	<29 <26	7	23 17	<4 <3	<141 <140		182 245	115 85
	Floodplain Floodplain	BB-098	10/22/2020	XRF	<396	10			<172	<27	<65	16	11	4	4	22	<3	9		268	67
	Floodplain	BB-099	10/22/2020	XRF	<383	15			<167	32	<83	27	9	5	7	26	<3	<133		235	108
	Floodplain	BB-100	10/22/2020	XRF	<398	11			<172	<27	<71	13	9	4	<30	22	<3	<137		295	72
	Floodplain	BB-101	10/22/2020	XRF	<393	15			<171	<28	<76	17	10	<26	5	26	<3	<136		291	75
	Floodplain	BB-144	10/20/2020	XRF	<372	25			<165	<28	<83	22	21	<27	9	22	<3	<132		224	122
	Floodplain	BB-145	10/20/2020	XRF XRF	<382	9			<166	39	<70	23	10	<25	<29	24	<3	<131		308	80 84
	Floodplain Floodplain	BB-146 BB-147	10/20/2020	XRF	<391 <380	7			<170 <165	32 <28	<77 <78	20 18	15 9	3	<29	21 25	<3 <3	<135 <131		212 258	71
	Floodplain	BB-148	10/20/2020	XRF	<400	6			<173	<28	<71	12	9	4	7	23	<3	<131		225	56
	Floodplain	BB-149	10/20/2020	XRF	<388	9			<167	33	<72	18	7	<26	<30	29	<3	<133		273	63
	Floodplain	BB-150	10/20/2020	XRF	<405	6			<175	<27	<63	14	7	<26	<31	18	<3	<139		242	54
	Floodplain	BB-151	10/20/2020	XRF	<375	14			<165	<29	<85	32	7	<26	9	29	<3	<131		235	115
	Floodplain	BB-152	10/20/2020	XRF	<382	9			<168	<28	<80	22	8	<26	6	19	<3	<133		227	102
	Floodplain	BB-153	10/20/2020	XRF	<372	8			<165	<28	<79	27	7	<26	11	22	<3	<132		158	118
	Floodplain	BB-154 BB-160	10/20/2020	XRF XRF	<367 <393	9			<163	<28	<78 <73	21 18	4	3	7	21	<3	<130		122 265	108 86
	Floodplain Floodplain	BB-161	10/20/2020	XRF	<393	18 10			<170 <170	35 <27	<69	14	13	<26 4	<31	21 16	<3 <3	<135 <135		241	64
	Floodplain	BB-162	10/20/2020	XRF	<394	8			<171	25	<72	19	8	<26	5	18	<3	<136		280	68
	Floodplain	BB-163	10/20/2020	XRF	<384	10			<168	<29	<80	24	8	4	7	24	<3	<134		302	105
	Floodplain	BB-164	10/20/2020	XRF	<385	9			13	26	<76	17	9	<27	7	19	<3	<134		194	91
	Floodplain	BB-165	10/20/2020	XRF	<380	12			<165	37	<80	22	10	4	4	25	<3	<131		257	89
	Floodplain	BB-166	10/20/2020	XRF	<393	10			<170	33	<80	23	8	4	3	24	<3	<135		243	95
AOC 1 - Northeastern	Floodplain Floodplain	BB-167 BB-168	10/20/2020	XRF XRF	<385 <385	9			<168 <168	<29 <29	<86 <84	26 26	11	<27 <27	6	26 27	<3 <3	<133 <133		231 215	114 110
Floodplain Area	Floodplain	BB-169	10/20/2020	XRF	<383	9			<167	<29	<84	24	8	4	10	22	<3	<133		212	114
	Floodplain	BB-74	10/22/2020	XRF	<376	12			<166	23	<83	28	16	<27	6	21	<3	<133		236	122
	Floodplain	BB-76	10/22/2020	XRF	<412	9			<179	<27	<60	10	8	<26	5	16	<3	<142		235	45
	Floodplain	BB-78	10/22/2020	XRF	<379	11			<165	23	<79	20	10	5	5	31	<3	<131		254	94
	Floodplain	BB-80	10/22/2020	XRF	<409	6			<178	<28	<63	9	10	3	3	12	<3	<141		242	43
	Floodplain in brush	BB-113	10/21/2020	XRF	<394	7			<171	28	<78	14	7	<26	5	17	<3	<136		241	66
	Floodplain in brush Floodplain in brush	BB-115 BB-118	10/21/2020	XRF XRF	<408 <374	5 13			<177 <166	<26 <29	<52 <80	9 36	10	<26 <26	<31 9	16 26	<3 <3	<140 <132		238 177	38 182
	Floodplain in brush	BB-119	10/21/2020	XRF	<380	10			<166	24	<82	31	10	3	5	29	<3	<132		253	97
	Floodplain in brush	BB-136	10/20/2020	XRF	<386	6			<169	<28	<72	18	8	<26	4	19	<3	<135		186	83
	Floodplain in brush	BB-137	10/21/2020	XRF	<378	10			<166	<29	<84	28	8	3	8	21	<3	<132		255	110
	Floodplain in brush	BB-057	10/23/2020	XRF	<403	13			<177	<27	<64	13	13	3	5	15	<3	<140		208	70
	Floodplain in brush	BB-045	10/23/2020	XRF	<400	10			<174	<28	<67	14	11	<27	4	18	<3	<139		248	63
	Floodplain in brush Floodplain in brush	BB-059 BB-061	10/23/2020	XRF XRF	<421 <388	8 12			<183 <171	<29 <29	<64 <77	10 25	8	3	5 9	9 19	<4 <3	<146 <136		203 185	37 114
	Floodplain in brush	BB-062	10/23/2020	XRF	<345	9			<158	<25	<70	18	<28	<24	15	7	<3	<128		93	122
	Floodplain in brush	BB-063	10/23/2020	XRF	<389	14			<171	<29	<84	26	6	3	10	20	<3	<136		189	100
1	Floodplain in brush	BB-064	10/23/2020	XRF	<415	6			<181	<26	<57	9	5	<26	3	12	<3	<144		197	78
l l	Floodplain in brush	BB-049	10/23/2020	XRF	<381	9			<167	<28	<79	23	11	4	5	27	<3	<133		218	101
	Floodplain in brush	BB-048	10/23/2020	XRF	<374	13			<167	<29	<82	27	11	<27	10	17	<3	<133		185	129
	Floodplain in brush Floodplain in brush. Relocated due to thick brush.	BB-047 BB-117	10/23/2020	XRF XRF	<418 <401	7			<183 <176	<28 <29	<57 <74	19	9	<27	11	12	<3	<146 <140		252	45 83
	Floodplain mole hill sand	BB-134	10/20/2020	XRF	<389	9			<168	33	<73	18	8	<26	<30	27	<3	11		237	68
	Near water level on beach	BB-037	10/21/2020	XRF	<403	8			<174	<27	<61	8	7	4	<30	15	<3	<138		265	44
	Near water level on beach	BB-038	10/21/2020	XRF	<378	37			<163	<30	<93	15	10	4	8	29	<3	<129		272	75
Ţ	North and west grid boundaries	BB-170	10/19/2020	XRF	<381	7			<165	33	<87	16	6	4	5	24	<3	<131		286	74
	North and west grid boundaries	BB-176	10/19/2020	XRF	<386	18			<172	<29	<83	22	18	<28	10	17	<3	<138		129	148
	North and west grid boundaries	BB-177	10/19/2020	XRF XRF	<396 <413	9			<174	<29 <28	<84 <67	26 11	16	<27	8	16 27	<3	<139 <141		195 315	104 48
	North and west grid boundaries North and west grid boundaries	BB-178 BB-179	10/19/2020	XRF	<413 <369	11			<178 <166	<28 <27	<69	31	3	<25	3 18	12	<3 <3	<141		86	48 156
	North and west grid boundaries North and west grid boundaries	BB-180	10/19/2020	XRF	<392	10			<172	<29	<80	21	9	<27	7	16	<3	<137		208	97
	North and west grid boundaries	BB-181	10/19/2020	XRF	<408	7			<177	<29	<74	18	7	4	8	17	<3	<141		197	78
· I · · · · · · · · · · · · · · · · · ·	North and west grid boundaries	BB-182	10/19/2020	XRF	<387	10			<169	<29	<83	23	9	3	8	26	<3	<135		257	93

AOC	Description/Location	Sample ID	Sample Date	Sample Method	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	North and west grid boundaries	BB-183	10/19/2020	XRF	<395	11			<170	51	<70	20	8	4	<30	29	<3	<135		288	68
AOC 1 - Northeastern	North and west grid boundaries	BB-184	10/19/2020	XRF	<394	7			<171	30	<71	18	10	4	6	20	<3	<135		294	65
Floodplain Area	North and west grid boundaries	BB-185	10/19/2020	XRF	<381	14			<166	32	<88	34	9	4	8	27	<3	<133		276	130
	North and west grid boundaries	BB-186	10/19/2020	XRF	<384	8			<171	<29	<82	27	5	5	12	15	<3	<136		142	118
	Background #1 Background #2	BB-B-01 BB-B-02	10/19/2020	XRF XRF	<379 <386	43 162			<164 <167	26 28	<77 <75	16 20	31 56	3	<29 <30	21	<3	<130 <132		244	139 106
 	Canal/ditch beach	BB-050	10/20/2020	XRF	<378	35			<165	<28	<77	18	75	4	7	20	<3	<131		205	121
	Canal/ditch beach	BB-051	10/20/2020	XRF	<392	16			<170	<29	<78	22	34	3	5	20	<3	<135		197	100
	Canal/ditch beach	BB-066	10/20/2020	XRF	<381	20			<165	<28	<77	31	85	31	5	25	<3	<131		198	119
	Ditch bench near house	BB-039	10/20/2020	XRF	<388	87			<167	<27	<73	16	26	3	3	28	<3	<133		236	98
	Floodplain	BB-085	10/20/2020	XRF	<383	37			<166	32	<78	21	61	4	3	25	<3	<132		225	119
	Floodplain Floodplain	BB-104 BB-121	10/20/2020	XRF XRF	<386 <384	53 17			<167 <166	<28 21	<74 <69	23 14	85 22	3	3 <29	27 16	<3	<133 <132		250 231	114 77
	Floodplain	BB-121	10/20/2020	XRF	<391	18			<170	24	<67	14	27	3	<30	18	<3	<135		256	89
 	Floodplain	BB-139	10/20/2020	XRF	22	40			<163	<28	<78	24	74	3	5	22	<3	<130		233	165
İ	Floodplain	BB-156	10/20/2020	XRF	<389	22			<168	44	<75	24	89	3	<30	25	<3	<133		257	197
[Floodplain	BB-140	10/20/2020	XRF	<381	28			<165	28	<78	40	99	6	3	20	<3	<131		233	159
[Floodplain near parking	BB-086	10/20/2020	XRF	<405	50			<175	29	<68	17	33	3	<31	19	<3	<139		224	85
	Floodplain, under tree	BB-103	10/20/2020	XRF	<365	70			<162	<27	<72	24	94	13	8	18	<3	<129		175	139
	Floodplain, under trees Floodplain, under trees	BB-052 BB-067	10/20/2020	XRF XRF	<382 <379	47 55			<166 <165	22 39	<82 <80	30 26	119 87	15	5 6	22 19	<3	<131 <131		227	152 161
	Floodplain, under trees Floodplain, under trees	BB-068	10/20/2020	XRF	<379	20			<165	<28	<80 <75	30	90	9	6	24	<3	<131		232	142
 	Floodplain, under trees	BB-084	10/20/2020	XRF	<375	69			<164	<28	<79	33	202	11	4	19	<3	<130		191	175
 	North and west grid boundaries	BB-171	10/19/2020	XRF	<389	24			<171	23	<74	24	40	3	8	18	<3	<136		189	127
İ	North and west grid boundaries	BB-172	10/19/2020	XRF	<381	32			<169	<28	<78	24	62	3	11	16	<3	<135		118	162
	North boundary delineation	BB-083	10/20/2020	XRF	<372	26			<162	27	<74	32	193	16	4	20	<3	<129		204	129
	North boundary delineation	BB-102	10/20/2020	XRF	<387	43			<168	<28	<75	15	76	9	3	17	<3	<134		191	116
	North boundary delineation	BB-120	10/20/2020	XRF	<384	25			<167	<28	<73	20	37	4	<30	21	<3	<132		264	95
AOC 2 - North Area	North boundary delineation North boundary delineation	BB-138 BB-155	10/20/2020	XRF XRF	<390 <396	24			<169 <171	34 29	<76 <71	20	25 43	3	<30	17 22	<3	<134 <136		212	100 93
-	North boundary delineation, hillside above ditch	BB-065	10/20/2020	XRF	<386	21			<168	39	<75	18	23	5	<30	23	<3	<133		248	110
1	Floodplain	BB-124	10/20/2020	XRF	<386	249			<168	<28	<76	57	185	12	6	25	<4	<134		198	176
1	Floodplain	BB-126	10/20/2020	XRF	<377	56			<165	<29	<82	31	52	4	6	22	<3	<132		221	131
	Floodplain	BB-090	10/22/2020	XRF	<372	26			<166	<29	<87	29	20	<27	10	22	<3	<133		232	155
	Floodplain	BB-141	10/20/2020	XRF	<368	47			<159	29	<75	36	75	5	3	30	<3	<126		205	145
	Floodplain	BB-142	10/20/2020	XRF	<378	41			<163	40	<78	77	91	7	<29	35	<3	<129		271 208	165
 	Floodplain Floodplain	BB-143 BB-157	10/20/2020	XRF XRF	<385 <387	27 58			<168 <169	23 27	<79 <78	54 54	41 179	5	5	23 18	<3 <4	9 <134		254	131 376
 	Floodplain	BB-158	10/20/2020	XRF	<390	14			<170	28	<67	14	12	3	<29	21	<3	<135		188	64
1	Floodplain	BB-159	10/20/2020	XRF	<388	15			<168	25	<75	20	29	<27	<30	22	<3	<134		235	105
1	Floodplain	BB-071	10/22/2020	XRF	<372	81			<165	<29	<83	29	90	6	11	21	<4	<132		176	142
	Floodplain	BB-072	10/22/2020	XRF	<400	12			<173	37	<66	12	18	<28	3	15	<3	<138		272	95
	Floodplain near parking	BB-069	10/20/2020	XRF	<374	132			<167	<29	<82	38	234	6	9	14	<4	<134		151	228
	Floodplain near parking	BB-070	10/20/2020	XRF	<378	58			<167	<29	<83	68	280	14	7	21	<4	10		213	176
	Floodplain near parking Floodplain near parking	BB-087 BB-105	10/20/2020 10/20/2020	XRF XRF	<389 <396	116 42			<170 <172	35 <28	<75 <73	19 21	53 31	5 <27	4	19 18	<3	<135 <137		178 205	124 88
	Floodplain flear parking Floodplain. Small pieces of slag located.	BB-103 BB-107	10/20/2020	XRF	<423	297			<183	24	<84	28	92	7	5	19	<4	<145		178	148
	North and west grid boundaries	BB-173	10/19/2020	XRF	<410	13			<180	<28	<63	15	22	<27	6	12	<3	<144		224	74
į t	North and west grid boundaries	BB-174	10/19/2020	XRF	<392	29			<171	<29	<81	26	24	4	6	26	<3	<136		269	137
[North and west grid boundaries	BB-175	10/19/2020	XRF	<387	43			<167	26	<74	17	25	4	<29	23	<3	<133		203	99
	Trail from flooplain to houses	BB-089	10/22/2020	XRF	<385	78			<166	32	<70	18	32	3	<29	16	<3	<132		248	91
	Under trees in low depression Northeast of mill foundation	BB-088 BB-073	10/22/2020	XRF XRF	<375 33	368 200			<167 <173	<27 <28	<77 <74	27	38 480	5	6	16 17	<4 <4	<134 <137		123 261	149 105
-	Above drainage	BB-033	10/22/2020	XRF	<386	699			<166	29	<77	22	105	5 8	<29	18	<4	14		236	100
	Above drainage Above drainage	BB-033	10/20/2020	XRF	<364	220			<161	<29	<88	39	130	5	11	31	<4	<129		153	266
	Above mill foundations	BB-021	10/20/2020	XRF	<410	272			<177	27	<74	51	31	10	4	18	<4	<140		266	109
	Above mill foundations	BB-026	10/20/2020	XRF	<397	941			<171	39	<75	22	272	5	<30	18	<4	<135		260	128
] [Base of foundation	BB-114	10/20/2020	XRF	<432	276			<189	<32	<87	22	62	18	11	16	<5	15		176	180
[Beach below house	BB-032	10/20/2020	XRF	22	1105			<166	33	<76	18	128	5	<30	21	<4	<132		242	110
AOC 3 - Mill Process	Bench below house	BB-040	10/20/2020	XRF	<388	634			<168	24	<74	17	111	<30	5	19	<4	<134		208	97
Area -	Between house and beach Drainage channel, moved point due to thick	BB-017 BB-035	10/20/2020	XRF XRF	<407 <361	130			<176 <160	28 <28	<75 <83	39	56	<30	5 11	15 32	<4	<139 <128		297 170	135 162
	brush	BB-041																			
	Hillside below bench Hillside below house	BB-041 BB-042	10/20/2020 10/20/2020	XRF XRF	<376 <378	332 120			<163 <164	26 46	<78 <80	29 24	70	<30	5 4	25 22	<4 <4	9 <130		193 251	184 273
	In mill foundation	BB-042 BB-022	10/20/2020	XRF	<378	483			<168	46	<80 <77	77	264	6	<30	17	<4	<130		179	144
1 1	Mill area	BB-022	10/20/2020	XRF	<402	139			<174	49	<59	11	24	3	<30	18	<3	<138		265	90
	Near mill foundations	BB-027	10/21/2020	XRF	<420	83			<182	<26	<54	14	16	<28	<32	<12	<3	<145		246	96

															ε						
AOC	Description/Location	Sample ID	Sample Date	Sample Method	mony	enic	Ë	E E	m im	m im	balt	pper	ad	cury	nuepo	- cke	mium	Ver	E E	adium	ji Li
,,,,,	2000 p. 100 p. 200 m. 100 p. 1	Campio 12	Campio Zaio		Anti	Ars	Ba	Bery	Cad	Chro	8	8	۳ ع	Mer	Molyb	ž	Sele	iii	Tha	Vana	Ä
	Near mill foundations	BB-028	10/21/2020	XRF	<401	230			<173	<28	<74	28	101	7	<31	17	<4	<138		206	111
	Near mill foundations	BB-029	10/21/2020	XRF	<385	70			<168	<29	<86	31	23	<28	8	23	<3	<134		217	112
	Near water level on beach	BB-024	10/21/2020	XRF	<384	13			<166	27	<100	12	12	<26	7	16	<3	<131		316	63
	Near water level on beach	BB-030	10/21/2020	XRF	<379	67			<163	31	<79	18	23	6	<29	20	<3	<129		303	71
AOC 3 - Mill Process	Floodplain in dense brush	BB-056	10/20/2020	XRF	<382	170			<171	<29	<85	22	24	4	13	20	<4	<137		151	146
Area	Floodplain near parking	BB-053	10/20/2020	XRF	23	173			<170	<29	<85	88	282	76	5	18	<4	<135		231	171
	Floodplain near parking	BB-054 BB-043	10/20/2020 10/20/2020	XRF XRF	<362 <374	410 123			<158 <168	<28 <29	<87 <85	53 34	435 61	47	6 13	21	<4 <4	<126 <135		142 147	173 163
	Location of former power turbine Trail from flooplain to houses	BB-043 BB-091	10/20/2020	XRF	<397	496			<172	<26	<59	14	35	3	<31	20	<4	<136		228	79
	Trail from flooplain to houses	BB-093	10/22/2020	XRF	<368	2183			<160	22	<69	21	90	<32	4	22	<4	<127		162	167
	Trail from flooplain to houses	BB-095	10/22/2020	XRF	69	1314			<165	<27	<73	25	172	<32	5	17	<4	<131		204	154
	Along property boundary	BB-108	10/23/2020	XRF	<415	178			<181	<30	<79	14	116	4	10	12	<4	<145		224	124
	Along property boundary	BB-075	10/23/2020	XRF	<397	35			<173	26	<85	8	590	4	7	15	<3	<137		207	100
	Along property boundary	BB-077 BB-079	10/23/2020	XRF XRF	<403 30	263 224			<175 <183	27 <30	<72 <80	19 10	20 59	3	6	13 11	<4 <4	<139 <146		241 198	112 82
	Along property boundary Along property boundary	BB-055	10/23/2020	XRF	142	623			<174	<29	<77	11	98	4	6	15	<4	<139		174	116
	Along property boundary	BB-060	10/23/2020	XRF	<439	364			<192	<33	<90	19	87	8	9	14	<6	<153		249	209
	Along property boundary above retaining wall	BB-058	10/23/2020	XRF	23	425			<173	<29	<85	15	64	<44	5	16	<4	<138		172	245
AOC 4 - Area Adjacent			10/23/2020	700	23	423			17,5	123	103	13	0-1	***	3	10		1130		1,2	243
to Residence	Along property boundary. Reshoot BB-79. 2" offset.	BB-079B	10/23/2020	XRF	<392	160			<169	<28	<78	11	12	<27	3	15	<3	<134		237	75
	Bench near house	BB-025	10/20/2020	XRF	414	10929			<147	38	<82	20	891	<52	<26	11	<7	26		138	197
	Offset 3 feet east of BB-25	BB-025-SO-01	10/22/2020	XRF	224	4678			<155	28	<79	29	461	7	5	24	<5	<123		187	185
		BB-106	10/22/2020	XRF	1172	8226			<151	25	<79	7	590	<47	5	7	<6	13		196	82
	Bench near house	BB-016	10/20/2020	XRF	<373	250			<161	50	<104	32	31	16	9	37	2	<128		247	444
	Below rock foundation (possible furnace) Bench near house	BB-097 BB-031	10/22/2020	XRF XRF	<429 <381	104 590			<185 <164	<29 27	<67 <71	13 16	10 99	9	4	21	<4 <4	<146 <131		264	81 169
	Bench near house	BB-031	10/20/2020	XRF	8764	2997			<118	<22	<61	17	249	<27	<21	20	<4	12		247	172
	Above trail	BB-012	10/20/2020	XRF	<408	1045			<176	<28	<66	13	61	8	3	23	<4	<139		261	86
	Above trail and cemented tailings	BB-131	10/20/2020	XRF	<390	183			<170	<29	<81	21	79	7	8	20	<4	<136		250	106
	Above trail and cemented tailings	BB-133	10/20/2020	XRF	<388	132			<168	<29	<79	25	38	6	4	20	<3	<133		257	87
	Below trail Just above water level	BB-015 BB-019	10/20/2020 10/20/2020	XRF XRF	<387 <396	1273 65			14 <172	<26 <28	<65 <67	11	412 8	16 <26	<29 <31	23 16	2 <3	<133 <136		186 192	550 47
	Below mill foundations	BB-023	10/20/2020	XRF	79	31092			<125	29	<74	<11	3162	108	<23	<11	4	68		<49	98
	Inside lower foundation at mill	BB-116	10/20/2020	XRF	28	1833			<160	<28	<79	33	1002	19	18	16	2	<127		216	189
AOC 5 - Cemented	11 feet south of BB-116, outside foundation	BB-116-SO-01	10/22/2020	XRF	95	9270			<153	<28	<83	15	1229	11	12	10	<1	34		144	101
Tailings	·																				
	Between house and beach Cemented mine waste surface, collecting side	BB-018	10/20/2020	XRF	<333	1488			<143	23	<74	76	6956	10	5	11	<9	<114		189	164
	wall sample from eroded features	BB-123	10/20/2020	XRF	<272	27168			<116	33	<96	<9	1801	693	<21	<11	<9	39		98	59
	Cemented tailings above boulder beach	BB-135	10/20/2020	XRF	32	10745			<149	41	<83	7	445	<51	<26	8	<7	15		<51	82
	Cemented tailings near river	BB-129	10/20/2020	XRF	<306	19793			<132	37	<92	<9	874	21	<23	<11	<8	17		114	23
	Trail above cemented mine waste	BB-009	10/20/2020	XRF	<401	1171			<174	<25	<42	7	306	39	<30	14	2	10		140	38
-	White tailings on trail Cemented tailings near river	BB-127 BB-007	10/20/2020 10/22/2020	XRF XRF	91 27	90189 11395			<76 <147	46 29	<96 <78	<9 <10	2340 1685	1458 275	<15 <26	<9 <11	<11 <8	190 19		<42 145	151 64
	Above trail by rock	BB-125	10/20/2020	XRF	<402	151			<174	<29	<71	22	22	6	6	23	<4	<137		287	70
	Along property boundary	BB-044	10/23/2020	XRF	<406	75			<177	<29	<81	19	26	<28	8	9	<4	<141		190	125
	Along property boundary	BB-046	10/23/2020	XRF	<396	44			<172	<29	<79	15	14	4	4	18	<3	<137		243	75
	Base of foundation	BB-112	10/20/2020	XRF	<409	60			<176	<31	<86	72	56	17	15	15	2	<140		254	92
	Bench near house Bench near house	BB-002 BB-005	10/20/2020 10/20/2020	XRF XRF	<400 <402	265 369			<173 <174	<27 <26	<64 <57	14 24	33	3 <28	<31	16 21	<4 <4	<138 <138		249 214	86 72
	Bench near house	BB-008	10/20/2020	XRF	<380	35			<165	<28	<81	17	12	5	5	28	<3	<131		223	73
AOC 6 - Downriver	Bench near house	BB-010	10/20/2020	XRF	<394	84			<170	27	<68	18	15	<26	<30	18	<3	<135		212	73
Distributed Mill	Bench near house	BB-013	10/20/2020	XRF	<385	86			<167	24	<77	27	32	3	<30	18	<3	<132		190	183
Material	Hill above trail near house	BB-011	10/20/2020	XRF	<397	122			<171	40 <27	<77	29	38	6	<31	17	<4	<135		233	72
	Hill above trail near house Rock slab	BB-014 BB-003	10/20/2020 10/20/2020	XRF XRF	<385 <402	129 63			<167 <174	<27	<70 <58	66 12	21 15	3	<30 <30	21	<3 <3	<132 <138		269 220	98 63
	Overwash soil/sediment southwest of													4							
	topographic high	BB-004	10/20/2020	XRF	<388	43			<168	<29	<82	26	19	4	8	28	<3	<133		295	90
	Southwest boundary	BB-001	10/20/2020	XRF	<391	42			<168	44	<78	18	42	4	5	24	<3	<133		284	87
	Southwest boundary	BB-002-SO-01	10/20/2020	XRF XRF	<381	22			<164	23 40	<78	11 17	8	3	<30	27 28	<3	<130		235	72 60
	Southwest boundary Upstream soil sample for Mod-01	BB-006 BB-M1-01	10/20/2020	XRF	<381 <405	22 8			<165 <176	<27	<73 <67	17	6	3	<29 5	15	<3	<130 <140		283	46
	Downstream soil sample for Mod-02	BB-M1-02	10/22/2020	XRF	<425	6			<184	<27	<51	11	10	3	<32	14	<3	<146		259	33
AOC 7 - Downriver	On Mod Island	BB-M1-03	10/22/2020	XRF	<409	4			<178	<27	<57	23	8	3	<31	17	<3	<141		228	48
Sand Bar	On Mod Island	BB-M1-04	10/22/2020	XRF	<394	7			<171	<27	<69	16	7	3	4	16	<3	<136		254	58
	On Mod Island	BB-M1-05	10/22/2020	XRF	<387	16			<167	38	<78	20	6	<26	<29	30	<3	<132		339	85
	On Mod Island interior streambed	BB-M1-06	10/22/2020	XRF	<392	22			<170	<28	<76	11	9	4	6	20	<3	<135		365	63

AOC	Description/Location	Sample ID	Sample Date	Sample Method	Antimony	Areanic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	рвед	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	On Mod Island near water	BB-M1-07	10/22/2020	XRF	<365	21			<157	28	<92	10	7	<24	<28	22	<3	<124		325	50
AOC 7 - Downriver	On Mod Island	BB-M1-08	10/22/2020	XRF	<399	8			<172	37	<68	13	7	3	<29	22	<3	<136		268	62
Sand Bar	On Mod Island	BB-M1-09	10/22/2020	XRF	<397	26			<171	<29	<77	18	9	<26	4	21	<3	<135		293	52
	On Mod Island	BB-M1-10	10/22/2020	XRF	<384	7			<165	34	<80	19	8	<25	<30	20	<3	<131		323	65
	Step out for BB-102	BB-102-SO-01	10/20/2020	XRF	<380	27			<164	<27	<75	30	49	7	<29	28	<3	<130		246	95
Boundary Delineation	Step out for BB-175	BB-175-SO-01	10/20/2020	XRF	<378	31			<165	<28	<78	23	18	<26	3	29	<3	<132		236	121
Samples	Step out for BB-175-SO-01	BB-175-SO-02	10/20/2020	XRF	<389	29			<168	40	<76	20	18	4	4	20	<3	<134		220	88
AOC 4 - Area Adjacent	Bench near house	BB-020	10/20/2020	Lab	160 A0	7 7400	A07 98	A07 <0.47 A07	60 A07	10	A07 6.7 J,	A07 15	A07 520	A07 2	A07 <0.5	A07 8.1	A07 <1.1	A07 8.5 A07	<0.49 A07	28 A07	150 A07
to Residence	Bench near house	BB-025	10/21/2020	Lab	120 A0	7 7100	A07 94	A07 <0.47 A07	51 A07	7.1	A07 4.5 J,	A07 17	A07 610	A07 3	A07 <0.5	A07 4.9	J,A07 <1.1	A07 11 A07	<0.49 A07	21 A07	360 A07
	Between house and beach	BB-018	10/20/2020	Lab	2.2 J,A)7 1900	A07 54	A07 <0.47 A07	14 A07	8.6	A07 4.8 J,	A07 87	A07 13000	A07 7.9	A07 1.8 J	,A07 6.3	A07 <1.1	A07 4.6 J,A07	<0.49 A07	25 A07	140 A07
	Associated with BB-018	DUP-02	10/20/2020	Lab	1.6 J,A)7 1200	A07 41	A07 <0.47 A07	9.1 A07	5.9	A07 3.5 J,	A07 40	A07 7100	A07 5.7	A07 <0.5	A07 4.5	J,A07 <1.1			17 A07	
	Above trail	BB-012	10/20/2020	Lab	0.83 J,A			A07 <0.47 A07		_	A07 5.1 J,		J,A07 66		A07 <0.5		J,A07 1.6 .			28 A07	
AOC 5 - Cemented	Cemented mine waste surface, collecting side wall sample from eroded features	BB-123	10/20/2020	Lab	4.5 J,A	1 5000	A07 41	A07 <0.47 A07	110 A07	3.7	J,A07 2.2 J,	A07 4.6	J,A07 1200	A07 350	A07 <0.5	A07 1.5	J,A07 <1.1	A07 11 A07	<0.49 A07	20 A07	36 A07
Tailings	Cemented tailings near river	BB-129	10/20/2020	Lab	3.3 J,A	7 19000	A07 47	A07 <0.47 A07	140 A07	4.4	J,A07 2.3 J,	A07 3	J,A07 990	A07 20	A07 <0.5	A07 <1.5	A07 <1.1	A07 2.2 J,A07	′ <0.49 A07	24 A07	19 J,A07
	White tailings on trail	BB-127	10/20/2020	Lab	74 A0	7 88000	18	A07 <0.47 A07	630 A07	<0.5	A07 <0.98 A	A07 7	J,A07 2400	A07 270	A07 <0.5	A07 <1.5	A07 <5.5	A07 45 A07	<0.49 A07	3.3 J,A07	7 190 A07
	Below mill foundations	BB-023	10/20/2020	Lab	21 A0		A07 45	A07 <0.47 A07		4.4		A07 28	A07 2200			A07 1.8		A07 30 A07		8.8 A07	
	Step out from foundation	BB-116-SO-01	10/22/2020	Lab	23 A0	7 13000	A07 79	A07 <0.47 A07	91 A07	10	A07 6.9 J,	A07 20	A07 1300	A07 8.8	A07 4.3 J	,A07 7.1	A07 <1.1	A07 24 A07	<0.49 A07	28 A07	110 A07
AOC 6 - Downriver Distributed Mill Material	Hill above trail near house	BB-011	10/20/2020	Lab	<0.8 A0	7 110	A07 58	A07 <0.47 A07	1.3 J,A07	4.6	J,A07 5.1 J,	A07 8.4	J,A07 34	A07 0.77	<0.5	A07 3	J,A07 3.9 .	J,A07 2.3 J,A07	′ <0.49 A07	21 A07	44 A07
	Upstream soil sample for Mod-01	BB-M1-01	10/22/2020	Lab	<0.8 A0	7 8.8	A07 <1.8	A07 <0.47 A07	<0.52 A07	9.1	A07 5.2 J,	A07 6.1	J,A07 <4.1	A07 0.022	J <0.5	A07 4.4	J,A07 <1.1	A07 <0.67 A07	<0.49 A07	32 A07	24 J,A07
	Downstream soil sample for Mod-01	BB-M1-02	10/22/2020	Lab	<0.8 A0	7 4.2	J,A07 52	A07 <0.47 A07	<0.52 A07	5.8	A07 4.8 J,	A07 6.3	J,A07 <4.1	A07 0.028	J <0.5	A07 3.5	J,A07 <1.1	A07 <0.67 A07	<0.49 A07	28 A07	27 A07
	On Mod Island	BB-M1-03	10/22/2020	Lab	<0.8 A0	7 4.2	J,A07 56	A07 <0.47 A07	<0.52 A07	3.9	J,A07 4.2 J,	A07 7.5	J,A07 <4.1	A07 4.3	A07 <0.5	A07 3.5	J,A07 <1.1	A07 <0.67 A07	<0.49 A07	19 A07	32 A07
	On Mod Island	BB-M1-04	10/22/2020	Lab	<0.8 A0	7 6.4	A07 93	A07 0.62 J,A0		11		A07 13		A07 0.058		A07 6.5		A07 <0.67 A07		53 A07	
AOC 7 - Downriver	On Mod Island	BB-M1-05	10/22/2020	Lab	<0.8 A0		A07 60	A07 <0.47 A07		8.4				A07 0.066	J <0.5		A07 <1.1		<0.49 A07		
Sand Bar	On Mod Island interior streambed	BB-M1-06	10/22/2020	Lab	<0.8 A0		A07 68	A07 <0.47 A07		12		A07 7.8		A07 <0.016		A07 5.2		A07 <0.67 A07			
	On Mod Island near water	BB-M1-07	10/22/2020	Lab	<0.8 A0		A07 52	A07 <0.47 A07		10		A07 6.9		A07 <0.016		A07 9.5	A07 1.8	,			
	On Mod Island	BB-M1-08	10/22/2020	Lab	<0.8 A0		A07 53	<0.47 A07		7.4		A07 7	J,A07 <4.1	A07 <0.016		A07 4.2		J,A07 <0.67 A07	<0.49 A07		
	On Mod Island	BB-M1-09	10/22/2020	Lab	<0.8 A0		A07 36	A07 <0.47 A07		9.3	7107 515	0 13		A07 <0.016		A07 4.1	-, -	A07 <0.67 A07	<0.49 A07		
	On Mod Island	BB-M1-10	10/22/2020	Lab	<0.8 A0	7 <1.7	A07 56	A07 <0.47 A07	<0.52 A07	12		A07 6.9	J,A07 <4.1			A07 4.8	J,A07 2.5 .	J,A07 <0.67 A07	<0.49 A07	62 A07	32 A07
	ARAR/TBC			RECEPTOR		•					Soil	and Dry Sec	liment Screeni	ng Criteria (m	g/kg)						
	Background BB-B-COMP-01 (XI	RF)		_	<376	19			<164	24	<80	26	59	3	6	13	<3	<131		209	128
	Three Times Background			All	<376	57			<164	72	<80	78	177	9	18	39	<3	<131		627	384
	Background BB-B-COMP-01 (Labo	ratory)			<0.8 A0	7 20	A07 82	A07 <0.47 A07	<0.52 A07	10	A07 6.3 J,	A07 10	A07 43	A07 0.62	<0.5 A	4.9	J,A07 <1.1	A07 <0.67 A07	<0.49 A07	30 A07	78 A07
	Three Times Background				<0.8	60	246	<0.47	<0.52	30	18.9	30	129	1.86	<0.5	14.7	<1.1	<0.67	<0.49	90	234
	TTLC				500	500	10000	75	100	2500	8000	2500	1000	20	3500	2000	100	500	700	2400	5000
				Avian	NE	43 ^a	720 ^c	NE	0.77 ^a	26 ^{a,1}	120 ^a	28 ^a	11 ^a	0.013 °	15 ^c	210 ^a	1.2 a	4.2 ^a	4.5 ^c	7.8 ^a	46 ^a
				Invertebrates	78 ^a	60 b	330 ^a	40 ^a	140 ^a	0.4 b,2	NE	80 ^a	1,700 ^a	0.1 ^b	NE	280 ^a	4.1 ^a	NE	NE	NE	120 ^a
	Ecological Soil Screening Levels	a,b,c,d		Mammals	0.27 ^a	46 ^a	2,000 ^a	21 ^a	0.36 ^a	34 ^{a,1}	230 ^a	49 ^a	56 ^a	1.7 ^c	0.52 ^d	130 ^a	0.63 ^a	14 ^a	0.42 ^c	280 ^a	79 ^a
				Plants	5 ^b	18 ^a	110 °	2.5 °	32 ^a	1 ^{b,2}	13 ^a	70 ^a	120 ^a	0.3 ^b	2 ^b	38 ^a	0.52 ^a	560 ^a	1 ^b	2 ^b	160 ^a
Preliminary Site Sc	reening Criteria (Most Stringent and Applicab	, ,	jical Receptors	Ecological	0.27	18	110	2.5	0.36	0.4	13	28	11	0.013	0.52	38	0.52	4.2	0.42	2	46
	EPA Regional Screening Levels - Gener			Residents	31	0.68	15,000	160	71	120,000 1	23	3,100	400	11	390	1,500	390	390	0.78	390	23,000
	DTSC-Modified Screening Leve				NE	0.11	NE	16	71	NE	NE	NE	80	1	NE	820	NE	NE	NE	NE	NE
Preliminary Site S	creening Criteria (Most Stringent and Applical Receptors	ble Values) for Reside	lential Human	Residents	31	0.11	15000	16	71	120,000	23	3100	80	1	390	820	390	390	0.78	390	23,000
	BLM Child/Adult Recreational Visit	tors ^g		Visitors	782	30.6	390,000	3,910	1,780	1,000,000 ¹	586	78,200	800	271	9,780	39,000	9,780	9,780	19.60	9,850	587,000
	Bioavailability (Soil/Dry	Sediment)																			
N	* , *	•				•				•		•				•					

¹ Screening values are for chromium III.

² Screening values are for total chromium (underlying toxicity data are for chromium VI).

Above Three-Times Background Concentrations (exceedance at background concentrations if below the laboratory MDL) Bold Blue Text Exceeds TTLC threshold

Acronyms and Abbreviations:

ARAR = Applicable or Relevant and Appropriate Requirement

BLM = Bureau of Land Management

DTSC = Department of Toxic Substances Control EcoSSL = Ecological Soil Screening Levels

EPA = United States Environmental Protection Agency

mg/kg = Milligrams per Kilogram

NE = Not Established

TBC = To-Be-Considered Requirement

TTLC = Total Threshold Limit Concentration

- Sources:

 a EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/ecotox/
- b Oak Ridge National Laboratory (ORNL). 2018. RAIS The Risk Assessment Information System Ecological Benchmark Tool. Https://rais.ornl.gov/tools/eco_search.php
- ^c Los Alamos National Laboratory (LANL). 2017. ECORISK Database (Release 4.1), https://www.lanl.gov/envirohment/protection/eco-risk-assessment.php
- d Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. Document ES/ER/TM-86/R3. June.
- ^e EPA. 2020. Regional Screening Levels (RSLs) Generic Tables. May 2020.
- $^{\rm f}$ DTSC. 2020. DTSC-modified Screening Levels (DTSC-SLs). HERO HHRA Note Number 3. June.
- ⁹ BLM. 2017. Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites.

AOC	Description/Location	Sample ID	Sample Depth (feet)	Sample Date	Sample Method	yacmita	Andinony	Arsenic		Barium		Beryllium	Cadmium	Chromium		Cobalt		Copper		Lead	Mercury	Molybdenum	Nickel		Selenium	Silver	Thallium		Vanadium	Zinc
	Bench near house	BB-025		10/20/2020	XRF	414		10929					<147	38		<82		20	891		<52	<26	11		<7	26			138	197
	BB-25 subsurface near house	BB-025-0.5	0.5	10/22/2020	XRF	157		24390					<129	45		<84		<9	1757		<64	<22	6		<9	45			144	43
AOC 4 - Area Adjacent to	Above mill foundations BB-25 subsurface near house	BB-025-1 BB-025-1.5	1.5	10/22/2020 10/22/2020	XRF	27 <396		3179 546					<161 13	22 45		<83 <70		24	131 59		<34 <30	<29 <31	15 26		<5 <4	10 <136			227 275	118 377
Residence	Offset 3 feet east of BB-25	BB-025-SO-01	0	10/22/2020	XRF	224		4678					<155	28		<79		29	461		7	5	24		<5	<123			187	185
	Offset 3 feet east of BB-25	BB-025-SO-01-0.5	0.5	10/22/2020	XRF	111		11422					<146	29		<87		<10	782	2	<50	<26	17		<7	18			220	103
	Offset 3 feet east of BB-25	BB-025-SO-01-1	1	10/22/2020	XRF	40		2483					<161	28		<85		31	299	9	15	5	23		<5	<128			218	538
	Cemented mine waste surface, collecting side wall sample from eroded features	BB-123	0	10/20/2020	XRF	<272		27168				-	<116	33		<96		<9	180	1	693	<21	<11		<9	39			98	59
	Cemented mine waste at river	BB-123-0.5	0.5		XRF	<343		11670					<148	29		<89		<10	1276		346	<26	<12		<8	15			170	87
	Cemented mine waste at river Cemented mine waste at river	BB-123-1 BB-123-2	1 2	10/20/2020 10/20/2020	XRF	<376 <396		5632 1097					<163 <171	20 <29		<74 <77		5 14	313		79 17	<28 4	6 11		<6 <4	10 <136			151 254	108
	Cemented mine waste at river	BB-123-3	3	10/20/2020	XRF	<373		1086					<161	33		<86		25	59		51	<29	25		<4	<127			272	194
	Cemented mine waste at river	BB-123-4	4	10/20/2020	XRF	<368		3186					<159	<27		<80		6	62		40	<27	11		<4	<125			184	110
	Cemented tailings near river	BB-129	0	10/20/2020	XRF	<306		19793					<132	37		<92		<9	874	4	21	<23	<11		<8	17			114	23
	Cemented tailings near river	BB-129-0.5	0.5	10/20/2020	XRF	<343		13786					<148	22		<86		<9	237		8	<26	<12		<7	10			161	28
	Cemented tailings near river	BB-129-1	1	10/20/2020	XRF	<368		10103					<160	20		<73		<9	154		<52	<28	<12		<7	<127			159	24
	Cemented tailings near river	BB-129-2 BB-129-3	3	10/20/2020 10/20/2020	XRF XRF	<366 <372		9430 8493					<157 <160	33		<72 <76		<9 <10	50 62		<50 <47	<27 <28	11 13		<6 <6	12 <127			218	23 40
	Cemented tailings near river Cemented tailings near river	BB-129-3 BB-129-4	4	10/20/2020	XRF	<372		4822					<168	34		<66		6	22		<40	<28	13		<5	<127			192	38
AOC 5 -	Cemented tailings near river	BB-129-5	5	10/20/2020	XRF	<343		10622					<148	<29		<94		<9	38		<47	6	11		<6	<118			188	61
Cemented	Inside lower foundation at mill	BB-116	0	5/21/2020	XRF	28		1833					<160	<28		<79		33	1002	2	19	18	16		2	<127			216	189
Tailings	Refusal on concrete	BB-116-0.5	0.5	10/22/2020	XRF	367		64693					17	53		<89		<10	621	1	<90	6	<10		<2	210		,	<44	111
	11 feet south of BB-116, outside foundation	BB-116-SO-01	0	10/22/2020	XRF	95		9270					<153	<28		<83		15	1229		11	12	10		<1	34			144	101
	Subsurface at BB-116-SO-01 Subsurface at BB-116-SO-01	BB-116-SO-01-0.5 BB-116-SO-01-1	0.5 1	10/22/2020 10/22/2020	XRF	152 58		33372 15474					<112 <143	62 37		<90 <86		12 54	2459 1289		<71 12	<20 4	<10 14		<9 <8	71 30			81 65	90 475
	Subsurface at BB-116-SO-01	BB-116-SO-01-1.5	1.5	10/22/2020	XRF	40		6260					<149	30		<88		36	566		47	<26	12		<6	17			162	131
	Subsurface at BB-116-SO-01	BB-116-SO-01-2	2	10/22/2020	XRF	<367		3997					<157	32		<83		27	129		8	<28	24		<5	<124			191	211
	Subsurface at BB-116-SO-01	BB-116-SO-01-2.5	2.5	10/22/2020	XRF	<353		5954					<152	34		<88>		33	298	3	65	<27	15		<5	<121			161	251
	Below mill foundations	BB-023	0	10/20/2020	XRF	79		31092					<125	29		<74		<11	3162	2	108	<23	<11		4	68			<49	98
	Subsurface at BB-23	BB-023-0.5	0.5	10/22/2020	XRF	42		15526					<149	25		<75		27	884		72	<27	<12		<8	24			61	99
	Subsurface at BB-23	BB-023-1 BB-023-2	1	10/22/2020	XRF	<10 <295		40262					<110 <126	<26 30		<99		21	2287		<79	<20	<11		<10 <9	68			<47	350 326
	Subsurface at BB-23 Subsurface at BB-23	BB-023-2 BB-023-3	3	10/22/2020 10/22/2020	XRF	<307		25511 13761					<131	62		<90 <100		<10 14	902 375		156 40	<23 <23	<11 10		<6	33 <103			114 234	222
	Subsurface at BB-23	BB-023-4	4	10/22/2020	XRF	<343		4647					<146	37		<89		37	172		35	<26	26		<5	<116			225	209
	Subsurface at BB-23	BB-023-5	5	10/22/2020	XRF	<375		1105					<161	42		<86		46	24		<29	<28	14		<4	<128			242	219
AOC 4 - Area	Bench near house	BB-025	0	10/21/2020	Lab	120	A07	7100	A07	94	A07	<0.47 A07	51 A07	7.1	A07	4.5	J,A07	17 A0	7 610) A07	3	A07 <0.5 A07	4.9	J,A07	<1.1 A07	11 A07	<0.49	A07	21 A	07 360 A07
Adjacent to Residence	BB-25 subsurface near house	BB-025-0.5	0.5	10/22/2020	Lab	58	A07	26000	A07	210	A07	<0.47 A07	160 A07	6.2	A07	2.2	J,A07	8.1 J,A	07 1800	0 A07	7.5	A07 <0.5 A07	2.7	J,A07	<1.1 A07	36 A07	<0.49		14 A(
	Cemented mine waste surface, collecting side wall sample from eroded features	BB-123-0.5	0.5	10/20/2020	Lab	3.1	1.407	6300	107	32	407	0.19 J	84	5.3	1.07	1.8	J	8.1	820		0.064		1.7		<0.55	7	<0.24	107	18	60
AOC 5 -	Cemented tailings near river Cemented tailings near river	BB-129 BB-129-0.5	0	10/20/2020 10/20/2020	Lab Lab		J,A07		A07	47		<0.47 A07 <0.47 A07			J,A07 J,A07		J,A07		07 990			A07 <0.5 A07 A07 <0.5 A07				2.2 J,A0			24 A(
Cemented Tailings	Step out from foundation	BB-116-SO-01	0.3	10/22/2020	Lab			13000		79		<0.47 A07			A07	6.9	J,A07					A07 4.3 J,A07						A07		
ı anınıgs	11 feet south of BB-116, outside foundation Below mill foundations	BB-116-SO-01-0.5 BB-023	0.5	10/22/2020	Lab		A07	30000		110		<0.47 A07		34	A07	2.6	J,A07	43 A0	7 2300	0 A07	40	A07 0.67 J,A07 A07 <0.5 A07	10	A07	<1.1 A07	69 A07	<0.49	A07	11 A	07 130 A07
	Subsurface at BB-23	BB-023-1		10/22/2020	Lab							<0.47 A07			J,A07															07 480 A07
	ARAR/TBC				RECEPTOR											•		y Sediment			_									
	Background BB-B-COI	MP-01 (XRF)				<376		19					<164	24		<80		26	59		3	6	13		<3	<131			209	128
	Three Times Back	. ,				<376	-	57	† †		1 1		<164	72	1	<80		78	177		9	18	39		<3	<131			627	384
	Background BB-B-COMP				All		-	20	A07	82	Δ07				A07	6.3	J,A07		7 43	_	7 0.62	<0.5 A07			<1.1 A07		<0.49		30 A0	
		***				<0.8	+		AUI				1 1		AUI		J,AU/		_	_										
	Three Times Back	vground				<0.8	+	60		246	_	<0.47	<0.52	30	+	18.9		30	129	_	1.86	<0.5	14.7	_	<1.1	<0.67	<0.49		90	234
	TTLC				A	500	-	500		10000		75 NE	100	2500	-	8000		2500	1000		20	3500	2000		100	500	700		400	5000
					Avian Invertebrates	NE 78 ^a	_	43 ^a 60 ^b		720 ° 330 °		NE 40 ^a	0.77 ^a	26 ^{a,1}	-	120 ^a NE		28 ^a 80 ^a	11°		0.013 ^c		210 ^a 280 ^a		1.2 ^a 4.1 ^a	4.2 ^a	4.5 ^c NE		7.8 ^a NE	46 ^a
	Ecological Soil Screening	ng Levels ^{a,b,c,d}		-	Mammals	0.27 a		60° 46°		2,000 a		40 ° 21 a	0.36 ^a	34 ^{a,1}	1	230 ^a		49 ^a	1,700 56 °		0.1 °	0.52 ^d	130 ^a		4.1 ° 0.63 ^a	14 ^a	0.42 °		280 ^a	79 ^a
					Plants	5 b		46 ^a	+ +	2,000°		21 ° 2.5 °	0.36 ^a	1 b,2	1	13 ^a		70 ^a	120		0.3 b		38 ^a		0.63 ° 0.52 °	560 ^a	1 b		2 ^b	160 ^a
Preliminary Si	ite Screening Criteria (Most Stringent and	Applicable Values) fo	r Ecologica	al Receptors	Ecological	0.27		18		110		2.5	0.36	0.4		13		28	11		0.013		38		0.52	4.2	0.42		2	46
	EPA Regional Screening Leve	els - Generic Tables ^e			Residents	31		0.68		15,000		160	71	120,000 ¹		23		3,100	400	0	11	390	1,500		390	390	0.78	;	390	23,000
	DTSC-Modified Screen	ning Levels f			Residents	NE		0.11		NE		16	71	NE	1	NE		NE	80	,	1	NE	820		NE	NE	NE	1 1	NE	NE
Preliminary S	Site Screening Criteria (Most Stringent an Receptors	d Applicable Values) for	or Residen	tial Human	Residents	31		0.11		15000		16	71	120,000		23		3100	80		1	390	820		390	390	0.78		390	23,000
	Receptors																													

June 2021

Site Inspection USFS-Big Blue Mill

юс	Description/Location	Sample ID	Sampl Depth (feet)		Sample Method	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	BLM Child/Adult Recrea	ational Visitors ^g			Visitors	782	30.6	390,000	3,910	1,780	1,000,000 1	586	78,200	800	271	9,780	39,000	9,780	9,780	19.60	9,850	587,000
	EP	A Method				6020	6020	6010B	6010B	6010B	6010B	6010B	6010B	6010B	7471A	6010B	6010B	6020	6010B	6020	6010B	6010B
Laboratory Method Detection Limits (Soil/Dry Sediment)					0.08	0.17	0.18	0.05	0.052	0.05	0.098	0.05	0.28	0.016	0.05	0.15	0.11	0.067	0.49	0.11	0.087	
Laboratory Reporting Limits (Soil/Dry Sediment)					0.5	0.5	0.5	0.5	0.5	0.5	2.5	1	2.5	0.16	2.5	0.5	0.5	1	0.25	0.5	2.5	
	Bioavailability	(Soil/Dry Sediment)																				

Notes:

² Screening values are for total chromium (underlying toxicity data are for chromium VI).

Above Three-Times Background Concentrations (exceedance at background concentrations if below the laboratory MDL)

Acronyms and Abbreviations:

ARAR = Applicable or Relevant and Appropriate Requirement

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TBC = To-Be-Considered Requirement

TTLC = Total Threshold Limit Concentration

Courses

- ^a EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/ecotox/
- b Oak Ridge National Laboratory (ORNL). 2018. RAIS The Risk Assessment Information System Ecological Benchmark Tool. Https://rais.ornl.gov/tools/eco_search.php
- ^c Los Alamos National Laboratory (LANL). 2017. ECORISK Database (Release 4.1), https://www.lanl.gov/envirohment/protection/eco-risk-assessment.php
- d Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. Document ES/ER/TM-86/R3. June.
- ^e EPA. 2020. Regional Screening Levels (RSLs) Generic Tables. May 2020.
- ^f DTSC. 2020. DTSC-modified Screening Levels (DTSC-SLs). HERO HHRA Note Number 3. June.
- ⁹ BLM. 2017. Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites.

¹ Screening values are for chromium III.

Sample Matrix	Target Compound	EPA Method	Reporting Limit	Method Detection Limit	ESVs (Plants)	ESVs (Invertebrates)	ESVs (Mammals)	ESVs (Birds)	Preliminary Site Screening Criteria (Most Stringent and Applicable Values) for Ecological Receptors	EPA Residential RSL Human Health Screening Level 1	Screening Level ²	Most Stringent Residential Human Health Screening Level	BB-022	BB-043	BB-097	BB-116-SO-01
									milligrams	per kilogram (m	ng/kg)					
	Acenaphthene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg	0.25 ^b		130 ^b		0.25	3,600	3,300	3,300	<0.00052	<0.0026 A01	<0.00052	<0.00052
	Acenaphthylene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg			120 ^b		120				0.0012 J	<0.0024 A01	<0.00047	<0.00047
	Anthracene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg	6.8 ^b		210 ^b		7	18,000	17,000	17,000	0.00077 J	<0.0036 A01	<0.00073	<0.00073
	Benzo[a]anthracene	8270C-SIM	0.10 mg/kg	0.0077 mg/kg	18 ^b		3.4 ^b	0.73 ^b	0.73	1.1	1.1	1.1	0.0056	0.0056 J,A01	0.0007 J	0.0011 J
	Benzo[a]pyrene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg			62 ^b		62	0.11	0.11	0.11	0.0087	0.0210 A01	0.0033	0.0051
	Benzo[b]fluoranthene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg	18 ^b		44 ^b		18	1.1	1.1	1.1	0.0037	0.0130 J,A01	0.0023 J	0.0028 J
	Benzo[g,h,i]perylene	8270C-SIM	0.10 mg/kg	0.013 mg/kg			25 ^b		25				0.0085	0.0250 A01	0.0042	0.0053
	Benzo[k]fluoranthene	8270C-SIM	0.10 mg/kg	0.0082 mg/kg			71 ^b		71	11	11	11	0.0026 J	<0.0034 A01	<0.00068	0.0015 J
Soil/Dry	Chrysene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg			3.1 ^b		3.1	110	110	110	0.0064	0.0042 J,A01	0.00042 J	0.002 J
Sediment	Dibenz(a,h)anthracene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg						0.11	0.028	0.028	0.0049	<0.0028 A01	<0.00057	0.0046
	Fluoranthene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg		10 ^a	22 ^b		10	2,400	2,400	2,400	0.0097	0.0056 J,A01	0.00061 J	0.0024 J
	Fluorene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg		3.7 ^b	250 ^b		30	2,400	2,300	2,300	<0.00037	<0.0018 A01	<0.00037	<0.00037
	Indeno[1,2,3-cd]pyrene	8270C-SIM	0.10 mg/kg	0.0069 mg/kg			71 ^b		71	1.1	1.1	1.1	0.0055	<0.0028 A01	<0.00055	0.0045
	Naphthalene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg	1 ^b		9.6 ^b	3.4 ^b	1.0	2.0	2.0	2.0	<0.00049	<0.0024 A01	<0.00049	<0.00049
	Phenanthrene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg		5.5 ^b	11 ^b		6				0.0013 J	<0.0024 A01	<0.00049	0.0011 J
	Pyrene	8270C-SIM	0.10 mg/kg	0.0067 mg/kg		10 ^b	23 ^b	33 ^b	10	1,800	1,800	1,800	0.0082	0.0046 J,A01	0.00061 J	0.002 J
	Total LMW PAHs	8270C-SIM	0.10 mg/kg	0.0067 mg/kg		29 ^a	100 ^a		29				0.01297	0.0056	0.00061	0.0035
	Total HMW PAHs	8270C-SIM	0.10 mg/kg	0.0067 mg/kg		18 ^a	1.1 ^a		1.1				0.0492	0.0734	0.0111	0.0243

DTSC = Department of Toxic Substances Control

Eco-SSL = Ecological Soil Screening Level

EPA = United States Environmental Protection Agency

ESV = Ecological Screening Value

HMW = High Molecular Weight PAHs (benzo(a)anthracene, benzo(g,h,i)perylene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, pyrene)

LANL = Los Alamos National Laboratory

LMW = Low Molecular Weight PAHs (acenaphthene, acenapthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene)

mg/kg = Milligrams per Kilogram

"--" = Not Established

PAH = Polycyclic Aromatic Hydrocarbon

SIM = Selected Ion Monitoring

Sources:

- ^a EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/ecotox/
- b Los Alamos National Laboratory (LANL). 2017. ECORISK Database (Release 4.1), https://www.lanl.gov/envirohment/protection/eco-risk-assessment.php
- ¹ EPA. Regional Screening Levels (RSLs) Generic Tables (Residential Soil). November 2020.
- $^{2}\,$ DTSC. 2020. DTSC-modified Screening Levels (DTSC-SLs). HERO HHRA Note Number 3. June.

Sample Matrix	Target Compound	EPA Method	Reporting Limit	Method Detection Limit	ESVs (Plants)	ESVs (Invertebrates)	ESVs (Mammals)	ESVs (Birds)	Preliminary Site Screening Criteria (Most Stringent and Applicable Values) for Ecological Receptors	EPA Residential RSL Human Health Screening Level ¹	EPA Residential DTSC Note 3 Human Health Screening Level ²	Most Stringent Residential Human Health Screening Level	BB-022 BB-043	BB-097	BB-116	3-SO-1
									milligrams p	er kilogram (mg	g/kg)					
	1,1,1-Trichloroethane	8260B	0.005	0.002			260 ^b		260	8,100	1700	1700	<0.00074 S08,Z1 <0.00067	<0.00067	<0.00086	S08,Z1
	1,1,2,2-Tetrachloroethane	8260B	0.005	0.0022						0.6	0.6	0.6	<0.00074 S08,Z1 <0.00084	<0.00084	<0.0011	S08,Z1
	1,1,1,2-Tetrachloroethane	8260B	0.005	0.002						2	2	2	<0.001 S08,Z1 <0.00095	<0.00095	<0.0012	S08,Z1
	1,1,2-Trichloroethane	8260B	0.005	0.0019						1.1	NE	1,1	<0.001 S08,Z1 <0.00094	<0.00094	<0.0012	S08,Z1
	1,1-Dichloroethane	8260B	0.005	0.0019			210 ^b		210	3.6	3.6	3.6	<0.0007 S08,Z1 <0.00064	<0.00064	<0.00082	S08,Z1
	1,1-Dichloroethene	8260B	0.005	0.0021			11 ^b		11	230	83	83	<0.0012 S08,Z1 <0.0011	<0.0011	<0.0014	S08,Z1
	1,2,3-Trichloropropane	8260B	0.005	0.0023						0.0051	0.0015	0.0015	<0.0021 S08,Z1 <0.0019	<0.0019	<0.0024	S08,Z1
	1,2,4-Trichlorobenzene	8260B	0.005	0.0027		20 ^a	0.27 ^b		0.27	24	7.8	7.8	<0.0015 S08,Z1 <0.0014	<0.0014	<0.0018	S08,Z1
	1,2-Dibromo-3-Chloropropane	8260B	0.005	0.0023						0.0053	0.0043	0.0043	<0.0011 S08,Z1 <0.00096	<0.00096		S08,Z1
	1,2-Dibromoethane	8260B	0.005	0.0019			 h			0.036	NE	0.036	<0.0009 S08,Z1 <0.00082	<0.00082	<0.0011	S08,Z1
	1,2-Dichlorobenzene	8260B	0.005	0.0023		20 ^a	0.92 ^b	 h	0.92	1,800	NE	1800	<0.00087 S08,Z1 <0.00073	<0.00079		S08,Z1
	1,2-Dichloroethane	8260B	0.005	0.0017		7003	27 ^b	0.85 ^b	0.85	0.46	NE	0.46	<0.0008 S08,Z1 <0.00073	<0.00073		S08,Z1
	1,2-Dichloropropane	8260B	0.005	0.0019		700 ^a			700	2.5	NE	2.5	<0.00088 S08,Z1 <0.0008	<0.0008	<0.001	S08,Z1
	1,3-Dichlorobenzene	8260B	0.005	0.0020		20 ^a	0.74 ^b		0.74	NE'	NE	NE 0.0	<0.0008 S08,Z1 <0.00073	<0.00073		S08,Z1
	1,4-Dichlorobenzene	8260B 8260B	0.005 0.020	0.0023 0.0068		20 ^a	0.89 ^b	 ch	0.89 1.2	2.6 61,000	NE NE	2.6 61,000	<0.0008 S08,Z1 <0.00079	<0.00073	<0.00094	S08,Z1
Dry Soil/Sediment	Acetone Benzene	8260B	0.020	0.0068			1.2 ^b	7.5 ^b	24		0.33	0.33	 0.0011 J,S08,Z1 <0.00067	<0.00067	<0.00086	 S08,Z1
	Bromodichloromethane	8260B	0.005	0.0018			24 ^b			1.2 0.29	0.33	0.33	<0.00011 3,308,Z1 <0.00087 <0.00086 S08,Z1 <0.00078	<0.00087		S08,Z1
	Bromoform	8260B	0.005	0.0020						19	19	19	<0.00066 S08,Z1 <0.00076 <0.00077 S08,Z1 <0.0007	<0.00076	<0.001	S08,Z1
	Bromomethane	8260B	0.005	0.0023						6.8	NE	6.8	<0.00077 S08,Z1 <0.0007 <0.0019 S08,Z1 <0.0017	<0.0007	<0.0009	S08,Z1
	Carbon tetrachloride	8260B	0.005	0.0024					58.6	0.65	0.65	0.65	<pre><0.0019</pre>	<0.0017		S08,Z1
	Chlorobenzene	8260B	0.005	0.0019		40 ^a	58.6 ^c 43 ^b	<u></u>	40	280	NE	280	<0.00085 S08,Z1 <0.00078	<0.00078	<0.0009	S08,Z1
	Chloroethane	8260B	0.005	0.0020		40	43	<u></u>	40	14,000	NE	14000	<0.0012 S08,Z1 <0.0011	<0.0011	<0.00099	S08,Z1
	Chloroform	8260B	0.005	0.0019			8 ^b		8	0.32	NE	0.32	<0.0009 S08,Z1 <0.0009	<0.0001	<0.0014	S08,Z1
	Chloromethane	8260B	0.005	0.0017					Ü	110	NE	110	<0.0012 S08,Z1 <0.0011	<0.0011	<0.0012	S08,Z1
	cis-1,2-Dichloroethene	8260B	0.005	0.0017			89.6°		89.6	160	18	18	<0.00059 S08,Z1 <0.00054	<0.00011	<0.00069	S08,Z1
	cis-1,3-Dichloropropene	8260B	0.005	0.0017			69.0			NE	NE	NE	<0.00064 S08,Z1 <0.00058	<0.00054		S08,Z1
	n-Butylbenzene	8260B	0.005	0.0021						3,900	NE	3900	<0.00084 S08,Z1 <0.00076	<0.00076		S08,Z1
	Diisopropyl ether	8260B	0.005	0.0043						2,200	NE	2200				
	Dibromomethane	8260B	0.005	0.0016						24	NE	24	<0.0015 S08,Z1 <0.0014	<0.0014	<0.0018	S08,Z1
	Dichlorodifluoromethane	8260B	0.005	0.0020						87	NE	87	<0.00087 S08,Z1 <0.00079	<0.00079		S08,Z1
	Ethylbenzene	8260B	0.005	0.0022						5.8	NE	5.8	<0.00076 S08,Z1 <0.00069	<0.00069		S08,Z1
	Sec-Butylbenzene	8260B	0.005	0.0021						7,800	NE	7800	<0.00078 S08,Z1 <0.00071	<0.00071	<0.00091	S08,Z1
	Methyl tert-butyl ether	8260B	0.005	0.0017						47	NE	47	<0.00062 S08,Z1 <0.00056	<0.00056		S08,Z1
	Methylene Chloride	8260B	0.005	0.0015	1,600 ^b		2.6 ^b		2.6	57	2.2	2.2	<0.0012 S08,Z1 <0.0011	<0.0011	<0.0014	S08,Z1
	Styrene	8260B	0.005	0.0020	300 ^a	1.2 ^b			1.2	6,000	5600	5600	<0.00068 S08,Z1 <0.00062	<0.00062		S08,Z1
	Tetrachloroethylene	8260B	0.005	0.0022	10 ^b		0.18 ^b		0.18	24	0.59	0.59	<0.0011 S08,Z1 <0.00097	<0.00097		S08,Z1
Soil/Dry Sediment	Toluene	8260B	0.005	0.0020	200 ^a		23 ^b		23	4,900	1100	1100	0.0012 J,S08,Z1 0.0014	J <0.00069		S08,Z1
	trans-1,2-Dichloroethene	8260B	0.005	0.0019			89.6 ^c		89.6	70	130	130	<0.0041 S08,Z1 <0.0037	<0.0037	<0.0047	S08,Z1
	trans-1,3-Dichloropropene	8260B	0.005	0.0018						NE	NE	NE	<0.00073 S08,Z1 <0.00066	<0.00066	<0.00085	S08,Z1
	Trichloroethene	8260B	0.005	0.0022			42 ^b		42	0.94	NE	0.94	<0.00081 S08,Z1 <0.00074	<0.00074	<0.00095	S08,Z1
	Vinyl chloride	8260B	0.005	0.0019			0.12 ^b		0.12	0.059	0.0082	0.0082	<0.00065 S08,Z1 <0.00059	< 0.00059	<0.00076	S08,Z1
	Xylenes (total)	8260B	0.01	0.0034	100 ^b		1.4 ^b	41 ^b	1.4	580	NE	580.0	<0.0028 S08,Z1 <0.0025	<0.0025	<0.0032	S08,Z1

EPA - United States Environmental Protection Agency

ESV - Ecological Screening Value

LANL - Los Alamos National Laboratory

"--" - Not Established

mg/kg - Milligrams per Kilogram

NE - Not Established

ORNL - Oak Ridge National Laboratory

VOC = Volatile Organic Compound

Sources:

- ^a ORNL Ecological Screening Values, 1997. Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants, Oak Ridge National Laboratory.
- ^b LANL Ecological Screening Values, 2017. ECORISK Database (Release 4.1). LA-UR-12-24548, Los Alamos National Laboratory
- ^c Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. Document ES/ER/TM-86/R3. June.
- ¹ EPA Regional Screening Levels (RSLs) Generic Tables. May 2020.

Description/ Location	Sample ID	Sample Date	Sample Method	Antimonia	Allemony		Alsemo	Barium		Beryllium		Cadmium	Chromium		4100	Cobair	radio	eddo	Lead		Mercury	Molybdenum		Nickel		Selenium	Silver	5	Thallium	Vanadium		Ë	2
Upriver of Site	BB-SW-01-SED	10/22/2020	XRF	<581		<10					<278	3	<31		<16		<13		<43		<38	23		<18		<5	<227		51	<5	9	8	
Upriver of Site	BB-SW-01-SED	10/22/2020	Lab	<0.8	A07	2.7	J,A07	52	A07	<0.47 A0	7 <0.5	2 A07	9.2	A07	5.3	J,A07	5.4	J,A07	<4.1	A07	<0.016	<0.5	A07	3.9 J	,A07 <	1.1 A0	7 <0.67	A07	<0.49 A	.07 5	7 A07	30	A07
Adjacent to Site	BB-SW-02-SED	10/22/2020	Lab	<0.8	A07	32	A07	31	A07	<0.47 A0	7 <0.5	2 A07	5.8	A07	3.4	J,A07	3.8	J,A07	<4.1	A07	0.55	<0.5	A07	2.8 J	,A07 1	.8 J,A0	7 <0.67	A07	<0.49 A	.07 3	I A07	24	J,A07
Downriver of Site in sandy deposits (Mod area)	BB-SW-03-SED	10/22/2020	Lab	<0.8	A07	13	A07	24	A07	<0.47 A0	7 <0.5	2 A07	4.4	J,A07	2.3	J,A07	2.8	J,A07	<4.1	A07	0.17	<0.5	A07	3.3 J	,A07 1	.2 J,A0	0.67	A07	<0.49 A	07 1 ⁻	7 A07	15	J,A07
Downriver of MOD area	BB-M1-SED-01	10/22/2020	Lab	0.13	J	22		21		0.22 J	0.31	J	7.2		3		3		2.6		0.08	<0.05		2.2	<0).11	<0.067	7	0.1	J 3	5	16	
											5	ubmer	ged Sedim	ent Scr	eening	Criteria	(mg/kg) ²															
	ogical Screening es ^{a,b,c}	Aquatic Inve	rtebrates	NE		9.79 ^a		NE		NE	0.99	а	43.4 ^a		NE		31.6 ^a		35.8 ^a		0.18 ^a	NE		22.7 ^a	0.	.9 b	1 °		NE	N	=	121 ^a	
EPA Regional So Generic	Ŭ.	Reside	ents	31		0.68		15,000		160	71		120,000 ¹		23		3,100		400		11	390		1,500	3	90	390		0.78	39	0	23,000	
DTSC-Modified S	Screening Levels ^e	Reside	ents	NE		0.11		NE		16	71		NE		NE		NE		80		1	NE		820	١	1E	NE		NE	N	≣	NE	
	te Screening Criteria alues) for Residentia			31		0.11		15000		16	71		120000		23		3100		80		1	390		820	3	90	390		0.78	39	0	23,000	
BLM Child/Adult Re	ecreational Visitors ^f	Visito	rs	782		30.6		390,000		3,910	1,78	0	1,000,000		586		78,200		800		271	9,780		39,000	9,	780	9,780		19.60	9,8	50	587,000	

Acronyms and Abbreviations:

ARAR = Applicable or Relevant and Appropriate Requirement

DTSC = Department of Toxic Substances Control

EPA = United States Environmental Protection Agency

mg/kg = Milligrams per Kilogram

NE = Not Established

TBC = To-Be-Considered Requirement

Sources:

- ^a D.D. MacDonald, C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39, 20-31 (2000).
- b Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110:71-85.
- ^c Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.
- ^d EPA. 2018. Regional Screening Levels
- e DTSC. 2020. DTSC-modified
- ^f BLM. 2017. Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites.

¹ No screening level value established for total chromium, value shown is chromium III.

² Screening levels established for aquatic invertebrates for streambed sediment.

Table 5: Summary of Surface Water Laboratory Analytical Results For Metals

Sample ID	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
BB-SW-01 - Total	10/22/2020	0.30	5.7	18	<0.14	<0.11	0.55	<0.1	0.62	<0.1	0.21	7.3	0.44	<0.19	<0.1	<0.1	<0.78	<1.7
BB-SW-01 - Dissolved	10/22/2020	<0.23	6.4	18	< 0.05	< 0.034	<0.15	0.059	< 0.32	<0.021	0.12	6.5	0.48	<0.25	< 0.015	< 0.025	0.67	<2.2
BB-SW-02 - Total	10/22/2020	0.19	6	17	<0.14	<0.11	<0.5	0.1	0.62	<0.1	0.39	7.5	0.44	<0.19	<0.1	<0.1	<0.78	1.9
BB-SW-02 - Dissolved	10/22/2020	<0.23	5.9	18	< 0.05	< 0.034	<0.15	0.051	< 0.32	0.024	0.25	6.6	0.45	<0.25	< 0.015	< 0.025	0.66	<2.2
BB-SW-03 - Total	10/22/2020	0.13	6.7	18	<0.14	<0.11	<0.5	<0.1	0.53	<0.1	0.16	7.9	0.46	<0.19	<0.1	<0.1	<0.78	<1.7
BB-SW-03 - Dissolved	10/22/2020	<0.23	7.3	18	< 0.05	0.050	<0.15	0.046	0.34	0.059	0.25	6.8	0.40	<0.25	< 0.015	< 0.025	0.66	<2.2
Dup-01 - Total (BB-SW-02)	10/22/2020	0.11	5.9	18	<0.14	<0.11	<0.5	<0.1	0.66	<0.1	0.22	7.8	0.48	<0.19	<0.1	<0.1	<0.78	<1.7
Dup-01 - Dissolved (BB-SW-02)	10/22/2020	< 0.23	6.5	18	< 0.05	0.034	<0.15	0.047	< 0.32	< 0.021	0.24	6.6	0.35	< 0.25	< 0.015	< 0.025	0.56	<2.2
ARAR/TBC									Surface W	ater Screeni	ing Criteria (μ	g/L)						
	Human Health (Inland Waters) a	14	NE	NE	NE	NE	NE	NE	1,300	NE	0.05	NE	610	NE	NE	1.7	NE	120
California Toxics Rule	Ecological (Freshwater Criteria Continuous Concentration, Inland Waters) ^a	NE	150	NE	NE	NE	180 ^{1,*}	NE	9	2.5*	NE	NE	52 [*]	5	NE	NE	NE	120 ^a
	Ecological (Freshwater Criteria Maximum Concentration, Inland Waters) ^a	NE	340 ª	NE	NE	3.9 ^{a,*}	550 ^{1,a,*}	NE	13 ^a	65 ^{a,*}	NE	NE	470 ^{a,*}	NE	3.4 ^a	NE	NE	120 ^a
	Human (Surface Water) ^b	5.6	0.018	1,000	NE	NE	NE	NE	NE	NE	NE	NE	610	170	NE	0.24	NE	7,400
EPA National Water Quality Criteria	Ecological (Freshwater Criterion Continuous Concentration) ^b	30	150	NE	NE	0.25*	74 ^{1,*}	NE	9	2.5*	0.77	NE	52 [*]	5	NE	NE	NE	120
	Ecological (Freshwater Criteria Maximum Concentration) ^b	88	340	NE	NE	2*	570 ^{1,*}	NE	13	65*	1.40	NE	470*	NE	3.2	NE	NE	120
	pening Criteria (Most Stringent and Applicable Values)	5.6	0.018	1,000	NE	NE	NE	NE	1,300	NE	0.05	NE	610	170	NE	0.2	NE	120
Preliminary Ecological Site Screen	ning Criteria (Most Stringent and Applicable Values)	30	150	NE	NE	0.25	74	NE	9	2.5	0.77	NE	52	5	3.2	NE	NE	120

Notes:

Acronyms and Abbreviations:

μg/L = Micrograms per Liter

ARAR = Applicable or Relevant and Appropriate Requirement

CalEPA = California Environmental Protection Agency

CCC = Criteria Continuous Concentration (water quality criteria to protect against chronic effects in aquatic life and is the highest instream concentration of a priority toxic pollutant metal consisting of a 4-day average not to be exceeded more than once every 3 years on average).

CMC = Criteria Maximum Concentration (water quality criteria to protect against acute effects in aquatic life and is the highest instream concentration of a priority pollutant metal consisting of a short-term average not to be exceeded more than once every 3 years on average).

NE = Not Established

RSL = Regional Screening Level

TBC = To-Be-Considered Requirement

Sources

- a EPA. 2000. 40 Code of Federal Regulations Part 131, Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Rule.
- ^b EPA. 2020a. National Recommended Water Quality Criteria Human Health Criteria Table Consumption of Water and Organisms and Aquatic Life Criteria Tables. February.

^{*} Freshwater aquatic life criteria for metals are expressed as a function of total hardness in the water body. Values presented correspond to a total hardness of 100 milligrams per liter.

¹ Screening level value established for chromium III.

Screening level value established for total chromium.

Sample ID	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Respirable Dust	Total Dust
			Particulate Screening Criteria (ug/m³)												mg/m³					
BB-D-1.1	10/21/2020	<2.2	<2.2	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2	<0.11	<0.11
BB-D-1.2	10/21/2020	<2.2	<2.2	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2		
BB-D-1.3	10/21/2020										< 0.056									
BB-D-2.1	10/21/2020	<2.2	<2.2	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2	<0.11	<0.11
BB-D-2.2	10/21/2020	<2.2	<2.2	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2		
BB-D-2.3	10/22/2020										<0.056									
BB-D-3.1	10/22/2020	<2.2	<2.2	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2	<0.11	0.15
BB-D-3.2	10/22/2020	<2.2	<2.2	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2		
BB-D-3.3	10/22/2020										<0.056									
BB-D-4.1	10/22/2020	<2.2	3.7	<11	<0.22	<0.44	<2.2	<1.1	<2.2	<1.1		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2	0.22	0.85
BB-D-4.2	10/22/2020	<2.2	23	<11	<0.22	<0.44	<2.2	<1.1	<2.2	1.7		<1.1	<2.2	<2.2	<2.2	<2.2	<1.1	<2.2		
BB-D-4.3	10/22/2020										<0.056									
ARAR/TBC	RECEPTOR								Particulate	Screening	Criteria (ug/n	n³)							mg	g/m³
EPA Regional Screening Levels - Generic Tables ^d	Residents	0.31	0.00065	0.52	0.0012		0.000012	0.00031		0.15	0.31		0.011	21			0.10			
DTSC Modified ^e	Residents										0.031		0.011							
EPA Regional Screening Levels - Generic Tables ^d	Industrial	1.3	0.0029	2.2	0.0051		0.00015	0.0014			1.3		0.047	88			0.44			
DTSC Modified ^g	industriai										0.13		0.047							
DIR Permissible Exposure Limits ^h		500	10	500	2	5	500	20	1000	50	25/100C	3000*	500	200	10	100	50		5	10

Acronyms and Abbreviations:

DTSC = Department of Toxic Substances Control
EPA = United States Environmental Protection Agency

µg/m³ = micrograms per cubic meter

mg/m³ = milligrams per cubic meter

-- = Not sampled

C = ceiling value

Sources

- a D.D. MacDonald, C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39, 20-31 (2000).
- b Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110:71-85.
- ^c Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.
- $^{\rm d}$ EPA. 2018. Regional Screening Levels (RSLs) Generic Tables. November 2018.
- $^{\mathrm{e}}\,$ DTSC. 2020. DTSC-modified Screening Levels (DTSC-SLs). HERO HHRA Note Number
- ^f BLM. 2017. Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites.
- ⁹ DTSC Note 3 Table 3, June 2020 (nickel is cancer endpoint)
- ^h Table AC-1 Permissible Exposure Limits for Chemical Contaminants, Particulates not otherwise regulated. California Department of Industrial Relations (PEL is 8-Hr TWA average for 40-hour work week)

¹ No screening level value established for total chromium, value shown is chromium III.

 $^{^{2}\,}$ Screening levels established for aquatic invertebrates for streambed sediment.

^{*} Respirable fraction

Table 7 Summary of Human Health and Ecological Risks For Surface Soil (XRF)

		Reside	nt	Recre	eational	Visitor		Plant		Invertebrate		Mammal		Avian	
AOC/Table Number	Cancer Risk - As	н	HQs (Sb, As, Pb, Hg)	Cancer Risk - As	н	HQs (Sb, As, Pb, Hg)	н	HQs (Sb, As, Cu, Pb, Hg, Ag, Zn)	НІ	HQs (Sb, As, Cu, Pb, Hg, Ag, Zn)	ні	HQs (Sb, As, Cu, Pb, Hg, Ag, Zn)	ні	HQs (Sb, As, Cu, Pb, Hg, Ag, Zn)	Total Ecological HI
Background															
Table H2-1	2E-04	50	As(46) , Pb(1), Hg(3)	6E-07	<1	<1	13	As(1), Hg(10), Zn(1)	32	Hg(30) , Zn(1)	5	Cu(1), Pb(1), Hg(2), Zn(2)	240	Cu(1), Pb (5), Hg (231), Zn(3)	290
AOC 1															
Table H2-2	1E-04	35	As(31), Hg(4)	4E-07	<1	<1	15	As(1), Hg(13) , Zn(1)	40	Hg(39) , Zn(1)	4	Hg(2), Zn(1)	304	Cu(1), Pb(1), Hg(300) , Zn(2)	363
AOC 2						<u> </u>					<u> </u>				
Table H2-3	7E-04	200	As(189), Pb(1), Hg(10)	3E-06	<1	<1	39	As(4), Pb(1), Hg(33), Zn(1)	101	As(1), Hg(98) , Zn(1)	12	As(2), Cu(1), Pb(2), Hg(6), Zn(2)	766	As(2), Cu(1), Pb(9), Hg(751), Zn(3)	918
AOC 3		•		•					•						
Table H2-4	6E-03	1615	As(1579), Pb(2), Hg(34)	2E-05	1	As(1)	151	As(36), Cu(1), Pb(1), Hg(113), Zn(1)	351	As(11), Hg(338) , Zn(1)	39	As(14), Cu(1), Pb(3), Hg(20), Zn(2)	2,634	As(15), Cu(1), Pb(14), Hg(2600), Zn(3)	3175
AOC 4		•													
Table H2-5	1E-01	26304	Sb(283), As(26007), Pb(6), Hg(8)	3E-04	24	Sb(11) , As(12) , Pb(1)	2,378	Sb(1753), As(592), Pb(4), Hg(27), Zn(1)	373	Sb(112), As(178), Hg(81), Zn(2)	32,708	Sb(32459), As(232), Pb(8), Hg(5), Ag(1), Zn(3)	922	As(248), Cu(1), Pb(42), Hg(624), Ag(4), Zn(4)	36381
AOC 5															
Table H2-6	3E-01	89748	Sb(3), As(88334), Pb(38), Hg(1373)	1E-03	50	As(41), Pb(4), Hg(5)	6,633	Sb(17), As(2012), Cu(1), Pb(25), Hg(4577), Zn(1)	14,339	Sb(1), As(604), Pb(2), Hg(13730), Zn(2)	1,980	Sb(318), As(787), Cu(1), Pb(54), Hg(808), Ag(9), Zn(2)		As(842), Cu(1), Pb(277), Hg(105615), Ag(31), Zn(4)	129723
AOC 6															
Table H2-7	1E-03	384	As(377), Hg(7)	5E-06	<1	<1	33	As(9), Hg(23), Zn(1)	74	As(3), Hg(70) , Zn(1)	10	As(3) , Cu(1), Pb(1), Hg(4), Zn(1)	548	As(4), Cu(1), Pb(3), Hg(538), Zn(2)	665
AOC 7											-				
Table H2-8	2E-04	45	As(42), Hg(4)	6E-07	<1	<1	13	As(1), Hg(12)	36	Hg(35) , Zn(1)	4	Hg(2) , Zn(1)	273	Cu(1), Pb(1), Hg(269), Zn(1)	326

Site Inspection USFS - Big Blue Mill

Table 7 Summary of Human Health and Ecological Risks For Surface Soil (XRF)

June 2021

Notes:

Cu = Copper Pb = Lead

Hg = Mercury

Summary of Human Health and Ecological Risks For Surface Soil (Laboratory)

		Reside	ent	Recr	eationa	l Visitor		Plant		Invertebrate		Mammal			
AOC/Table Number	Cancer Risk - As	н	HQs (Sb, As, Cd, Pb, Hg)	Cancer Risk - As	н	HQs (Sb, As, Cd, Pb, Hg)	н	HQs (Sb, As, Cd, Cr, Cu, Pb, Hg, Mo, Se, Ag, Zn)	ні	HQs (Sb, As, Cd, Cr, Cu, Pb, Hg, Mo, Se, Ag, Zn)	н	HQs (Sb, As, Cd, Cr, Cu, Pb, Hg, Mo, Se, Ag, Zn)	н	HQs (Sb, As, Cd, Cr, Cu, Pb, Hg, Mo, Se, Ag, Zn)	Total Ecological HI
Background	=														9
Table H2-1	2E-04	50	As(49) , Pb(1), Hg(1)	7E-07	<1	<1	14	As(1), Cr(10), Hg(2)	32	Cr(25), Hg(6), Zn(1)	3	Pb(1), Zn(1)	55	Pb(4), Hg(48), Zn(2)	104
AOC 4		•	•			•					•				
Table H2-5	7E-02	18065	Sb(5), As(18049), Cd(1), Pb(8), Hg(3)	2E-04	9	As(8) , Pb(1)	473	Sb(32), As(411), Cd(2), Cr(10), Pb(5), Hg(10), Zn(2)	184	Sb(2), As(123), Cr(25), Hg(30), Zn(3)	939	Sb(593), As(161), Cd(167), Pb(11), Hg(2), Ag(1), Zn(5)	548	As(172), Cd(78), Cu(1), Pb(55), Hg(231), Ag(3), Zn(8)	2144
AOC 5															
Table H2-6	4E-01	99233	Sb(2), As(98720), Cd(4), Pb(157), Hg(350)	1E-03	64	As(46), Pb(16), Hg(1)	3,555	Sb(14), As(2249), Cd(9), Cr(8), Cu(1), Pb(105), Mo(2), Hg(1167), Zn(1)	4,207	Sb(1), As(675), Cd(2), Cr(20) , Cu(1), Pb(7), Hg(3500) , Zn(1)	2,384	Sb(256), As(880), Cd(805), Cu(1), Pb(225), Hg(206), Ag(2), Mo(8), Zn(2)	29,396	As(941), Cd(376), Cu(2), Pb(1144), Hg(26923), Ag(6), Zn(3)	39542
AOC 6															
Table H2-7	1E-03	270	As(268) , Hg(1)	4E-06	<1	<1	22	As(6), Cr(5), Hg(3), Se(8)	22	As(2), Cr(12), Hg(8) , Se(1)	14	As(2), Cd(4), Pb(1), Se(6) , Zn(1)	72	As(3), Cd(2), Pb(3), Hg(59), Se(3), Ag(1), Zn(1)	130
AOC 7															
Table H2-8	1E-04	106	As(27), Hg(4)	4E-07	<1	<1	26	As(1), Cr(10), Hg(14)	70	Cr(26), Hg(43)	4	Hg(3)	333	Hg(331), Zn(1)	433

Notes:

As = Arsenic

Cd = Cadmium

Ag =Silver Cu = Cop

Cr = Chromium Cu = Copper

Hg = Mercury

HI = Hazard Index HQ = Hazard Quotient

HQ = Hazard Quotient Mo = Molybdenum Pb = Lead

Sb = Antimony Se = Selenium Zn = Zinc

Table 9 Summary of Human Health and Ecological Risks For Subsurface Soil (XRF) AOC 4 and AOC 5

		Reside	nt	Recre	ational	Visitor		Plant		Invertebrate		Mammal		Avian	
AOC/Table Number	Cancer Risk - As	н	HQs (As, Pb, Hg, Sb)	Cancer Risk - As	н	HQs (As, Pb, Hg, Sb)	н	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	н	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	н	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	н	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	Total Ecological HI
Surface Soil S	Sample fro	m AOC	4												
Table H2-9	7E-02	19059	Sb(10), As(19033), Pb(8), Hg(7)	3E-04	10	As(9) , Pb(1)	529	Sb(64), As(434), Cd(2), Pb(6), Hg(23), Zn(1)	207	Sb(4), As(130), Hg(70), Zn(2)	1,514	Sb(1181), As(170), Cd(142), Cu(1), Pb(12), Hg(4), Ag(2), Zn(2)	859	As(181), Cd(66), Cu(1), Pb(61), Hg(538), Ag(6), Zn(4)	3109
AOC 4 Depth	(0-1 feet b	gs)													
Table H2-9	9E-02	25316	Sb(3), As(25289), Pb(9), Hg(15)	3E-04	13	As(12) , Pb(1)	656	Sb(17), As(576), Cd(5), Pb(6), Hg(50), Zn(1)	327	Sb(1), As(173) , Cd(1), Hg(150), Zn(2)	1,007	Sb(310), As(225), Cd(444), Cu(1), Pb(13), Hg(9), Ag(2), Zn(3)	1,681	As(241), Cd(208), Cu(1), Pb(67), Hg(1154), Ag(6), Zn(4)	3671
AOC 4 (1-2 fee	et bgs)						T:								
Table H2-9	5E-03	1332	As(1332) , Pb(1)	2E-05	1	As(1)	34	As(30), Zn(2)	13	As(9), Zn(3)	54	As(12), Cd(36) , Pb(1), Zn(5)	44	As(13), Cd(17), Cu(1), Pb(5), Zn(8)	145
Surface Soil S	Sample fro	m AOC	5												
Table H2-9	2E-01	43683	Sb(2), As(43491), Pb(20), Hg(170)	6E-04	23	As(20), Pb(2) , Hg(1)	1591	Sb(13), As(991), Cd(5), Pb(13), Hg(568), Zn(1)	2005	Sb(1), As(297), Cd(1), Pb(1), Hg(1704) , Zn(1)	1,179	Sb(249), As(388), Cd(408), Pb(29), Hg(100), Ag(3), Zn(1)	13,872	As(415), Cd(191), Cu(1), Pb(147), Hg(13108), Ag(9), Zn(2)	18647
AOC 5 Depth	(0-1 feet b	gs)													
Table H2-9	2E-01	57180	Sb(5), As(57051), Pb(21), Hg(103)	8E-04	29	As(27), Pb(2)	1696	Sb(31), As(1299), Cd(6), Pb(14), Hg(345), Zn(1)	1430	Sb(2), As(390) , Cd(1), Pb(1), Hg(1034) , Zn(1)	1,686	Sb(573), As(508), Cd(507), Pb(30), Hg(61), Ag(4), Zn(2)	8,905	As(544), Cd(237), Cu(1), Pb(153), Hg(7954), Ag(13), Zn(3)	13717
AOC 5 Depth	(1-2 feet b	gs)													
Table H2-9	8E-02	22645	Sb(1), As(22583), Pb(4), Hg(57)	3E-04	11	As(11)	717	Sb(8), As(514), Pb(3), Hg(190), Zn(1)	727	Sb(1), As(154), Hg(570) , Zn(1)	393	Sb(148), As(201), Cu(1), Pb(6), Hg(34), Ag(1), Zn(2)	4,640	As(215), Cu(1), Pb(31), Hg(4385), Ag(5), Zn(3)	6477
AOC 5 Depth	(2-3 feet b	gs)													
Table H2-9	7E-02	17917	As(17862), Pb(2), Hg(52)	2E-04	9	As(8)	583	As(407), Pb(2), Hg(173), Zn(1)	644	As(122), Hg(520) , Zn(1)	196	As(159), Pb(4), Hg(31), Zn(2)	4,193	As(170), Cu(1), Pb(18), Hg(4000), Zn(4)	5616
AOC 5 Depth	(3-4 feet b	gs)													
Table H2-9	4E-02	10327	As(10289), Pb(1), Hg(38)	1E-04	5	As(5)	361	As(234), Pb(1), Hg(125), Zn(1)	447	As(70), Hg(375) , Zn(1)	117	As(92), Pb(2), Hg(22), Zn(2)	2,994	As(98), Cu(1), Pb(8), Hg(2885), Zn(3)	3919

Table 9 Summary of Human Health and Ecological Risks For Subsurface Soil (XRF) AOC 4 and AOC 5

	Resident Re		Recre	ecreational Visitor			Plant		Invertebrate		Mammal		Avian		
AOC/Table Number	Cancer Risk - As	Ħ	HQs (As, Pb, Hg, Sb)	Cancer Risk - As	н	HQs (As, Pb, Hg, Sb)	Ħ	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	Ħ	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	Ħ	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	н	HQs (Ag, As, Cd, Cu, Hg, Pb, Sb, Zn)	Total Ecological HI
AOC 5 Depth	(4-5 feet b	gs)													
Table H2-9	5E-02	14302	As(14301)	2E-04	7	As(7)	328	As(326), Cu(1), Zn(1)	99	As(98), Cu(1), Zn(1)	131	As(127) , Cu(1), Pb(1), Zn(2)	144	As(136), Cu(2), Pb(3), Zn(3)	702

Notes:

Cadmium concentrations represent laboratory results where present (see Appendix H, Table H2-9)

As = Arsenic HI = Hazard Index
Ag = Silver HQ = Hazard Quotient

Cd = Cadmium Pb = Lead
Cu = Copper Sb = Antimony
Hg = Mercury Zn = Zinc

Table 10 Summary of Human Health and Ecological Risks for Sediment (River)

Sample ID/ AOC	Table		Resident	t	Recrea	itional V	isitor	Aquatic Invertebrate		
	Tuble	Cancer Risk - As	ні	HQs (As)	Cancer Risk - As	НІ	HQs (As)	НІ	HQs (As, Hg, Se)	
Sediment in Kern Riv	er upriver of sit	te								
BB-SW-01-SED	H2-10	2E-05	7	As(7)	9E-08	<1	<1	<1	<1	
Sediment Sample Adj	acent to Site									
BB-SW-02-SED	H2-10	3E-04	78	As(78)	1E-06	<1	<1	8	As(3), Hg(3), Se(2)	
Sediment Sample Dov	wnriver of Site	(AOC 7 Area	1)							
BB-SW-03-SED	H2-10	1E-04	32	As(32)	4E-07	<1	<1	4	As(1), Hg(1), Se(1)	
Sediment Sample Dov	wnriver of AOC	7 Area			_					
BB-M1-SED-01	H2-10	2E-04	54	As(54)	7E-07	<1	<1	3	As(2)	

Notes:

As = Arsenic

Pb = Lead

Se = Selenium

HI = Hazard Index

HQ = Hazard Quotient

Table 11 Summary of Human Health and Ecological Risks for Surface Water

		Maximum Concent	ration				
Sample ID		EPA National Water Quality Criteria	California Toxics Rule Criteria				
	Date	Cancer Risk - As	HI (As, Hg)	HQs			
Surface Water Sample i	in Kern River	Upriver of Site					
BB-SW-01 - Total	10/22/2020	3E-04	4	Hg(4)			
Surface Water Sample	Adjacent to S	ite					
BB-SW-02 - Total	10/22/2020	3E-04	8	Hg(8)			
Surface Water Sample	Downriver of	Site - AOC 7 area					
BB-SW-03 - Total	10/22/2020	4E-04	3	Hg(3)			

Notes:

As = arsenic

Hg = mercury

HI = Hazard Index

HQ = Hazard Quotient

Appendix A Previous USFS Investigation Results

Removal Preliminary Assessment

For The

Big Blue Mill Site

Kernville Ranger District Sequoia National Forest



February 10, 2020

Prepared by: Noelle Graham-Wakoski, P.E. On-Scene Coordinator

Pacific Southwest Region USDA Forest Service

Removal Preliminary Assessment For the Big Blue Mill Site

Kernville Ranger District Sequoia National Forest

February 10, 2020

Prepared by:

Noelle Graham-Wakoski, P.E On-Scene Coordinator

1.0 LOCATION

The Big Blue Mill Site (Site) is a former gold ore processing facility dating back to the 1860s that was associated with the nearby historic Big Blue and Summer group of mines. The Site is located in Section 27, Township 25 South, Range 33 East, Mount Diablo Meridian, on the western bank of the North Fork of the Kern River (River) – a tributary feeding into Lake Isabella within Kern County, California (see Figure 1). The Site is located on both private and national forest system land under the jurisdiction, custody and control of the U.S. Department of Agriculture Forest Service (Forest Service), within the Sequoia National Forest, Kern River Ranger District.

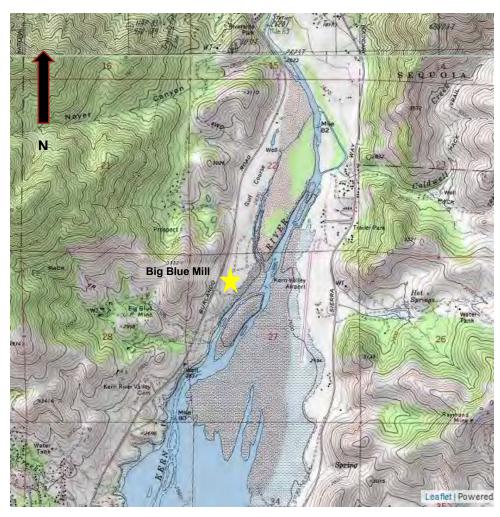


Figure 1: Location of the Big Blue Mill Site on the western bank of the Kern River above Lake Isabella, Kern County

The Site is located approximately 2 miles south of Kernville, California and can be accessed by taking California State Highway 178 east from Bakersfield toward Lake Isabella, California. Then turn left and head north on Highway 155 toward Wofford Heights. Continue north on Highway 495 (Burlando Road) toward Kernville for approximately three miles to the Site on the right side, which is approximately 800 feet east of the road toward the Kern River. The preferred access to the Site within Forest Service land is via the abandoned golf course just south of downtown Kernville. This path entails a one-mile travel on single lane track. The north end of the Site is the northern portion of the mill building foundations and the south end of the Site is just beyond the ragged peak along the shoreline of the Kern River.

2.0 BACKGROUND

2.1 Site History

The Big Blue Mill Site, also referred to as the "Sumner Mill" in some historic reports, is a former gold ore processing facility dating back to the 1860s that was associated with the nearby historic Big Blue and Summer group of mines. The Big Blue and Sumner group of mines are located southwest of the Site (see Figure 1) and were part of the historic Cove Mining District on the west side of the Kern River Valley. The September 15, 1896, Thirteenth Report of the State Mineralogist, for the California State Mining Bureau, indicates that there were multiple mining claims associated with mill site, these being the Big Blue, Commonwealth, Content, Nelly Dent, Nelly Dent Extension, Sumner, and Summer 5 Extensions (Beauregard, Bull Run, Frank, Jeff Davis, Lady Bell, and Urbana). According to the January 1940 "Volume 36 California Journal of Mines and Geology", the gold vein mined by these mines was first discovered in 1860.

Historic records from the California State Division of Mines indicate that mineral processing operations were conducted at the site dating back to the 1860s. At least four different mineral processing operations occurred at the Site, including: a 16-stamp mill from approximately 1867 through the mid-1870s, an 80-stamp mill from 1875 through 1883, a 10-stamp mill from approximately 1901 through 1932, and floatation plant and ball mill from 1934 – 1943. Records stated that the 80-stamp mill was the largest of its kind at the time.

The 1888 "Eighth Annual Report of the State Mineralogist" described the 80-stamp mill as follows: "It is an eighty-stamp mill. Built in 1874 and 1875 and was run by a 56-inch turbine water wheel. The ore from the mine was dumped from five-ton cars into a 60-ton bin, or bunker, whence it fell and went through a 15 by nine jaw-crusher of peculiar lever construction and thence dropped into small cars running on a tramway the whole length of the building. From these cars it was dumped by hand into the separate hoppers of the automatic feeders, one to each battery of five stamps. From the batteries the pulp went to Hendy concentrators, one to each battery. Later on, two of the Hendy concentrators were replaced by four Frue vanners. Below the concentrators and vanners, there are six pans and three large settlers. Tailings were allowed to run into the river. The whole eighty stamps are said to have been run continuously for some two years, after first starting up in the spring of 1875. After that, the mill ran spasmodically, with more or less stamps at a time, up to the date of its final substantial stoppage in November, 1883."



Figure 2: Big Blue Mill Site on the west bank of the Kern River (date is unknown but thought to be from the 1870s era)

According to several Annual Reports of the State Mineralogist, up until the 1930s, tailings and other materials from the mill operations were dumped into the Kern River and most washed down stream. In the early 1930s, the flotation plant and ball mill was installed at the site (1934 30th Annual Report of the State Mineralogist) from which point tailings from the processing operations were pumped across the Kern River and deposited into a tailings pond. The 1934 30th Annual Report of the State Mineralogist for the California Division of Mines lists the size of the floatation plant at 150 -ton.

FLOW SHEET - 150 TON MILL BIG BLUE MINE KERN CO., CALIFORNIA. Ore delivered in 10 ton frucks, Grizzly, 10" openings Symons Gyrafory 250 ton I'Product Steel Ore Bin Elevator 24" Bels 9'x9'Traylo Ball Mill Conveyor Duplex Dorr Classifier 3º Wilfley 000 Air agitated Conditioner 8 Kraut Rougher Cells 2 Krauf cleane 4" Wilfley Concentrates Settling Tank 1-0-0-

Figure 3: Floatation Plant Flow Sheet for the Big Blue Mill (source 1934 30th Annual Report of the State Mineralogist)

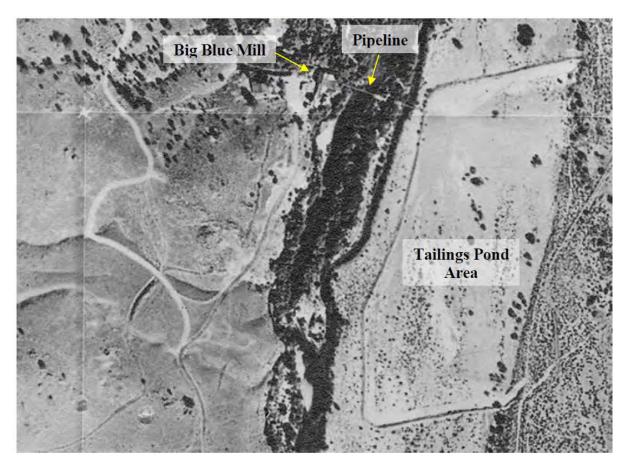


Figure 4: October 20, 1938 Aerial photo showing Big Blue Mill, pipeline, and tailings pond area



Figure 5: Big Blue Mill Circa pre-1940 (source January 1940, Vol 36 California Journal of Mines and Geology)

The Big Blue Mill operated up until 1943 when it was shut down during World War II as a result of Order L 208 of the War Production Board. Order L 208, issued by the War Production Board gave priority to copper mining, which had useful military implications, and labeled gold mines as "nonessential" for purposes of the war effort. As such, Order L-208 prohibited mining of "nonessential" materials. The 1962 report "Mines and Mineral Resources of Kern County, California" by the California Division of Mines and Geology states that Order L208 caused the mine to be shut down permanently.

2.2 Current Land Status

In 1948, US Army Corps of Engineers (USACE) began construction of the Lake Isabella Dam and reservoir project. In 1954, to complete the reservoir project, the USACE acquired all land below elevation 2617 feet. This included Big Blue Mill site which was at a lower elevation than the spillway of Lake Isabella dam. In 1957, the mill was sold at auction, and removed to New Mexico (California Division of Mines and Geology, 1962)

In 1991, in order to ensure ongoing public access to recreational activities along the river, this USACE floodplain land area was exchanged, from the USACE to the USDA Forest Service.

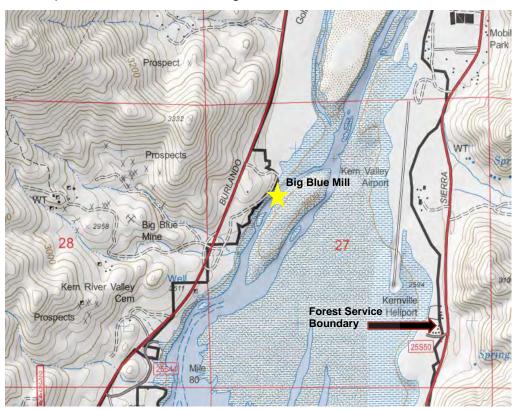


Figure 6: Current Forest Service land boundary

2.3 Current Land Use

The site is immediately adjacent to the Kern River which is a popular recreation area for fishing and water sports. The banks of the Kern River are reportedly popular fishing locations and some of the tailing materials encompass a common fishing platform and are bisected by a user created, well developed 'fishermen's trail' leading up from the south. There are also permitted commercial rafting corridors along the Kern River allowing access whereby recreational rafters may readily climb up on the shoreline in this location. There is an occupied single-family private residence within 100 feet of the Site. The home sits immediately adjacent to the posted private property-National Forest land boundary. There are two other parcels with homes at an

approximate distance of 500 feet and 1,000 feet respectively from the Site. It is unknown at this time whether there are children living in these homes. This portion of the River has been determined to be eligible as a Wild & Scenic river byway for permitted, non-permitted and commercial recreational use. The Kern River Valley Chamber of Commerce holds an annual Lake Isabella Fishing Derby for the public every April. This event likely draws huge crowds along the north fork of the Kern River and south/downriver to Lake Isabella.

3.0 PREVIOUS INVESTIGATIONS

No previous investigations have been performed at the location of the former Big Blue Mill. The Forest Service has conducted several investigations of the former tailings pond area which is located across the Kern River from the former mill site (see Figure 4 above). The former tailings pond area is referred to as the "Kern Floodplain Site". Previous investigations associated with the Kern Floodplain Site include the following:

- February 2011, Investigation Results for Suspected Big Blue Mine Tailings between the Kern Valley Airport Campground and the Kern River by Jerome DeGraff, Forest Service
- January 2013, Kern Floodplain Site Sequoia National Forest, Site Inspection Summary Report, Weston Solutions
- October 2016, Final Engineering Evaluation and Cost Analysis, Kern Floodplain Site, ECM Consultants
- May 2018, Potentially Responsible Party Search Final Report, Kern Floodplain Site, ECM Consultants

3.1 Kern Floodplain Site Investigation Summary

The Kern Floodplain Site is the location of the former tailings pond area for the Big Blue Mill. Historic records indicate that tailings from the Big Blue Mill were deposited at the Kern Floodplain Site from approximately 1934 through 1943. The Kern Floodplain site is approximately 4.1 acres in size and is located directly across the Kern River from the Big Blue

Mill Site.

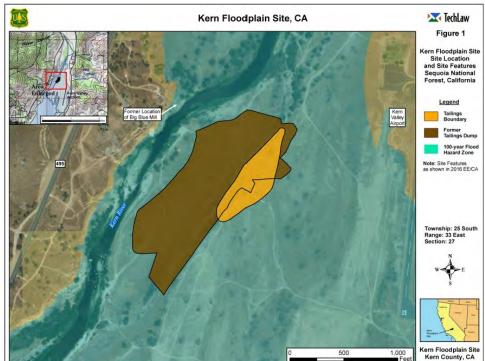


Figure 7: Kern Floodplain Site Tailings Delineation

Forest Service site investigation efforts at the Kern Floodplain site found elevated levels of arsenic, cadmium and lead present in the mill tailings. With arsenic concentrations peaking at 4,200 mg/kg, lead at 220 mg/kg and cadmium at 4.7 mg/kg.

Table 9: Summary of Analytical Results by Sample Location

Sample Location	Sample Depth	Arsenic (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)
Trench 1	0.5	640	1.6	0.12
Trench 1	2	1,500	3.3	0.1
Trench 1	1	2,300	4	0.56
Pothole 11	1	1,300	1.6	46
Trench 2	3	120	3.3	15
Trench 2	4	100	4	3.4
Trench 2	1.5	2,800	2.8	61
Trench 2	8	37	0.29	2.6
Trench 2	- 8	190	0.072	7.4
Trench 2	4	130	3.3	7.2
Trench 2	0.5	160	0.088	14
Trench 3	3	3,900	0.34	190
Trench 3	3	3,700	0.25	180
Trench 3	4	240	0.94	11
Trench 3	7	190	3.5	6.6
Trench 5	4	130	3.3	3.1
Trench 5	4	120	0.22	3.2
Pothole 15	0.5	4.5	0.11	2.7
Pothole 15	3	4.3	0.091	2.2
Pothole 16	0.8	940	3.6	46
Pothole 16	2	6.6	0.079	2.2
Pothole 18	0.8	14	0.14	3
Pothole 18	2.5	4.4	0.091	2.4
Pothole 20	0.25	17	0.46	5.2
Pothole 20	2.5	3.2	0.063	3.3
Pothole 21	1.5	4,200	4.7	220
Pothole 21	4	62	0.16	4.4
Pothole 22	0.5	15	0.26	4.5
Pothole 22	1.5	5.5	0.17	3.4
Pothole 23	0.6	22	0.82	6.2
Pothole 23	3	6.2	0.16	2
Background		5.64	0.15	16.24
TTLC		500	100	1,000

Notes:

Italicized text denotes concentration exceeds site-specific background.

Bold text denotes concentration exceeds the Total Threshold Limit Concentration (TTLC).

Figure 8: Summary of arsenic, lead and cadmium levels present in tailings at the Kern Floodplain Site (source October 2016 Final Engineering Evaluation and Cost Analysis Report, Kern Floodplain Site)

4.0 BIG BLUE MILL SITE INVESTIGATION

On October 17, 2019, an initial site visit was made to the former Big Blue Mill Site to assess whether there was a tailings deposit near the former mill site. The site was chosen because of its historical connection to the tailing materials discovered in 2011 in the floodplain on the east side of the Kern River. Initial screening with a field X Ray Fluorescence (XRF) revealed elevated arsenic and lead levels in deposits along the bank. Arsenic levels ranged from 95

milligrams per kilogram (mg/kg) to 97,592 mg/kg and lead levels ranged from 35 mg/kg to 7,539 mg/kg. Based on these initial results a follow-up assessment was planned to further assess site contamination and potential risks.

The follow-up site assessment was conducted on January 14, 2020 by Forest Service On-Scene Coordinators (OSCs), Rick Weaver and Noelle Graham-Wakoski using two separate field XRF field instruments to better delineate the full range of contaminants at the Site.

During the October 2019 visit, the Big Blue Mill site was accessed by foot from the abandoned golf course on National Forest land north of the private property from Burlando Road. For the January site visit, Forest Service employees were accompanied by a Law Enforcement officer, who had previously contacted the occupant of the northern parcel residence. Permission was granted to the Forest Service to park vehicles along the private driveway and to walk down toward the former mill site from above.

4.1 Current Site Conditions

The only physical evidence remaining at the site of the former mill structures are concrete foundations and dilapidated retaining walls. The area is strewn with driftwood and other river debris and indicates that the site has been subject to periodic flooding.









Figure 9: Concrete foundations that once supported structures and processing equipment at the Big Blue Mill. Photo taken from across the Kern River shows the proximity of nearby residences to the foundations that once supported site structures and processing equipment.

The mill foundation and tailings materials are located within 100 feet of the northern parcel single-story residence that was constructed up to the public/private property boundary in the early 2000s (Figures 9 and 10). Given the large footprint of the former Mill structures, there is the potential that the home foundation is immediately adjacent, if not on top of the footprint of the former mill structures. Two other residential dwellings are located within 500 and 1,000 feet of the site. Trash and other evidence of human visitation to the Site is present throughout the area.



Figure 10: Approximate location of the former mill relative to nearby residences and the Kern Floodplain Site

Fishing is very popular along the Kern River from the shoreline. A well-used 'Fishermen's Trail' exists through the Site and a fishing platform was observed on the heavy metal impacted tailing materials at the shoreline. The west bank of the Kern River near the former site is heavily eroded although pockets of tailing deposits remain. The east side of the river is lined with cottonwoods, locust and willow trees. Along the shoreline there is clear evidence of tailings depicted by very fine brown materials, rust colored formations, white powdery and chunked deposits, likely to be mineral processing wastes from the former mill operations. (Figures 11, 12).





Figure 11: Rust colored tailings and mineral processing deposits along the Kern riverbank below the former mill.





Figure 12: Deposits of very fine white powdery material along the riverbank (left) and brown silty materials below the former mill foundation (right) where elevated arsenic, lead and mercury were found.



Figure 13: Fishing platform on river bank comprised of mill tailing deposits below the former mill site.

4.2 Site Sampling

Field screening was conducted using a Thermo Scientific Niton Model XL3t-600 and an Olympus Delta Model DS-4000 handheld X-Ray Fluorescence analyzer. XRF sampling was performed by Forest Service OSCs along the areas with visible evidence of tailings along the streambank and near foundation of the former mill. A total of 31 locations throughout the former mill site were sampled, including one (1) up gradient location for site background (Figure 14).



Figure 14: January 14, 2020, XRF (sample Locations 429-445 taken by the Thermo Scientific Niton Model XL3t-600 and sample numbers 3-22 by the Olympus Delta XRF Model DS-4000).

Prior to conducting sampling, both XRFs were field calibrated in accordance with manufacturer specifications and checked to ensure they were set to the same analysis mode. XRF readings were taken using a 60 second acquisition time period. Materials in several locations were also analyzed by both instruments in order to assess the variability between the two XRF devices.

Nine (9) soil samples were taken around the site in locations with the highest XRF reading for laboratory confirmation sampling. Samples were drawn using a steel hand shovel and placed into new sample bags and immediately labelled with a sharpie pen with the corresponding XRF instrument auto numbered identifier shot on that sample bag. Full sample description labels were created with sampler name, sample date, sample identifier, and project information following the field visit. Samples were sent to Babcock Laboratories in Riverside, California - a California and National ELAP accredited laboratory for analysis.

4.3 Site Sampling Results

XRF values obtained during this assessment indicate that contamination is present at the Site as a result of historic mineral processing activities. XRF results are provided below in Table 1. Inital screeing results point to arsenic, lead, mercury and zinc initial constituents of concern.

										able 1	Sur	Table 1: Summary of XRF Data	of XR	: Data													
Big Blue Mill	Arsenic, mg/kg	-	Antimon	Antimony, mg/kg	Barium, mg/kg	_	Cadmium, mg/kg	_	Chromium, mg/kg	⊢	Cobalt, mg/kg	⊢	Copper, mg/kg	Lead	mg/kg	Mercun	Mercury, mg/kg	Molybden	Molybdenum, mg/kg	Nickel, mg/kg	mg/kg	Selenium, mg/kg	, mg/kg	Silver, mg/kg	ıg/kg	Zinc, mg/kg	8
Sample number/description	XRF	=	XRF	+/- Var	XRF	—	XRF	—	XRF +/	<u> </u>	XRF +/-	-	F +/- Var	X.	+/- Var		+/- Var	XRF	+/- Var	XRF	+/- Var	XRF	+/- Var	XRF	+/- Var	XR	+/- Var
Thermo Scientific Niton Model XL3t-600										\vdash																	
429 - white tailings on top, brown silty at	-	:					!	!	:						:	!	!			!	1		:			-	
0.5", powdery	405	.a	!		1		2	/11	586		+		+	3	39	2	1/			2	99	4//	79			7/	07
430 -white tailings - center of site	9	9	2	202	9	919	9	326	53		_	28 28	23	9	7	9	6			9	88	9	2		1	2	15
431-fine, silty, brown-center of site3	143,314	864	9	464	9	1,468	2	176	28	24 2,	2,208 8.	870 ND	141	3,356	170	1,183	117			Q	221	Q	80			311	97
432-center of site	116,272	4,338	455	æ					ND 1	1,270	37.1 2	231 ND	29	3,326	190	9	300,000			9	88	Q.	32			75	9
434-rust colored, clumpy, easily breakable	138,125	832					QN	41	72	38	ND 1,7	1,275 ND	134	3,144	161	743	102			ND	212	ON	78			311	92
437-rust colored	8,503	104	N	69	937	141	Q.	279	58		ND 33	338 ND	35	723	38	53	16			ND	58	QN	12			88	22
438 - fine silty, brown	249	25	ON	401	QN	1,257	QN	331	44	11	ND 2	287 ND	25 (83	18	QN	22			QN	79	QN	10			115	28
439-fine, silty, brown-mid bank on South end	11,518	123	QN	724	QN	2,075			43	Н	ND 2	296 ND	39	972	45	122	20			QN	62	QN	14			70	21
440-south end	8,946	108							78		ND 33			420	31	56	15			ON	99	QN	13			153	26
441-fine, silty, brown-bank area on south end	856	32									ND 2	280 ND	34	90	14	Q	13			QN	50	QN	9			155	22
443-fine, silty, brown-below mill foundation,	41,000	706												222	H	1 240	5			9	110	9	76			213	ų
ווסותו בווס	4T,033	į.									ON ON	ON 070	8	00/	CC	1,240	/0			N.	011	2	5			3	5
445-rust colored, clumpy, hardened-below main foundation-North end	22,579	185							40	21	ND 28	289 ND	9 46	1,592	62	149	25			9	69	N	19			194	88
Olympus Delta XRF Model DS-4000																											
3-North White Tailings	217,719	1,637	695	54	QN	342	6	11	ND	97 1,	1,331	92 0	34	12,513	131	QN		0	31	0	27			0	159	120	10
4-North White Tailings	103,772	1,707	140	16	Q	187	11	∞	Q	49		S	36	3,520	65	3,653	88	18	2	Q	21	QN	12	169		393	23
5-North White Tailings	172,971	3,667	147	21	Q	321	9	10	N O	98		2	(49	2,129	55	3,694	115	29	3	N	31	Q	17	219	::	648	35
6-white Tailings	83,419	1,276	65	15	QN	295	14	10	QN	79		ND	32	2,229	41	1,673	20	14	2	QN	19	QN	10	131	8	369	20
7-Sample Bag	159,533	3,240	139	20	424	113	9	5	38	27		QN		2,336	57	3,570	107	33	3	ND	28	QN	16	210	11	624	33
8-Sample Bag³	152,928	2,985	143	20	305	91	5	5	8	22		ND	44	2,733	62	3,016	94	20	3	ND	27	QN	16	226	11	593	31
9-Red Conglomerate	10,924	118	5	11	217	119	0	9	45	30		23	16	650	11	188	11	4	1	ND	10	QN	3	11	5	51	7
10-South White Tailings	5,710	62	23	10			334	28	120	37		33	13	4,954	54	2,642	36	3	1	3	8	29	3	167	2	126	
11-Red Conglomerate	16,461	184	14	Ħ	370	118	-	9	N	31		16	18	1,857	25	1,330	76	3	1	Q	10	QN	4	97	2	173	10
12-Red Conglomerate	54,136	371	1,136	41	Q.	419	31	11	Q	111	0	168 0	29	6,328	65	2		0	40	0	25			0	218	119	7
13-Red Conglomerate	8,774	25	9	Ħ	S	364	43	11	Q	104		Q	16	240	10	209	16	21	1	Q	10	QN	3	∞	2	293	10
14-South Rocky Point*	207,984	4,720	182	22	Q	139	11	9	10	35		ND	92	3,761	96	3,896	132	32	4	ND	36	QN	21	292	13	1,041	47
15-White Chunks, Bagged	181,752	3,890	122	21	491	108	9	5	Q.	26		N N	52	8,257	186	846	73	36	3	QN	32	QN	19	599	13	437	33
16-Riverbank, Mill Bldg.	46,355	281	81	13	363	101	9	2	Q.	24		8) 22	1,877	29	156	21	6	2	Q	13	11	9	88	9	239	13
17-Yellow Chunk	18,749	200	47	::	544	82	9	4	75	20		9		1,356	19	220	14	9	1	Q	6	1	4	47	2	579	10
18-NW Mill Bldg./Riverbank	9,303	96	33	10	9	463	14	13	2	131		9	16	910	13	287	12	9	1	32	6	Q		15	2	137	∞
19-Floodplain North Side	133	4	S	6	270	20	6	4	43	18		89	12	124	4	SS	4	5	1	43	7	7	ū	2	4	68	9
20-East Mill Bldg. Foundation	239,639	6,021	727	34	854	98	ON	5	29	20		QN	64	2,479	74	QN	78	41	4	QN	40	QN	23	262	15	396	38
21-East Mill Bldg. Foundation	2,484	24	20	6								78	13	91	3	10	4	1	1	15	7	1	1	9	4	151	9
22-Background	15	2	10	6								ND		21	2	8	3	0	1	28	7	3	1	ON	4	42	2

Levels of arsenic, lead, mercury, and zinc (CERCLA hazardous substances) greatly exceed site background levels, as shown in Table 2 below and indicates that a release of hazardous substances to the environment has occurred as a result of historic mineral processing operations.

Table 2: Summary of XRF Arsenic, Lead, Mercury, and Zinc Concentrations Compared to Site Background Levels

	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)
XRF Detection Range	ND - 239,639	ND - 12,513	ND - 3,896	ND - 1,047
Site Background (sample 22)	15	21	8	42
Site Background Exceedance	0x - 15,975.9x	0x - 595.9x	0x - 487x	0x - 24.9x

To assess field instrument consistency, soil sample 8 was analyzed by both XRF devices. The readings of the two machines are compared below in Table 3.

Table 3: Field XRF Consistency Samples

XRF Device	Arsenic mg/kg	Lead mg/kg	Mercury mg/kg	Zinc mg/kg
Olympus Delta Model DS- 4000	152,928	2,733	3,016	593
Thermo Scientific Niton Model XL3t-600	143,314	3,356	1,183	311
Relative percent difference	6.5	20.5	174.6	62.4

The variation between the two separate XRF instruments range from 6.5 percent for arsenic to 174.6 percent for mercury and 62.4 for zinc. While the variance results seems to vary greatly between the two instruments, both results confirm the trend of elevated metals. The low relative percent difference for arsenic between the two instruments demonstrates a higher confidence of an elevated concentrations detected at the Site.

Laboratory results for the ten (10) samples sent off for laboratory analysis are provided in Appendix A. It is believed that the sample preparation method utilized by the laboratory did not provide for a full extraction of the metals from the samples. Resulting in lower reporting and not providing a correct correlation with the XRF data. The laboratory results, summarized in Table 3, do confirm that arsenic, lead and mercury are present in concentrations significantly above background levels and that a release of hazardous substances has occurred as a result of historic mineral processing operations.

Table 3: Summary of Laboratory Arsenic, Lead, Mercury, and Zinc Concentrations Compared to Site Background Levels

	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)
Laboratory Analytical Results	400 - 60,000	50 - 8,300	5 - 1,500	25 - 180
Site Background (sample 22)	15	21	8	42
Site Background Exceedance	26.7x - 4,000x	2.4x - 395.2x	0.6x - 187.5x	0.6x - 4.3x

4.4 Human Health Risk Screening Assessment

Exposure pathways of concern for the Big Blue Mill Site are through inhalation, dermal exposure and ingestion by site visitors. Contamination is present within 100 feet from an occupied residence on private land and within 500 feet and 1,000 feet of two other residences on separate private parcels. Mill waste and tailings are present in powdery surface deposits and soils and there is a high likelihood of transferring contamination to clothing, equipment and vehicles that would result in contaminated material being transported and deposited at off-site locations such as residences and offices. Fishing is very popular along the Kern River from the shoreline. A well-used 'Fishermen's Trail' exists through the Site and a fishing platform was observed on the heavy metal impacted tailing materials at the shoreline (Figure 13). The close proximity of occupied residences to the site and the high recreational usage of the area increase the likelihood of exposure of children to contaminants. Children are considered a sensitive group upon which exposures to heavy metals could interfere with neurological development.

Arsenic, lead, and mercury concentrations at the Site greatly exceed established human health risk screening levels (SLs). Screening levels are concentrations of chemicals in soil intended to be protective of human health and/or the environment under a defined exposure setting (Cox, 2017 Update). They represent heavy metal concentrations thresholds at which people, under varying exposure levels, will not experience adverse health effects during their lifetimes.

The most widely used human health screening values are the Regional Screening Level (RSLs) developed by the US EPA for residential and industrial populations (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables). EPA RSLs are based on a residential exposure frequency of 350 days/year for 26 years and the industrial RSLs assume worker exposure frequency of 225 days/year for 25 years. These residential and industrial exposure frequencies are very conservative for many abandoned mine land (AML) sites. Recreational visitors are the most common group of human receptors to AML sites. This is a broad category that can cover a range of possible recreational activities, including camping, hiking, hunting, biking, ATV riding, horseback riding, etc.

To address recreational visitation at AML sites, the Bureau of Land Management (BLM) developed recreational exposure SLs for metals found in soils at AML sites. BLM's recreational SLs take into account the reduced exposures associated with most recreational activities and are based on a recreational exposure frequency of 14 days/year for 26 years (Cox, September 2017 update).

Although highly conservative for most AML sites, EPA's RSLs provide a useful benchmark in gaining an initial understanding of the magnitude of potential risk and at sites where off-site residents live in immediate proximity of the contamination. In the case of the Big Blue Mill site, residential property is immediately adjacent to the former mill site and an occupied residential home is located within 100 feet of identified site contamination. Two other occupied residences are located within 500 and 1,000 feet of site contamination (see Figures 9, 10 and 14). Given the close proximity of occupied residences to the site, the use of EPA residential RSLs is warranted in assessing potential site risks.

A summary of arsenic, lead, and mercury concentrations compared to EPA residential RSLs and BLM recreational SLs is provided in Table 4 below and a comparison to the laboratory results is provided in Table 5.

Table 4: Summary of XRF Arsenic, Lead, and Mercury Concentrations Compared To Human Health Screening Levels

	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
XRF Concentration Range	ND - 239,639	ND -12,513	ND - 3,896
EPA Residential RSL ¹	0.68 ²	400	11
EPA Residential RSL Exceedance	0x - 352,410.3x	0x - 31.3x	0x - 354.2x
BLM Recreation SL ³	30.6	800	271
BLM Recreation SL Exceedance	0x - 7,831.3x	0x - 15.6x	0x - 14.4x

¹ (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Table 5: Summary of Laboratory Arsenic, Lead, and Mercury Concentrations Compared To Human Health Screening Levels

	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
Laboratory Concentration Range	400 - 60,000	50 - 8,300	5 - 1,500
EPA Residential RSL ¹	0.68	400	11
EPA Residential RSL Exceedance	588.2x - 88,235.3x	0.1x - 20.8x	0.5x - 136.4x
BLM Recreation SL ²	30.6	800	271
BLM Recreation SL Exceedance	13.1x - 1,960.8x	0.06x - 10.4x	0.0x - 5.5x

¹ (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Arsenic, lead, and mercury concentrations greatly exceed residential and recreational exposure screening levels. Exceedances of the SLs can be interpreted as follows in order to provide a means for assessing the hazard posed by the presence of heavy metals:

Less than the criteria: low risk

• 1-10 times the criteria: moderate risk

• 10-100 times the criteria: high risk

• >100 times the criteria: extremely high risk

The range of detected arsenic concentrations indicate the Site poses a potential extremely high risk for arsenic under recreational and residential exposure scenarios. XRF screening found arsenic concentrations in surface materials ranging from 133 to 239,639 mg/kg. Greatly exceeding residential and recreational exposure SLs (Table 4). Laboratory results, provided in Table 5, confirm that arsenic concentrations exceed EPA residential RSLs and BLM recreational SLs and that the Site poses potential extremely high risk for arsenic under recreational and residential exposure scenarios. The exposure routes of concern for arsenic would primarily be through the inhalation, ingestion, and dermal pathways.

XRF lead concentrations ranged from 83 to 12,513 mg/kg, indicating the Site poses a potential high risk for lead under recreational and residential exposure scenarios. Laboratory results, provided in Table 5, confirm that lead concentrations exceed EPA residential RSLs and BLM recreational SLs and that the Site poses a potential exposure high risk to recreational and

² Arsenic detected in background sample at 15 mg/kg.

³ September 2017 Update, BLM Technical Memorandum: Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

² September 2017 Update, BLM Technical Memorandum: Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

residential visitors for lead. The exposure routes of concern for lead would primarily be through the ingestion and inhalation pathways.

XRF mercury concentrations ranged from 26 to 3,896 mg/kg, indicating the Site poses a potential extremely high risk for mercury under the residential exposure scenarios and a high exposure risk under the recreational exposure scenario. Laboratory results, provided in Table 5 confirm that lead concentrations exceed EPA residential RSLs and BLM recreational SLs and that the Site poses a potential extremely high risk for mercury under the residential exposure scenarios and a moderate exposure risk under the recreational exposure scenario. The exposure routes of concern for mercury would be the inhalation, ingestion, and dermal pathways.

4.5 Ecological Risk Screening Assessment

To assess potential risks to wildlife posed by contamination present at the site, XRF and laboratory data was compared to EPA Ecological Soil Screening Levels (Eco-SSLs). Eco-SSLs are concentrations of contaminants in soil that are protective of ecological receptors that commonly come into contact with soil or ingest biota that live in or on soil. Although Eco-SSLs were developed specifically to be used during Step 2 of the Superfund ecological risk assessment process (Screening-Level Exposure Estimate and Risk Calculation), they can be used during the site screening process to screen soil contaminants in order to determine if additional ecological site studies are warranted.

Tables 6 and 7 below list the primary constituents of concern from the site XRF and laboratory data which exceed EPA Eco-SSLs.

Table 6: Summary of XRF Concentrations for Constituents Exceeding Ecological Screening Levels

	Antimony	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Selenium	Silver	Zinc
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
XRF Concentration	ND -	133 -								51 -
Range	1,136	239,639	ND - 937	ND - 334	8 - 289	ND - 78	83 -12,513	ND - 477	ND - 295	1,047
Plant ECO-SSL ¹	NA ²	18	NA ²	32	NA ²	70	120	0.52 ³	560	160
Plant ECO-SSL		6.3x -					0.7x -	0x -		0.3x -
Exceedance		13,313.3x		0x - 10.4x		0x - 1.1x	104.3x	917.3x	0x - 0.5x	6.5x
Soil Invertebrates										
ECO-SSL	78	NA^2	330^{3}	140	NA^2	80	1700	4.1	NA^2	120
Soil Invertebrates										
ECO-SSL								0x -		0.4x -
Exceedance	0x - 14.6x	-	0x - 2.8x	0x - 2.4x		0x - 1x	0.0x - 7.4x	116.3x		8.7x
Avian Wildlife ECO-										
SSL	NA ²	43	NA ²	0.77	26 ³	28	11 ³	1.2 ³	4.2	46
Avian Wildlife ECO-		3.1x -		0x -			7.5x -	0x -		1.1x
SSL Exceedance		5,573x		433.7x	0.3x - 11.1x	0x - 2.8x	1,137.5x	397.5x	0x - 70.2x	22.8x-
Mammalian Wildlife										
ECO-SSL	0.27^{3}	46	2000	0.36	34 ³	49	56	0.63^{3}	14	79
Mammalian Wildlife										
ECO-SSL	0x-	2.9x -		0x -			1.5x -	0x -		0.6x -
Exceedance	4,207.4x	5,209.5x	0x - 0.5x	927.8x	0.2x - 8.5x	0x - 1.6x	223.4x	757.1x	0x - 21.1x	13.3x

¹ EPA Ecological Soil Screening Levels (ECO-SSLs) (https://www.epa.gov/chemical-research/interim-ecological-soil-screening-level-documents)

² NA = Not Available

³ECO-SSL Below Site XRF Background Concentrations

Table 7: Summary of Laboratory for Constituents Exceeding Ecological Screening Levels

	Antimony (mg/kg)	Arsenic (mg/kg)	Cadmium (mg/kg)	Lead (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
Laboratory	(9,9)	(9,1.9)	(9,9)	\g,g,	(9,9)	(9.1.9)	(9,9)
Concentration		400 -		50 -			
Range	ND - 38	60,000	ND - 334	8,300	ND - 5.5	ND - 82	51 - 1,047
Plant ECO-SSL ¹	NA ²	18	32	120	0.52 ³	560	160
		6.3x -					
Plant ECO-SSL		13,313.3		0.7x -			
Exceedance		X	0x - 10.4x	104.3x	0x -10.6x	0x - 0.1x	0.3x - 6.5x
Soil Invertebrates							
ECO-SSL	78	NA^2	140	1700	4.1	NA ²	120
Soil Invertebrates							
ECO-SSL				0.0x -			
Exceedance	0x - 14.6x	-	0x - 2.4x	7.4x	0x - 1.3x		0.4x - 8.7x
Avian Wildlife							
ECO-SSL	NA ²	43	0.77	11 ³	1.2 ³	4.2	46
Avian Wildlife							
ECO-SSL		3.1x -	0x -	7.5x -		0x -	1.1x
Exceedance		5,573x	433.7x	1,137.5x	0x - 4.6x	19.5x	22.8x-
Mammalian							
Wildlife ECO-SSL	0.27^{3}	46	0.36	56	0.63^{3}	14	79
Mammalian							
Wildlife ECO-SSL	0x-	2.9x -	0x -	1.5x -			0.6x -
Exceedance	4,207.4x	5,209.5x		223.4x	0x - 8.7x	0x -5.9x	13.3x

¹ EPA Ecological Soil Screening Levels (ECO-SSLs) (https://www.epa.gov/chemical-research/interim-ecological-soil-screening-level-documents)

Initial site screening indicates that levels of antimony, arsenic, lead and zinc greatly exceed both site background levels and EPA Eco-SSLs. Mill waste and tailings are present in powdery surface deposits and soils and are readily accessible to wildlife. Some of the contaminated materials are un-vegetated and exposed on the banks of the Kern River and there is evidence of on-going erosion into the river. Additional ecological risk evaluation is warranted in order to fully assess the risks to wildlife posed by the Site.

5.0 CONCLUSIONS AND RECOMMENDATIONS

XRF values obtained during the Removal PA indicate that contamination is present as a result of historic mineral processing activities at the Site. Elevated concentrations of arsenic is present in mill tailings exceed site background levels (up to 13,866x for arsenic, 393x for lead, and 487x for mercury) and indicates that a release of hazardous substances to the environment has occurred. The tailings are susceptible to migration because of water- and wind-borne influences. Mill waste and tailings are present in surface deposits and soils and are susceptible to migration because of water- and wind-borne influences. Some of the contaminated materials are un-vegetated and exposed on the banks of the Kern River and there is evidence of on-going erosion into the river.

Concentrations of arsenic, lead, and mercury in the mill tailings greatly exceed established human health risk screening thresholds for residential and recreational exposure scenarios and indicate that the site poses an exposure hazard to nearby populations. Contamination is present within 100 feet from an adjacent occupied residence on private land and within 500 feet and 1,000 feet of two other residences on separate private parcels. There is evidence of public visitation to the site and the area along the river bank where tailings are present is used by the public for fishing. Mill waste and tailings are present in powdery surface deposits and soils and

² NA = Not Available

³ECO-SSL Below Site XRF Background Concentrations

there is a high likelihood of transferring contamination to clothing, equipment and vehicles that would result in contaminated material being transported and deposited at off-site locations such as residences and offices. Mill tailings are also readily accessible to wildlife.

A full CERCLA Site Inspection (SI) is recommended in order to delineate the full nature and extent of contamination and human health and ecological risks posed by the Site.

Conditions represent a threat of release of CERCLA hazardous substances, threatening to public health, or welfare, or the environment based on the factors set forth in the NCP, 40 CFR § 300.415(b)(2). A Time-Critical Removal Action (TCRA) is recommended to implement institutional controls to restrict all public access to the Site and the area of contamination. It is recommended that these controls include a prohibition on all public entry to the Site. Based on available data, the recommended initial closure area includes former mill area east and northeast of the adjacent private Parcel APN 296-110-11-00-1 and the area between the Kern River and private Parcels APN 296-110-11-00-1 and 296-110-12-00-4 (see Figure 15 below).

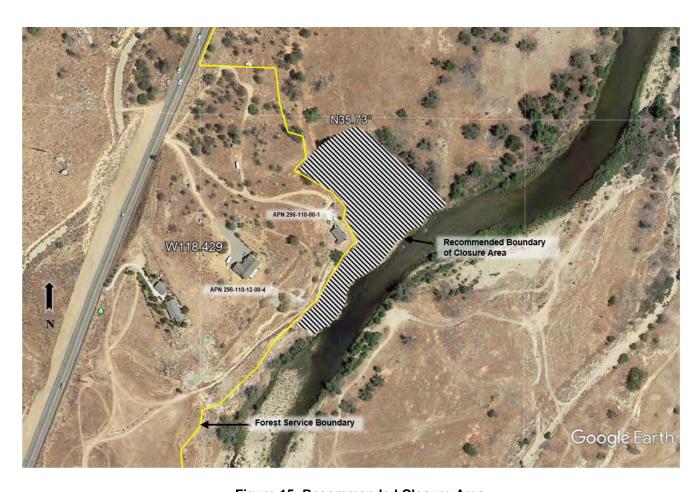


Figure 15: Recommended Closure Area

References Cited

September 15, 1896, Thirteenth Report (Third Biennial) of the State Mineralogist For The Two Years Ending September 15, 1896, California State Mining Bureau

January 1934, Volume 30 California Journal of Mines and Geology Quarterly Chapter of State Mineralogist's Report XXX, State Division of Mines

January 1940, Volume 36 California Journal of Mines and Geology Quarterly Chapter of State Mineralogist's Report XXXVI, State Division of Mines

1962, Mines and Mineral Resources of Kern County, California, California Division of Mines and Geology, County Report 1

October 2004, Technical Note 390, "Risk Management Criteria for Metals at BLM Mining Sites", Karl L. Ford, Ph.D., Bureau of Land Management, National Science and Technology Center

September 2017 Update, BLM Technical Memorandum: Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

APPENDIX A



Contact: Noelle Graham-Wakoski Address: 10845 Rancho Bernardo Rd

San Diego, CA 92127

Report Date: 29-Jan-2020

Analytical Report: Page 1 of 11

Project Name: CAM 17 Metals - Solid

Project Number: Big Blue Mill - Sequoia NF

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Attached is the analytical report for the sample(s) received for your project. Below is a list of the individual sample descriptions with the corresponding laboratory number(s). Also, enclosed is a copy of the Chain of Custody document (if received with your sample(s)). Please note any unused portion of the sample(s) may be responsibly discarded after 30 days from the above report date, unless you have requested otherwise.

Thank you for the opportunity to serve your analytical needs. If you have any questions or concerns regarding this report please contact our client service department.

Sample Identification

<u>Lab Sample #</u> C0A1592-01	Client Sample ID 444	<u>Matrix</u> Solid	<u>Date Sampled</u> 01/14/20 00:00	<u>By</u> Noelle Graham-Wako	<u>Date Submitted</u> 01/15/20 14:04	<u>By</u> Noelle Graham-Wak owski
C0A1592-02	R-15	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-03	441	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-04	439	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-05	431	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-06	435	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-07	442	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-08	434	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski
C0A1592-09	445	Solid	01/14/20 00:00	Noelle Graham-Wako	01/15/20 14:04	Noelle Graham-Wak owski



Contact: Noelle Graham-Wakoski

Report Date: 29-Jan-2020

Address: 10845 Rancho Bernardo Rd

San Diego, CA 92127

Analytical Report: Page 2 of 11

Project Name: CAM 17 Metals - Solid

Project Number: Big Blue Mill - Sequoia NF

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Laboratory Reference Number

C0A1592-01

Sample DescriptionMatrixSampled Date/TimeReceived Date/Time444Solid01/14/20 00:0001/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW8	46 Series						
Antimony	13	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Arsenic	31000	50	mg/kg	EPA 6020	01/24/20 14:06	MEL	
Barium	36	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Cadmium	3.9	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Total Chromium	2.4	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Copper	31	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Lead	1600	100	mg/kg	EPA 6020	01/24/20 14:06	MEL	
Mercury	100	100	mg/kg	EPA 7471A	01/22/20 14:03	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Nickel	1.1	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Silver	33	10	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Vanadium	7.0	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	
Zinc	100	1.0	mg/kg	EPA 6020	01/21/20 18:04	MEL	



Analytical Report: Page 3 of 11

Contact: Noelle Graham-Wakoski

Project Name: CAM 17 Metals - Solid

Address: 10845 Rancho Bernardo Rd

Project Number: Big Blue Mill - Sequoia NF

San Diego, CA 92127

Work Order Number: C0A1592

°C Temp:

Report Date: 29-Jan-2020

Received on Ice (Y/N):

Yes

Laboratory Reference Number

C0A1592-02

Sample Description

R-15

Matrix Solid

Sampled Date/Time 01/14/20 00:00

Received Date/Time 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846 Series							
Antimony	11	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Arsenic	55000	50	mg/kg	EPA 6020	01/24/20 14:08	MEL	
Barium	20	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Cadmium	6.7	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Total Chromium	1.8	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Copper	39	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Lead	8300	100	mg/kg	EPA 6020	01/24/20 14:08	MEL	
Mercury	470	250	mg/kg	EPA 7471A	01/22/20 14:05	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Nickel	1.3	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Selenium	5.5	5.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Silver	82	10	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Vanadium	2.3	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	
Zinc	110	1.0	mg/kg	EPA 6020	01/21/20 18:06	MEL	



Analytical Report: Page 4 of 11

Contact: Noelle Graham-Wakoski

Report Date: 29-Jan-2020

Project Name: CAM 17 Metals - Solid

Address: 10845 Rancho Bernardo Rd

Project Number: Big Blue Mill - Sequoia NF

San Diego, CA 92127

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp:

°C

Laboratory Reference Number

C0A1592-03

 Sample Description
 Matrix
 Sampled Date/Time
 Received Date/Time

 441
 Solid
 01/14/20 00:00
 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846	Series						
Antimony	ND	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Arsenic	400	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Barium	75	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Cadmium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Total Chromium	7.5	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Cobalt	5.3	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Copper	8.9	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Lead	50	2.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Mercury	4.6	2.5	mg/kg	EPA 7471A	01/24/20 15:06	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Nickel	5.1	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Silver	ND	10	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Vanadium	28	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	
Zinc	52	1.0	mg/kg	EPA 6020	01/21/20 18:09	MEL	



Analytical Report: Page 5 of 11

Contact: Noelle Graham-Wakoski

Report Date: 29-Jan-2020

Project Name: CAM 17 Metals - Solid

Address: 10845 Rancho Bernardo Rd

Project Number: Big Blue Mill - Sequoia NF

San Diego, CA 92127

Work Order Number: C0A1592

Received on Ice (Y/N): Yes

Temp: °C

Laboratory Reference Number

C0A1592-04

Sample DescriptionMatrixSampled Date/TimeReceived Date/Time439Solid01/14/20 00:0001/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW8-	46 Series						
Antimony	2.2	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Arsenic	7200	5.0	mg/kg	EPA 6020	01/24/20 14:11	MEL	
Barium	39	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Cadmium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Total Chromium	3.1	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Cobalt	1.6	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Copper	5.1	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Lead	710	2.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Mercury	160	120	mg/kg	EPA 7471A	01/22/20 14:09	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Nickel	2.1	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Silver	10	10	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Vanadium	13	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	
Zinc	25	1.0	mg/kg	EPA 6020	01/21/20 18:11	MEL	



ffice Analytical Report: Page 6 of 11

Contact: Noelle Graham-Wakoski Address: 10845 Rancho Bernardo Rd Project Name: CAM 17 Metals - Solid

San Diego, CA 92127

Project Number: Big Blue Mill - Sequoia NF

Report Date: 29-Jan-2020 Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Laboratory Reference Number

C0A1592-05

 Sample Description
 Matrix
 Sampled Date/Time
 Received Date/Time

 431
 Solid
 01/14/20 00:00
 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW	/846 Series						
Antimony	35	1.0	mg/kg	EPA 6020	01/24/20 13:19	MEL	
Arsenic	60000	50	mg/kg	EPA 6020	01/24/20 14:13	MEL	
Barium	7.8	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Cadmium	4.1	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Total Chromium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Copper	3.6	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Lead	2600	100	mg/kg	EPA 6020	01/24/20 14:13	MEL	
Mercury	1500	250	mg/kg	EPA 7471A	01/22/20 14:11	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Nickel	ND	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Silver	41	10	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Vanadium	ND	1.0	mg/kg	EPA 6020	01/21/20 18:14	MEL	
Zinc	110	1.0	mg/kg	EPA 6020	01/24/20 13:19	MEL	



Analytical Report: Page 7 of 11

Contact: Noelle Graham-Wakoski

Report Date: 29-Jan-2020

Project Name: CAM 17 Metals - Solid

Address: 10845 Rancho Bernardo Rd

Project Number: Big Blue Mill - Sequoia NF

Yes

San Diego, CA 92127

Work Order Number: C0A1592

Received on Ice (Y/N):

Temp: °C

Laboratory Reference Number

C0A1592-06

 Sample Description
 Matrix
 Sampled Date/Time
 Received Date/Time

 435
 Solid
 01/14/20 00:00
 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW8	46 Series						
Antimony	24	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Arsenic	53000	100	mg/kg	EPA 6020	01/24/20 16:31	MEL	
Barium	12	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Cadmium	3.5	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Total Chromium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Copper	8.0	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Lead	3200	200	mg/kg	EPA 6020	01/24/20 16:31	MEL	
Mercury	420	250	mg/kg	EPA 7471A	01/22/20 14:13	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Nickel	ND	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Silver	53	10	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Vanadium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	
Zinc	120	1.0	mg/kg	EPA 6020	01/24/20 13:32	MEL	



Analytical Report: Page 8 of 11

Contact: Noelle Graham-Wakoski

Report Date: 29-Jan-2020

Project Name: CAM 17 Metals - Solid

Address: 10845 Rancho Bernardo Rd

Project Number: Big Blue Mill - Sequoia NF

San Diego, CA 92127

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Laboratory Reference Number

C0A1592-07

 Sample Description
 Matrix
 Sampled Date/Time
 Received Date/Time

 442
 Solid
 01/14/20 00:00
 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846	Series						
Antimony	38	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Arsenic	49000	100	mg/kg	EPA 6020	01/24/20 16:43	MEL	
Barium	32	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Cadmium	5.4	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Total Chromium	2.5	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Copper	14	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Lead	2400	200	mg/kg	EPA 6020	01/24/20 16:43	MEL	
Mercury	870	250	mg/kg	EPA 7471A	01/22/20 14:15	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Nickel	ND	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Selenium	5.4	5.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Silver	69	10	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Vanadium	4.8	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	
Zinc	170	1.0	mg/kg	EPA 6020	01/24/20 13:34	MEL	



Contact: Noelle Graham-Wakoski

Address: 10845 Rancho Bernardo Rd

San Diego, CA 92127

Analytical Report: Page 9 of 11

Project Name: CAM 17 Metals - Solid

Project Number: Big Blue Mill - Sequoia NF

Report Date: 29-Jan-2020 Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Laboratory Reference Number

C0A1592-08

 Sample Description
 Matrix
 Sampled Date/Time
 Received Date/Time

 434
 Solid
 01/14/20 00:00
 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846	Series						
Antimony	7.3	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Arsenic	16000	100	mg/kg	EPA 6020	01/24/20 16:45	MEL	
Barium	190	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Cadmium	8.4	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Total Chromium	1.8	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Copper	13	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Lead	1300	200	mg/kg	EPA 6020	01/24/20 16:45	MEL	
Mercury	190	50	mg/kg	EPA 7471A	01/24/20 16:24	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Nickel	3.1	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Silver	20	10	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Vanadium	4.5	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	
Zinc	140	1.0	mg/kg	EPA 6020	01/24/20 13:36	MEL	



Analytical Report: Page 10 of 11

Contact: Noelle Graham-Wakoski Address: 10845 Rancho Bernardo Rd Project Name: CAM 17 Metals - Solid

San Diego, CA 92127

Project Number: Big Blue Mill - Sequoia NF

Report Date: 29-Jan-2020

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Laboratory Reference Number

C0A1592-09

 Sample Description
 Matrix
 Sampled Date/Time
 Received Date/Time

 445
 Solid
 01/14/20 00:00
 01/15/20 14:04

Analyte(s)	Result	RDL	Units	Method	Analysis Date	Analyst	Flag
Metals and Metalloids; EPA SW846 Serie	es						
Antimony	8.4	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Arsenic	21000	100	mg/kg	EPA 6020	01/24/20 16:48	MEL	
Barium	270	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Beryllium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Cadmium	12	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Total Chromium	2.2	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Cobalt	ND	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Copper	15	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Lead	1700	200	mg/kg	EPA 6020	01/24/20 16:48	MEL	
Mercury	240	50	mg/kg	EPA 7471A	01/24/20 16:26	KSL	
Molybdenum	ND	5.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Nickel	4.1	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Selenium	ND	5.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Silver	24	10	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Thallium	ND	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Vanadium	5.9	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	
Zinc	180	1.0	mg/kg	EPA 6020	01/24/20 13:39	MEL	



Contact: Noelle Graham-Wakoski Address: 10845 Rancho Bernardo Rd

San Diego, CA 92127

Report Date: 29-Jan-2020

Analytical Report: Page 11 of 11

Project Name: CAM 17 Metals - Solid

Project Number: Big Blue Mill - Sequoia NF

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C

Notes and Definitions

ND: Analyte NOT DETECTED at or above the Method Detection Limit (if MDL is reported), otherwise at or

above the Reportable Detection Limit (RDL)

NR: Not Reported

RDL: Reportable Detection Limit
MDL: Method Detection Limit

* / "" : NELAP does not offer accreditation for this analyte/method/matrix combination

Approval

Enclosed are the analytical results for the submitted sample(s). Babcock Laboratories certify the data presented as part of this report meet the minimum quality standards in the referenced analytical methods. Any exceptions have been noted.

Angela E. Brown For KayeLani A. Marshall

cc:

e-Short_No Alias.rpt

This report applies only to the sample(s) analyzed. As a mutual protection to clients, the public, and Babcock Laboratories, Inc., this report is submitted and accepted for the exclusive use of the Client to whom it is addressed. Interpretation and use of the information contained within this report are the sole responsibility of the Client. Babcock Laboratories, Inc. is not responsible for any misinformation or consequences that may result from misinterpretation or improper use of this report. This report is not to be modified or abbreviated in any way. Additionally, this report is not to be used, in whole or in part, in any advertising or publicity matter without written authorization from Babcock Laboratories, Inc. The liability of Babcock Laboratories, Inc. is limited to the actual cost of the requested analyses, unless otherwise agreed upon in writing. There is no other warranty expressed or implied.



Contact: Noelle Graham-Wakoski Address: 10845 Rancho Bernardo Rd

San Diego, CA 92127

Report Date: 29-Jan-2020

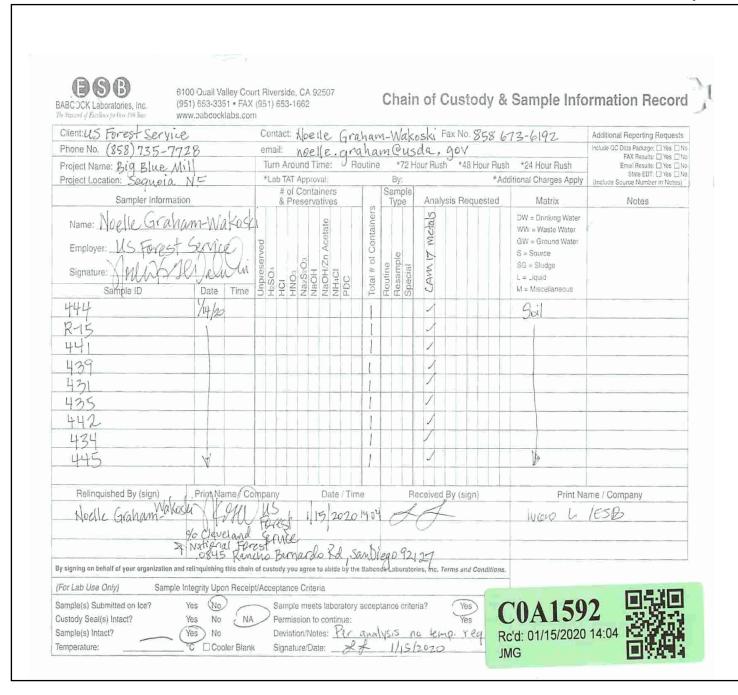
Analytical Report: Page 1 of 1

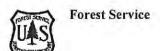
Project Name: CAM 17 Metals - Solid

Project Number: Big Blue Mill - Sequoia NF

Work Order Number: C0A1592

Received on Ice (Y/N): Yes Temp: °C





Regional Office, R5 1323 Club Drive Vallejo, CA 94592 (707) 562-8737 TDD: (707) 562-9240

File Code:

2160

Route To:

Date:

February 26, 2020

Subject:

Time Critical Removal Action Memorandum for the Big Blue Mill Site, Sequoia

National Forest

To:

Forest Supervisor, Sequoia National Forest

Enclosed you will find the signed Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Action Memorandum for the time critical removal action at the Big Blue Mill Site on the Sequoia National Forest. The Action Memorandum describes the site investigation work conducted to date and identifies the site response action to be undertaken to address the site contamination concerns in accordance with the National Contingency Plan.

Upon completion of the removal action, Noelle Graham-Wakoski, the site On-Scene Coordinator, needs to provide the Regional Environmental Engineer with a copy of the removal action completion report and the CERCLA administrative record for the project. If you have any questions regarding this matter, please contact Dennis Geiser, Regional Environmental Engineer, at 707-562-8729.

TYRONE KELLEY
Director of Engineering

Enclosure: Big Blue Mill final TCRA 02-14-2020

cc: Noelle Graham-Wakowski, Belinda Walker, Dennis Geiser





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I. PURPOSE

The Big Blue Mill Site (Site) is a former gold processing facility dating back to the 1860s that was associated with the nearby historic Big Blue and Sumner Mines. It is located on the western bank of the north fork of the Kern River – a tributary feeding into Lake Isabella within Kern County, California. The Site sits easterly of the historic Big Blue Mine and directly across the river from the Kern Valley airport in Kernville. It is located on National Forest System Lands under the jurisdiction, custody and control of the U.S. Department of Agriculture, Forest Service ("Forest Service"), within the Sequoia National Forest, Kern River Ranger District, Kern County, California. This land on the periphery of Lake Isabella Reservoir was acquired through a land exchange with the U.S. Army Corps of Engineers (USACE). The Forest Service is conducting response actions at the Site pursuant to its lead agency authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended under the Superfund Amendments and Reauthorization Act (SARA), 42 U.S.C. 9601 et seq., and Executive Order 12580.

The purpose of this memorandum is to select the time-critical removal action to implement institutional controls that will prevent public exposure to arsenic, lead and mercury contaminated tailings at the Big Blue Mill Site. This response action consists of area closure of this 4.1-acre Site to the public to prohibit public access and use of the Site by Forest Service issuance of a Forest Closure Order. These site access restrictions will prevent immediate on-site exposure while the Forest Service completes additional studies and related actions needed for implementing a response action to abate the release, or threat of a release of hazardous substances posed by the contaminated tailings at the Site.

The conditions at the Site meet the criteria for a removal action under Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"). This decision document, called a Time-Critical Removal Action Memorandum (TCRAM), presents the Forest Service's selected removal response action for the Site, chosen in accordance with CERCLA and to the extent practicable, the NCP. This TCRAM is based upon the administrative record for the Site. No Federal, State or local permits are required for this on-site response actions, 42 USC 9621 (c) and 40 CFR 300.400 (e).

II. SITE CONDITIONS AND BACKGROUND

A. Site Location

The Big Blue Mill Site is located along the western shore of the Kern River, north east of the historic Big Blue and Sumner mines and across the Kern River from the Kern Valley airport. It is located on National Forest System Lands under the jurisdiction, custody and control of the Sequoia National Forest, Kern River Ranger District. The Site lies just south of Kernville,

California within Section 27 of Township 25 South, Range 33 East of the Mt. Diablo Base Meridian at an elevation of approximately 2600 feet (Figure 1).

The Site lies on the western bank of the Kern River, approximately 2 miles upstream of Lake Isabella. The Site can be accessed by taking California State Highway 178 east from Bakersfield toward Lake Isabella, California. Then turn left and head north on Highway 155 toward Wofford Heights. Continue north on Highway 495 (Burlando Road) toward Kernville for approximately three miles to the Site on the right side, which is approximately 800 feet east of the road toward the Kern River. The preferred access to the Site within Forest Service land is via the abandoned golf course just south of downtown Kernville. This path entails one mile of travel on a single lane track. The north end of the Site is the northern portion of the mill building foundations and the south end of the Site is just beyond the ragged peak along the shoreline of the Kern River.

B. Site Description

The Site is approximately 4.1 acres in size located on the western shoreline of the Kern River. The only physical evidence remaining at the Site of the former mill structures are concrete foundations and dilapidated retaining walls (Photographs 1 & 2). The Site is strewn with driftwood and other river debris and indicates that the site is subject to periodic flooding. Along the shoreline there is clear evidence of tailings and mineral processing wastes from the former mill operations. There is evidence of iron oxide suspected from roasting operations associated with former mineral processing activities at the Site.

The mill foundation and tailings materials are located within 100 feet of an occupied residence that was constructed up to the Forest Service property boundary in the early 2000s, and within 500 and 1000 feet of two additional occupied residences (Figure 4 and Photographs 3 & 4). Given the large footprint of the former mill and associated mineral processing operations, there is the potential likely that the nearest residence may have been constructed within the footprint of the former mill operation.

The Kern River area is a popular rafting and fishing corridor for locals and recreationists. There is a worn "Fisherman's trail" that runs parallel to the shoreline through the area (Photograph 5). The former mill site the area is also used as an area of rest for those rafting on the popular Kern River as there are permitted commercial rafting corridors along the Kern River in this area.

C. Operational History

The Big Blue Mill Site, also referred to as the "Sumner Mill" in some historic reports, is a former gold ore processing facility dating back to the 1860s that was associated with the nearby historic Big Blue and Summer group of mines. The Big Blue and Sumner group of mines are located southwest of the Site (see Figure 1) and were part of the historic Cove Mining District on the west side of

the Kern River Valley. The September 15, 1896, Thirteenth Report of the State Mineralogist, for the California State Mining Bureau, indicates that there were multiple mining claims associated with mill site, these being the Big Blue, Commonwealth, Content, Nelly Dent, Nelly Dent Extension, Sumner, and Summer 5 Extensions (Beauregard, Bull Run, Frank, Jeff Davis, Lady Bell, and Urbana). According to the January 1940 "Volume 36 California Journal of Mines and Geology", the gold vein mined by these mines was first discovered in 1860.

Historic records from the California State Division of Mines indicate that mineral processing operations were conducted at the site dating back to the 1860s. At least four different mineral processing operations occurred at the Site, including: a 16-stamp mill from approximately 1867 through the mid-1870s, an 80-stamp mill from 1875 through 1883, a 10-stamp mill from approximately 1901 through 1932 and floatation plant and ball mill from 1934 – 1943. Historic records state that the 80-stamp mill was the largest of its kind at the time.

According to several Annual Reports of the State Mineralogist, up until the 1930s, tailings and other materials from the mill operations were dumped into the Kern River and most washed down stream. In the early 1930s, the flotation plant and ball mill were installed at the Site (1934 30th Annual Report of the State Mineralogist) from which point tailings from the processing operations were pumped across the Kern River and deposited into a tailings pond.

During the 1930s and early 1940s tailings were pumped across the river to a "tailings pond" located on the eastern banks of the river (Figure 3). The Big Blue Mill ceased operations in 1943 when regulations were instituted by the U.S. Government limiting sale of mining supplies to producers of strategic metals needed in the war effort and gold was not one of the strategic metals (Powers, 1940). The 1962 report "Mines and Mineral Resources of Kern County, California" by the California Division of Mines and Geology states that Order L208 caused the mine to be shut down permanently.

In 1948, US Army Corps of Engineers (USACE) began construction of the Lake Isabella Dam and reservoir project. In 1954, to complete the reservoir project, the USACE acquired all land below elevation 2617 feet (California Division of Mines and Geology, 1962). This included Big Blue Mill site which was at a lower elevation than the spillway of Lake Isabella dam. In 1957, the mill was sold at auction, and removed to New Mexico (California Division of Mines and Geology, 1962). In 1991, in order to ensure ongoing public access to recreational activities along the river, this USACE floodplain land area was exchanged, from the USACE to the USDA Forest Service.

D. Other Actions to Date

A Removal Preliminary Assessment (PA) report for the Big Blue Mill Site was completed February 14, 2020 (Graham-Wakoski, 2020). The investigation was initiated because of the Site's historical connection to the tailing materials discovered in 2011 in the floodplain on the east side of the Kern River. A site assessment of the Big Blue Mill Site was conducted on January 14, 2020 by Forest Service On-Scene Coordinators, Rick Weaver and Noelle Graham-Wakoski using

two separate field X Ray Fluorescence (XRF) field instruments to assess whether contaminants from historic mineral processing operations are present. Field XRF screening found that elevated concentrations of arsenic, lead and mercury are present in the mill tailings present in the area.

Arsenic is present at concentrations ranging from non-detect to 239,639 mg/kg, with most readings exceeding the initial site background levels of 15 mg/kg.

Lead is present at concentrations ranging from range of non-detect to 12,513 mg/kg with most readings exceeding the initial background reading of 21 mg/kg.

Mercury is present at concentrations ranging from non-detect to 3,896 mg/kg with most readings exceeding the initial background reading of 8 mg/kg.

Table 1 below presents the XRF sampling results for arsenic, lead and mercury from the January 14, 2020, site visit. XRF sampling locations are show on Figure 4.

Table 1: Big Blue Mill Site Removal Preliminary Assessment XRF Results

Big Blue Mill	Arsenic, mg/kg		Mercury, mg/kg		Lead, mg/kg	
Sample number/description	XRF	+/- Var	XRF	÷/- Var	XRF	+/- Var
Thermo Scientific Niton Model XL3t-600						
429 - white tailings on top, brown silty at 0.5", powdery	405	35	ND	17	506	39
430 -white tailings - center of site	ND	6	ND	9	ND	7
431 -fine, silty, brown-center of site	143,314	864	1,183	117	3,356	170
432-center of site	116,272	4,338	ND	300,000	3,326	190
434-rust colored, clumpy, easily breakable	138,125	832	743	102	3,144	161
437-rust colored	8,503	104	53	16	723	38
438 - fine silty, brown	249	25	ND	22	83	18
439-fine, silty, brown-mid bank on South end	11,518	123	122	20	972	45
440-south end	8,946	108	26	15	420	31
441-fine, silty, brown-bank area on south end	953	32	ND	13	90	14
443-fine, silty, brown-below mill foundation, north end	41,099	304	1.240	67	766	55
445-rust colored, clumpy, hardened-below main						
foundation-North end	22,579	185	149	25	1,592	62
Olympus Delta XRF Model DS-4000	10					
3-North White Tailings	217,719	1,637	ND		12,513	131
4-North White Tailings	103,772	1,707	3,653	85	3,520	65
5-North White Tailings	172,971	3,667	3,694	115	2.129	55
6-White Tailings	83,419	1,276	1,673	50	2,229	41
7-Sample Bag	159,533	3,240	3,570	107	2,336	57
8-Sample Bag	152,928	2.985	3,016	94	2,733	62
9-Red Conglomerate	10,924	118	188	11	650	11
10-South White Tailings	5,710	62	2.642	36	4.954	54
11-Red Conglomerate	16,461	184	1.330	26	1.857	25
12-Red Conglomerate	54,136	371	ND		6.328	65
13-Red Conglomerate	8,774	97	607	16	540	10
14-South Rocky Point	207,984	4,720	3,896	132	3,761	96
15-White Chunks, Bagged	181,752	3.890	846	73	8,257	186
16-Riverbank, Mill Bldg.	46,355	581	156	21	1.877	29
17-Yellow Chunk	18,749	200	220	14	1,356	19
18-NW Mill Bldg./Riverbank	9,303	96	287	12	910	13
19-Floodplain North Side	133	4	53	4	124	4
20-East Mill Bldg. Foundation	239,639	6,021	ND	78	2,479	74
21-East Mill Bldg. Foundation	2,484	24	10	4	91	3
22-Background	15	2	8	3	21	2

E. State and Local Authorities Roles

The Forest Service has delegated CERCLA authority and is the lead agency for response actions where the release is on, or the sole source of the release is from, National Forest System Lands at non-National Priorities List sites. No other appropriate response mechanisms or authorities are currently available to address this site.

In compliance with the Forest Service's role in protecting the public health and welfare and the environment, and because the release or threatened releases are on NFS lands under the administration of the Sequoia National Forest, and pursuant to the authority found at 42 U.S.C. 9604(a), Executive Order 12580, and 7 CFR 2.60, the Forest Service issues this Action Memorandum. The response action will be not inconsistent with the NCP.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health, or Welfare or the Environment

The release of hazardous substances from the drainage emanating from the Site supports the determination that it poses threats to public health, welfare and the environment and that it is appropriate to implement the response actions described in this AM. In accordance with Title 40 Code of Federal Regulations, Part 300, Section 415 (40 CFR 300.415), the following conditions indicate that removal action is warranted for the Site:

 § 300.415 (b) (2) (i) Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby human populations, animals, or the food chain;

Public Health and Welfare:

The contaminants of potential concern that have been identified to date are arsenic, lead, and mercury, and are hazardous substances or pollutants or contaminants as defined by sections 101 (14) and 101 (33) of CERCLA, as amended, 42 U.S.C. Section 9601(14) and (33).

The Removal PA for the Big Blue Mill Site compared site XRF data against established risk-based screening levels (SLs) to evaluate whether a release has occurred and to get an initial understanding of the potential risks. The Removal PA compared site data against the Regional Screening Level (RSLs) developed by the US EPA for residential and industrial populations (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables) and the recreational exposure SLs developed by the Bureau of Land Management (BLM) for metals in soils at AML sites.

Site XRF data regarding the nature and extent of mill-waste contamination compared to human health screening levels are summarized below in Table 2.

Table 2: Summary of Contaminant Concentrations Compared To Site Background and Human Health Screening Levels

	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
XRF Detection Range	ND - 239,639	ND - 12,513	ND - 3,896
Site Background	15	21	8
Site Background Exceedance	0 - 15,976 times	0 - 596 times	0 - 487 times
EPA Residential RSL ¹	0.68	400	11
EPA Residential RSL Exceedance	0 - 352,410 times	0 - 31 times	0 - 354 times
EPA Industrial RSL ¹	3	800	46
EPA Industrial RSL Exceedance	0 - 78,880 times	0 - 16 times	0 - 85 times
BLM Recreation SL ²	30.6	800	271
BLM Recreation SL Exceedance	0 - 7,831 times	0 - 16 times	0 - 14 times

¹ (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)

Site exposure pathways of concern due to the presence of arsenic, mercury and lead are through inhalation, dermal exposure and ingestion. Contamination is present within 100 feet from an occupied residence on private land and within 500 feet and 1,000 feet of two other residences on separate private parcels. Mill waste and tailings are present in surface deposits and soils and are susceptible to migration because of water- and wind-borne influences. Some of the contaminated materials are un-vegetated and exposed on the banks of the Kern River and there is evidence of on-going erosion into the river. There is a high likelihood of transferring contamination to clothing, equipment and vehicles that would result in contaminated material being transported and deposited at off-site locations such as residences and offices.

Fishing is very popular along the Kern River from the shoreline. A well-used 'Fishermen's Trail' exists through the Site and a fishing platform was observed on the heavy metal impacted tailing materials at the shoreline.

The XRF values obtained during the Removal PA indicate that contamination is present as a result of historic mineral processing activities at the Site. Concentrations of arsenic, lead, and mercury greatly exceed site background levels and established human health risk screening thresholds and indicates that the site poses an exposure hazard to nearby populations.

² September 2017 Update, BLM Technical Memorandum: Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

§ 300.415 (b) (2) (iv): High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;

Elevated concentrations of arsenic (239,639 mg/kg), lead (12,513 mg/kg) and mercury (3,896 mg/kg) in mill tailings exceed Site background levels (up to 15,976 times for arsenic, 596 times for lead, and 487 times for mercury) and indicates that a release of hazardous substances to the environment has occurred. These materials are unvegetated and exposed on the banks of the Kern River and there is evidence of on-going erosion into the river. The Site is also subject to periodic flooding from the river and strong winds in the Kern river valley. The tailings are susceptible to migration because of water- and wind-borne influences

iii. § 300.415 (b) (2) (vii): Availability of Other Appropriate Federal or State Response Mechanisms to Respond to the Release;

The Site is located on National Forest System lands under the jurisdiction, custody and control of the U.S.D.A. Forest Service, within the boundaries of the Sequoia National Forest. There are no other appropriate Federal or State response mechanisms to respond to the threat of release at this Site.

IV. ENDANGERMENT DETERMINATION

Conditions represent a potential threat of release of a CERCLA hazardous substance threatening to public health, or welfare, or the environment based on the factors set forth in the NCP, 40 CFR § 300.415(b)(2). Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response actions selected in this Action Memorandum, will continue to present an imminent and substantial endangerment to public health, or welfare, or the environment

V. PROPOSED ACTION AND ESTIMATED COSTS

A. Proposed Actions

The scope and goal for this time-critical removal action is to prevent human exposure to elevated concentrations of arsenic, lead, and mercury at the Big Blue Mill Site. The concentration of arsenic, lead, and mercury present in the tailings are at the ground surface throughout the former mill site and pose an exposure threat to site visitors.

The proposed action would implement institutional controls to restrict all public access to the Site and the area of contamination. These controls include a prohibition on all public entry to the Site. Warning signs would be placed at the boundaries to identify the nature of the exposure hazard and would be placed in a manner that encompasses the contaminated area as presently known.

Figure 5 shows the approximate boundaries of the closed area. The closure area includes the former mill area east and northeast of the adjacent private residence (Parcel APN 296-110-11-00-1) and the area between the Kern River and private residences (Parcel APNs 296-110-11-00-1 and 296-110-12-00-4). This area may be expanded depending on the results of future site investigations.

Enforcement of the institutional controls and site access restrictions will be through the issuance of a Forest Closure Order by the Sequoia National Forest. The Forest Closure Order will contain the legal description of the area to be closed and will provide the mechanism for enforcement of the CERCLA site access restrictions.

The current assessment of the extent of elevated heavy metals present in the soil-like tailings is based on a preliminary field screening. There is a need for additional sampling to establish the vertical and lateral extent of the contamination present at the Site. The results of this additional investigation will determine future CERCLA response actions at the Site.

This proposed action shall, to the extent practicable, considering the exigencies of the situation, attain ARARs under federal or state environmental or facility siting laws. Other federal and state advisories, criteria or guidance may, as appropriate, be considered in formulating the removal action.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

The risk of delay is the risk of arsenic, mercury, and lead exposure to human populations. Failure to restrict access to the Site will permit direct contact by individuals with arsenic, mercury, and lead contamination without realizing this hazard exists. It will permit exposure to soils contaminated with these heavy metals resulting in potential contamination of footwear and clothing and potential off-site contamination of vehicles and residences. Inhalation of dust contaminated with arsenic, mercury, and lead has the potential to occur by local residents and recreationalists fishing from the shoreline or exiting rafts or other water craft stepping onto the shore at the former Big Blue Mill Site.

VII. OUTSTANDING POLICY ISSUES

None have been identified at this time.

VIII. ENFORCEMENT

To date, the Forest Service has not completed its investigation of potentially responsible parties (PRPs) for the Site. PRP investigation efforts are ongoing. Forest Service law enforcement personnel are expected to provide enforcement of this time critical removal action's Forest Closure Order.

IX. DECISION

Conditions at the Site satisfy NCP Section 300.415 (b) (2) criteria for a removal action. The removal action for the Big Blue Mill Site was developed

in accordance with CERCLA, as amended, and is not inconsistent with the NCP. The closure order and related actions address the immediate human health exposure concerns arising from the presence of hazardous substances in the tailings present at the ground surface at the former Big Blue Mill Site.

Approval is hereby given by the Forest Service to conduct a time-critical removal action to implement institutional controls to restrict public access to the former Big Blue Mill Site on the Sequoia National Forest.

Approval Signature

Tyrone Kelley

Director of Engineering

USDA Forest Service Pacific Southwest Region

References Cited

- September 15, 1896, Thirteenth Report (Third Biennial) of the State Mineralogist For The Two Years Ending September 15, 1896, California State Mining Bureau
- January 1934, Volume 30 California Journal of Mines and Geology Quarterly Chapter of State Mineralogist's Report XXX, State Division of Mines
- January 1940, Volume 36 California Journal of Mines and Geology Quarterly Chapter of State Mineralogist's Report XXXVI, State Division of Mines
- 1962, Mines and Mineral Resources of Kern County, California, California Division of Mines and Geology, County Report 1
- September 2017 Update, BLM Technical Memorandum: Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites
- February 2020, Removal Preliminary Assessment Report for the Big Blue Mill Site, Sequoia National Forest. Noelle Graham-Wakoski, USDA Forest Service (Pacific Southwest Region)

FIGURES

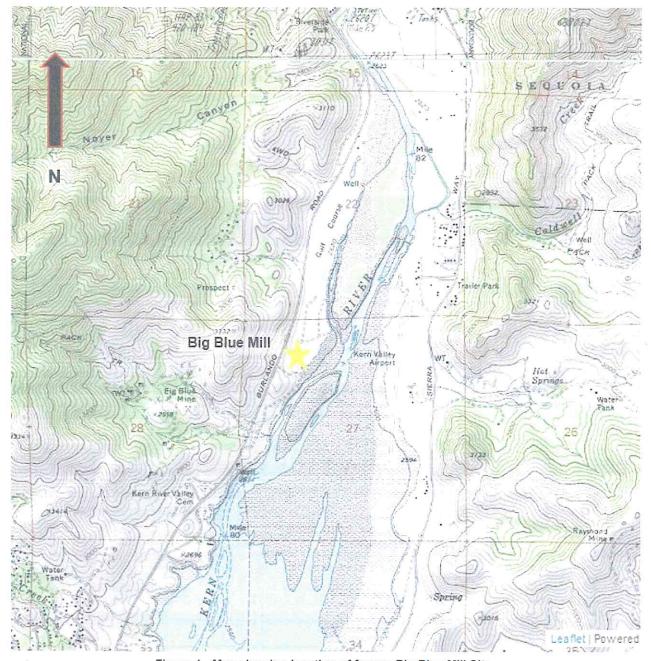


Figure 1 - Map showing location of former Big Blue Mill Site.

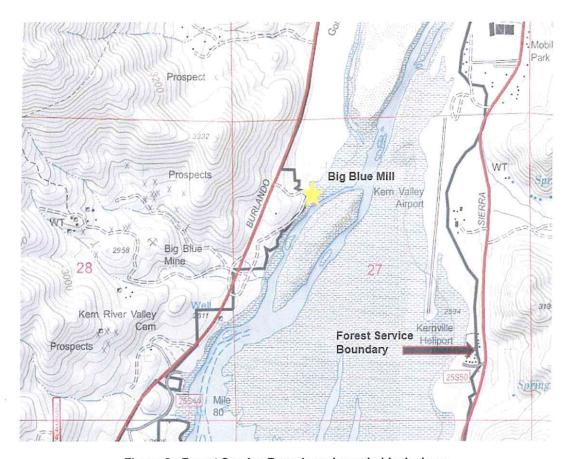


Figure 2 - Forest Service Boundary shown in black above

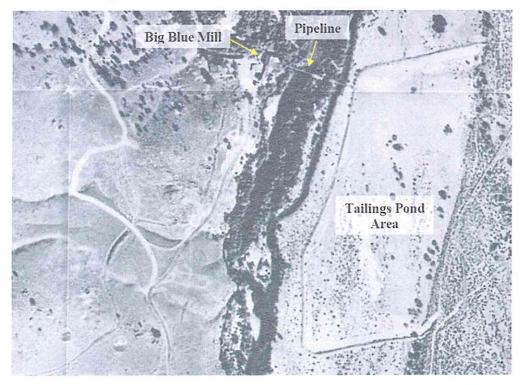


Figure 3 - October 20, 1938 Aerial photo showing Big Blue Mill, pipeline, and tailings pond area



Figure 4 - X-Ray Fluorescence (XRF) Sampling Locations, Big Blue Mill Site



Figure 5 - Approximate Boundaries of Forest Closure Area and Access Restrictions

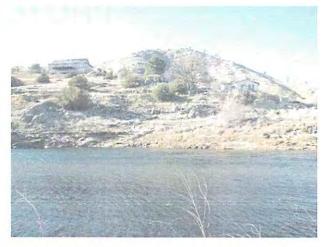
PHOTOGRAPHS



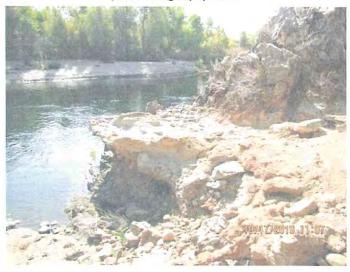


Photographs 1 & 2 - Concrete foundations that once supported structures and processing equipment at the Big Blue Mill





Photographs 3 & 4 - Proximity of nearby residences to the foundations that once supported structures and processing equipment.



Photograph 5 - Popular fishing platform above the Kern River comprised of mill tailing deposits.

ORDER NO. 0513-20-03

SEQUOIA NATIONAL FOREST KERN RIVER RANGER DISTRICT BIG BLUE MILL SITE AREA CLOSURE

Pursuant to 16 USC 551 and 36 CFR 261.50(b), and to provide for public safety, the following acts are prohibited within the Big Blue Mill Site Closure Area within the Kern River Ranger District of the Sequoia National Forest. This Order is effective from March 5, 2020, through February 27, 2022.

Going into or being upon National Forest System lands within the Big Blue Mill Site Closure Area. The Big Blue Mill Site Closure Area boundary begins at a point approximately 750 feet from the southwest corner of the northwest quarter of Section 27, Township 25 South, Range 33 East, Mount Diablo Base and Meridian, then continues north approximately 2,300 feet along the boundary of the Sequoia National Forest to a point 250 feet east of the intersection of the Forest boundary and Burlando Road, then continues due east approximately 1,200 feet to the west bank of the Kern River, then continues south approximately 2,500 feet along the Kern River to a point 650 feet from where the Forest boundary intersects with Burlando Road, then continues due west approximately 220 feet back to the starting point, as shown on the attached map. 36 CFR 261.53(e).

Pursuant to 36 CFR 261.50(e), the following persons are exempt from this Order:

- 1. Any Federal, State or local officer, or member of an organized rescue or fire-fighting force in the performance of an official duty with explicit approval from the Forest Service Regional On-Scene Coordinator.
- 2. Persons with a contract from the Forest Service specifically authorizing work within the Big Blue Mill Site Closure Area and their employees, subcontractors or agents, to the extent authorized by the contract.
- Persons, who have explicit approval from the Forest Service Regional On-Scene Coordinator, with a Permit for Use of Roads, Trails, or Areas Restricted by Regulation or Order (Form FS-7700-48) from the Forest Service specifically authorizing the otherwise prohibited act or omission.

These prohibitions are in addition to the general prohibitions in 36 CFR Part 261, Subpart A. A violation of these prohibitions is punishable by a fine of not more than \$5,000 for an individual or \$10,000 for an organization, or imprisonment for not more than six months, or both. 16 USC 551 and 18USC 3559, 3571, and 3581.

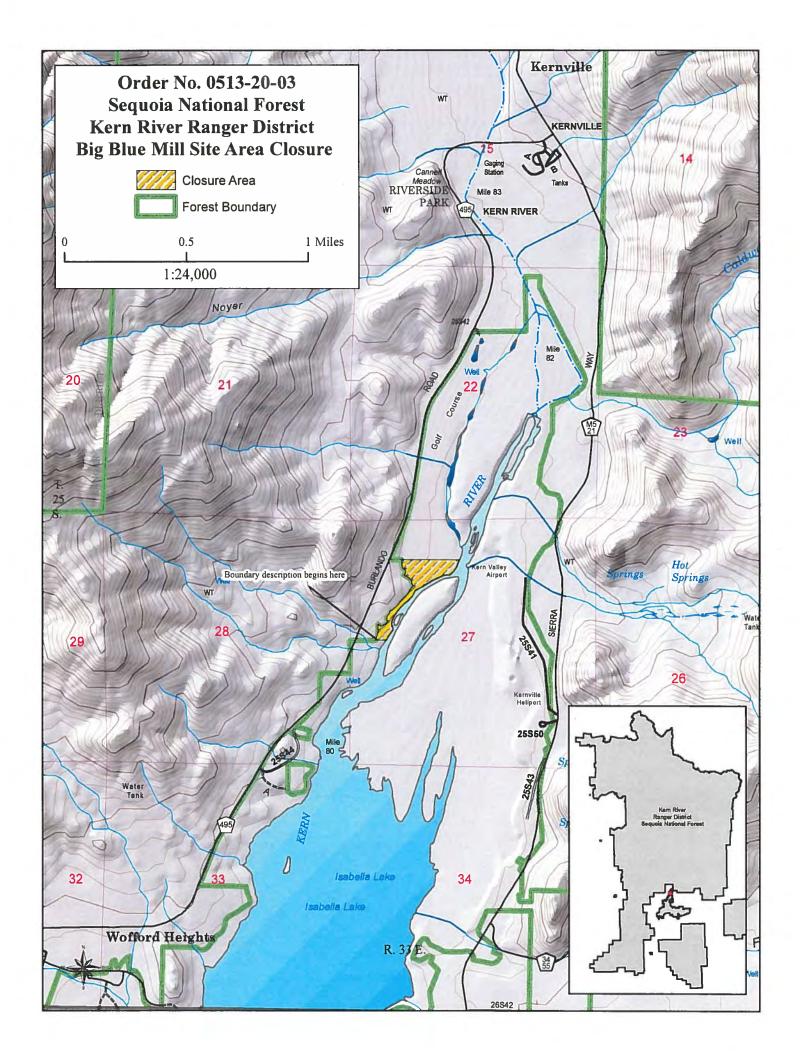
Executed in Porterville, California this 4th day of March, 2020.

TERESA BENSON

Forest Supervisor

Sequoia National Forest

This Order supersedes Order No. 0513-20-02, dated February 27, 2020.



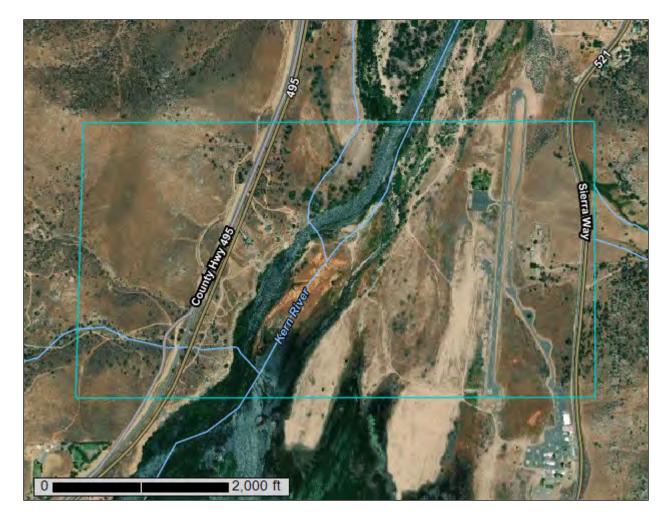




Appendix B Soil Map



Natural Resources Conservation Service A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants Custom Soil Resource
Report for
Kern County, Northeastern
Part, and Southeastern Part
of Tulare County, California
Big Blue Mill Site



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2 053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

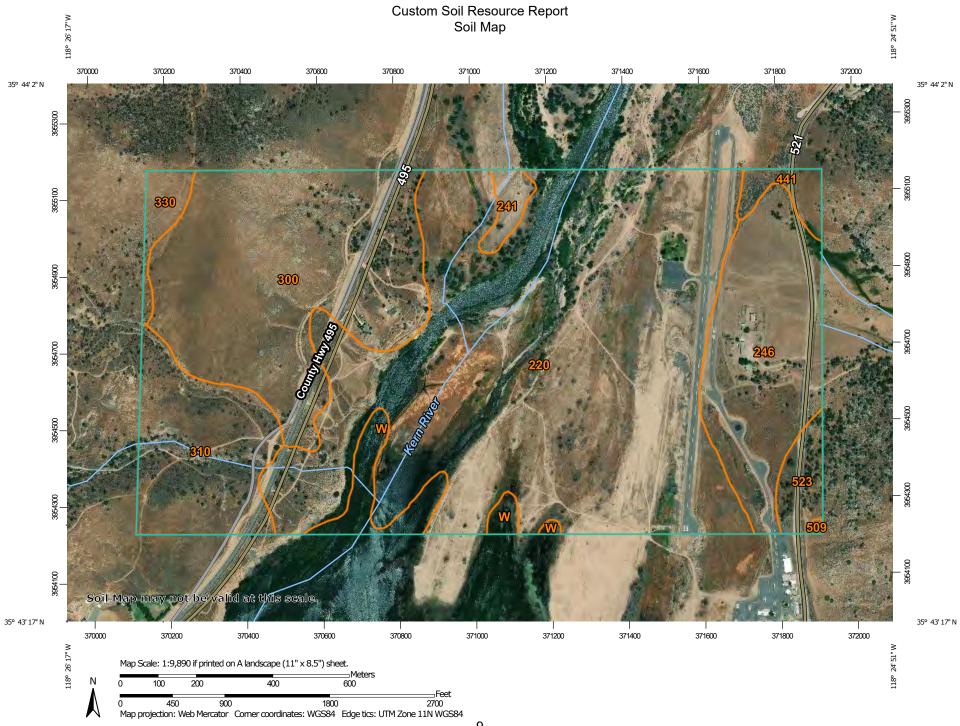
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



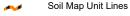
MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons



Soil Map Unit Points

Special Point Features

Blowout ဖ

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

å Stony Spot

00 Very Stony Spot

Ŷ Wet Spot

Other Δ

Special Line Features

Water Features

Streams and Canals

Transportation

Rails ---

Interstate Highways

US Routes

Major Roads

Local Roads

Background

00

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24.000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kern County, Northeastern Part, and Southeastern Part of Tulare County, California Survey Area Data: Version 13, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 9, 2015—Nov 2, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

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MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
220	Aquents-Aquolls-Riverwash complex, 0 to 5 percent slopes, flooded	211.8	50.4%
241	Inyo gravelly loamy coarse sand, 0 to 5 percent slopes	4.0	1.0%
246	Chollawell gravelly loamy coarse sand, 5 to 15 percent slopes	49.4	11.7%
300	Stineway-Kiscove association, 30 to 60 percent slopes	89.3	21.2%
310	Stineway-Kiscove association, 5 to 30 percent slopes	36.7	8.7%
330	Kernville-Faycreek-Rock outcrop complex, 30 to 75 percent slopes	5.5	1.3%
441	Inyo-Urban land complex, 0 to 5 percent slopes	5.4	1.3%
509	Xyno-Faycreek-Rock outcrop complex, 30 to 60 percent slopes	0.3	0.1%
523	Kernville-Faycreek-Rock outcrop association, 30 to 60 percent slopes	7.2	1.7%
W	Water	11.1	2.6%
Totals for Area of Interest		420.6	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

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Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

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of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Kern County, Northeastern Part, and Southeastern Part of Tulare County, California

220—Aquents-Aquolls-Riverwash complex, 0 to 5 percent slopes, flooded

Map Unit Setting

National map unit symbol: hp99 Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 200 to 220 days

Farmland classification: Not prime farmland

Map Unit Composition

Aquents and similar soils: 40 percent Aquells and similar soils: 35 percent

Riverwash: 15 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aquents

Setting

Landform: Flood plains, mountain valleys, channels, depressions

Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Tread

Down-slope shape: Linear, concave Across-slope shape: Linear, concave

Parent material: Alluvium derived from granite

Typical profile

A - 0 to 7 inches: loamy fine sand Cng - 7 to 18 inches: fine sandy loam C - 18 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high

(0.60 to 6.00 in/hr)

Depth to water table: About 0 to 24 inches Frequency of flooding: NoneFrequent Frequency of ponding: Frequent

Calcium carbonate, maximum content: 4 percent

Gypsum, maximum content: 1 percent

Maximum salinity: Nonsaline to slightly saline (1.0 to 4.0 mmhos/cm)

Sodium adsorption ratio, maximum: 15.0 Available water capacity: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): 4w Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: A/D Hydric soil rating: Yes

Description of Aquolls

Setting

Landform: Flood plains, mountain valleys, channels Landform position (two-dimensional): Toeslope

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Alluvium derived from granitoid

Typical profile

An - 0 to 3 inches: silt loam

A - 3 to 12 inches: very fine sandy loam C - 12 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high

(0.60 to 2.00 in/hr)

Depth to water table: About 0 to 24 inches Frequency of flooding: NoneFrequent Frequency of ponding: Frequent

Calcium carbonate, maximum content: 3 percent

Gypsum, maximum content: 1 percent

Maximum salinity: Nonsaline to slightly saline (1.0 to 5.0 mmhos/cm)

Sodium adsorption ratio. maximum: 20.0

Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 4w Land capability classification (nonirrigated): 6w

Hydrologic Soil Group: B/D Hydric soil rating: Yes

Description of Riverwash

Setting

Landform: Mountain valleys, channels, drainageways Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Tread

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Alluvium derived from granitoid

Properties and qualities

Slope: 0 to 2 percent Runoff class: High

Depth to water table: About 0 to 12 inches Frequency of ponding: Occasional

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7w

Hydric soil rating: Yes

Minor Components

Kelval

Percent of map unit: 6 percent

Landform: Mountain valleys, flood plains

Hydric soil rating: No

Inyo, stratified

Percent of map unit: 4 percent

Landform: Stream terraces, mountain valleys, inset fans

Hydric soil rating: Yes

241—Inyo gravelly loamy coarse sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hp9j Elevation: 2,500 to 4,000 feet

Mean annual precipitation: 5 to 8 inches

Mean annual air temperature: 57 to 61 degrees F

Frost-free period: 190 to 220 days

Farmland classification: Not prime farmland

Map Unit Composition

Inyo and similar soils: 75 percent Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Inyo

Setting

Landform: Inset fans, alluvial fans

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Tread

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Alluvium derived from mixed

Typical profile

A - 0 to 8 inches: loamy coarse sand

C - 8 to 60 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00

to 20.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: RareNone Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: A

Ecological site: R029XF054CA - DRY WASH 8-10 P.Z.

Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 9 percent

Landform: Drainageways, intermittent streams

Hydric soil rating: No

Chollawell

Percent of map unit: 9 percent Landform: Alluvial fans, fan remnants

Hydric soil rating: No

Kelval

Percent of map unit: 5 percent Landform: Flood plains Hydric soil rating: No

Urban land

Percent of map unit: 1 percent Landform: Alluvial fans Hydric soil rating: No

Kernfork

Percent of map unit: 1 percent Landform: Flood plains Hydric soil rating: No

246—Chollawell gravelly loamy coarse sand, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: hp9n Elevation: 4,000 to 4,500 feet

Mean annual precipitation: 6 to 9 inches

Mean annual air temperature: 57 to 61 degrees F

Frost-free period: 190 to 220 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Chollawell and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chollawell

Setting

Landform: Fan remnants

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Side slope

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Alluvium derived from granitoid

Typical profile

A - 0 to 19 inches: gravelly loamy coarse sand Bt - 19 to 54 inches: gravelly coarse sandy loam C - 54 to 60 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 5 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00

in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: RareNone Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): 6e Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A Ecological site: R029XY182CA

Hydric soil rating: No

Minor Components

Inyo

Percent of map unit: 9 percent

Landform: Inset fans Hydric soil rating: No

Riverwash

Percent of map unit: 7 percent Landform: Drainageways Hydric soil rating: No

Cowspring

Percent of map unit: 3 percent

Landform: Hillslopes Hydric soil rating: No

Kelval

Percent of map unit: 1 percent Landform: Flood plains Hydric soil rating: Yes

300—Stineway-Kiscove association, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: hpc3 Elevation: 2,600 to 5,000 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 54 to 63 degrees F

Frost-free period: 150 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Stineway and similar soils: 50 percent Kiscove and similar soils: 30 percent Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stineway

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Residuum weathered from schist and/or residuum weathered

from metamorphic rock

Typical profile

A - 0 to 4 inches: very gravelly sandy loam

Bt1 - 4 to 10 inches: very gravelly loam

Bt2 - 10 to 13 inches: very gravelly loam

R - 13 to 23 inches: bedrock

Properties and qualities

Slope: 30 to 60 percent

Surface area covered with cobbles, stones or boulders: 2.0 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Drainage class: Well drained Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): 6e Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D Hydric soil rating: No

Description of Kiscove

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Residuum weathered from metamorphic rock

Typical profile

A - 0 to 3 inches: gravelly loam

Bt - 3 to 9 inches: gravelly clay loam

Cr - 9 to 12 inches: weathered bedrock

R - 12 to 22 inches: bedrock

Properties and qualities

Slope: 30 to 60 percent

Depth to restrictive feature: 5 to 19 inches to paralithic bedrock; 9 to 20 inches to

lithic bedrock

Drainage class: Well drained Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): 6e Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D Hydric soil rating: No

Minor Components

Backcanyon

Percent of map unit: 5 percent Landform: Mountain slopes Hydric soil rating: No

Rock outcrop

Percent of map unit: 4 percent Landform: Mountain slopes Hydric soil rating: No

Sesame

Percent of map unit: 3 percent

Landform: Mountain slopes Hydric soil rating: No

Southlake

Percent of map unit: 3 percent Landform: Fan piedmonts Hydric soil rating: No

Alberti

Percent of map unit: 2 percent Landform: Mountain slopes Hydric soil rating: No

Riverwash

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

Unnamed, flooded

Percent of map unit: 1 percent Landform: Mountain valleys Hydric soil rating: Yes

Urban land

Percent of map unit: 1 percent Landform: Mountain slopes Hydric soil rating: No

310—Stineway-Kiscove association, 5 to 30 percent slopes

Map Unit Setting

National map unit symbol: hpcc Elevation: 2,600 to 3,200 feet

Mean annual precipitation: 8 to 12 inches

Mean annual air temperature: 52 to 62 degrees F

Frost-free period: 170 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Stineway and similar soils: 50 percent Kiscove and similar soils: 30 percent Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stineway

Setting

Landform: Mountain slopes, hillslopes, hills Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank, side slope

Down-slope shape: Concave, linear

Across-slope shape: Concave, linear

Parent material: Residuum weathered from schist and/or residuum weathered

from metamorphic rock

Typical profile

A - 0 to 4 inches: very gravelly sandy loam Bt - 4 to 14 inches: very gravelly loam

R - 14 to 24 inches: bedrock

Properties and qualities

Slope: 5 to 30 percent

Surface area covered with cobbles, stones or boulders: 2.0 percent

Depth to restrictive feature: 10 to 20 inches to lithic bedrock

Drainage class: Well drained Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 1 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D Hydric soil rating: No

Description of Kiscove

Setting

Landform: Hillslopes, mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Mountainflank, side slope

Down-slope shape: Linear Across-slope shape: Convex

Parent material: Residuum weathered from metamorphic rock

Typical profile

A - 0 to 2 inches: gravelly sandy loam

Bt - 2 to 9 inches: gravelly clay loam

Cr - 9 to 12 inches: weathered bedrock

R - 12 to 22 inches: bedrock

Properties and qualities

Slope: 15 to 30 percent

Depth to restrictive feature: 5 to 19 inches to paralithic bedrock; 9 to 20 inches to

lithic bedrock

Drainage class: Well drained Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm) Available water capacity: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 5 percent Landform: Mountain slopes, hillslopes

Hydric soil rating: No

Southlake

Percent of map unit: 4 percent

Landform: Mountain valleys, fan piedmonts

Hydric soil rating: No

Backcanyon

Percent of map unit: 3 percent

Landform: Hillslopes, mountain slopes

Hydric soil rating: No

Sesame

Percent of map unit: 3 percent

Landform: Mountain slopes, hillslopes

Hydric soil rating: No

Goodale

Percent of map unit: 2 percent Landform: Drainageways, channels

Hydric soil rating: No

Unnamed, wet, flooded

Percent of map unit: 1 percent

Landform: Drainageways

Landform position (two-dimensional): Toeslope

Hydric soil rating: Yes

Urban land

Percent of map unit: 1 percent

Landform: Mountain slopes, hillslopes

Hydric soil rating: No

Riverwash

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

330—Kernville-Faycreek-Rock outcrop complex, 30 to 75 percent slopes

Map Unit Setting

National map unit symbol: hpcf Elevation: 2,600 to 5,000 feet

Mean annual precipitation: 10 to 12 inches Mean annual air temperature: 52 to 61 degrees F

Frost-free period: 130 to 210 days

Farmland classification: Not prime farmland

Map Unit Composition

Kernville and similar soils: 35 percent Faycreek and similar soils: 25 percent

Rock outcrop: 20 percent Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kernville

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Mountaintop, mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Residuum weathered from granitoid

Typical profile

A1 - 0 to 5 inches: gravelly loamy coarse sand A2 - 5 to 16 inches: gravelly loamy coarse sand

Cr - 16 to 19 inches: weathered bedrock

R - 19 to 29 inches: bedrock

Properties and qualities

Slope: 30 to 75 percent

Surface area covered with cobbles, stones or boulders: 10.0 percent

Depth to restrictive feature: 7 to 19 inches to paralithic bedrock; 10 to 20 inches to

lithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D Hydric soil rating: No

Description of Faycreek

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope, shoulder, summit Landform position (three-dimensional): Mountaintop, mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Residuum weathered from granitoid

Typical profile

A1 - 0 to 5 inches: gravelly loamy coarse sand A2 - 5 to 12 inches: gravelly loamy coarse sand

Cr - 12 to 22 inches: weathered bedrock

Properties and qualities

Slope: 30 to 75 percent

Surface area covered with cobbles, stones or boulders: 2.0 percent Depth to restrictive feature: 10 to 20 inches to paralithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.06 to 0.20 in/hr) Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Mountaintop, mountainflank

Down-slope shape: Convex Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Hungrygulch

Percent of map unit: 5 percent Landform: Mountain slopes Hydric soil rating: No

Tollhouse

Percent of map unit: 4 percent Landform: Mountain slopes Hydric soil rating: No

Xyno

Percent of map unit: 3 percent Landform: Mountain slopes Hydric soil rating: No

Hogeye

Percent of map unit: 3 percent Landform: Mountain slopes Hydric soil rating: No

Tweedy

Percent of map unit: 2 percent Landform: Mountain slopes Hydric soil rating: No

Unnamed, wet, flooded

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

Riverwash

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

Xerofluvents, flooded

Percent of map unit: 1 percent Landform: Flood plains Hydric soil rating: No

441—Inyo-Urban land complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1jpyz Elevation: 2,500 to 4,000 feet

Mean annual precipitation: 6 to 8 inches

Mean annual air temperature: 57 to 61 degrees F

Frost-free period: 190 to 225 days

Farmland classification: Not prime farmland

Map Unit Composition

Inyo and similar soils: 65 percent

Urban land: 15 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Inyo

Setting

Landform: Alluvial fans, inset fans, mountain valleys Landform position (two-dimensional): Footslope Landform position (three-dimensional): Tread

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Alluvium derived from mixed

Typical profile

A - 0 to 8 inches: loamy coarse sand

C - 8 to 60 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 5 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00

to 20.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: RareNone Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: A Hydric soil rating: No

Description of Urban Land

Setting

Landform: Mountain valleys, alluvial fans, inset fans Landform position (two-dimensional): Footslope Landform position (three-dimensional): Tread

Down-slope shape: Linear Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Chollawell

Percent of map unit: 9 percent

Landform: Fan remnants, mountain valleys

Hydric soil rating: No

Kelval

Percent of map unit: 5 percent

Landform: Flood plains, mountain valleys

Hydric soil rating: No

Riverwash

Percent of map unit: 3 percent

Landform: Mountain valleys, drainageways

Hydric soil rating: No

Southlake

Percent of map unit: 2 percent

Landform: Mountain valleys, fan remnants

Hydric soil rating: No

Kernfork

Percent of map unit: 1 percent

Landform: Mountain valleys, flood plains

Hydric soil rating: No

509—Xyno-Faycreek-Rock outcrop complex, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: hpcr Elevation: 2,600 to 5,200 feet

Mean annual precipitation: 8 to 10 inches

Mean annual air temperature: 50 to 61 degrees F

Frost-free period: 130 to 210 days

Farmland classification: Not prime farmland

Map Unit Composition

Xyno and similar soils: 40 percent *Faycreek and similar soils:* 20 percent

Rock outcrop: 15 percent Minor components: 25 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xyno

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Colluvium derived from granitoid and/or residuum weathered from

granitoic

Typical profile

A - 0 to 11 inches: gravelly loamy coarse sand C - 11 to 15 inches: gravelly loamy coarse sand Cr - 15 to 25 inches: weathered bedrock

Properties and qualities

Slope: 30 to 60 percent

Surface area covered with cobbles, stones or boulders: 0.0 percent

Depth to restrictive feature: 8 to 20 inches to lithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D Hydric soil rating: No

Description of Faycreek

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Upper third of mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Residuum weathered from granitoid

Typical profile

A1 - 0 to 2 inches: gravelly loamy coarse sand A2 - 2 to 10 inches: gravelly loamy coarse sand Cr - 10 to 20 inches: weathered bedrock

Properties and qualities

Slope: 30 to 60 percent

Surface area covered with cobbles, stones or boulders: 2.0 percent Depth to restrictive feature: 10 to 20 inches to paralithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 0.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Convex Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Canebrake

Percent of map unit: 8 percent Landform: Mountain slopes Hydric soil rating: No

Pilotwell

Percent of map unit: 6 percent Landform: Mountain slopes Hydric soil rating: No

Scodie

Percent of map unit: 4 percent Landform: Mountain slopes Hydric soil rating: No

Goodale, flooded

Percent of map unit: 2 percent Landform: Alluvial fans, channels

Hydric soil rating: No

Riverwash

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

Unnamed, wet, flooded

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

Urban land

Percent of map unit: 1 percent Landform: Mountain slopes Hydric soil rating: No

Rubble land

Percent of map unit: 1 percent Landform: Mountain slopes Hydric soil rating: No

Inyo

Percent of map unit: 1 percent Landform: Alluvial fans Hydric soil rating: No

523—Kernville-Faycreek-Rock outcrop association, 30 to 60 percent slopes

Map Unit Setting

National map unit symbol: hpd1 Elevation: 2,700 to 4,600 feet

Mean annual precipitation: 9 to 12 inches

Mean annual air temperature: 54 to 61 degrees F

Frost-free period: 140 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Kernville, bouldery, and similar soils: 45 percent

Faycreek and similar soils: 20 percent

Rock outcrop: 15 percent Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kernville, Bouldery

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Residuum weathered from granitoid

Typical profile

A - 0 to 16 inches: gravelly loamy coarse sand Cr - 16 to 20 inches: weathered bedrock

R - 20 to 30 inches: bedrock

Properties and qualities

Slope: 30 to 60 percent

Surface area covered with cobbles, stones or boulders: 13.0 percent

Depth to restrictive feature: 7 to 19 inches to paralithic bedrock; 10 to 20 inches to

lithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D Hydric soil rating: No

Description of Faycreek

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Concave Across-slope shape: Concave

Parent material: Residuum weathered from granitoid

Typical profile

A1 - 0 to 6 inches: gravelly loamy coarse sand A2 - 6 to 12 inches: gravelly loamy coarse sand Cr - 12 to 22 inches: weathered bedrock

Properties and qualities

Slope: 30 to 60 percent

Surface area covered with cobbles, stones or boulders: 2.0 percent Depth to restrictive feature: 10 to 20 inches to paralithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to

moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very low (about 0.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Mountain slopes

Landform position (two-dimensional): Backslope Landform position (three-dimensional): Mountainflank

Down-slope shape: Convex Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydric soil rating: No

Minor Components

Hogeye

Percent of map unit: 6 percent Landform: Mountain slopes Hydric soil rating: No

Hungrygulch

Percent of map unit: 5 percent Landform: Mountain slopes Hydric soil rating: No

Unnamed, shallow to hard rock

Percent of map unit: 4 percent Landform: Mountain slopes Hydric soil rating: No

Xerofluvents, flooded

Percent of map unit: 2 percent

Landform: Flood plains, drainageways

Hydric soil rating: No

Unnamed, flooded

Percent of map unit: 1 percent

Landform: Drainageways, flood plains

Hydric soil rating: No

Riverwash

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

Unnamed, wet, flooded

Percent of map unit: 1 percent Landform: Drainageways Hydric soil rating: Yes

W-Water

Map Unit Composition

Water: 100 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

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Appendix C IPaC Threatened and Endangered Species List

Appendix C Biological Resources

From USACE 2012. Isabella Lake Dam Safety Modification Project, Environmental Impact Statement Draft, Volume 1 – Draft Environmental Impact Statement, March.

3.10 BIOLOGICAL RESOURCES

This section presents a discussion of the regulatory setting, methods of data collection, an overview of the affected environment (including special status species), summarizes the environmental consequences from implementing the Action Alternatives, and includes mitigation measures for reducing potential impacts on biological resources.

3.10.1 Regulatory Setting

The laws, regulations, or policies relevant to the biological resources affected by the Isabella DSM Project are described in the following paragraphs. State and local requirements are included that were helpful in characterizing the overall context of the analyses, even though some of these requirements do not directly apply to this Federal action.

Federal

Fish and Wildlife Coordination Act of 1958, as amended (16 USC §661 et seq.)

This act authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with Federal and State agencies to protect, rear, stock, and increase the supply of game and fur-bearing animals. Amendments enacted in 1946 require consultation with the USFWS and the fish and wildlife agencies of states where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources." (For more information see Appendix C).

Federal Endangered Species Act (16 USC §1531 et seq)

This act requires that any action authorized by a Federal agency not be likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires Federal agencies to consult with the USFWS and National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service to ensure that project actions do not jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of these species. (For more information see Appendices C, D and E).

Federal Water Pollution Control Act (Clean Water Act), Section 404 and 401(33 USC §1344)

Under Section 404 of the Clean Water Act, the US Army Corps of Engineers (Corps) and the US Environmental Protection Agency (EPA) regulate the discharge of dredge and fill materials into waters of the United States. Section 401 of the act delegates authority to the states to regulate waters of the United States within their borders.

Executive Order 13112, Invasive Species (3 February 1999)

This Executive Order requires that Federal agencies, to the extent possible, use relevant programs and authorities to (i) prevent the introduction of invasive species, (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner, (iii) monitor invasive species populations accurately and reliably, (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them.

Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds (10 January 2001)

This Executive Order directs Executive departments and agencies to take further actions to implement the Migratory Bird Treaty Act. Federal agencies taking actions that have , or are likely to have, a measurable negative effect on migratory bird populations are directed to develop and implement, within two years, a Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations.

Forest Service Manual and Handbook (FSM/H 2670)

The USFS develops and implements management practices to ensure that plants and animals do not become threatened or endangered and to ensure their continued viability in national forests. The USFS maintains lists of sensitive plant or animal species identified by the regional forester for which population viability is a concern. It is USFS policy to analyze impacts on sensitive species to ensure management activities do not create a significant trend toward Federal listing or loss of viability.

Migratory Bird Treaty Act (16 USC §703-712)

This act implements treaties that the United States has signed with a number of countries to protect birds that migrate across national borders. The act makes unlawful the taking, possessing, pursing, capturing, transporting, or selling of any migratory bird, its nest or its eggs.

National Environmental Policy Act of 1969, as amended (42 USC 4321 et seq)

This act establishes policy that promotes the enhancement of the environment by establishing procedural requirements for all Federal agencies to integrate environmental values into their decision making process by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. This is accomplished through the preparation of an Environmental Impact Statement (EIS).

<u>Sequoia National Forest Land and Resource Management Plan, as amended by the Sierra Nevada Forest Plan Amendment (2001) and the Mediated Settlement Agreement</u>
This *Plan* requires that field surveys for threatened, endangered, proposed, and sensitive plant species be conducted early enough in the project planning process that the project can be designed to conserve or enhance these plants and their habitat. Additionally,

sensitive plant species will be managed to prevent the need for Federal listing as threatened and endangered.

USFS National Forest Management Act of 1976

The National Forest Management Act of 1976 (NFMA) (90 Stat. 2949, et seq.; 16 U.S.C. 1601-1614), set standards for land and resource management planning across the National Forest System, including a requirement related to diversity of plant and animal communities. Each forest plan developed under the 1982 Planning Rule for the NFMA was required to identify certain vertebrate and/or invertebrate species as Management Indicator Species (MIS) as one of various elements to address NFMA requirements related to diversity of plant and animal communities [1982: 36 CFR 219.19(a)]. The direction for MIS is related to forest plan development, forest project implementation, and forest plan monitoring. On December 14, 2007, based on a review of all the alternatives assessed in the Final Environmental Impact Statement (FEIS), the Regional Forester for the Pacific Southwest Region made the decision to adopt a common list of MIS and associated monitoring strategies for ten forests in the Sierra Nevada, including the Sequoia National Forest. Rule (1982: 36 CFR 219.19(a)(1)) and in the Forest Service Manual (FSM 2621.1). The 1982 Planning Rule states that species are to be selected as MIS because their population changes are believed to indicate the effects of land management activities (1982: 36 CFR 219.19 (a)(1)).

USFS, National Threatened, Endangered, and Sensitive Species Program

This program provides an initiative dedicated to conserve and recover plant and animal species that need special management attention and to restore National Forest and Grassland ecosystems and habitat. Isabella Lake is on National Forest System lands and recreation facilities. Lands associated with the lake are managed by the USFS, which is the cooperating agency for the Isabella DSM Project.

USFWS Mitigation Policy (46 FR 7644, 23 January 1981)

Under this policy, resources are assigned to one of four distinct resource categories, each having a mitigation planning goal consistent with USFWS values. The Mitigation Policy does not apply to threatened and endangered species, nor does it apply to USFWS recommendations for completed Federal projects, projects permitted or licensed prior to the enactment of USFWS authorities, or USFWS recommendations related to the enhancement of fish and wildlife resources.

State

California Endangered Species Act (CESA)

The USFWS works with all interested persons, agencies, and organizations to protect and preserve sensitive biological resources and their habitats. These resources include all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants and their habitats that are threatened with extinction and those experiencing a significant decline. The CESA also allows for take incidental to otherwise lawful development projects. CESA emphasizes early consultation to avoid potential impacts on rare,

endangered, and threatened species and to develop appropriate mitigation planning to offset losses of listed species caused by the project.

California Fish and Game Code (Sections 3511, 4700, 5050, and 5515)

This code defines Fully Protected Animals. Fish, mammal, amphibian, reptile, and bird species that may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Most fully protected species have been listed as State threatened or endangered under more recent endangered species laws and regulations.

<u>California Native Plant Society (CNPS) Inventory of Rare and Endangered Vascular</u> Plants

The CNPS maintains a comprehensive database of rare and endangered plants. Although the society has no regulatory authority, its lists are generally consulted when preparing baseline conditions reports.

Porter-Cologne Water Quality Control Act

This act establishes Water Quality Control Boards in California responsible for overseeing water quality and preparing Water Quality Control Plans (Basin Plans) that establish beneficial uses of a water body, water quality standards, and actions to maintain the identified standards.

Local

Kern River Valley Specific Plan and Environmental Impact Report

The *Specific Plan* addresses approximately 110,510 acres in the northeastern portion of Kern County. Currently, the land use development in the Specific Plan Area is guided by the Kern County General Plan and the South Lake Specific Plan and the Kelso Valley Specific Plan. The county plans to implement the General Plan and to replace the specific plans with a single comprehensive planning document. This will integrate the policies and programs of the General Plan, the South Lake Specific Plan, and the Kelso Valley Specific Plan to provide a clear and unified vision and direction to guide future land use development within the Kern River Valley (Kern County 2011a, 2011b).

3.10.2 Affected Environment

Physical

Isabella Lake and much of the Kern River are in the foothills of Sequoia National Forest. Hydrologic features, such as natural springs, hot springs, tributaries of the Kern River, and the Kern River itself, dominate the surrounding landscape and support extensive areas of riparian and limnetic habitat, as well as some fringing wetland habitat, flanked by upland that is dominated by oak and pine woodlands or patches of sagebrush-scrub uplands. Urban, rural, and public lands also surround Isabella Lake. Climate in this region is generally Mediterranean, with cool wet winters and hot dry summers.

Vegetation

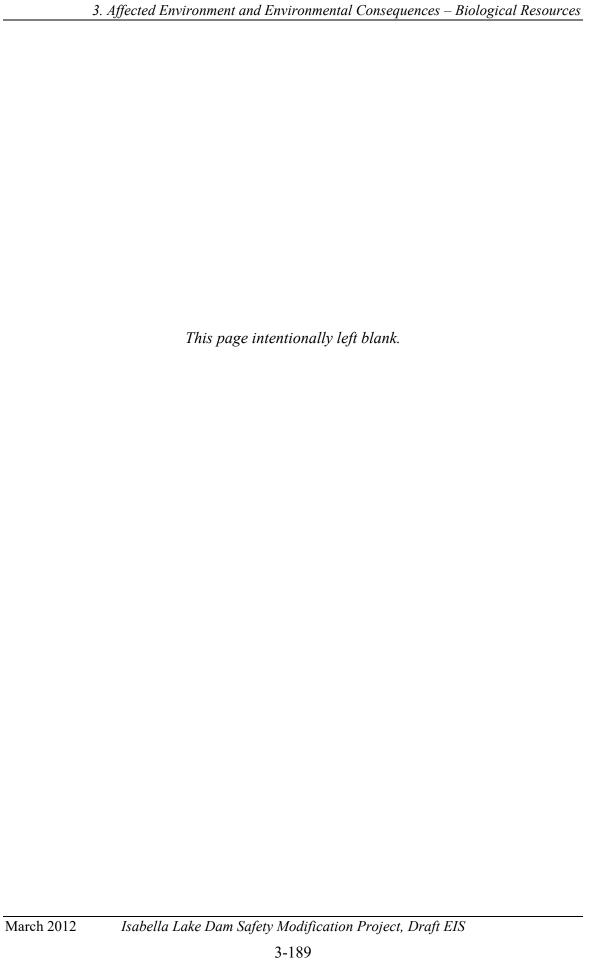
Isabella Lake is in the California Floristic Province (Hickman 1993), which is the largest and most significant geographic unit in California (Hickman 1993; see Smithsonian Institution 2010). Vegetation alliances in the proposed project area were classified according to Sawyer et al. (2009). This method was used to describe vegetation communities because this is the only system accepted by the California Department of Fish and Game's (CDFG) Vegetation Classification and Mapping Program (CDFG 2009). The Sawyer et al. (2009) classification system is hierarchical, with alliances representing the generic vegetation units. This system relies on diagnostic species which have similar composition and reflects subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes (CDFG 2009a). The primary purpose of this system is to assist in locating and determining the significance and abundance of vegetation types for tracking purposes in the California Natural Diversity Database (CNDDB) (CDFG 2010).

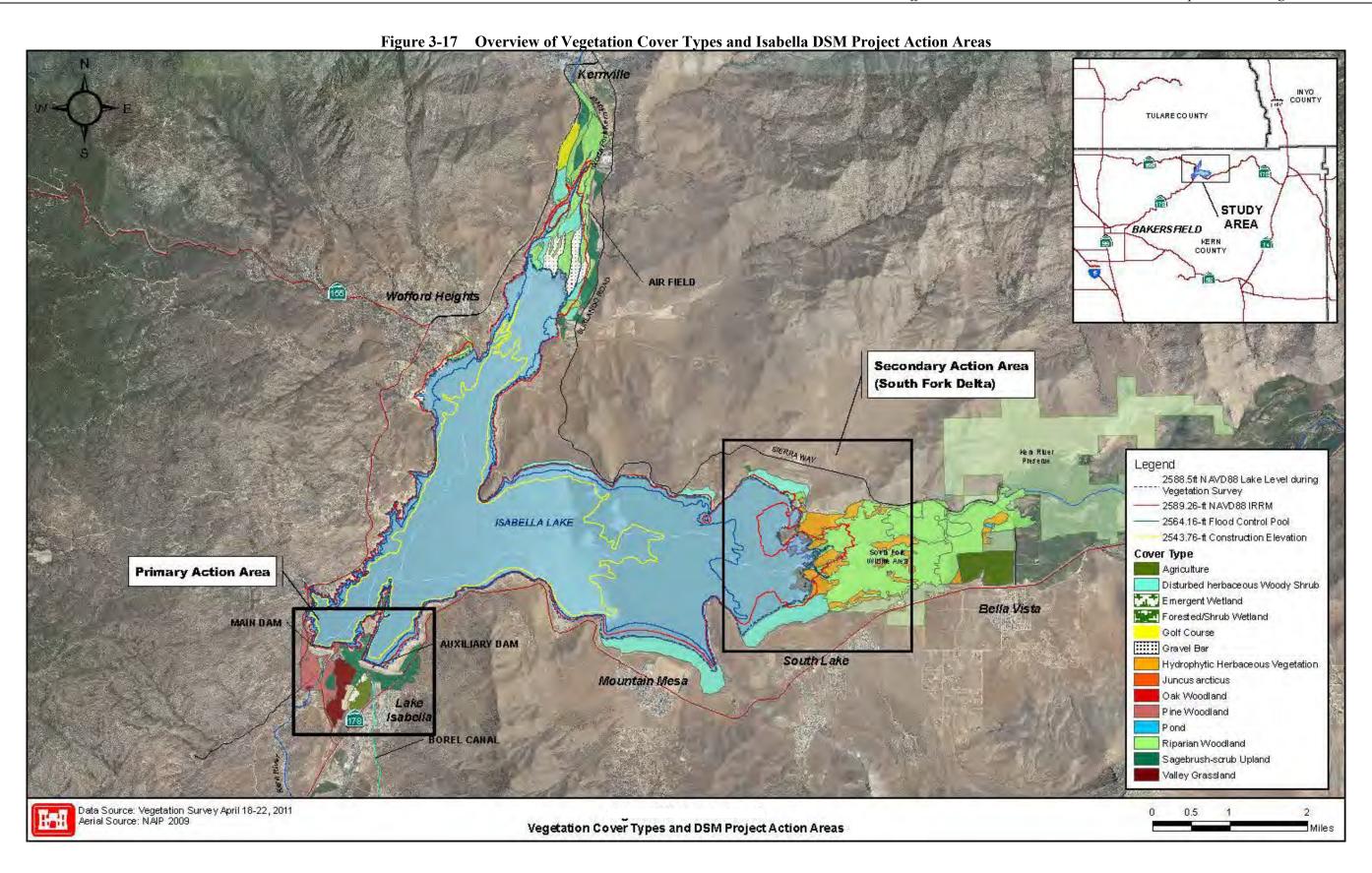
Vegetation alliances identified in the proposed project area include: Salix gooddingii, Populus fremontii and S. laevigata Woodland Alliances (collectively riparian woodlands), Quercus wislizeni Woodland Alliance (oak woodlands), Pinus sabiniana Woodland Alliance (pine woodlands), Ericameria nauseosa Shrubland Alliance (sagebrush-scrub upland) and Bromus rubens-Schismus (arabicus, barbatus) Semi-Natural Herbaceous Stands (valley grasslands). General cover types in the proposed project area are illustrated in Figures 3-17 to 3-19.

Numerous non-native and invasive plant species are also found in the project area.

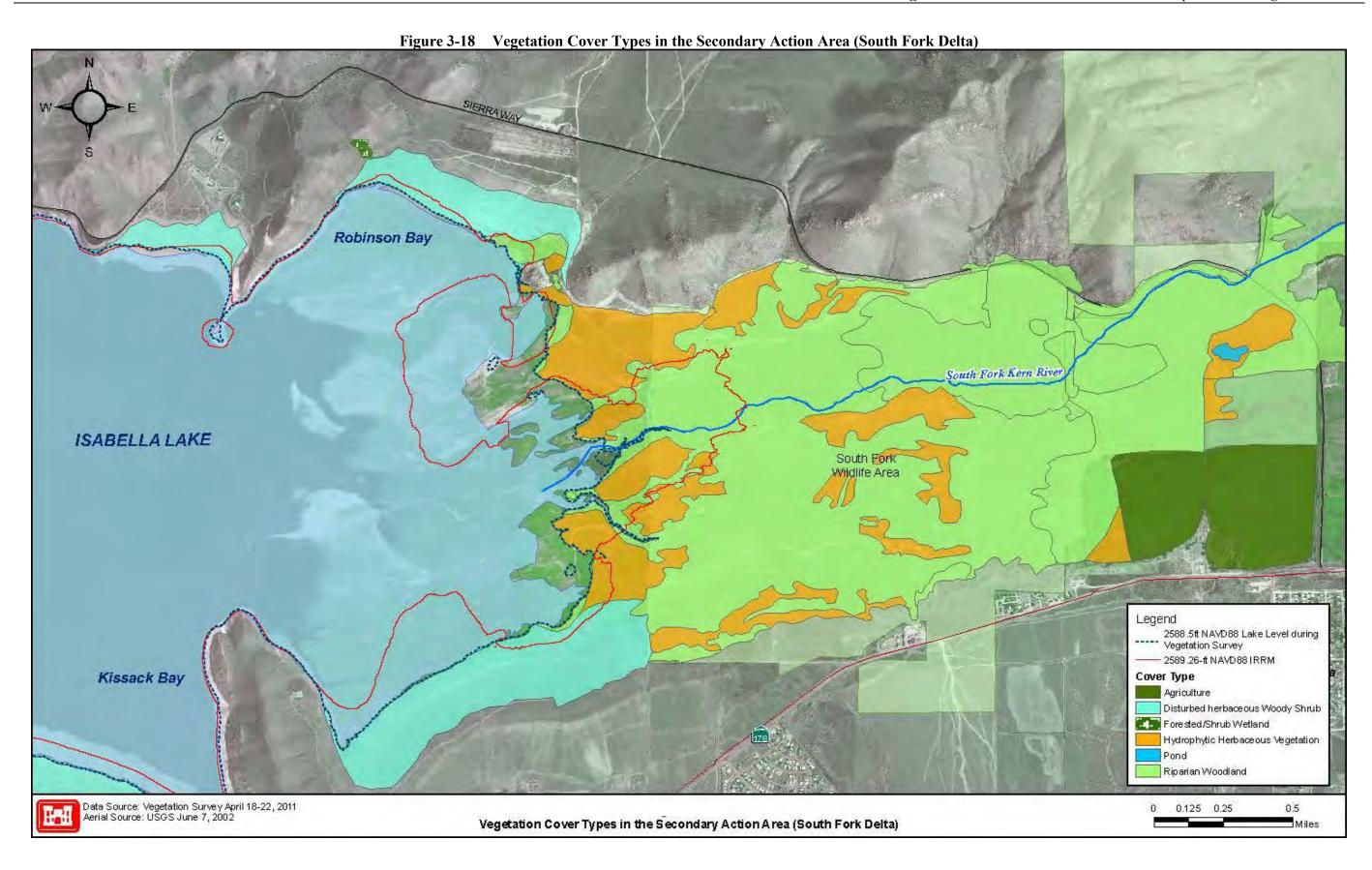
Riparian woodlands (Salix gooddingii, Populus fremontii, and S. laevigata Woodland Alliances)

Riparian woodlands are common in the proposed project area upstream of the limnetic zone of Isabella Lake along the North and South Fork Kern Rivers (Figure 3-17). The riparian woodland cover type is dominated by Goodding's willow (Salix gooddingii), Fremont cottonwood (Populus fremontii), and red willow (S. laevigata). Also common in some areas is Pacific willow (S. lasiandra), yellow willow (S. lutea), narrowleaf willow (S. exigua), shining willow (S. lucida ssp.), boxelder (Acer negundo), California buckeye (Aesculus californica), and white alder (Alnus rhombifolia) (Sawyer et al. 2009). Black elderberry (Sambucus nigra) is also found in this vegetation type. Tree canopy height can be up to 80 feet and is open to continuous (Sawyer et al. 2009). Common shrubs in the riparian woodlands include mule-fat (Baccharis salicifolia), coyote brush (B. pilularis), and redosier dogwood (Cornus sericea), which also form an open to continuous cover (Sawyer et al. 2009). The herbaceous layer is variable and is often dominated by primary colonizers such as rough cocklebur (Xanthium strumarium), stinging nettle (Urtica dioica), goosegrass (Elusine indica), common rush (Juncus effusus), common knotweed (Polygonum lapathifolium), common plantain (Plantago major), and cress (Cardamine sp.) (Sawyer et al. 2009).

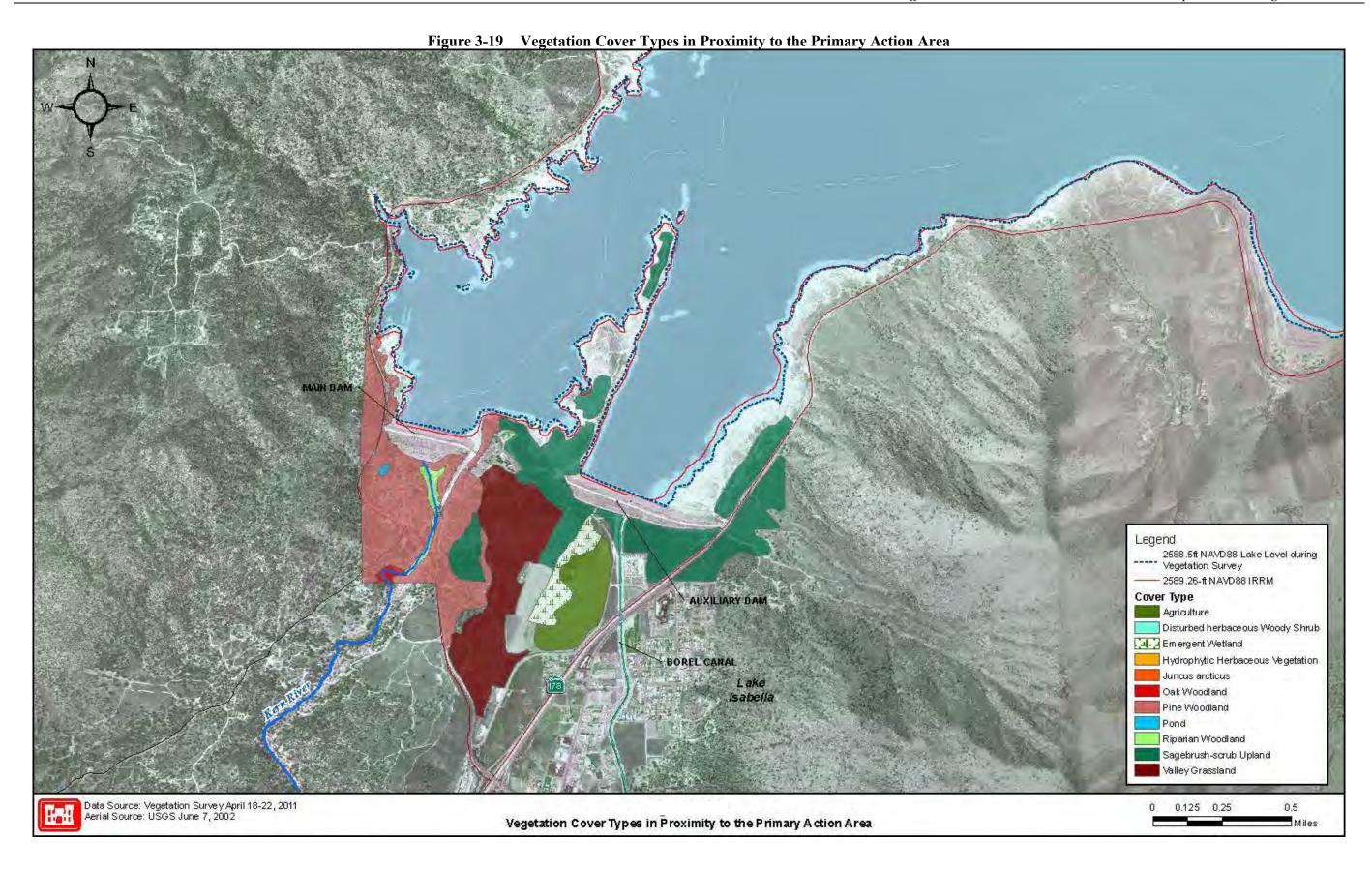


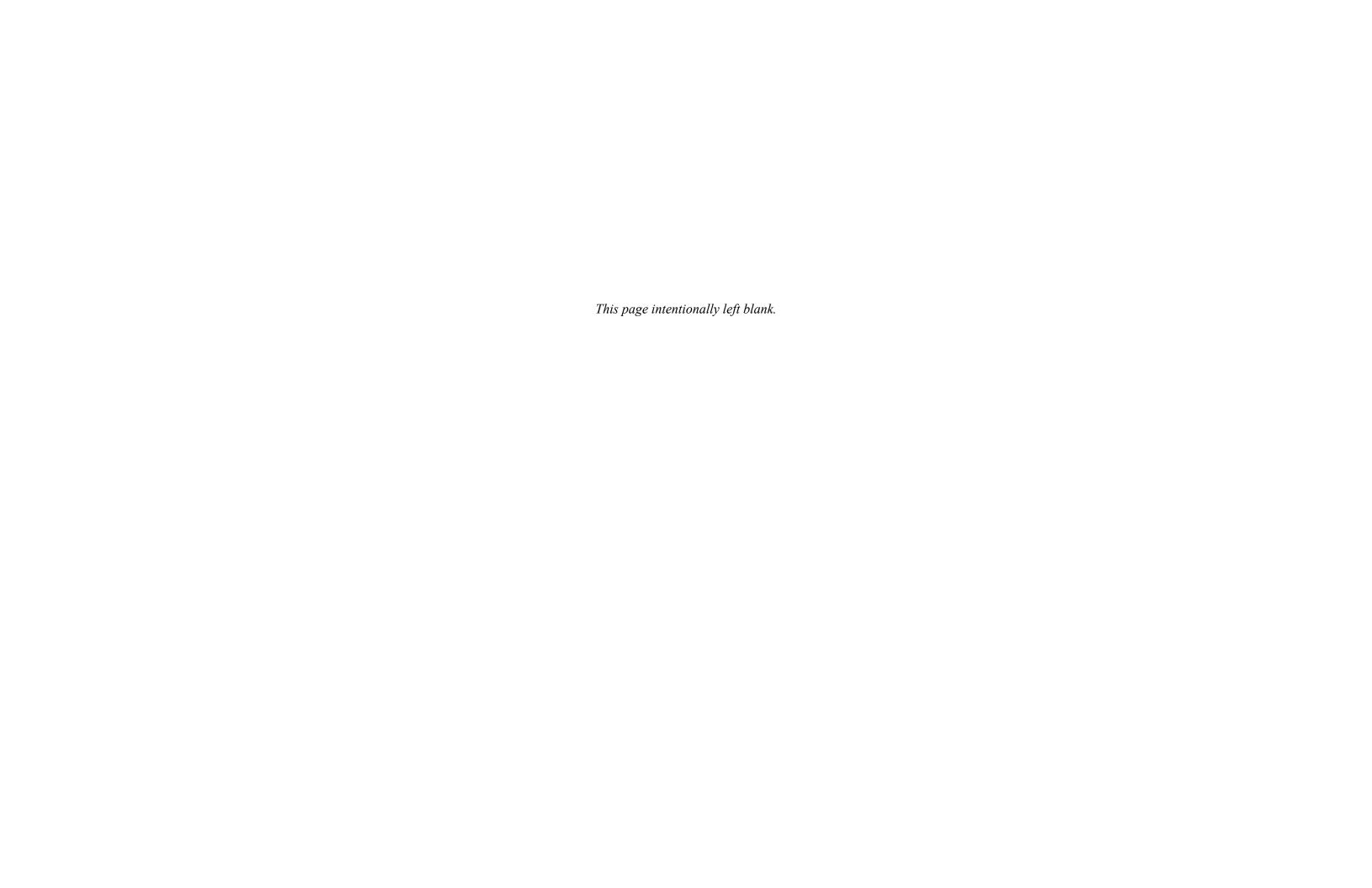












The broad floodplain along the South Fork Kern River gently slopes up from Isabella Lake, causing it to be frequently inundated, contributing to the regeneration of Goodding's willow and long-term maintenance of the riparian forest (Figure 3-18). These characteristics function to maintain diverse species composition and forest structure essential for Federally listed species, such as southwestern willow flycatchers (*Empidonax traillii extimus*) and least Bell's vireos (*Vireo bellii pusillus*) (Jones & Stokes 2003, 2004, 2006, 2008; Whitfield and Henneman 2009).

Oak Woodlands (Quercus wislizeni Woodland Alliance)

Oak woodland in the Primary Action Area is restricted to a thin patchy band on either side of the Kern River, downstream of the Main Dam and west of Hwy 155 (Figure 3-19). The oak woodland cover type is dominated in the tree canopy by interior live oak (*Quercus wislizeni*), California buckeye, gray pine (*Pinus sabiniana*), canyon live oak (*Quercus chrysolepis*), and blue oak (*Q. douglasii*) (Sawyer et al. 2009). The tree canopy of oak woodland is usually less than 65 feet high and forms either intermittent or continuous cover in canyons or basins, or in open areas, a savanna-like canopy (Sawyer et al. 2009). The shrub and herbaceous layers are open to intermittent and host a diversity of species common to grasslands or other upland plant communities, disturbed areas, or riparian buffers. This cover type occurs on upland slopes, valley bottoms, or on terraces with soils that are shallow and moderately to excessively drained (Sawyer et al. 2009).

Along the Kern River, clusters of interior live oaks grow, primarily with gray pine, immediately above the ordinary high-water elevation of the Lower Kern River. In this area, stream flows are buffered due to modulation by the Main Dam (Pope et al. 2004), and the presence of well-drained soils and steep stream banks that abruptly transition to upland conditions all likely contribute to this alliance becoming established so near the streambed.

Pine-Oak Woodland (Pinus sabiniana and Quercus wislizeni Woodland Alliances)

Pine-oak woodland dominates much of the upland area surrounding Isabella Lake; however, in the Primary Action Area, it is found only downstream of the Main Dam, specifically in the Main Dam Campground (see Figure 3-19). The pine-oak woodland cover type is dominated by gray pine with intermittent interior live oak, blue oak, canyon live oak, California buckeye, western juniper (Juniperus occidentalis), and Coulter pine (Pinus coulteri) (Sawyer et al. 2009). Tree canopy is typically less than 65 feet high and is open to intermittent and one to two tiered (Sawyer et al. 2009). Shrubs are common or infrequent and include a mix of such species as rubber rabbitbrush (Ericameria nauseosa), black mustard (Brassica nigra), California buckwheat (Eriogonum fasciculatum), Russian thistle (Salsola tragus), Mormon tea (Ephedra viridis), California scrub oak (Quercus berberidifolia), Datura sp., Cirsium spp., yerba santa (Eriodictyon trichocalyx), flatspine bur ragweed (Ambrosia acanthicarpa), chaparral yucca (Hesperoyucca whipplei), and common mullein (Verbascum thapsus). The herbaceous layer is sparse or grassy and hosts species such as Italian rye grass (Lolium multiflorum), foxtail chess (Bromus madritensis), and common fiddleneck (Amsinckia menziesii). Pineoak woodland is found on streamside terraces, valleys, slopes, and ridges where soils are shallow, often stony, infertile, moderately to excessively drained, and at elevations between 990 and 6,990 feet (Sawyer et al. 2009).

The patch of pine-oak woodland near the Main Dam has been partially altered by the establishment of the campground and the outlet facility for the Main Dam. Construction of dam infrastructure, access roads, campsites, parking areas, and a small constructed reservoir have all diminished the extent of native habitat in this area. Human disturbance has allowed for the introduction and establishment of various invasive plant species. Planting of ornamental species, mainly Aleppo pine (*Pinus halepensis*), has also reduced the quality of native habitat.

Sagebrush-scrub upland (Ericameria nauseosa Shrubland Alliance)

Sagebrush-scrub upland dominates much of the upland area surrounding Isabella Lake. In the Primary Action Area, it is found in upland areas near the Main and Auxiliary Dams (see Figure 3-19). The sagebrush-scrub upland cover type is dominated by rubber rabbitbrush with other species including big sagebrush (Artemisia tridentata), yellow rabbitbrush (Chrysothamnus viscidiflorus), Mormon tea, California buckwheat, western juniper, and antelope bitterbrush (*Purshia tridentata*); immature junipers or pine may also be present at low cover (Sawyer et al. 2009). The shrub canopy is typically less than 10 feet high and is open to continuous (Sawyer et al. 2009). The herbaceous layer is sparse or grassy and primarily includes annual grasses and herbs, such as Bromus spp., California poppy (Eschscholzia californica), longbeak stork's bill (Erodium boytrys), redstemmed filaree (E. cicutarium), perennial goldfields (Lasthenia californica), miniature lupine (Lupinus bicolor), slender oat (Avena barbata), wild oat (A. fatua), mustards (Brassica spp.), owl's-clover (Castilleja exserta), Italian rye grass, and yellow star-thistle (Centaurea solstitialis) (Sawyer and Keeler-Wolf 1995). Sagebrush-scrub upland is found in all topographic settings, especially in disturbed settings. Soils are well-drained sand and gravel at elevations ranging between 0 and 10,500 feet (Sawyer et al. 2009). Locally, stands are usually associated with broad intermittent watercourses, road cuts, and other clearings.

Many of the areas dominated by sagebrush-scrub species are frequently disturbed by vehicles and machinery.

<u>Valley Grasslands</u> (*Bromus rubens-Schismus (arabicus, barbatus*) Semi-Natural <u>Herbaceous Stands</u>)

Valley grasslands are restricted to a small ridgeline between and downstream of the Main and Auxiliary Dams (see Figure 3-19). The valley grassland cover type is dominated by red brome grass (*Bromus rubens*), Mediterranean grass (*Schismus barbatus*), and Arabian schismus (*Schismus arabicus*), along with other nonnative species growing in the herbaceous layer (Sawyer et al. 2009). Other common species include California poppy, longbeak stork's bill, red-stemmed filaree, perennial goldfields, miniature lupine, slender oat, wild oat, mustards, owl's-clover, Italian rye grass, and yellow star-thistle. Emergent shrubs may be present at low cover. Herbs in this stand are usually less than 2.5 feet tall, and cover is intermittent to continuous (Sawyer et al. 2009).

The ridgeline between the Main and Auxiliary Dams dominated by valley grasslands has been highly disturbed in the past by human activities, including cattle ranching and offroad vehicle use.

Wetlands and Other Waters of the U.S.

A preliminary delineation of wetlands and other waters of the U.S. was conducted in the project area by Tetra Tech biologists on April 19 to 22, 2011. Wetlands were described according to Cowardin et al. (1979). Within the Primary and Secondary Action Areas, riverine, freshwater emergent wetlands and freshwater forested/shrub wetlands were observed (Table 3-59); however, it should be noted that these acreages are estimates due to limited access (e.g., private property, flooding, etc.).

Table 3-59
Wetland Type and Preliminary Coverage Estimate within the Proposed Project

Area				
Type	Approximate Acres			
Emergent	18			
Forested/Shrub	1.8			
Forested/Shrub	1,360			
Emergent	337			
	Type Emergent Forested/Shrub Forested/Shrub			

Approximately 18 acres of emergent wetlands were observed below the Auxiliary Dam, just south of Barlow Road (see Figure 3-19). During the site visit, there was no access to the adjacent private property to the south, but wetland vegetation was observed in the area. Therefore, acreage estimates for this wetland are thus largely based on aerial photography and data from the National Wetland Inventory (NWI) (USFWS 2011). It should be noted that NWI was only used for descriptive purposes and not for the purpose of determining the actual extent of jurisdictional features. Wetland plant species observed included: *Juncus balticus* (an obligate [OBL] wetland species meaning there is more than a 99% probability the species will occur in a wetland) and *Rumex crispus* (a facultative wetland [FACW] species meaning there is between 67% and 99% probability the species will be occur in a wetland).

A mosaic of forested/shrub and emergent wetlands were observed in the South Fork Delta area, although much of the wetlands are east of the Secondary Action Area (Supplemental sand filter borrow area west of Patterson Lane and Rabbit Island). A 1.8 acre, spring-fed, forested wetland was observed on the western edge of Hanning Flat, located northwest of Rabbit Island. Dominant wetland species observed near Hanning Flat included: *J. balticus*, *Distichlis spicata* (FACW), *Salix laevigata* (FACW), *Scirpus americanus* (OBL), and *Polygonum lapathifolium* (OBL).

The North Fork and South Fork Kern Rivers are the dominant riverine systems in the project area. The North Fork Kern River has a fairly defined bed and bank, with sediment deposited bars and a developing riparian community (see Figure 3-17). Near the confluence with Isabella Lake, the North Fork Kern River is braided, with intermittent

freshwater emergent and forested/shrub wetlands. By contrast, much of the South Fork Kern River is highly braided, with a mosaic of forested/shrub and freshwater emergent wetlands, particularly at the confluence with Isabella Lake (see Figure 3-17; Table 3-18). Dominant wetland plant species in the South Fork area included: *Salix gooddingii* (OBL), *J. balticus*, *Urtica dioica* (FACW), *Eleocharis macrostachya* (OBL).

The lower Kern River is located downstream of the Main Dam where water is released directly into the natural stream channel and through the Isabella Partners Hydroelectric Project facility. The lower Kern River is characterized by a defined bed and bank without associated riparian wetlands. The Auxiliary Dam releases water directly into the Borel Canal or through seepage that is collected in a drain ditch, where it flows to a sump and is pumped into the Borel Canal.

Isabella Lake is the dominant lacustrine system in the project area. Isabella Lake is operated as a multipurpose reservoir for flood control, downstream water users, and recreation. As previously mentioned, the maximum conservation storage level is 2,609.26 feet (Corps 2008a); however, the lake is maintained at or below 2,589.26 feet as an IRRM.

Other freshwater emergent wetlands within the ordinary high water mark (OHWM) of Isabella Lake were observed in the vicinity of Wofford Heights and another south of the golf course west of the North Fork Kern River; however these wetlands are not in the Isabella DSM Project Action Areas.

Three freshwater ponds were identified in proximity to the project area: a previously mentioned seepage collection channel below the Auxiliary Dam, an oxidation pond below the Main Dam, and Prince Pond east of the South Fork Wildlife Area.

Non-native and Invasive Vegetation

Numerous non-native and/or nuisance plants are found in the vicinity of Isabella Lake (Table 3-60). No invasive plants found in the project area are listed on the Federal Noxious Weed List (USDA 2006); however, some are listed by California Department of Food and Agriculture's (CDFA) Pest Ratings of Noxious Weed Species and Noxious Weed Seed (CDFA 2010). These include common Russian thistle (Salsola tragus), perennial pepperweed (Lepidium latifolium), purple loosestrife (Lythrum salicari), and tree-of-heaven (Ailanthus altissima).

Of particular concern for the proposed Isabella DSM Project is the potential for nonnative or invasive plant species to be transported from one location to another during construction.

Table 3-60
Non-native or Nuisance Plant Species in or near the Proposed Project Area

Common Name	Species	CDFA List ¹
Bermuda grass	Cynodon dactylon L.	NA
black mustard	Brassica nigra	NA
brass buttons	Cortula coronopifolia L.	NA
broadleaf birdsfoot trefoil	Lotus corniculatus	NA
Cheatgrass	Bromus tectorum	NA
common Russian thistle	Salsola tragus L.	С
curly dock	Rumex crispus L.	NA
flix weed/tansy mustard	Descurainia sophia	NA
floating primrose willow	Ludwigia peploides	NA
Kentucky bluegrass	Poa pratensis L.	NA
perennial pepperweed	Lepidium latifolium	В
prickly sow thistle	Sonchus asper	NA
prickly wild rose	Rosa acicularis	NA
purple loosestrife	Lythrum salicaria	В
red brome	Bromus rubens L.	NA
redstem filaree	Erodium cicatarium	NA
rough cocklebur	Xanthium strumarium	NA
Russian olive	Elaeagnus angustifolia L.	NA
spotted knapweed	Centaurea stoebe	NA
tree-of-heaven	Ailanthus altissima	С
wild oat	Avena fatua	NA

¹ CDFA 2010

Wildlife

The diversity of habitats around Isabella Lake attracts a variety of wildlife species, including many residents and abundant migrants. The extensive riparian areas found in the deltas of the North and South Fork Kern Rivers are the most substantial habitat for wildlife found in the vicinity of Isabella Lake. These areas host expanses of mature riparian woodland growing in braided stream channels, pools, and wetlands. In particular, the South Fork Wildlife Area has been identified as one of the largest intact patches of riparian habitat remaining in California. It is estimated that over 300 species of birds use this area, with most being neotropical migrants that nest and forage during summer and overwinter in Central and South America (Audubon 2011).

Common birds include passerines such as flycatchers, warblers, kinglets, chickadees, thrushes, jays, blackbirds, sparrows, finches, towhees, wrens, nuthatches, and swallows. Other common birds are hummingbirds, woodpeckers, water birds, waders, and various raptors such as owls, buteos, and smaller accipiters (Audubon 2011). Wildlife species common in this area include mammals such as foxes, coyote, bobcat, striped skunk, spotted skunk, raccoon, Virginia opossum, bats, and woodrats. Reptiles and amphibians that are relatively common include the Pacific chorus frog, western toad, bullfrog, and

A list (noxious weed)

B list (noxious weed)

C list (noxious weed)

valley garter snake (Audubon 2011). Many invertebrates are also common in this area and provide the dietary basis for the high densities seen in some wildlife species.

Much of the upland habitat around Isabella Lake hosts species adapted to arid environments. Common reptiles include side-blotched lizard, southern alligator lizard, western fence lizard, California kingsnake, Pacific gopher snake, and Northern Pacific rattlesnake (Audubon 2011). Common upland bird species include California quail, scrub jay, goldfinches, wrentit, and acorn woodpecker. Mammals that are expected to be in the area include pocket gophers, mice, tree and ground squirrels, mule deer, mountain lion, and a diversity of bats. Isabella Lake and the Kern River host a variety of waterfowl, including migratory and resident waterfowl such as American coot, grebes, cormorants, gulls, and waders (Audubon 2011).

Fish

The open water of Isabella Lake and the Kern River hosts a variety of aquatic species, including native fishes (e.g. Sacramento pikeminnow, hardhead, Sacramento sucker, Kern River rainbow trout), and introduced fishes (e.g. smallmouth bass, rainbow trout, redear sunfish, spotted bass, crappie, bluegill, brown bullhead, brown trout) (Table 3-61).

Table 3-61
Fish Species of Isabella Lake and Vicinity

Common Name	Species	Status
black crappie	Pomoxis nigromaculatus	Introduced
bluegill	Lepomis macrochirus	Introduced
brown bullhead	Ameiurus nebulosus	Introduced
brown trout	Salmo trutta	Introduced
carp	Cyprinus carpio	Introduced
channel catfish	Ictalurus punctatus	Introduced
Chinook salmon	Oncorhynchus tshawytscha	Introduced
coho salmon	Oncorhynchus kisutch	Introduced
fathead minnow	Pimephales promelas	Introduced
golden shiner	Notemigonus crysoleucas	Introduced
goldfish	Carassius auratus	Introduced
green sunfish	Lepomis cyanellus	Introduced
hardhead	Mylopharodon conocephalus	Native
Kern River rainbow trout ¹	Oncorhynchus mykiss gilberti	Native
kokanee salmon	Oncorhynchus nerka	Introduced
largemouth bass	Micropterus salmoides	Introduced
Little Kern golden trout	Oncorhynchus mykiss whitei	Native
mosquitofish	Gambusia affinis	Introduced
rainbow trout ²	Oncorhynchus mykiss	Introduced
redear sunfish	Lepomis microlophus	Introduced
Sacramento pike minnow	Ptychocheilus grandis	Native
Sacramento hitch	Lavinia exilicauda	Native
Sacramento sucker	Catostomus occidentalis	Native
San Joaquin roach	Lavinia symmetricus	Native
smallmouth bass	Micropterus dolomieui	Introduced
spotted bass	Micropterus punctulatus	Introduced

Common Name	Species	Status
threadfin shad	Dorosoma petenense	Introduced
white catfish	Ictalurus catus	Introduced
white crappie	Pomoxis annularis	Introduced

Sources: CDFG et al. 1999, SCE 1991a.

Isabella Lake has been managed as both a coldwater and warmwater fishery since the 1950s, (CDFG et al. 1999). Introductions of coldwater fish include domesticated rainbow trout that began in 1927 with the establishment of the Kern River Fish Hatchery. The native rainbow trout population of Isabella Lake has been supplemented with several strains of rainbow trout in an effort to develop a self-perpetuating population adapted to conditions in the lake and Kern River above the lake. Since 1969 California Department of Fish and Game (CDFG) has stocked catchable-size rainbow trout when water temperatures are cooler - during the winter and spring months (CDFG et al. 1999).

The optimal temperature range for adult rainbow trout is about 9 to 17°C (48.2 to 62.6°F) with an upper limit of 28 to 29°C (82.4 to 84.2°F) (Lee and Rinne 1980; McCauley et al. 1977; Molony 2001). Chinook salmon have also been introduced to Isabella Lake and, while they grow well in the lake, they are not successful spawners in the Kern River thus their population is not self-sustaining (CDFG et al. 1999).

Numerous warmwater fish species have also been introduced to Isabella Lake since the 1950s - specifically, sport fish such as largemouth bass, black crappie, white crappie, and white catfish (see Table 3-61). Similarly, various forage fish have been introduced including golden shiners and fathead minnows; bluegill were introduced as both a forage food and sport fish. Later introductions included threadfin shad to compensate for declines in the crappie populations observed in the 1960s. The hardy and long-lived Florida strain largemouth bass, smallmouth bass, and spotted bass were introduced in the 1970s; however, smallmouth are now only observed in the Kern River above the lake and spotted bass have not been appreciably successful (CDFG et al. 1999). Carp were likely illegally introduced for live bait and have successfully established in Isabella Lake. Adult largemouth bass have an optimum temperature range of 25 to 30°C (77 to 86°F) and an upper limit of 36°C (96.8°F) (summarized in Jobling 1981).

The warmwater fish species are self-sustaining in Isabella Lake; however, increased temperatures, low pH and low dissolved oxygen negatively impacts cold freshwater habitat beneficial uses such that continuous stocking of rainbow trout is required. CDFG maintains a hatchery facility along the North Fork Kern River. Rainbow trout are stocked by CDFG according to the following criteria:

"Catchable trout shall not be stocked in streams when water temperatures reach 75°F and it appears that such temperatures will continue to occur regularly, or when stream flows drop below 10 cfs. The exception is that suitable streams with flows between 2 and 10 cfs may be planted if water

¹ Likely extirpated from Isabella Lake

² Hatchery-reared stock

temperatures do not exceed 70°F and other conditions are satisfactory. Stocking shall be discontinued if conditions are unsuitable because of shallow water, lack of pools, growth of algae, poor water quality, or other reasons

Catchable trout shall not be stocked in lakes or reservoirs after surface water temperatures reach 78°F and it appears that such temperatures will continue to occur regularly, nor after a trout die-off is attributed in whole or in part to an oxygen deficiency. Stocking shall be discontinued if algae blooms, aquatic weed growth, high turbidity, high alkalinity, or other conditions render the lake unsuitable for catchable trout or for fishing.

Catchable trout shall not be stocked in lakes or reservoirs until water temperatures reach 42°F or higher most afternoons, or in streams until water temperatures reach 45°F or higher most afternoons. Catchable trout stocking may be suspended in reservoirs during periods of spill in order to avoid losses of planted fish to downstream areas where the trout may not be readily available to anglers" (CDFG 2011).

Natural fish habitat in Isabella Lake is extremely limited. This is largely attributed to 1) the extreme changes in water level in Isabella Lake that results in little recruitment of large wood from riparian corridors or establishment of submersed aquatic vegetation and 2) the basin morphology is quite flat with soils that are typically alluvium derived sand and silt (USDA-NRCS 2010). Nest-building spawners such as largemouth bass and bluegill prefer sand and gravel substrates; however, known areas with appropriate nest building materials are limited to Hanning Flat, Brown's Cove, Kissack Cove, near the South Fork boat launch, French Gulch, Boulder Gulch north to Orick Cove, and the western side of the North Fork Kern River confluence with the lake (CDFG et al. 1999). Various habitat improvements and artificial structures have been added to Isabella Lake including cages of various designs and materials and wood structure such as planted willows and anchored Christmas trees (CDFG et al. 1999).

Threatened, Endangered, and Other Special Status Species

The special status species addressed in this Draft EIS include the following:

- Those species considered endangered, threatened, or of special concern by the USFWS.
- Those considered sensitive by the USFS.
- Those considered threatened, endangered, or fully protected by CDFG.
- Those considered threatened by the California Native Plant Society (CNPS).

Federal (USFWS and USFS) and State (CDFG) special status plant and animal species are legally protected according to provisions and codes previously identified in Section 3.12.1 Regulatory Setting. Overall, there are 45 special status species (USFWS, USFS,

CDFG, and CNPS) with the potential (low, medium, or high) to occur in or near the proposed Isabella DSM Project area (Tables 3-62, 3-63, and 3-64).

The USFWS (2011) identified 29 special status invertebrate, fish, amphibian, reptile, bird, mammal and plant species within Kern County and the following U.S. Geologic Survey (USGS) Quads: Breckenridge Mtn (238A), Mt. Adelaide (238B), Rio Bravo Ranch (239A), Oil Center (239B), Stevens (240C), Tupman (241D), Walker Pass (259A), Onyx (259B), Cane Canyon (259C), Weldon (260A), Lake Isabella North (260B), Lake Isabella South (260C), Woostalf Creek (260D), Alta Sierra (261A), Glennville (261B), and Democrat Hot Springs (261C) (Appendix E). Of the 29 USFWS (2011) special status species, those with "low" potential for occurrence were excluded from further evaluation in this Draft EIS. This exclusion was done in consultation with the USFWS (Biological Resources Meeting 7/19/2011; notes available in the Administrative Record). In general, species were excluded because sufficient suitable habitat (e.g., habitat for breeding rearing, cover, food, water, and protection from disturbance) is not available and/or the species is not known to occur in or near the Proposed Action areas (Corps 2012).

The USFS Sequoia National Forest lists five plant species and nine animal species as sensitive (USFS 2007a). CNPS lists level 1, 2, and 3 Threat Rank plants near Isabella Lake. CDFG lists two rare and five endangered plant species and six threatened, four endangered, and one fully protected animal species.

Life history characteristics of species with a "high" potential for occurring in the action areas of the Isabella DSM Project are further discussed following Table 3-62 through Table 3-64. Information on the plant and animal species with a high potential to occur in or near the Isabella DSM Project Action Areas was gathered from a variety of sources including: CNDDB (2011), Corps (2010a), CDFG (2011b), USFWS (2010), and USFWS (2011i). Aside from recent surveys conducted for other studies (e.g. *Barlow Road Geotechnical Investigations, Final Environmental Assessment for the Planned Deviation from the Water Control Plan*, and compliance reports for the *Valley Elderberry Longhorn Beetle [VELB] Management Plan*), additional targeted field surveys have not yet been conducted within the Isabella DSM Project Action Areas.

Those species identified in Table 3-62 that have a high probability of occurring in the project action Areas are briefly described in the following paragraphs.

Alkali mariposa lily

Alkali mariposa lily (Calochortus striatus) is listed as USFS sensitive. Alkali mariposa lily is a small perennial herb that arises from an underground bulb and flowers in the spring, roughly from April to June. It occurs in elevations 2,000 to 3,700 feet and prefers springs and wet alkaline meadows. The plant is considered a facultative wetland (FACW) species according to USFWS (1993a). FACW plant species usually occur in wetlands (estimated probability 67% to 99%), but occasionally are found in non-wetlands.

Table 3-62 Special Status Plant Species Known to Occur in or near the Project Area

Common Name	Species -				Potential to Occur in	Justification
Common Name Species	Species	Federal ^{1/2}	CDFG ³	CNPS ⁴	Action Areas	Justineation
Alkali mariposa lily	Calochortus striatus	None/S	None	1B.2	High	Suitable habitat near the action areas; occurs within one mile of action areas
Bakersfield cactus	Opuntia treleasei	FE/S	SE	1B.1	Low	Suitable habitat not found within the action areas
Bakersfield smallscale	Atriplex tularensis	None	SE	1B.1	Low	Habitat absent in action area; requires low elevation (91-96m) subalkaline margins of alkali sinks
California jewel- flower	Caulanthus californicus	FE/S	SE	1B.1	Low	Habitat absent in action area; requires undisturbed low elevation, open subalkaline or sandy loam basins
Keck's checkerbloom	Sidalcea keckii	FE	None	1B.1	Low	Habitat absent in action area; requires relatively open areas on grassy slopes with serpentine soils; poor competitor
Kern mallow	Eremalche kernensis	FE	None	1B.1	Low	Habitat absent in action area; grows under and around <i>Atriplex</i> spp. and in patches with other herbaceous cover but with shrub cover less than 25% and variable herbaceous cover; soils are alkaline, sandy loam, or clay.
Mojave tarplant	Deinandra mohavensis	None	SE	1B.3	Low	Suitable habitat not found within the action areas
Red rock tarplant	Deinandra arida (=Hemizonia arida)	None	Rare	1B.2	Low	Habitat absent in action area; requires clay soil of washes with creosote bush scrub at moderate elevations; only known from Red Rock Canyon
San Joaquin adobe sunburst	Pseudobahia peirsonii	FT/S	SE	1B.1	Low	Suitable habitat (heavy clay adobe soils) not present in the project area; elevation range (0 to 1,000 ft.) well below that of the project area
San Joaquin woollythreads	Monolopia congdonii (=Lembertia congdonii)	FE	None	1B.2	Low	Historically occurred in the San Joaquin Valley; nearest populations near Bakersfield

Common Name	Species		Status		Potential to Occur in Action Areas	Justification
Striped adobe lily	Fritillaria striata	None/S	ST	1B.1	Low	Suitable habitat (open areas in grassland and blue oak woodland, pockets or islands of heavy adobe clay) not found within the action areas
Twisselmann's nemacladus	Nemacladus twisselmannii	None	Rare	1B.2	Low	Habitat absent in action area; grows among high-elevation granite in the southern Sierra Nevada

FT = Federal threatened

FE = Federal endangered

FC = Federal candidate

S = USFS sensitive

SE = State endangered

ST = State threatened

Table 3-63 Special Status Plant Species CNPS Threat Ranking

1	
Rank	Description
CNPS Threat Rank 0.1	Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat).
CNPS Threat Rank 0.2	Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).
CNPS Threat Rank 0.3	Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known).

¹USFWS URL: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=06029. Accessed 27 October 2010. ²USDA Forest Service. 2011. Regional Foresters Sensitive Plant List, dated 2006. Pacific Southwest Region. Received January 12, 2011.

³ CNDDB 2010. URL: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp. Accessed October 27, 2010

⁴ CNPS URL: http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi. Accessed October 27, 2010

Table 3-64 Special Status Animal Species that may occur in or near the Project Area

	_	Sta	tus	Potential to	
Common Name	Species	Federal ^{1/2}	CDFG ³	Occur in Action Areas	Justification
		Inve	rtebrates		
Conservancy fairy shrimp	Branchinecta conservatio	FE	None	Low	Suitable habitat not found within the action areas
Longhorn fairy shrimp	Branchinecta longiantenna	FE	None	Low	Suitable habitat not found within the action areas
Vernal pool fairy shrimp	Branchinecta lynchi	FT	None	Low	Suitable habitat (vernal pools) not found within the action areas
Kern primrose sphinx moth	Euproserpinus euterpe	FT	None	Low	Limited or no habitat present in action area; requires desert scrub, particularly in and around washes, where its host plant (an evening primrose) grows
Valley elderberry longhorn beetle	Desmocerus californicus dimorphus	FT	None	High	Host plant known to occur within the Isabella DSM Project Action Areas
			Fish		
Delta smelt	Hypomesus transpacificus	FT	SE	Low	No suitable habitat (freshwater-saltwater mixing zones) in the Action Areas
Hardhead	Mylopharodon conocephalus	S	None	High	Species observed in the Isabella DSM Project Action Areas
Volcano Creek (=California) golden trout	Oncorhynchus. mykiss aguabonita	S	None	Medium	Observed in drainages of the Kern River in the vicinity of Bald Mountain, upstream of Isabella Lake

		Sta	tus	Potential to		
Common Name	Species	Federal ^{1/2}	CDFG ³	Occur in Action Areas	Justification	
		Am	phibians			
California red-legged frog	Rana draytonii	FT	None	Low	Isabella DMS Project Action Areas are outside current species distributional range	
California tiger salamander	Ambystoma californiense	FT	None	Low	Habitat absent in action area; requires annual grassland and grassy understory of valley-foothill hardwoods; breeds in vernal pools and some human-made ponds w/o fish, <1,000 feet in elevation	
Foothill yellow-legged frog	Rana boylii	S	None	Medium	Suitable habitat (low gradient streams) and reported population (CNDDB) north of Wofford Heights; no known populations or suitable habitat in the vicinity of the action areas	
Kern Canyon slender salamander	Batrachoseps simatus	None	ST	Medium	Limited to lower Kern River Canyon which has not been identified as occurring in the action area	
Mountain yellow-legged frog	Rana muscosa	FC/S	None	Low	Suitable habitat not found within the action areas; nearest CNDDB reported population in the Taylor Creek drainage of the South Fork Kern River outside the action areas	
Tehachapi slender salamander	Batrachoseps stebbinsi	None	ST	Low	Limited to the Caliente Creek drainage and Piute Mountains; neither of these areas fall within the action area	
		R	eptiles			
Blunt-nosed leopard lizard	Gambelia (=Crotaphytus) sila	Е	SE	Low	Not in action area; found in open grassland of the valley floor below 1,000' elevation	

	_	Sta	tus	Potential to		
Common Name	Species	Federal ^{1/2}	CDFG ³	Occur in Action Areas	Justification	
California legless lizard	Anniella pulchra	S	None	Medium	CNDDB indicates two populations, one in Orchard quad in SW Kern County and other in Gosford quad west of Bakersfield	
Giant garter snake	Thamnophis couchi gigas	FT	ST	Low	Endemic to wetlands in the Sacramento and San Joaquin Valleys; historic range limited to Bakersfield area; suitable habitat (low gradient streams and wetlands) present in the project area, but not known to historically or currently occur	
Southwestern pond turtle	Clemmys marmorata pallida	S	None	High	Species known to occur upstream (Kern R. to Cannell Creek in Tulare Co. and downstream of Lake Isabella; potential habitat in SFWA	
]	Birds			
Bald eagle	Haliaeetus leucocephalus	D, S	SE	High	Common winter resident to Isabella Lake	
Bank swallow	Riparia riparia	None	ST	Low	Habitat not present in action area; require eroding mud banks they can excavate into for nesting and roost sites	
California condor	Gymnogyps californianus	FE	SFP	Low	Isabella DSM Project Action Areas do not contain suitable roosting habitat and does not overlap with designated Critical Habitat	
Least Bell's vireo	Vireo bellii pusillus	FE	SE	High	Species observed in the Isabella DSM Project Action Areas	
Southwestern willow flycatcher	Empidonax traillii extimus	FE	SE	High	Species observed in the Isabella DSM Project Action Areas	
Swainson's hawk	Buteo swainsoni	None	ST	Low	Habitat not present in action area; require open grassland with moderately tall trees or structures for nesting and hunting	
Western snowy plover	Charadrius alexandrinus nivosus	FT	None	High	Species observed in the Isabella DSM Project Action Areas	

	_	Sta	tus	Potential to		
Common Name	Species	Federal ^{1/2}	CDFG ³	Occur in Action Areas	Justification	
Western yellow-billed cuckoo	Coccyzus americanus occidentalis	FC/S	SE	High	Species observed in the Isabella DSM Project Action Areas	
		Ma	nmals			
Buena Vista Lake shrew	Sorex ornatus relictus	FE	None	Low	Habitat not present in action area; only known from marshes in the San Joaquin Valley	
Fisher	Martes pennanti	FC	SCT	Low	Habitat not present in action area; found in mature coniferous and mixed conifer and hardwood forests	
Giant kangaroo rat	Dipodomys ingens	FE	SE	Low	Habitat not present in action area; inhabit undisturbed grassland and shrub communities on a variety of soils at elevations up to 2,850 feet	
Pallid bat	Antrozous pallidus	S	None	High	Species known to occur near the Isabella DSM Project Action Areas	
San Joaquin kit fox	Vulpes macrotis mutica	FE	ST	Low	Not present in the project area Nearest historic distribution included San Joaquin Valley in southern Kern County; suitable habitat (grasslands and shrublands)	
Sierra Nevada big horn sheep	Ovis canadensis californiana	FE	SE	Low	Not present in the action area; inhabit portions of eastern Sierra Nevada at elevations between 1,460 m and 4,300 m	
Tipton kangaroo rat	Dipodomys nitratoides nitratoides	FE	SE	Low	Not present in the action area; limited to arid-land communities occupying the Tulare Basin Valley floor in level or nearly level terrain	

¹ USFWS, URL: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=06029. Accessed 27 October 2010. ² USDA Forest Service. 2011. Regional Foresters Sensitive Animal List (Sequoia National Forest), dated 2007. Pacific Southwest Region. Received January 12, 2011. ³ CNDDB 2010. URL: http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp. Accessed October 27, 2010.

D = Federal delisted

FT = Federal threatened

FE = Federal endangered

FC = Federal candidate

FP = Federal proposed

S = USFS sensitive

SE = State endangered

SCT = State candidate threatened

SFP = State fully protected

ST = State threatened

There are no USFWS NWI mapped wetlands near the Main Dam or campground; however, USFWS NWI forested/shrub and emergent wetlands are identified in the vicinity of the Kern Valley Airport (USFWS 2010a) where the CNDBB (2010) also indicates an occurrence of alkali mariposa lily. Also, CNDDB (2010) indicates an occurrence of the alkali mariposa lily within a mile of the main dam and spillway.

Bald eagle

Although the bald eagle (*Haliaeetus leucocephalus*) was federally delisted as threatened in 2007, it has been listed as state endangered since 1980 and is USFS sensitive. The bald eagle inhabits forested areas near large bodies of water, nesting in large, old growth, or dominant live trees with open branches (e.g., ponderosa pine). During the winter, they can be found in coastal areas along large rivers and large unfrozen lakes. They can be found from Alaska throughout Canada and in scattered localities in nearly all of the lower 48 states of the United States. There are no occurrences of bald eagles near Isabella Lake recorded in the CNDDB (2010); however, Audubon - California birders commonly see them around Isabella Lake during winter, in and near the Kern River Preserve (Audubon - California 2010).

Least Bell's vireo

Least Bell's vireo (*Vireo bellii pusillus*) was listed as federally endangered May 2, 1986 (Federal Register 51(85): 16474-16481) and as State endangered October 10, 1980. The least Bell's vireo is a migratory songbird that depends on riparian habitat for breeding. The least Bell's vireo inhabits dense, low, shrubby vegetation, generally early successional stages in riparian areas, brushy fields, young second-growth forest or woodland, scrub oak, coastal chaparral, and mesquite brushland, often near water in arid regions below 2,000 feet.

The historic range of the least Bell's vireo included western Kern and Tulare counties, including the proposed project area. There are areas of mature riparian willows and other shrubby vegetation along the Kern River corridor; however, much of this area lacks substantial understory vegetation and is therefore less suitable for nesting than more early and mid-successional riparian stands where dense understory vegetation is present (Douglas 2008). Least Bell's vireo is endangered primarily from loss of riparian habitat and cowbird parasitism, and populations continue to decline throughout its range.

Surveys for least Bell's vireos have been conducted along the South Fork Kern River since 1997 to determine its current status in the Kern River Valley (Douglas 2008). Although only one male has been observed (July 9, 2002), from 1992 through 1997, at least eight other individuals have been reported to have moved through the Kern River Valley (Douglas 2008). The CNDDB (2011) documents one occurrence in southwestern Kern County along the San Emigdio River.

There is no critical habitat designation for the least Bell's vireo within the proposed Isabella DSM Project area (Federal Register 59(22): 4845-4867).

Southwestern willow flycatcher

Southwestern willow flycatcher (*Empidonax traillii extimus*) was listed as Federal endangered February 27, 1995 (Federal Register 60: 10693). The geographic area occupied by the southwestern willow flycatcher is widespread as a result of its behavior, breeding range, known migration, and dispersal habits (USFWS 2005). The southwestern willow flycatcher, a neotropical migrant, travels annually through diverse migratory habitats from its wintering grounds in Central and South America to its breeding grounds in the United States. The riparian habitat it uses for breeding, foraging, migrating, dispersing, and shelter is dynamic in quality, growth, and location due to its proximity to water and susceptibility to disturbance by flooding (USFWS 2002c; Koronkiewicz et al. 2004; Cardinal and Paxton 2005).

Southwestern willow flycatchers are a riparian obligate species that have specific habitat requirements, typically dominated by willows (Salix spp.) and alders (Alnus spp.), and permanent water often in the form of low-gradient watercourses, ponds, lakes, wet meadows, marshes, and seeps in and next to forested landscapes (Sogge et al. 1997; Craig and Williams 1998; USFWS 2005). In general, southwestern willow flycatchers inhabit monotypic high-elevation willow forests, monotypic exotic stands of saltcedar (Tamarix spp.) or Russian olive (*Elaeagnus* spp.), native broadleaf deciduous forests, and mixed native/exotic forests (Sogge et al. 1997). The dynamic habitat preferred by southwestern willow flycatchers is regularly disturbed by flooding, drought, or occasionally by fire, continually driving successional transitions in vegetation. Throughout this process, some trees and shrubs of appropriate height and structure must remain in the system in order for it to remain useful to flycatchers. Although nesting typically requires larger mature trees (Jones & Stokes 2004, 2006, 2008; Whitfield and Henneman 2009), even if this feature is lacking, a habitat patch could retain utility for migration or foraging. Transitions are usually temporary, and patches may cycle back into suitability for breeding if allowed to mature (USFWS 2002c).

Survey results suggest that southwestern willow flycatchers do not settle randomly in willow and cottonwood forest but choose to establish territories and nest sites in areas with specific vegetative features (Whitfield and Henneman 2009). Southwestern willow flycatchers have been shown to prefer areas with greater canopy cover and understory vegetation than what has been generally available in the area, clarifying why only a small fraction of the area that appears suitable for breeding is actually used (Whitfield and Henneman 2009).

Southwestern willow flycatchers forage either by aerially gleaning (capturing an insect from a substrate while hovering) from trees, shrubs, and herbaceous vegetation, or by hawking larger insects on the wing by waiting on exposed forage perches and capturing insects in flight (Craig and Williams 1998). During the breeding season, the qualities that are important for this species are a high-quality local source of nutrients to meet the nutritional needs of territorial establishment and defense, mating, nest building, egg laying, brooding, and nestling rearing (Craig and Williams 1998). After the breeding season, when fledglings become more mobile and are able to forage for themselves, the

adults are not as dependent on local food sources (Craig and Williams 1998), allowing them to forage more broadly.

Individuals typically breed in different locations each year (Luff et al. 2000; Kenwood and Paxton 2001; USFWS 2002c; Newell et al. 2003). Although they do not usually exhibit nest-site fidelity, they demonstrate loose territory fidelity by returning to the same general area where they previously bred or hatched (Luff et al. 2000; Kenwood and Paxton 2001; USFWS 2002c; Newell et al. 2003). This life history trait results in the geographical area occupied by this species to be much broader than what the specific locations used while nesting would indicate.

Studies have estimated that only 938 to 1,256 southwestern willow flycatcher territories remain (Sogge et al. 2003; Durst et al. 2005). Riparian woodlands found throughout the riparian zone of the SFWA forms one of the most extensive riparian woodlands remaining in California (USFS 2010), and provides essential structure for Southwestern willow flycatchers which have been closely monitored in the area since 1989 (Whitfield 1990, Jones & Stokes 2004, 2006, 2008; Whitfield and Henneman 2009). In fact, the South Fork Kern River Valley population may be the largest in California (Unitt 1987; Craig and Williams 1998).On the South Fork Kern River, southwestern willow flycatchers tend to nest in areas that have more trees greater than 17 feet tall, a larger amount of tree canopy cover, and a larger amount of foliage volume (Copeland 2004), from 0 to 13 feet (Whitfield 1990).

Southwestern willow flycatchers migrate across a wide distribution over the lowlands of California, from as early as April at the South Fork Kern River to as late as mid-June in Red Bluff (Craig and Williams 1998). Transients are observed in California through mid-September (Zeiner et al. 1990), but little is known about the post-breeding season movements of each local subspecies (Craig and Williams 1998). Grinnell and Miller (1944) reported that post-breeding fall migrations may include invasions of the species into habitat higher in elevation than the highest breeding habitat. At desert oases in eastern Kern County, the earliest summer date is July 28 and the latest fall record is October 18, with peak of migration from mid-August to early September (Craig and Williams 1998). Other observations document adults departing mainly during the last half of August, remaining rarely as late as September 4 (Unitt 1987). Juveniles remain later in September, but all depart by October 1 (Unitt 1987). Little data exists on use of migratory stopover sites, but it appears that willow flycatchers pause only briefly in these areas (Craig and Williams 1998).

Since surveys began, the population size of breeding southwestern willow flycatchers in the South Fork Kern River Valley has steadily decreased from 40 males and 30 females in 1989 to 13 males and 7 females in 2008 (Jones & Stokes 2004, 2006, 2008; Whitfield and Henneman 2009). During the same interval, Mayfield Nest Success Estimates have ranged from a low of 17 percent in 1991, to 90 percent in 2008, and the annual number of fledglings may be in decline (see Whitfield and Henneman 2009). Results of resident southwestern willow flycatcher surveys from 1998 to 2011 are provided in Table 3-65.

The mechanism for this decline remains unclear, despite comparable breeding parameters between this population and those measured in stable or increasing populations elsewhere (Whitfield and Henneman 2009).

Table 3-65
Numbers of Adult Resident Southwestern Willow Flycatchers Detected in the South
Fork Wildlife Area (1988-2011)

	Tork Whulite Area (1700-2011)								
Year	No. Residents Detected	Year	No. Residents Detected						
1988	2ª	2000	1						
1989	15	2001	4						
1990	10	2002	10						
1991	8	2003	10						
1992	4	2004	15						
1993	10	2005	11						
1994	8	2006	8						
1995	13	2007	4						
1996	4	2008	0						
1997	7	2009	3						
1998	6	2010	4^{b}						
1999	2	2011	3						

Source: Correspondence from Mary J. Whitfield, Research Director, Southern Sierra Research Station, to Mitch Stewart, U.S. Army Corps of Engineers, Sacramento District, September 14, 2011.

Loss and degradation of riparian habitat and brood parasitism by the invading brown-headed cowbird appears to be responsible for the southwestern willow flycatcher's decline (Unitt 1987; Marshall and Stoleson 2000; Periman and Kelly 2000; USFWS 2005; Brodhead et al. 2007). Overgrazing by cattle has also been an important factor in habitat reduction in some areas (Marshall and Stoleson 2000; Periman and Kelly 2000). Cattle eat and trample understory vegetation that southwestern willow flycatcher rely upon (Unitt 1987; USFWS 2005). Loss of vegetation reduces cover for the birds and reduces soil permeability which in turn causes declines in the water table (Unitt 1987; USFWS 2005). This can lead to the desiccation of wetlands and ultimately the elimination of quality habitat (Marshall and Stoleson 2000). Other processes that disrupt the water table, such as overpumping for agriculture, urban use, soil compaction, or accelerating runoff, also adversely affect the flycatcher's habitat (Unitt 1987; USFWS 2005).

Water level can play a significant role in the availability of riparian habitat for southwestern willow flycatcher. For some lakes, such as Isabella Lake, drought can lead to reduced water storage which in turn increases the exposure of wet soils along the shoreline and allows for increased vegetation. The increase in riparian vegetation may provide sufficient nesting habitat for flycatchers (Ellis et al. 2008). Conversely, in 1995,

^a No willow flycatcher surveys conducted in 1988, these birds were detected while doing other bird work

^b Only a few, limited willow flycatcher surveys conducted in 2010, some birds were detected while conducting other bird fieldwork.

700 acres of willow habitat were inundated in the SFWA, resulting in the loss of flycatcher nests and subsequent decline in the number of breeding flycatchers (Whitfield and Strong 1995; USFWS 1997).

Critical Habitat. The action addressed within this Draft EIS does not fall within the current critical habitat under Section 4(b)(2) of the ESA for the southwestern willow flycatcher. Critical habitat was designated on October 19, 2005 (50 CFR, Part 17) although it was excluded from the SFWA, Sprague Ranch and an easement on the Haffenfeld property. These areas were excluded because a panel of scientists, convened by the USFWS, determined that the impacts of routine operations of Isabella Lake was an attractive nuisance resulting from periodic inundation, and further determined that the SFWA had no value to southwestern willow flycatcher habitat. These areas are comanaged by the Corps and USFS to protect riparian habitat values, in accordance with a long-term biological opinion (USFWS 2005).

According to the Corp's 1999 Revised Project Description in the Isabella Lake and Dam Routine Operating Procedures for Anticipated Future Operations,

"...routine reservoir operations contemplate storage ranging between 30,000 acre-feet and 245,000 acre-feet during the November through February period. Any storage in excess of the 2,584-foot elevation during the winter period of October 1 to March 20, which results in inundation of a portion of the SFWA, would be due to temporary rain flood conditions. An evacuation of water above 2,584 feet after March 20 would require a deviation from the Isabella Water Control Plan. Such short-term inundation does not coincide with the breeding and nesting cycle of the flycatcher since the flycatcher arrives in the area in mid-May and has migrated south and out of the region by the end of August or early September. Likewise, any such short-term inundation is predominantly during the dormant non-growing season for riparian trees and herbaceous plants located in the SFWA."

On August 15, 2011, USFWS proposed to revise critical habitat for the southwestern willow flycatcher under ESA. The revised critical habitat proposal includes the upper 1.0 km (0.6 mi) of Isabella Lake (including the SFWA), and the Sprague Ranch and Haffenfeld conservation easement. Comments on the proposed rule were accepted until October 14, 2011. All Primary Constituent Elements (PCE) of critical habitat for the southwestern willow flycatcher are found in the riparian ecosystem in the 100-year floodplain of the South Fork Kern River Delta (see USFWS 2005). The PCEs include: (a) PCE 1 – Riparian Vegetation; and (b) PCE 2 – Insect Prey Populations. These elements are discussed below.

PCE 1 – Riparian Vegetation. Riparian habitat in a dynamic river or lakeside, natural or manmade successional environment (for nesting, foraging, migration, dispersal, and shelter) that is comprised of trees and shrubs (that can include Gooddings willow, coyote

willow, Geyer's willow, arroyo willow, red willow, yewleaf willow, pacific willow, boxelder, tamarisk, Russian olive, buttonbush, cottonwood, stinging nettle, alder, velvet ash, poison hemlock, blackberry, seep willow, oak, rose, sycamore, false indigo, Pacific poison ivy, grape, Virginia creeper, Siberian elm, and walnut) and some combination of the following:

- Dense riparian vegetation with thickets of trees and shrubs that can range in height from about 2 m to 30 m (about 6 to 98 ft.). Lower-stature thickets (2 to 4 m or 6 to 13 ft. tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle and lower-elevation riparian forests; and/or
- Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft.) above ground or dense foliage only at the shrub or tree level as a low, dense canopy; and/or
- Sites for nesting that contain a dense (about 50 percent to 100 percent) tree or shrub (or both) canopy (the amount of cover provided by tree and shrub branches measured from the ground); and/or
- Dense patches of riparian forests that are interspersed with small openings of open water or marsh or areas with shorter and sparser vegetation that creates a variety of habitat that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac).

PCE 2 – Insect prey populations. A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, which can include: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies, moths, and caterpillars (Lepidoptera); and spittlebugs (Homoptera).

Western snowy plover

The western snowy plover (*Charadrius alexandrinus nivosus*) was federally listed as threatened March 5, 1993 (Federal Register 66: 42676-42677). The western snowy plover can be found across North and South America, Eurasia, and Africa. In North America, it is restricted to the Gulf and Pacific coasts of the United States and scattered inland localities from Saskatchewan to California and Texas (USFWS 1993b).

Winter range habitat is primarily coastal beaches, tidal flats, lagoon margins, and salt-evaporation ponds. Inland populations in California regularly winter at agricultural wastewater ponds in the San Joaquin Valley and at desert saline lakes in Southern California (e.g., the Salton Sea) (USFWS 1993b).

Western snowy plovers breed up to 10,000 feet in elevation on barren to sparsely vegetated ground, generally near alkaline or saline lakes, reservoirs, and ponds, on riverine sand bars, and at sewage, salt-evaporation, and agricultural wastewater ponds (USFWS 1993b). The snowy plover frequently raises two broods a year and sometimes three in places where the breeding season is long (USFWS 1993b). At around the time

chick's hatch, females, which brood the precocial chicks, desert their mate and initiate a new breeding attempt with a different male.

The CNDDB (2011) lists limited occurrences of the western snowy plover in Kern County, near the mouth of the Kern River, in areas of appropriate habitat in the Buena Vista Lakebed, and in the Freemont Valley southeast of the proposed project area. The proposed project area encompasses some aspects of preferred habitat for the western snowy plover, and birds were observed in the South Fork Kern River area during a site visit August 2011 by the Corps and USFWS.

There is no critical habitat designation under Section 4(b)(2) of the ESA for the western snowy plover in the proposed Isabella DSM Project area.

Western yellow billed cuckoo

The western yellow billed cuckoo (Coccyzus americanus occidentalis) is a Federal species of concern and listed as endangered by the State of California and sensitive by the USFS. Nesting habitat for the western yellow-billed cuckoo is characterized by a dense subcanopy or shrub layer (regeneration canopy trees, willows, or other riparian shrubs) in lowland riparian areas. Overstory in these habitats may be either large gallery-forming trees 33 to 90 feet, or developing trees 10 to 33 feet, usually cottonwoods (USFWS 1982; Wiggins 2005). Riparian habitat is critical for breeding, wintering, migration stopovers, and as corridors for juvenile dispersal. The earliest spring arrival date for western yellow-billed cuckoo in California is April 23 (Laymon 1998). While there are regularly a few arrivals in May, although not every year, most breeding pairs arrive from June to early July (Laymon and Halterman 1989). Western yellow-billed cuckoos are rarely detected during spring migration in California.

Distribution, habitat, and life history information on the western yellow-billed cuckoo was compiled primarily from the Layman (1998), Layman et al. (1997), Laymon and Halterman (1985, 1989), and USFWS (1982, 2010b, 2010c). Recent distribution information for the action area was provided by Whitfield and Stanek (2010).

Historically, the western yellow-billed cuckoo was a common breeding species in riparian habitat throughout much of lowland California (Grinnell 1915; Grinnell and Miller 1944; Laymon 1998). Early accounts from the Central Valley list the species as common (Belding 1890). Grinnell and Miller (1944) described the cuckoo's range as the coastal valleys from the Mexican border to Sebastopol, Sonoma County, and the Central Valley, from Bakersfield and Weldon, Kern County, north to Redding, Shasta County. Small populations were also found in Northern California along the Shasta River, Siskiyou County, and in Surprise Valley, Modoc County. Populations were also found in suitable habitat east of the Sierra Nevada in the Owens Valley and along the Colorado and Mojave Rivers. By 1944, cuckoos were no longer present in many areas where they were once found "because of removal widely of essential habitat conditions" (Grinnell and Miller 1944). Estimates of the number of current breeding pairs range widely but it is apparent that cuckoos' population and range have been largely diminished since Ridgway (1877)

first described the subspecies. Currently, the range of the cuckoo is limited to fragments of riparian habitats (USFWS 2010c).

Western yellow-billed cuckoos are long-range migrants that winter in northern South America in tropical deciduous and evergreen forests (Ehrlich et al. 1988). In California, breeding populations of greater than five pairs that persist every year are limited to the Sacramento River, from Red Bluff to Colusa, and the South Fork Kern River, from Isabella Reservoir to Canebrake Ecological Reserve (Layman 1998), although they may breed in a few other California locations (Laymon and Halterman 1997). Prior surveys also showed cuckoo populations to be most consistent in these locations (Layman and Halterman 1989; Halterman 1991), which have proved to be the only localities in California that sustain breeding populations (USFWS 2010c). Continuous surveys along the South Fork Kern River from 1985 to 2000 showed a population that varied from a low of two pairs in 1990 to a high of 24 pairs in 1992 (Laymon et al. 1997; Whitfield and Stanek 2010). The most recent survey in this area (Whitfield and Stanek 2010) detected a total of 71 cuckoos during the breeding season (mid-June to mid-August). The majority of detections (68 of the 71) were in the SFWA, although 3 detections were made in the Kern River Preserve.

Western yellow-billed cuckoos along the South Fork Kern River are typically associated with upland sites early in the season during wet years but not in dry years (Laymon 1998). It is likely that flooding in wet years reduces the survival of the larvae of the preferred prey (katydids [Tettigonioidea] and sphinx moth [Sphingidae]), which winter underground (Laymon 1998). These conditions restrict cuckoos to foraging in upland areas until the prey base in the lower floodplain begins to recover later in the breeding season (Laymon 1998). Locally, most extant riparian habitat is in the primary floodplain making the potential high for a large reduction in the prey base during wet years (Laymon 1998). If this occurs along with baseline habitat losses from agriculture and urban development (USFWS 1982), the cuckoo population in the action area could be significantly compromised. Restoration would include planting at least a portion of forests on upper terrace sites that do not regularly flood.

The peak of the breeding season at the South Fork Kern River is in the first half of July, though nests have been started as early as June and as late as early August (Laymon 1998). The period of incubation to the point when nestlings leave the nest is typically 16 to 20 days, and while typically only one brood is raised per year (Laymon 1998) at the South Fork Kern River, in years of abundant food resources, two and even three broods have been successfully fledged (Laymon et al. 1997). While nests are almost always placed in willows, cottonwoods are extremely important for foraging. These birds are primarily foliage gleaners in riparian habitats, though at times they sally from a perch and catch flying prey, such as dragonflies (Odonata) or butterflies (Lepidoptera), or drop to the ground to catch grasshoppers (Orthoptera) or tree frogs (*Pseudacris regilla*) (Laymon 1998). They also require upland habitat where they can forage on various other insect species (Laymon 1998). The humid shady environment creates a microclimate that protects the nesting birds, eggs, and fledglings from the dry heat of late summer in the

western United States (USFWS 1982). Territory size at the South Fork Kern River ranges from 8 to 100 acres (Laymon and Halterman 1985).

The CDFG's CNDDB (2010) lists only one occurrence of the western yellow-billed cuckoo in the general region of Isabella Lake. The single occurrence is found within the boundary of the nine quads directly surrounding the lake. Birders know the cuckoo from the South Fork Valley of the Kern River, and while they are rarely spotted, they possibly nest in vicinity of the SFWA (Audubon - California 2010).

Hardhead Minnow

The hardhead minnow (*Mylopharodon conocephalus*) is a USFS sensitive and State species of concern. They typically inhabit deep, rocky and sandy pools of small and large rivers (e.g. Sacramento-San Joaquin and Russian River drainages) (Page and Burr 1991). Hardhead are present in the Kern River, Lake Isabella, and the lower Kern River. Little is known about their juvenile life history, but based on gill net sampling and shore seining in Isabella Lake in 1999 and 2000; their numbers represented only 1% of the total fish population of the lake (USFS unpublished data in McGuire 2009).

Isabella Lake is not the preferred habitat for the hardhead minnow, and similar to the rainbow trout, hardheads are intolerant of low DO, high water temperatures, and high turbidity (Moyle 2002). Unlike rainbow trout, hardhead prefer water temperatures of 20°C (68°F) or better (McGuire 2009). Though it has been suggested that rainbow trout prey upon hardheads, there is insufficient evidence to support this due to incongruent water temperature preferences between the two species (McGuire 2009).

Valley elderberry longhorn beetle

Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) was listed as federally threatened in August 8, 1980 (Federal Register 45: 52803). The valley elderberry longhorn beetle depends on its host plant, the elderberry (*Sambucus* spp.), which is a locally common component of the fragmented riparian forests and savannas of the Central Valley. In most cases, the only evidence of the shrub's use by the beetle is an exit hole created by the larva just before the pupal stage. Larvae tend to be distributed in elderberry stems that are one inch or greater in diameter at ground level (USFWS 1999). Studies suggest that based on the spatial distribution of occupied shrubs, the beetle is a poor disperser (Barr 1991; Collinge et al. 2001). Low density and limited dispersal capability adversely impact the beetle, particularly isolated small subpopulations in fragmented habitat. Moreover, once a small beetle population has been extirpated from an isolated habitat patch, the species may be unable to recolonize the patch if it is unable to disperse from nearby occupied habitat (USFWS 2007a).

The nearest extant population of valley elderberry longhorn beetles is found along the South Tule River east of Porterville (CNDDB 2011).

Potential habitat that could support valley elderberry longhorn beetles is present in the action area. Three valley elderberry shrubs were identified below the Auxiliary Dam

during a site visit on April 8, 2008 (Corps 2008b). Although no exit holes were observed, based on the shrubs diameter, they could provide potential habitat. Habitat features that could potentially support longhorn beetles were also identified along the Borel Canal. During surveys conducted in 2001 at the Borel facilities, three elderberry stands were found within the fenced Borel powerhouse area and were determined to provide suitable habitat (Psomas 2010). However, no beetles were observed during these surveys or within 150 feet of the Borel Canal or the elevated flumes, which run between the Lake Isabella Auxiliary Dam and the Bodfish siphon (Psomas 2010). Additional elderberry shrubs were identified along the Kern River away from the Borel Project but no exit holes were observed. The elderberry stands near the Borel Canal were re-surveyed in 2008, 2009, and 2010. The shrubs remained relatively intact as they were found in 2001, but no beetles were observed and only 6 new exit holes were apparent (Psomas 2010).

There is no critical habitat designation under Section 4(b)(2) of the Endangered Species Act (ESA) for the valley elderberry longhorn beetle within the proposed Isabella DSM Project area.

Pallid bat

The pallid bat (Antrozous pallidus) is a USFS sensitive species. Pallid bats are found statewide except Sierra Nevada, northwest portions of the Kern Valley and the southern Tehachapi Mountains. They prefer deserts, grasslands, shrubslands, woodlands, and forests and are most common in open, dry habitats, with rocky areas for roosting. Pallid bats are opportunistic generalist that feed on beetles, centipedes, cicadas, crickets, and other invertebrates, and either capture prey on substrates or on the wing. Mating occurs from October to February and females have one to two pups per year. Adult and yearling males may roost in maternity colony structures, but remain separate from females. Little is known about its winter habitat; however, they do not appear to migrate long distances between summer and winter sites, when they occasionally use different sites. Overwinter sites tend to have relatively cool and stable temperatures and are located in protected structures beneath the forest canopy or on the ground and out of direct sunlight. In the summer, roosts must protect bats from high temperatures. Pallid bats are very sensitive to disturbance of roosting sites, such as vandalism, recreational activities, or where manmade structures are occupied, demolished, or modified.

CNDDB (2010) indicates two occurrences of pallid bats in the vicinity of Isabella Lake. The nearest to Isabella DSM Project action area is an occurrence along Hwy 155 at the Kern River and an occurrence along the South Fork Kern River northeast of the community of Bella Vista.

Southwestern pond turtle

The southwestern pond turtle (*Clemmys marmorata pallida*) is a USFS sensitive species. Western pond turtles occur from northern Baja California Norte, Mexico to the Puget Sound region in Washington (Bury 1970, Nussbaum et al. 1983, Iverson 1986, Stebbins 2003). They occur in a variety of aquatic habitats including rivers, streams, ponds, lakes, marshes, vernal pools, and even wastewater and stock ponds (Storer 1930, Germano and

Bury 2001, Buskirk 2002) in areas with mild wet winters and dry, hot summers (Bury and Germano 2008).

Though they prefer low gradient ponds and streams, they can be found up to one mile from perennial waters for as long as six months (Bury and Germano 2008). Preferential aquatic habitat features include abundant basking sites (logs, boulders, vegetation mats, and muddy riparian zones), sufficient plunge pools Western pond turtles are opportunistic feeders, primarily consuming aquatic larvae of mayfies, dragonflies, stoneflies, caddisflies, beetles, midges, and beetles (Holland 1985, Bury 1986). Lesser food items include fishes, anurans, macrophytes, and filamentous algae.

Historic threats to the Western pond turtle population was commercial harvesting for human consumption and the aquarium trade (Bury and Germano 2008). Current primary threats to the southwestern pond include loss, alteration, and fragmentation of aquatic and terrestrial habitat (Bury and Germano 2008). The CNDDB does not report observations of Clemmys sp. in the vicinity of Isabella Lake; however, the USFS reports their presence in the Kern River to Cannell Creek (north of Kernville).

3.10.3 Environmental Consequences

This section discusses the potential impacts on biological resources that are anticipated from the Proposed Action Alternatives and support actions. The discussion includes a description of the methods and assumptions used to conduct the analysis and the criteria for determining the level of the potential impacts.

Scope and Methods

Numerous sources of information were used to compile information to characterize the biological resources found in the Primary and Secondary Action Areas. Tetra Tech obtained a list of endangered, threated, proposed, and candidate species from the USFWS on January 11, 2012 (Document No. 120111031623; Appendix E). Additional sources of information included: California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB) and the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants. Following review of existing information, a reconnaissance-level habitat and vegetation survey was conducted in the proposed project area from October 12 to 14, 2010 by Tetra Tech biologists. During the survey, the surface elevation of Isabella Lake was at 2,562.75 feet. A follow up vegetation and preliminary wetland and other waters of the U.S. delineation was conducted April 18 to 22, 2011 when Isabella Lake was between 2,581.25 and 2,583.15 feet. The USFWS list, information from the field reconnaissance and existing information was used in the development by Tetra Tech of a Biological Data Report (BDR) that was provided to the Corps and the USFWS in April 2011. Information in the BDR was used by the USFWS for the planning aid letter provided to the Corps (letter dated May 10, 2011 (Appendix E).

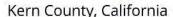
The factors that are important for evaluating the context and intensity of impacts on vegetation and wildlife species include a qualitative assessment of whether the action would cause a substantial loss, degradation, or fragmentation of any sensitive natural

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location





Local office

Sacramento Fish And Wildlife Office

4 (916) 414-6600

(916) 414-6713

Federal Building 2800 Cottage Way, Room W-2605 Sacramento, CA 95825-1846

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

- 1. Draw the project location and click CONTINUE.
- 2. Click DEFINE PROJECT.
- 3. Log in (if directed to do so).
- 4. Provide a name and description for your project.
- 5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the <u>Ecological Services Program</u> of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact <u>NOAA Fisheries</u> for <u>species under their jurisdiction</u>.

- 1. Species listed under the <u>Endangered Species Act</u> are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the <u>listing status page</u> for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
- 2. <u>NOAA Fisheries</u>, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME STATUS

Fisher Pekania pennanti

No critical habitat has been designated for this species.

https://ecos.fws.gov/ecp/species/3651

Endangered

Birds

NAME STATUS

California Condor Gymnogyps californianus

There is **final** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/8193

Endangered

Least Bell's Vireo Vireo bellii pusillus

Wherever found

There is **final** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/5945

Endangered

Southwestern Willow Flycatcher Empidonax traillii extimus

Wherever found

There is **final** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/6749

Endangered

Yellow-billed Cuckoo Coccyzus americanus

There is **proposed** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/3911

Threatened

Amphibians

NAME STATUS

California Red-legged Frog Rana draytonii

Wherever found

There is **final** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/2891

Threatened

Fishes

NAME STATUS

Delta Smelt Hypomesus transpacificus

Wherever found

There is **final** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/321

Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act^{1} and the Bald and Golden Eagle Protection Act^{2} .

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described <u>below</u>.

- 1. The Migratory Birds Treaty Act of 1918.
- 2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds
 http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the <u>USFWS Birds of Conservation Concern</u> (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ <u>below</u>. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the <u>E-bird data mapping tool</u> (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found <u>below</u>.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A

BREEDING SEASON IS INDICATED

FOR A BIRD ON YOUR LIST, THE

BIRD MAY BREED IN YOUR

PROJECT AREA SOMETIME WITHIN

THE TIMEFRAME SPECIFIED,

WHICH IS A VERY LIBERAL

ESTIMATE OF THE DATES INSIDE

WHICH THE BIRD BREEDS

ACROSS ITS ENTIRE RANGE.

"BREEDS ELSEWHERE" INDICATES

THAT THE BIRD DOES NOT LIKELY

BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

https://ecos.fws.gov/ecp/species/1626

California Thrasher Toxostoma redivivum

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Clark's Grebe Aechmophorus clarkii

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Costa's Hummingbird Calypte costae

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9470

Golden Eagle Aquila chrysaetos

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

https://ecos.fws.gov/ecp/species/9464

Breeds Jan 1 to Aug 31

Breeds Jan 1 to Jul 31

Breeds Jan 1 to Dec 31

Breeds lan 15 to Jun 10

Breeds Jan 1 to Aug 31

Breeds Mar 20 to Sep 20

Nuttall's Woodpecker Picoides nuttallii

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

https://ecos.fws.gov/ecp/species/9410

Breeds Apr 1 to Jul 20

Oak Titmouse Baeolophus inornatus

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

https://ecos.fws.gov/ecp/species/9656

Breeds Mar 15 to Jul 15

Rufous Hummingbird selasphorus rufus

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

https://ecos.fws.gov/ecp/species/8002

Breeds elsewhere

Song Sparrow Melospiza melodia

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/4243

Breeds Apr 15 to Jul 20

Breeds Feb 20 to Sep 5

Wrentit Chamaea fasciata

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Mar 15 to Aug 10

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that

- week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
- 2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
- 3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (1)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS <u>Birds of Conservation Concern (BCC)</u> and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the <u>Avian Knowledge Network (AKN)</u>. The AKN data is based on a growing collection of <u>survey, banding, and citizen science datasets</u> and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project

intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (<u>Eagle Act</u> requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the <u>AKN Phenology Tool</u>.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the <u>Avian Knowledge Network (AKN)</u>. This data is derived from a growing collection of <u>survey</u>, <u>banding</u>, <u>and citizen science datasets</u>.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

- 1. "BCC Rangewide" birds are <u>Birds of Conservation Concern</u> (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
- "BCC BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
- 3. "Non-BCC Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the <u>Eagle Act</u> requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the <u>Diving Bird Study</u> and the <u>nanotag studies</u> or contact <u>Caleb Spiegel</u> or <u>Pam Loring</u>.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to <u>obtain a permit</u> to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the <u>National Wildlife Refuge</u> system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

MSULTATIO

Impacts to <u>NWI wetlands</u> and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local <u>U.S. Army Corps of Engineers District</u>.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1Ah

FRESHWATER FORESTED/SHRUB WETLAND

PSSAh

PFOAh

LAKE

L1UBHh

L2USCh

L2UBHh

RIVERINE

R4SBC

R5UBF

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

JT FOR CONSULTATIO

Appendix D Field Notes and Forms

Air I nitoring Form



phone web 3525 H. Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Site Address:

Big Blue Mill Expanded SI

Client:

USFS

Date: 10/21/20
Recorded by: 35K

Sample ID	Date Sampled	Pump Start Time	Pump End Time	Flow Rate (L/min)	Cassette Type	Lab Method	Wind Direction	Wind Speed (mph)	Notes:
BB-D-1.1	16/20/20	1230	1430	2.5	wlyclone	Resp Metals	SW	3.	windform Sw to NE
B-5-1.2	10/21/20	1230	1430	2.5		Total Dustals	SW	3	31
BBD13	10/3/120	1230	1430	2.5	w/cyclone	Resp	SW	3	31
BB-MV-01	10/21/20	1-1	-	1	_	_	SW	4	MV=,000 1310
BB-D-2.1	10121126	1300	1500	,2.5	iyelong	Resp	SW	3	
B-D-2.2	10121/20	1300	1500	2.5		Total Dust Metals	SW	3	
33-0-23	16/21/20	1300	1500	2.5	ajclone	Rech	SW	3	
38-MV-02	10/21/20						-Sw	4	M=.000 1312
BB-MV-0?	16/2/20	_					Sw	4	MV=-000 1314

BB-D-1+2 location track recorded in Gaira - 90, Sw wind 3-4 mph, no visible of ustra air, Walked property box wary & mill area, collect XRFG amples @ nill found atton area

Air 'nnitoring Form



address | 3525 | J Ave #200 Costa Mesa, CA 92626 phone web | 714.662.2759 ecmconsults.com

Site Address:

Big Blue Mill Expanded SI

Client:

USFS

10/21/20

Recorded by:

Sample ID	Date Sampled	Pump Start Time	Pump End Time	Flow Rate (L/min)	Cassette Type	Lab Method	Wind Direction	Wind Speed (mph)	Notes:
BB-MV-OY	10/21/20						SW	4	MV= ,000 1316
BB-MV-05	10/21/20						SW	4	MV= 000 1318
BB-MV-06	10/21/20	-				-	SW	4	WV=.000 1320
BB-MU07	10/24/20						SW	4	MV=,000 1321
BB-111 V-08	10/21/20					-	SW	3	MV=.000 1323
BB-MU-09	6/21/20						SW	4	MV=10000 (325
BB-MV-10	10/21/20						SW	4	MV= 1000 1727
BB-MU-11	6/21/20						SW	4	MV = 200.005 +245

Comments:	BBMV-11 taken week true	k parking	near	POINT BB-	54

Air / nitoring Form



address 3525 P Ave #20 Costa \ . CA 92626 phone web 714.662.2759 ecmconsults.com

Site Address:

Big Blue Mill Expanded SI

Client:

USFS

Date: 19/22/20

Recorded by: JS

Sample ID	Date Sampled	Pump Start Time	Pump End Time	Flow Rate (L/min)	Cassette Type	Lab Method	Wind Direction	Wind Speed (mph)	Notes:
BB-D-3.1	10/22/20	1200	1-/00	2.5	Chilone	Resp motals	5		Collected attending beach area between creded cemented tailings face + water
BB-0-32	10122120	1200	1900	2.5		Total Dust Metals	5	1	level. Collect BB 23 during dust Sample (+Subscribece)
BB-0-3.3	10122120	1200	1400	2.5	yelone	^	S	1	
BB-D-4.1	1-122/20	1200	14/00	2.5	Cyclone	Rosp Metals	5	J	
BB-D=4.2	10/22/20	1200	1400	2.5		Total Dust Metals	5	1	
BB-0-4.3	(0122120	1200	(400	2.5	(yelone	Resp	5	1	
		1 000		()					/=

comments: leconded GPS + makest rampling a traction for the GPS please app

Surface Sampling Form



address Costa Mesa, CA 92626 phone web 1714.662.2759 ecmconsults.com

Site Address:	Big Blue Mill Site	Date: 16/20-
Client:	USFS	Recorded by: JSK

Sampling Location	Time Gauged	Flowing?	River Width	River Depth	Flow Rate (fps)	Parabolic (P) Flat (F)	Temp (°C)	Electric Conductivity	pН	ORP	Turbidity (NTU)	Dissolved Oxygen	Sample Time	Notes:
Kinsate Blank-C	1 -											-	1715	10/20/20
RinsateBlank	2-												1745	10/21/20
BB-SW-02	1330	Yes	-40'	~2-10'?	-3	F	16.39	181	8,38	35.4	0.71	0.94	1330	10/22/20
RinsaleBanko													1 130	10/22/20 Sampled as
DUP-OI	1335	Yes	440'	2-101?	43	t	16.39	181	8.38	354	0.71	6.94	1335	10/22/20 Dopot
BBM1-01												406		
BB-541-03	1545	Yes	~20'	~2'	~3	F	16,91	184	8.03	107:7	0.90		1545	10/22120
BB-5W-01	1715	Yes	~ 50'	u3'51	~2	F	16.45	186	7.87	129.5	1.05	1.04	1715	10/22/20
								1						
					1									

Comments:



Site Address: Client:	Big Blue N	fill Expand	ed SI		- Dat	
					_ Recorded b	JSK JSK
Sample ID	Date Sampled	Time Sampled	Sample Type (Discrete, ISM, Background)	Location Description (Background, tailings pile, wash, next to headframe, near ore pile, etc.)	Media Description	
88-B- Comp-01	10/19/20	1540	By composite	BG	(Gravelly sand, fine tailings, streambed sediment, etc.) Mation Sandu/ Soi Loty	Notes:
BB-5W-	10122120	1330	colocated sedment	Riverbank	malionsail pour books	
88-m1-	10122120	1510	Mad-01 Sediment	Setiment submerged Thrower about bank	Meeting Sand, madium grained pourly Sco	
88-50- 88-50- 01-5ed	40122130	1545	Colocated	River bank on Mod Island	Sand, medium, rained, pour & serve	
01-sed	16122120	1715	Colocated Sediment	River bank upstream of site	Sand medium graned well see tel	
					J	
Comments:						



Industria, . lygiene Chain of Custody

EMSL Order Number (Lab Use Only):

Report To Ca	Report To Contact Name: Day	David Allison		Bill	Bill To Company: ECM Consultants	any: ECI	A Consul	tants		Client ID #	**
Company Name:	ame: ECM Consultants	sultants		Att	ention To:	Mona A	lansell &	Attention To: Mona Mansell & David Allison	on	#Sample	# Samples in Shipment 12
Street: 3525	Street: 3525 Hyland Ave, Suite 200	uite 200		Str	Street: 3525 Hyland Ave, Suite 200	Hyland	Ave, Su	ite 200		Date of S	Date of Shipment: 10/26/2020
City: Costa N	City: Costa Mesa State/Province: CA		Zip/Postal Code: 92626		City: Costa Mesa State/Province: CA	esa State	/Province		Zip/Postal Code: 92626		Sampled By (Signature): And Mush
Phone: 208	Phone: 208-407-1440	Fax:		Pho	Phone: 714-662-2759 Fax:	-662-27	59 Fax:			Purchase Order:	1
Email Result	Email Results To: dallison@ecmconsults.com	ecmconsults	.com	Proj	Project Name: Big Blue Mill	Big BI	ue Mill		te where San	U.S. State where Samples Collected: CA	CA
Turna	Turnaround Time (TAT) - Please Check: If No Selecti	T) - Please (Sheck: If No	Selection M	lade, Star	Idard 2	Week TA	on Made, Standard 2 Week TAT Will Apply	Me	Media Type:	
2 Week	1 Week	4 Day	3 Day		2 Day	11	1 Day	Other (Call Lab)	Lab)	Manufacturer/Part #:	1#:
										#	
Client	I ocation/Description	Secription	Analyte /	Modio	Flow	Sampl	Sample Time	Volume /	Sample	Sample	- Manual All
Sample ID	The state of the s	Honding	Method	Media	(Ipm)	On	Off	Area	Type	Date	Comments
BB-D-1.1	Near property boundary and walking trail	ry and walking trail	Respirable Dust NIOSH 0500 + CAM-17 (minus Hg)	Dust Cassette	2.5	1230	1430	450 L	☐ Area	10/21/2020	0 Collected with cyclone
BB-D-1.2	Near property boundary and walking trail	ry and walking trail	Total Dust NIOSH 0500 + CAM-17 Motals (minus Hg)	Dust Cassette	2.5	1230	1430	450 L	☐ Area	10/21/2020	
BB-D-1.3	Near property boundary and walking trail	ny and walking trail	Respirable Dust MOSH 7303 Hg	Dust Cassette	2.5	1230	1430	450 L	☐ Area	10/21/2020	Collected with cyclone
BB-D-2.1	Near property boundary and walking trail	ry and walking trail	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	Dust Cassette	2.5	1300	1430	450 L	☐ Area	10/21/2020	Collected with cyclone
BB-D-2.2	Near property boundary and walking trail CAM-17 Melals (minute Hg)	ry and walking trail	Total Dust NIOSH 0500 + CAM-17 Metals (minus Hg)	Dust Cassette	2.5	1300	1500	450 L	☐ Area	10/21/2020	
BB-D-2.3	Near property boundary and walking trail	ry and walking trail	Respirable Dust NIOSH 7303 Hg	Dust Cassette	2.5	1300	1500	450 L	☐ Area ■ Personal	10/21/2020	Collected with cyclone
BB-D-3.1	Near river and cemented tailings	nented tailings	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	Dust Cassette	2.5	1200	1400	450 L	☐ Area ■ Personal	10/22/2020	Collected with cyclone
BB-D-3.2	Near river and cemented tailings	mented tailings	Total Dust NIOSH 0500 + CAM-17 Metals (minus Hg)	Dust Cassette	2.5	1200	1400	450 L	☐ Area ■ Personal	10/22/2020	
BB-D-3.3	Near river and cemented tailings	mented tailings	Respirable Dust NIOSH 7303 Hg	Dust Cassette	2,5	1200	1400	450 L	☐ Area ■ Personal	10/22/2020	Collected with cyclone
BB-D-4.1	Near river and cemented tailings	mented tailings	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	Dust Cassette	2.5	1200	1400	450 L	☐ Area	10/22/2020	Collected with cyclone

Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates.

Released By	1 1 0	Date	Received By	Date
	Jared Kemper ECM Consultants Jud Jugar	10/26/2020		
Comments:				

LABORATORIES

B

Required Fields

4100 Atlas Court Bakersfield, Ca. 93308 (661) 327-4911 + FAX (661) 327-1918 + www.bclabs.com

Chain of Custody

Init. 16229-1450 SAMPLES 56145-146149 1646-149 ANALYSIS REQUESTED MEL FBH Sobok PIA# Company Packing Material: 6+1-411.17L Check/Cash/Card 601013-Ba, Be, Cd, Cr. Pb, mo, U, Mg, 6020-81-56, A, 56, TI 107'07 EPA 🗌 Received by (Signafure and Print Name) Received by (Signature And Print Name) Payment Received at Delivery: <u>۲</u> BLUE NONE dallison@ecmconsults.com Amount Merced Co Tulare Co CDHS Fresno Co Regulatory Compliance Electronic Data Transfer. System No. * FAX * #: Comments / Station Code SO = Solid Carbon Copies: ms/msp WET CFW = Clorinated Finished Water CWW = Chorinated Waster BW = Bottled Water FW = Finished Water WW = Waste Water SW = Storm Water DW = Drinking Water Phone * #: 208-407-1440 Other. Date: Cooling Method: ✓STD [5 Day** [2 Day**]! Day* Matrix * 20 8 2 8 R 8 8 2 8 2 1215 Time Time Time F-mail. Result Request ** Surcharge 92626 Date Date Zip * BCL Quote # |Mail Only PO# CAO UPS GSO WALK-IN SIVC FED EX OTHER David Allison S STD Level II How would you like your completed results sent? V E-Mail Fax EDD State * Report Attention *: ECM Sample Description / Location * QC Request Company Company BB-B-6mp-01 Costa Mesa 138-129,-0.5 BB-018 NUP-62 138-139 BB-020 BB-017 B3-127 83-123 88-035 BB-011 City * Received for Lab by. (Signature and Printed Name) Matrix Types: RSW = Raw Surface Water RGW = Raw Ground Water clinquisked by: (Signature and Printed Name) Relinquished by: (Signature and Printed Name, Janes dod l'endel 3525 Hyland Ave. Suite 200 doll added 1432 object 1432 6/9/20 1535 197020 1233 Chin oche/a 10/2012 NOS Jabo 1452 13420 1457 ECM Consultants (daotac) 1113 HH1 00/00/01 Sampler Name Printed / Signature Legy New Bed USFS Big Blue Mill Date Client/Company Name *: Shipping Method: Project Information: Bottles Address * Sample

BC

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4100 Atlas Court Bakersfield, Ca. 93308

(661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com

Chain of Custody

1.246 MAZZUTEB Init. SHUBER ANALYSIS REQUESTED हमानुड भाध MET 弘 7395 H8V × 英 PIA# Company Packing Material: PH-AITHT 7 Check/Cash/Card 6000-82,86,64,65,65,6006 Pb, Me, Will Ag, Will 17,32,24,62...66,000 Received by (Signature and Print Name) Payment Received at Delivery: EPA ۲ ا NONE Merced Co Tulare Co E-mail: dallison@ecmconsults.com DIALY Amount: Total metals out CDHS Fresno Co FAX * #: Regulatory Compliance Electronic Data Transfer. System No. * Comments / Station Code BLUE SO = Solid Esta Metals Received by (Signatur Voc sol Carbon Copies: WET Vac only RSW = Raw Sufface Water CFW = Clorinated Finished Water CWW = Chorinated Waste Water BW = Bottled Water RGW = Raw Grbund Water FW = Finished Water WW = Waste Water SW = Storm Water DW = Drinking Water Phone * #: 208-407-1440 Other: Date: Cooling Method: ✓STD ☐5 Day** ☐2 Day** ☐1 Day** Matrix * 20 20 20 2 30 20 30 20 8 1215 3 3 Time Time Time Result Request ** Surcharge 10/292 92626 Date Date Date Zip* BCL Quote # Mail Only PO# CAO UPS GSO WALK-IN SIVC FED EX OTHER David Allison S STD Level II EDD State * Report Attention *: Sample Description / Location * 万つど How would you like your completed results sent? V E-Mail Fax BB-16-50-01-0.5 QC Request Company 9 Ranghe Blows - 62 RoscheBlank Costa Mesa 88-025-0.5 138-116-50-01 138-032 88-033-83-033 BB-643 88-25 BB097 City Received for Lab by: (Signature and Printed Name) Relingdished by: (Signature and Printed Name) Rejinquished by: (Signature and Printed Name) 1745 1929 1033 रुप्रद 3525 Hyland Ave. Suite 200 6/26/20 16,23 10/20 000 WS 959 ch260 6/3000 1638 1213 10/3012 TIE 3080 strato 8011 08/18/0 Time 144 **ECM Consultants** Sampler Name Printed / Signature Sand Jemoel **USFS Big Blue Mill** 10/21/20 lo/avao 08220 Date Client/Company Name *: Shipping Method: Project Information: # Bottles Matrix Types: * Required Fields Address * Sample #

SR-F1-0012-00 (Analytica

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(661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com 4100 Atlas Court Bakersfield, Ca. 93308

Chain of Custody

Init. ANALYSIS REQUESTED SAZULIAS (17.091) -017+ PIA# Company Company Packing Material: 9-41LHL Check/Cash/Card 6000 - Se, Re, CB, CB, CC, CO, CU Pb, Mo, Ni) Ag, V; ZA 6020 - Sb, As, Se, TI EPA 🗌 Received by (Signapure and Print Name) Payment Received at Delivery. ۲ ا NONE E-mail: dallison@ecmconsults.com Amount: Merced Co Tulare Co CDHS Fresno Co Regulatory Compliance Electronic Data Transfer. System No. * FAX * #: Comments / Station Code BLUE SO = Solid Received by (Signature Carbon Copies: MS/MSD WET CFW = Clorinated Finished Water CWW = Chorinated Waster BW = Bottled Water FW = Finished Water WW = Waste Water SW = Storm Water DW = Drinking Water Phone * #: 208-407-1440 Other: Date: Cooling Method: ✓STD 5 Day** 2 Day** 1 Day* Matrix * 20 2 2 R R 20 R 8 8 8 8 Time Time Time Result Request ** Surcharge 92626 CEZIO Date Date Date Zip * BCL Quote # Mail Only # Od CAO UPS GSO WALK-IN SIVC FED EX OTHER David Allison S EDD STD Level II State * Report Attention *: Sample Description / Location * How would you like your completed results sent? V B-Mail Fax ECIM QC Request Company Company Costa Mesa 10 100 11 15 ST SU DISC 15/21/25 BB-1/21/2 30-IM-88 83 miles B3-M-07 BR-M1-65 BB-111-62 B3-14-66 BB-M1-03 135-MI-04 83-MI-Si City * Received for Lab by: (Signature and Printed Name) RSW = Raw Surface Water RGW = Raw Ground Water Relinquished by: (Signature and Printed Name) elinquished by: (Signature and Printed Name) 3525 Hyland Ave. Suite 200 1000 Pal 1513 1922/24/158 8 essi estica निक्रमा विद्या Chara ist7 lopy 1578 (45) SESS Time ASISSISK **ECM Consultants** 7245 Sampler Name Printed / Signature pelican USFS Big Blue Mill lary Tempol Date Client/Company Name *: Shipping Method: Project Information: Matrix Types: # Bottles * Required Fields Address * Sample #

SR-FL-0012-00 (Analytica

BC

* Required Fields

LABORATORIES

4100 Atlas Court Bakersfield, Ca. 93308

(661) 327-4911 + FAX (661) 327-1918 + www.bclabs.com

Chain of Custody

ULB 09EB ANALYSIS REQUESTED 2721 'shot 8,006 Company Company H-AITHT 60 (103-84)86, 64, 64, 64, 64, 72h Pb, Mb, Mi, Ag, Y, 2h 6230-86, As, Se, TI Received by (Signature and Print Name) and Print Name) EPA ۲ ا Lobb: Hechodassived metals abilkatordasalus metals aby the char has been been below Merced Co Tulare Co abiller for discoughnet E-mail: dallison@ecmconsults.com CDHS Fresno Co Regulatory Compliance Electronic Data Transfer. System No. * FAX * #: Comments / Station Code SO = Solid solmetals on Received by (Signatur galo only Carbon Copies: CFW = Clorinated Finished Water CWW = Chorinated Waste Water BW = Bottled Water FW = Finished Water WW = Waste Water SW = Storm Water DW = Drinking Water Phone * #: 208-407-1440 Other: ✓STD S Day** Day** Day** Matrix * 20 R 33 3 3 12K Time Time Result Request ** Surcharge 108312 92626 Date Date Zip * BCL Quote # Mail Only PO# David Allison S STD | Level II How would you like your completed results sent? E-Mail Fax EDD State * Report Attention *: Sample Description / Location * N. S. Rasafe Blank-0 QC Request Company Company B3-56 W3-56 Costa Mesa 88-20-03 88-50-W-88 83-5W-62 123-5w-01 Kip Bank Penze! Diso City * RSW E Raw Surface Water RGW = Raw Ground Water Relynquished by; (Signature and Printed Name) iquished by: (Signature and Printed Name) 129/2 1330 St.51 8000 3525 Hyland Ave. Suite 200 2000 MIS 0251 of 1230 ME 1545 pitaga Maso るなる一なん 433 po 1730 **ECM Consultants** Time Sampled Sampler Name Printed / Signature emper **USFS Big Blue Mill** Date Client/Company Name *: Project Information: # Bottles Matrix Types: sand ! Address * Sample #

Init

Check/Cash/Card PIA #

4mount:

Date:

Cooling Method:

CAO UPS GSO WALK-IN SIVC FED EX OTHER

Payment Received at Delivery:

Time

Date

Received for Lab by: (Signature and Printed Name)

Shipping Method:

Packing Material:

NONE

BLUE

WET

10/23/20 ECM Consultants Big Blue Mill Supled: Jared Komper PM: David Altron Report metals totals before running TCLP+Brownariability
Lab to filter water samples for dissolved metals
Run 6010B for barium, beryllium, codmium chronium, cobalt, Run 6020 har antimony, arsenic, selevium, the Viven
Run Brownicosility or for antimony, arsenic, lead, mercu

Tailgate Safety Meeting



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Project Name: Big Blue Mill Site		Date:	10/19/20
Project Manager: David Allison			
Presented By: Jared Kemper			
Daily Activities: XRF			
emergency procedures & evacuation route site safety plan review and location Safety First / self-check before every task equipment and machinery familiarization sharp object, rebar, and scrap metals slips, trips, and falls vehicle safety and driving/road conditions overhead utility locations and clearance open pits, excavations, and site hazards excavation/trenching inspections/documentation Smoking in designated areas Eye wash station locations employee Right-To-Know/MSDS location no short cuts heat and cold stress operational discipline hazard identification Level D personal protection equipment is required on Onsite personnel will upgrade to level C or above as a field personnel will be authorized to continue or stop v	appropriate. The project manager will be no	personal partial strains and buddy system portable to public safe parking & hot work parking debries and the strain of the strai	oftem (as needed) col safety and awareness ety and fences lay down/ wheel chocks permits ris hazards uisher location swing and loading vapor control the night before ation safety i, insects, biological hazards ergies GETS HURT!
NAME	SIGNATURE		COMPANY
Jared Lemper	July 1 cm		Ecm-
Apelle Makoshi	AKIYO ON	Zm.	MSFS
AFTERNOON SAFETY BREAK TOPICS		TIME:	

Conduct a daily safety meeting prior to beginning each day's site activities.

Follow-up on any noted items and document resolution.

Daily Field Report



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client:	USFS	Date:	10/19/20	Mo Tu We Th Fr Sa Su
Job Site:			Weather: Salvan	(1 ~ 900
Location	Kern County, CA		Subcontractors ons	
Observer		==1		
Daily Act	livities: XRF BG + Demautron, 1	Mab:	ire	
Time	Description			
0630	Med & Ripon,	,		
1200	Drop attrailer O Camp	Ken	uille.	
1300	11/0. 1.1 > 1 \ 1 /		checation,	ample BG,
1000		prag	the libertron, S	he appointed gackanound
	LOCA JON: DBCUSS beam ENC		/11 1-0	10 with affects L&D. The
	agreed 14 LOD for AS 10 40 5	eg T	sacceptable. I	13coss 6200+ in-5tu,
	The said has its fine for of F	-der	texts, but regs	est homogiphization
	tarter Mgs			3
1790	Official			
		/		
		1		
				×
/				
/				

Work Permit Required? N Y#_____ Mileage: _____ miles

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Tailgate Safety Meeting



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Project Name: Big Blue Mill Site		Date: 10/20/20
Project Manager: David Allison		
Presented By: Javed Kemper		
Daily Activities: XRF, Soil samp	ing	
emergency procedures & evacuation route site safety plan review and location Safety First / self-check before every task equipment and machinery familiarization sharp object, rebar, and scrap metals slips, trips, and falls vehicle safety and driving/road conditions overhead utility locations and clearance open pits, excavations, and site hazards excavation/trenching inspections/documentation Smoking in designated areas Eye wash station locations employee Right-To-Know/MSDS location no short cuts heat and cold stress operational discipline hazard identification Level D personal protection equipment is required on Onsite personnel will upgrade to level C or above as a field personnel will be authorized to continue or stop v	appropriate. The project manager will be	site specific hazards personal protective equipment strains and sprains buddy system (as needed) portable tool safety and awareness public safety and fences parking & lay down/ wheel chocks hot work permits flying debris hazards fire extinguisher location excavator swing and loading dust and vapor control effects of the night before demobilization safety bee stings, insects, biological hazards Critical Allergies NOBODY GETS HURT! the Site Health and Safety Plan are met, notified immediately of condition change and
NAME	SIGNATURE	COMPANY
Chris McComzell	1 /ll	ECM
Soulle Graham-Wak	Juny Jule	ili USFS
AFTERNOON SAFETY BREAK TOPICS		TIME:

Conduct a daily safety meeting prior to beginning each day's site activities.

Follow-up on any noted items and document resolution.

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Page	of	
		_

Daily Field Report



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client:	USFS	Date:	10/20/20	Мо	Tu We	Th	Fr	Sa	Su				
Job Site:	Big Blue Mill Site		Weather: Sonny, a 850										
Location	Kern County, CA		Subcontractors onsite:										
Observer	Jand Lemper												
Daily Act	ivities: XRF soil sample												
Time	Description												
0700	Onsite, Got up equipme u Shoot blesakt Standard up cuit in true to our fix de Stoot XRF on northernhoundary Noelle onside, explain delin As is stightly higher moone are very similar to hat s	XRI at you	on criteria, Pes (24 us 19 bg)	omogou other Exp	1.	NA FE	الكرة المراد	1+50					
100 1200 1230	Move toward we ter collects Delineate She houndary XRF computed mine waste and e Relacate XRF sample BB-12 Comented mine waste into hagg bag, then shoot each, interve has, Material top hard to ha	ped 23 to 12 les	ORF 13tal Starwa sample this as from stolecuall (XRF. Sam XRI when Computed	Has thom FOC Anno	a deptose angenize	h/h ea. (scoll ist	hising!	and s	amp/				
1300	higher XRF. 1'=4' darhers. Continue XRF doug trail near depth internals like BB-123 (O against bedrack a erson	river	and comente (2',3',4',5') 5	Jail Shot	wobles the S. XI	gai.	B-K	296	P HA				
1500	Per comented failing @aerra			round'a	trons@	site	2, w	ater	-				
1700	Complete with XRFshot, tall riverabout drone work.	to l	nome owner (2 Sma	Thouse	clo	sest	10					
1715 1730	Deconfield equipment and Offsite	(00)	ect Kinsate	Blan	k			_					
		JK							-				
		74							\dashv				

Work Permit R	equired? N Y#
Mileage:	miles

Tailgate Safety Meeting



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Project Name: Big Blue Mill Site		Date: 0/20/20
Project Manager: David Allison		
Presented By: Jared Vemper		
Daily Activities: Drune frant XP	F, Soil + SW sampling	
emergency procedures & evacuation route site safety plan review and location Safety First / self-check before every task equipment and machinery familiarization sharp object, rebar, and scrap metals slips, trips, and falls Vehicle safety and driving/road conditions overhead utility locations and clearance open pits, excavations, and site hazards excavation/trenching inspections/documentation smoking in designated areas Eye wash station locations employee Right-To-Know/MSDS location no short cuts heat and cold stress operational discipline hazard identification Level D personal protection equipment is required on Onsite personnel will upgrade to level C or above as a field personnel will be authorized to continue or stop versions.	appropriate. The project manager will be r	site specific hazards personal protective equipment strains and sprains buddy system (as needed) portable tool safety and awareness public safety and fences parking & lay down/ wheel chocks hot work permits flying debris hazards fire extinguisher location excavator swing and loading dust and vapor control effects of the night before demobilization safety bee stings, insects, biological hazards Critical Allergies NOBODY GETS HURT! the Site Health and Safety Plan are met, notified immediately of condition change and
NAME,	SIGNATURE	COMPANY
Jared Kemper	Ladden	Ecm
Chris Mc Cormack	The	ECM
Moelle Graham-Wat	ostu Allosy	lala USTES
THOMAS F. GUSTAFF	Mun fortratt	CEI
Mike Edwards	The in	- CEI
AFTERNOON SAFETY BREAK TOPICS		
		TIME:

Conduct a daily safety meeting prior to beginning each day's site activities.

Page ____of___

Follow-up on any noted items and document resolution.

Daily Field Report

Work Permit Required? N Y#_

Mileage: _____ miles



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Page ____of__

Client:	USFS	Date:	10/21/20 Mo Tu We Th Fr Sa Su
Job Site:	Big Blue Mill Site		Weather: Jack 800
Location	Kern County, CA		Subcontractors onsite: Comers tone (Drone Survey)
Observer	Jared Kemper		
	ivities: Drane Survey, XRF, S	soil+S	SW saupling
Time	Description		
0645	Ousite, prep paper	rock Ca	I wy Cornerstone, setting up drone
M 7. ~.	on historia.	1 0	, A + + + +
0700	100016 - 1071 - 1 1076	ed for	property boundarysies to be shown
0730	Corners fore out it, At	11166 6	cope spatety for disnesurvey
0800	Cornerstone barns plu	1.	
0840			transcologist
	- Could be roaxing nea	rbricks	sousite, used line in roasting toould have
	made coment w/ noto	1 1	
		11 0	newton banks, 80,000 CFS.
	- Water Dowered gener	1 1	
	- Also a boundar by slav	1	
0900	Continue XRF, collect so	(BB	343 for VOCs
100			very marker foratto in dallation
1200			, tero cal + adjust zero. Set up pumps
1230	Cornerstone finish source	- 1	
10.20	1000 111010	eded by	1 Ut 1830 85 2010000
41	Jarred @ 1300, Welkon	1 1 1	
1245	Collect Jerome 43/ in	erwing?	raper samples about property boundary
1430	12 1 23-D-1		
1500 \$ 1230	Frish BB-D-2	157 :	not 56.58. Chris not fred Noelle who
100		57 but	
1530	Talk to David Allison, said to a		
	for Brown lability + TelPiote	A 1	
116-	for a tews a uple ponds	111	
600	Continue XRF, Using backup	battery ?	parkthat blocks comera
1745	Frish XRF, affeste, allect in	sate blank	K

Tailgate Safety Meeting



web ecmconsults.com

address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759

Project Name: Big Blue Mill Site		Date: 10/22/20
Project Manager: David Allison		
Presented By: Javed Yearper		
Daily Activities: Xpf, Soil Alabersauga	Ing	
emergency procedures & evacuation route site safety plan review and location Safety First / self-check before every task equipment and machinery familiarization sharp object, rebar, and scrap metals slips, trips, and falls vehicle safety and driving/road conditions overhead utility locations and clearance open pits, excavations, and site hazards excavation/trenching inspections/documentation Smoking in designated areas Eye wash station locations employee Right-To-Know/MSDS location no short cuts heat and cold stress operational discipline hazard identification Level D personal protection equipment is required on Onsite personnel will upgrade to level C or above as a field personnel will be authorized to continue or stop v	appropriate. The project manager will be no	
NAME	SIGNATURE,	COMPANY
Ind temper Chris McCompet Noelle Graham-Wakosh	Jered Grand	Ecm Ecm USTES
AFTERNOON SAFETY BREAK TOPICS		
		TIME:
		TIME:

Page ___ of

Daily Field Report



address 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client:	USFS	Date:	10/22/20	Мо	Tu	We	Th	Fr	Sa	Su
Job Site:	Big Blue Mill Site		Weather: ปังห	www.						
Location	Kern County, CA		Subcontractors of	nsite: (JSF.	S	ne/es	Jar -	-	
Observer	Jared Kemper									
Daily Acti	vities: XRF, Soil HWater Sampli	ha								
Time	Description	,								
6700	Arrive onste, Setup XRF+	field	sneets, cal	w/ Da	ue		. ^	1		
0730	Drzcuss sample occasions		selle, she sug	ar sites	Trea	rues	ed	the	et	- 1
in (9	We take a substantace sav	- 1	in the will f	ound at	tool	10	BB-	-116		
0800	Surveyors removed post 5	- 1		TO 1	-7.1	1	b		11	1
0900		park	ling area lnee	(-1818-10	35)-	6 4	حمد	Pas	+4	he
0930	Afterny + so bsorface sampling		1 1 2 2 2	auge	1	F69	ZD	-25	. 4	F
0 ()0	Heroselan bandarara	J '	(0 111	18"-20		rp)	-1		-31	1
		@ 12	". XRFed ev		11	erva	1.)	lese	16	
	said there is no need to so	epot	more in that	area	1	0	13	like	y	
			0-01 was bys	1	4	1		-25-	0.5	2
low	Aftempt Sulsortuce Sampling @	BB-	116, Hit refusal	@ Cono	rete	Fren	data	on f	long	
	Q6", Shot 0-6" W/XRF, 60,00	-	V - 5					1	-	
	be sudget to he aftempt subs				()	00			1	
	sandy layeran 16" woody rave		wel againe;		Hitr		1		1	
	BB-116-50-1 wood further S	U	45. Sample	0	0	11		aml	ling	
1130	Frish subsorface bornys, setti		V 1 11		plan		-116	-50-	12	_
	Vocs, PID=00 Vocs	11		7-544	1	1			1 304	
1145	Set up dust monitors							1		
1200	Begin dost monitor mg			trail	- wa	ter	اودو			
1300	XRF + Sample subsurface & F		13							
330	Collect SW+Sed@BB-SW-C									-
1335	Collect DP-01 @ BR-SW-		1 1	ß					_	-
1415	Enish Dastsamal Ing Bragar SumpleMod a rea + six/sed	63 ,	wangles@to	r R						\dashv
1916	Sample XRF & SW/Sed OL	March	world I		L			1	100	1
1800	Organize truck de part site		C () BUC TX TO	usechs	hetse	P	solle:	Ty	11-6	roin
					JK				_	\neg

Work Permit Required? N Y#_____ Mileage: _____ miles

1630

Page _____of____

Tailgate Safety Meeting



address 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 web ecmconsults.com

Project Name: Big Blue Mill Site		Date:	10/23/20
Project Manager: David Allison			
Presented By: Jana Vemper			
Daily Activities: XRF, pickupsamp	le berg 5		
emergency procedures & evacuation route site safety plan review and location Safety First / self-check before every task equipment and machinery familiarization sharp object, rebar, and scrap metals slips, trips, and falls vehicle safety and driving/road conditions overhead utility locations and clearance open pits, excavations, and site hazards excavation/trenching inspections/documentation Smoking in designated areas Eye wash station locations employee Right-To-Know/MSDS location po short cuts heat and cold stress operational discipline hazard identification Level D personal protection equipment is required on soonsite personnel will upgrade to level C or above as a field personnel will be authorized to continue or stop w LIST JHAS REVIEWED (As Applicable)	daily work scope directions to hospital Stop Work Authority pinch points Iffting techniques orderly site and housekeeping traffic safety backing up hazards electrical ground fault noise hazards refueling procedures decontamination procedures first aid, safety, and PPE location no horseplay visitors cell phones securing loads/cargo site. If hazardous conditions specified ppropriate. The project manager will be	strains and fouddy system portable to public safet parking & la hot work per flying debristire extingule excavators dust and vareffects of the demobilization foe stings, Critical Alle NOBODY Coin the Site Health	rotective equipment I sprains em (as needed) of safety and awareness ty and fences ay down/ wheel chocks ermits s hazards isher location swing and loading apor control ne night before tion safety insects, biological hazards regies GETS HURT!
NAME	SIGNATURE		COMPANY
Olmis M Compek Sored Kemper	Juston		ECM ECM
AFTERNOON SAFETY BREAK TOPICS		TIME:	

Page ____of_

Daily Field Report



address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client:	USFS	Date:	10123120	Мо	Tu	We	Th	Fr	Sa	Su				
Job Site:	Big Blue Mill Site		Weather: Sonny 2700											
Location	Kern County, CA		Subcontractors onsite:											
Observer	Jared Kenger													
Daily Act	ivities: XPF, Leonob													
Time	Description													
0640	Ousite, set up XRF+ GPS	٨												
0700		dary												
0000	Frish Hover Han XII	1		-						_				
0900	1 5-1		w Soil lettoupl	,	1 m	1	1	110	1					
U 193	Rich Willhaber came de			the such	M	- Th	19	in	Nest	25 c				
	was collecting sig sam			,,,,,,	Y	(ic ()	11-						
1020	Obsite pagnostola	b' ;	o cA							7,17				
1230	Dropoteramples @BC:	~ Bez k	2013 frad											
1720	Exipon pilkopeex									_				
1900	Chame	_								=				
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Appendix E Photographic Log



address phone

Client Name: US Forest Service

Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No.

Description:

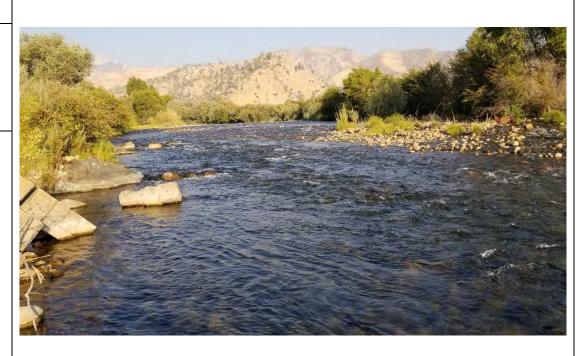
Floodplain north of mill site.



Photo No.

Description:

Downstream view of Kern River





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client Name: US Forest Service Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No.

Description:

"Cemented tailings" along river bank.



Photo No.

4

Description:

Tailings and foundation bricks located near BB-09





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client Name: US Forest Service

Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No.

Description:

In-place tailings over native river rock/cobbles.



Photo No.

Description:

Grain size and cemented material example of Sample BB-25-0.5





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 web ecmconsults.com

Client Name: US Forest Service Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No. 7

Description:

Existing mill foundations shown downslope of occupied residences.



Photo No. 8

Description:

Location of Sample 116 showing concrete below surface. Unable to collect sub surface sample.





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client Name: US Forest Service

Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No. 9

Description:

Approximate location of step-out location Sample BB-116-SO1.



Photo No. 10

Description:

Measured thickness of observed tailings over native soil. Approximately 62 inches.





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 web | ecmconsults.com

Client Name: US Forest Service

Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No. 11

Description:

Tailings shown over native river rock/cobbles along Kern River bank.



Photo No. 12

Description:

Personal air sampling pumps for monitoring metals in total dust and respirable fraction dust.





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 714.662.2759 ecmconsults.com

Client Name: US Forest Service

Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No. 13

Description:

Sand bar sampling locations down stream of Site.



Photo No. 14

Description:

Sand bar sampling locations down stream of Site.





address | 3525 Hyland Ave #200 Costa Mesa, CA 92626 phone | 714.662.2759 web ecmconsults.com

Client Name: US Forest Service Site Location: Big Blue Mill Kern County, California

Project Name: Big Blue Mill – Site Inspection

Photo No. 15

Description:

"Cemented" tailings along river bank near Sample BB-129



Photo No. 16

Description:

"Cemented" tailings along river bank with USFS installed property boundary warning signs. Fishing platform located near large rock outcrop.



Appendix F Laboratory Analytical Reports and Chain-ofCustody Records

Attn: David Allison 11/11/2020

Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200 Costa Mesa, CA 92626

Phone: (510) 964-4399 Fax: (510) 295-2656

The following analytical report covers the analysis performed on samples submitted to LA Testing on 10/28/2020. The results are tabulated on the attached data pages for the following client designated project:

Big Blue Mill

The reference number for these samples is EMSL Order #332019281. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (714) 828-4999.

Approved By:

Michael Chapman, Laboratory Manager

Michael Chapman



LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

Phone/Fax: (714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

David Allison Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200

Costa Mesa, CA 92626

Project: Big Blue Mill

LA Testing Order: 332019281 CustomerID:

ENCM42

CustomerPO: ProjectID:

(510) 964-4399

(510) 295-2656

10/22/2020

10/28/2020 10:25 AM

Phone:

Received:

Collected:

Fax:

	Į.	Analytical	Result	s							
Client Sample Description	BB-D-1.3 Near property boundary and walking	trail	Colle	ected:	10/21/2020	Lab	ID:	332019281-	0001		
Method	Parameter	Result	RL	Units	Prep Date & Analyst						
METALS											
ID-145	Mercury	<0.056	0.056	μg/m³		11/9/2020	DP	11/9/2020	DP		
Client Sample Description	BB-D-2.3 Near property boundary and walking	trail	Colle	ected:	10/21/2020	Lab	ID:	332019281-	0002		
Method	Parameter	Result	RL	Units		•	•		alysis & Analyst		
METALS											
ID-145	Mercury	<0.056	0.056	μg/m³		11/9/2020	DP	11/9/2020	DP		
Client Sample Description	BB-D-3.3 Near river and cemented tailings		Colle	ected:	10/22/2020	Lab	ID:	332019281-	0003		
Method	Parameter	Result	RL	Units		Prep Date & Analyst		Analys Date & Ai			
METALS											
ID-145	Mercury	<0.056	0.056	μg/m³		11/9/2020	DP	11/9/2020	DP		
Client Sample Description	BB-D-4.3 Near river and cemented tailings		Colle	ected:	10/22/2020	Lab	ID:	332019281-	0004		
Method	Parameter	Result	RL Units			Prep Date & Analyst		Analysi st Date & Ana			
METALS											
ID-145	Mercury	<0.056	0.056	µg/m³		11/9/2020	DP	11/9/2020	DP		

Definitions:

MDL - method detection limit

RL - Reporting Limit (Analytical)

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit

D - Dilution Sample required a dilution which was used to calculate final results



LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

Phone/Fax: (714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

CustomerPO: ProjectID:

CustomerID: ENCM42

332019283

LA Testing Order:

David Allison

Environmental Cost Management, Inc. 3525 Hyland Avenue

Suite 200 Costa Mesa, CA 92626 Phone: (510) 964-4399 Fax: (510) 295-2656 Received: 10/28/2020 10:25 AM

Analysis Date: 10/30/2020 Collected: 10/21/2020

Project: Big Blue Mill

Test Report: Respirable Dust by NIOSH 0600

Sample	Location	Volum e (L)	Sample Weight (mg)	Concentration (mg/m³)	Reporting Limit (mg/m³)	Notes	
BB-D-1.1 332019283-0001	Near property boundary and walking trail	450	<0.050	<0.11	0.11		
BB-D-2.1 332019283-0002	Near property boundary and walking trail	450	<0.050	<0.11	0.11		
BB-D-3.1 332019283-0003	Near river and cemented tailings	450	<0.050	<0.11	0.11		
BB-D-4.1 332019283-0004	Near river and cemented tailings	450	0.10	0.22	0.11		

Notes: Discernable field blank not submitted with samples.

Results are not field blank corrected.

michael Chapman Analyst(s) Christine Do (4)

Michael Chapman, Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. Sample results are blank corrected unless otherwise noted. Discernable field blank(s) submitted with samples if listed above. Samples analyzed by LA Testing Huntington Beach, CA AlHA-LAP, LLC--IHLAP Accredited #101650

Initial report from 10/30/2020 15:29:20

OrderID: 332019283



Industrial Hygiene Chain of Custody EMSL Order Number (Lab Use Only): # 3 3 2 0 1 9 2 8 3

20 10:25	10128			(EX)	1			10/26/2020	10/2	Heed hugh	ECM Consultants	Jared Kemper ECN	
Date				1	>	Received By	Re	Date	D	7			Released By
	licates.	the proper number of field blanks and duplicates	ber of field b.	per num		ibility to sur	s respons	samplers	It is the IH field sampler's responsibility to submit		ethods require	Note: Most NIOSH and OSHA methods require field blanks.	Note: Most NIC
clone	Collected with cyclone	10/22/2020		☐ Area ■ Personal	450 L	1400	1200	2.5	Dust Cassette	Respirable Dust NICSH 0800 + CAM-17 (minus Hg)	-	Near river and cemented tailings	BB-D-4.1
clone	Collected with cyclone	10/22/2020		☐ Area ■ Personal	450 L	1400	1200	2.5	Dust Cassette	Respirable Dust NIOSH 7303 Hg	-	Near river and cemented tailings	BB-D-3.3
		10/22/2020		☐ Area ■ Personal	450 L	1400	1200	2.5	Dust Cassette	g +	-	Near river and cemented tailings	BB-D-3.2
clone	Collected with cyclone	10/22/2020		☐ Area ■ Personal	450 L	1400	1200	2.5	Dust Cassette	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)		Near river and cemented tailings	BB-D-3.1
clone	Collected with cyclone	10/21/2020		Area Personal	450 L	1500	1300	2.5	Dust Cassette	Respirable Dust NIOSH 7303 Hg	-	Near property boundary and walking trail	BB-D-2.3
		10/21/2020		☐ Area ■ Personal	450 L	1500	1300	2.5	Dust Cassette	Total Duet NIOSH 0500 + CAM-17 Metals (minus Hg)	-	Near property boundary and walking trail	BB-D-2.2
clone	Collected with cyclone	10/21/2020		☐ Area ■ Personal	450 L	1430	1300	2.5	Dust Cassette	Respirable Dust NIOSH 0800 + CAM-17 (minus Hg)	-	Near property boundary and walking trail	BB-D-2.1
clone	Collected with cyclone	10/21/2020		☐ Area ■ Perso	450 L	1430	1230	2.5	Dust Cassette		-	Near property boundary and walking trail	BB-D-1.3
		10/21/2020		☐ Area ■ Personal	450 L	1430	1230	2.5	Dust Cassette	Total Dust NIOSH 0500 * CAM-17 Metals (minus Hg)		Near property boundary and walking trail	BB-D-1.2
clone	10/21/2020 Collected with cyclone	10/21/2020	Sonal	☐ Area ■ Personal	450 L	1430	1230	2.5	Dust Cassette	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	-	Near property boundary and walking trail	BB-D-1.1
nents	Comments	Sample Date	•	_	Volume Area	Off	Sample	(lpm)	Media	Analyte / Method	scription	Location/Description	Client Sample ID
			Lot #:										
	75	Manufacturer/Part #:	_	all Lab)	Other (Call Lab)	Day	11	2 Day		3 Day	4 Day	1 Week	2 Week
		Туре:	Media Type:	y	T Will Apply	Week TA	ndard 2	ade, Star	Selection Ma	heck: If No S	T) - Please C	Turnaround Time (TAT) – Please Check: If No Selection Made, Standard 2 Week TAT W	Turnar
	Ä	U.S. State where Samples Collected: CA	ere Samples	state wh	U.S. S	Blue Mill	Big BI	Project Name: Big	Proje	com	ecmconsults.	Email Results To: dallison@ecmconsults.com	Email Results
)rder:	Purchase Order:				759 Fax:	662-27	Phone: 714-662-2759	Pho		Fax:	-407-1440	Phone: 208-407-1440
and hugh	Sampled By (Signature):	-	Zip/Postal Code: 92626	/Postal (City: Costa Mesa State/Province: CA	esa State	Costa M		Zip/Postal Code: 92626		City: Costa Mesa State/Province: CA	City: Costa Me
/2020	Date of Shipment: 10/26/2020	Date of Ship			te 200	Ave, Suite	Hyland	Street: 3525 Hyland Ave,	Stre		Suite 200	Street: 3525 Hyland Ave, St	Street: 3525
12	# Samples in Shipment: 12	# Samples i		lison	Attention To: Mona Mansell & David Allison	/lansell &	Mona N	ntion To:	Atte		ultants	me: ECM Consultants	Company Name:
		Client ID #			ants	Bill To Company: ECM Consultants	any: ECN	To Comp	Bill		David Allison		Report To Contact Name:

OrderID: 332019283



Industrial Hygiene Chain of Custody EMSL Order Number (Lab Use Only):

#332019283

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	Madia	Flow	Sampl	e Time	Volume /	Sample	Sample	Dammania
	Media	(lpm)	On	Off	Area	Type	Date	Comments
	Dust Cassette	2.5	1200	1400	450 L	☐ Area ☐ Personal	10/22/2020	
_	Dust Cassette	2.5	1200	1400	450 L	Area	10/22/2020	Collected with cyclone
						☐ Area ☐ Personal		
						☐ Area ☐ Personal		
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	Near river and cemented tailings Near river and cemented tailings	Analyte / Method Total Dark INDISH 0000 * CANA-17 Media (morale 1) Respirable Dark Hoah 7200 Hg 1900 Hg 1900 Hg	Analyte / Method Method Valat Day NOSH (1920) (CAN-17) Meals (Immara 194) Dust Cassette Respirable Dost Neath Dust Cassette	Analyte / Method (Ipm) Total Day 190201 0500* C.C.S.F. 7 Media (Ipm) Coult - Ty Media (Immae 14) Respectable Dout Neath 7203 Hg Dust Cassette 2.5 Dust Cassette 2.5	Analyte / Method (Ipm) On Cast Day (Ipon) On On Cast Day (Ipon) On On On On On On On On On On On On On	Analyte / Media (lpm) Sample Time (lpm) On Off Off Off Off Off Off Off Off Off	Analyte / Media	Analyte / Media Media Clpm Common

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Attn: David Allison 11/10/2020

Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200 Costa Mesa, CA 92626

Phone: (510) 964-4399 Fax: (510) 295-2656

The following analytical report covers the analysis performed on samples submitted to LA Testing on 10/28/2020. The results are tabulated on the attached data pages for the following client designated project:

Big Blue Mill

The reference number for these samples is EMSL Order #332019286. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (714) 828-4999.

Approved By:

Michael Chapman, Laboratory Manager

Michael Chapman



LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

(714) 828-4999 / (714) 828-4944 Phone/Fax:

http://www.LATesting.com

gardengrovelab@latesting.com

David Allison Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200

Project: Big Blue Mill

Costa Mesa, CA 92626

LA Testing Order: 332019286 CustomerID: ENCM42

CustomerPO:

ProjectID:

Phone: (510) 964-4399 Fax: (510) 295-2656 10/28/2020 10:25 AM Received: Collected: 10/22/2020

Analytical Results

Client Sample Description BB-D-1.1 Collected: 10/21/2020 Lab ID: 332019286-0001

Near property boundary and walking trail

	Near property boundar	y and walking trail						
Method	Parameter	Result	RL	Units	Prep Date & Anal	yst	Analys Date & An	
METALS								
7300 Modified	Antimony	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22).22	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Cadmium	<0.44).44	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Chromium	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Cobalt	<1.1	1.1	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Copper	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Lead	<1.1	1.1	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Molybdenum	<1.1	1.1	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Nickel	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Selenium	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Silver	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Thallium	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH

Collected: Lab ID: Client Sample Description BB-D-2.1 10/21/2020 332019286-0002

Near property boundary and walking trail

real property boundary and wanti	.9				
Parameter	Result	RL	Units	Prep Date & Analyst	Analysis Date & Analyst
Antimony	<2.2	2.2	μg/m³	11/9/2020 TH	I 11/9/2020 TH
Arsenic	<2.2	2.2	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Barium	<11	11	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Beryllium	<0.22	0.22	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Cadmium	<0.44	0.44	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Chromium	<2.2	2.2	μg/m³	11/9/2020 TH	I 11/9/2020 TH
Cobalt	<1.1	1.1	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Copper	<2.2	2.2	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Lead	<1.1	1.1	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Molybdenum	<1.1	1.1	μg/m³	11/9/2020 TH	I 11/9/2020 TH
Nickel	<2.2	2.2	µg/m³	11/9/2020 TH	I 11/9/2020 TH
Selenium	<2.2	2.2	μg/m³	11/9/2020 Th	I 11/9/2020 TH
Silver	<2.2	2.2	µg/m³	11/9/2020 TH	I 11/9/2020 TH
	Parameter Antimony Arsenic Barium Beryllium Cadmium Chromium Cobalt Copper Lead Molybdenum Nickel Selenium	Parameter Result Antimony <2.2	Parameter Result RL Antimony <2.2	Parameter Result RL Units Antimony <2.2	Parameter Result RL Units Prep Date & Analyst Antimony <2.2



Attn:

LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

Phone/Fax: (714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

David Allison Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200

Costa Mesa, CA 92626

Project: Big Blue Mill

LA Testing Order: CustomerID:

332019286

ENCM42 CustomerPO:

ProjectID: (510) 964-4399

Fax: (510) 295-2656 Received: 10/28/2020 10:25 AM

Collected: 10/22/2020

Phone:

		Analytical	Result	s					
Client Sample Description	BB-D-2.1 Near property boundary and walkin	g trail	Colle	ected:	10/21/2020	Lab	ID:	332019286-	0002
Method	Parameter	Result	RL	Units		Prep Date & An	alyst	Analys Date & Ar	
METALS									
7300 Modified	Thallium	<2.2	2.2	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
Client Sample Description	BB-D-3.1 Near river and cemented tailings		Colle	ected:	10/22/2020	Lab	ID:	332019286-	0003
Method	Parameter	Result	RL	Units		Prep Date & An	alyst	Analys Date & Ar	
METALS									
7300 Modified	Antimony	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	<2.2	2.2	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22	0.22	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Cadmium	<0.44	0.44	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Chromium	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Cobalt	<1.1	1.1	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Copper	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Lead	<1.1	1.1	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Molybdenum	<1.1	1.1	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Nickel	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Selenium	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Silver	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Thallium	<2.2	2.2	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	μg/m³		11/9/2020	TH	11/9/2020	TH
Client Sample Description			Colle	ected:	10/22/2020	Lab	ID:	332019286-	0004
	Near river and cemented tailings					_		_	
Method	Parameter	Result	RL	Units		Prep Date & An	alyst	Analys Date & Ar	
METALS									
7300 Modified	Antimony	<2.2	2.2	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	3.7	2.2	μg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	µg/m³		11/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22	0.22	µg/m³		11/9/2020	TH	11/9/2020	TH



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LA Testing Order: CustomerID:

332019286 ENCM42

CustomerPO: ProjectID:

David Allison

Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200

Costa Mesa, CA 92626

Project: Big Blue Mill

Phone: (510) 964-4399 Fax: (510) 295-2656 10/28/2020 10:25 AM Received:

Collected: 10/22/2020

Analytical Results

Client Sample Description BB-D-4.1 Collected: 10/22/2020 Lab ID: 332019286-0004 Near river and cemented tailings

	Trous Trot data companie				
Method	Parameter	Result R	L Units	Prep Date & Analyst	Analysis Date & Analyst
METALS					
7300 Modified	Cadmium	<0.44 0.4	4 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Chromium	<2.2 2.	2 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Cobalt	<1.1 1.	1 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Copper	<2.2 2.	2 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Lead	<1.1 1.	1 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Molybdenum	<1.1 1.	1 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Nickel	<2.2 2	2 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Selenium	<2.2 2	2 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Silver	<2.2 2	2 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Thallium	<2.2 2	2 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Vanadium	<1.1 1.	1 μg/m³	11/9/2020 TH	11/9/2020 TH
7300 Modified	Zinc	<2.2 2.	2 μg/m³	11/9/2020 TH	11/9/2020 TH

Definitions:

MDL - method detection limit

RL - Reporting Limit (Analytical)

D - Dilution Sample required a dilution which was used to calculate final results

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit



LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

Phone/Fax: (714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

CustomerID: CustomerPO: ProjectID:

LA Testing Order: ENCM42

332019287

David Allison Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200 Costa Mesa, CA 92626

Fax: (510) 295-2656 Received: 10/28/2020 10:25 AM Analysis Date: 10/30/2020 Collected: 10/22/2020

(510) 964-4399

Phone:

Project: Big Blue Mill

Test Report: Total Dust by NIOSH 0500

Sample	Location	Volum e (L)	Sample Weight (mg)	Concentration (mg/m³)	Reporting Limit (mg/m³)	Notes	
BB-D-1.2 332019287-0001	Near property boundary and walking trail	450	<0.050	<0.11	0.11		
BB-D-2.2 332019287-0002	Near property boundary and walking trail	450	<0.050	<0.11	0.11		
BB-D-3.2 332019287-0003	Near river and cemented tailings	450	0.069	0.15	0.11		
BB-D-4.2 332019287-0004	Near river and cemented tailings	450	0.38	0.85	0.11		

Notes: Discernable field blank not submitted with samples.

Results are not field blank corrected.

michael Chapman Analyst(s) Christine Do (4)

Michael Chapman, Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. Sample results are blank corrected unless otherwise noted. Discernable field blank(s) submitted with samples if listed above. Samples analyzed by LA Testing Huntington Beach, CA AlHA-LAP, LLC--IHLAP Accredited #101650

Initial report from 10/30/2020 15:39:01

Took Donard II INI. isangaDirat 7 07 6 Drintad, 40/20/2000 2:20:04 DNA

OrderID: 332019287

Comments:

Released By

Jared Kemper ECM Consultants

10/26/2020 Date

Received By

1018 20

10:26

Date



Industrial Hygiene Chain of Custody EMSL Order Number (Lab Use Only): # 3 3 2 0 1 9 2 8 7

licates.	Note: Most NIOSH and OSHA methods require field blanks. It is the IH field sampler's responsibility to submit the proper number of field blanks and duplicates	number of field	bmit the proper	bility to sut	s responsi	sampler	is the IH field	field blanks. I	methods require	OSH and OSHA	Note: Most N
Collected with cyclone	10/22/2020	Area Personal	450 L	1400	1200	2.5	Dust Cassette	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	Near river and cemented tailings	Near river and c	BB-D-4.1
Collected with cyclone	10/22/2020	☐ Area ■ Personal	450 L	1400	1200	2.5	Dust Cassette	Respirable Dust NIOSH 7303 Hg	Near river and cemented tailings	Near river and c	BB-D-3.3
	10/22/2020	Area Personal	450 L	1400	1200	2.5	Dust Cassette	Total Dust NIOSH 0500 + CAM-17 Metals (minus Hg)	Near river and cemented tailings	Near river and c	BB-D-3.2
Collected with cyclone	10/22/2020	☐ Area ■ Personal	450 L	1400	1200	2.5	Dust Cassette	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	Near river and cemented tailings	Near river and c	BB-D-3.1
Collected with cyclone	10/21/2020	Area Personal	450 L	1500	1300	2.5	Dust Cassette	Respirable Dust NICSH 7303 Hg	Near property boundary and walking trail	Near property bound	BB-D-2.3
	10/21/2020	☐ Area ■ Personal	450 L	1500	1300	2.5	Dust Cassette	Total Dust NIOSH 0500 + CAM-17 Metals (minus Hg)	Near property boundary and walking trail	Near property bound	BB-D-2.2
Collected with cyclone	10/21/2020	Area Personal	450 L	1430	1300	2.5	Dust Cassette	Respirable Dust NICSH 0600 + CAM-17 (minus Hg)	Near property boundary and walking trail	Near property bound	BB-D-2.1
Collected with cyclone	10/21/2020	☐ Area ■ Personal	450 L	1430	1230	2.5	Dust Cassette	Respirable Dust NIOSH 7303 Hg	Near property boundary and walking trail	Near property bound	BB-D-1.3
	10/21/2020	☐ Area ■ Personal	450 L	1430	1230	2.5	Dust Cassette	Total Dust NIOSH 0500 + CAM-17 Metals (minus Hg)	Near property boundary and walking trail	Near property bound	BB-D-1.2
Collected with cyclone	10/21/2020	Area Personal	450 L	1430	1230	2.5	Dust Cassette	Respirable Dust NIOSH 0600 + CAM-17 (minus Hg)	Near property boundary and walking trail	Near property bound	BB-D-1.1
Comments	Sample Date	Sample Type	Volume / Area	e Time Off	Sample On	Flow (ipm)	Media	Analyte / Method	Location/Description	Location/L	Client Sample ID
	77	Lot #:									
#:	Manufacturer/Part #:		Other (Call Lab)	1 Day	10	2 Day		3 Day	4 Day	1 Week	2 Week
	Media Type:	Medi	WII.	Neek TAT	ndard 2 \	ade, Sta	No Selection Made, Standard 2 Week TAT	Check: If No	- Please	Turnaround Time (TAT)	Turna
SA	.S. State where Samples Collected: CA	e where Samp	U.S. State	ue Mill	Project Name: Big Blue Mill	ect Name	Proj	.com	ecmconsults	Email Results To: dallison@ecmconsults.com	Email Result
Order:	Purchase Order:			59 Fax:	Phone: 714-662-2759	ne: 714			Fax:	-407-1440	Phone: 208-407-1440
Sampled By (Signature): Jud hugh	_	Zip/Postal Code: 92626		City: Costa Mesa State/Province: CA	esa State	: Costa N		Zip/Postal Code: 92626		City: Costa Mesa State/Province: CA	City: Costa N
Date of Shipment: 10/26/2020	Date of Ship		te 200	Street: 3525 Hyland Ave, Suite 200	Hyland	et: 3525	Stre		Suite 200	Street: 3525 Hyland Ave, Suite 200	Street: 3525
# Samples in Shipment: 12	# Samples	Ď	David Allison	Attention To: Mona Mansell & David	Mona N	ention To	Atte		nsultants	me: ECM Consultants	Company Name:
	Client ID #		ants	Bill To Company: ECM Consultants	any: ECN	To Comp	BIII		avid Allison	Report To Contact Name: David Allison	Report To Co

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OrderID: 332019287



Industrial Hygiene Chain of Custody EMSL Order Number (Lab Use Only):

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Sample ID		Metrica		(april)	9	9		1 7 700	Date	
BB-D-4.2	Near river and cemented tailings	Total Dust NIOSH 0500 + CAM-17 Metals (minus Hg)	Dust Cassette	2.5	1200	1400	450 L	☐ Area ■ Personal	10/22/2020	
BB-D-4.3	CO	Respirable Dust Niesh 7303 Hg	Dust Cassette	2.5	1200	1400	450 L	Area Personal	10/22/2020	Collected with cyclone
								☐ Area ☐ Personal		
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Comments:										

Attn: David Allison 11/10/2020

Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200 Costa Mesa, CA 92626

Phone: (510) 964-4399 Fax: (510) 295-2656

The following analytical report covers the analysis performed on samples submitted to LA Testing on 10/28/2020. The results are tabulated on the attached data pages for the following client designated project:

Big Blue Mill

The reference number for these samples is EMSL Order #332019288. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (714) 828-4999.

Approved By:

Michael Chapman, Laboratory Manager

Michael Chapman



LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

(714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

ProjectID: Phone: (510) 964-4399

LA Testing Order:

CustomerID:

CustomerPO:

332019288

ENCM42

Fax: (510) 295-2656 Received: 10/28/2020 10:25 AM

Collected: 10/22/2020

David Allison Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200 Costa Mesa, CA 92626

Project: Big Blue Mill

Analytical Results

Client Sample Descrip	otion BB-D-1.2	Collected:	10/21/2020	Lab ID:	332019288-0001
Ciletit Sample Descrip	711011 DD-D-1.2	Conected.	10/21/2020	Lav ID.	332073200-000

Near property boundary and walking trail

	inear property boundary	and waiking trail						
Method	Parameter	Result	RL	Units	Prep Date & Analy	st	Analys Date & An	
METALS								
7300 Modified	Antimony	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22	0.22	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Cadmium	<0.44	0.44	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Chromium	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Cobalt	<1.1	1.1	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Copper	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Lead	<1.1	1.1	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Molybdenum	<1.1	1.1	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Nickel	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Selenium	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Silver	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Thallium	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH

BB-D-2.2 Collected: 10/21/2020 Lab ID: Client Sample Description 332019288-0002

Near property boundary and walking trail

	rical property boundar	y and wanting train						
Method	Parameter	Result I	RL	Units	Prep Date & Analy	st	Analys Date & An	
METALS								
7300 Modified	Antimony	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22 0.3	22	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Cadmium	<0.44 0.	44	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Chromium	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Cobalt	<1.1 1	1.1	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Copper	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Lead	<1.1 1	1.1	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Molybdenum	<1.1 1	1.1	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Nickel	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Selenium	<2.2	2.2	μg/m³	11/9/2020	TH	11/9/2020	TH
7300 Modified	Silver	<2.2	2.2	µg/m³	11/9/2020	TH	11/9/2020	TH



David Allison

Attn:

LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

Phone/Fax: (714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

Environmental Cost Management, Inc. 3525 Hyland Avenue Suite 200

Costa Mesa, CA 92626

Project: Big Blue Mill

LA Testing Order: 332019288 ENCM42 CustomerID:

CustomerPO: ProjectID:

(510) 964-4399 Phone: Fax: (510) 295-2656 Received: 10/28/2020 10:25 AM

Collected: 10/22/2020

		Analytical F	Result	S					
Client Sample Des	cription BB-D-2.2 Near property boundary a	and walking trail	Colle	ected:	10/21/2020	Lab	D:	332019288-	0002
Method	Parameter	Result	RL	Units	L	Prep Date & Analyst		Analys Date & Ar	
METALS									
7300 Modified	Thallium	<2.2	2.2	μg/m³	11.	/9/2020	TH	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	μg/m³	11.	/9/2020	TH	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	µg/m³	11/	/9/2020	TH	11/9/2020	TH
Client Sample Des	cription BB-D-3.2 Near river and cemented	tailings	Colle	cted:	10/22/2020	Lab	D ID:	332019288-	0003
Method	Parameter	Result	RL	Units	L	Prep Date & An		Analys Date & Ar	
METALS									
7300 Modified	Antimony	<2.2	2.2	μg/m³	11,	/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	<2.2	2.2	μg/m³		/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	μg/m³	11,	/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22	0.22	μg/m³	11,	/9/2020	TH	11/9/2020	TH
7300 Modified	Cadmium	<0.44	0.44	μg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Chromium	<2.2	2.2	μg/m³	11.	/9/2020	TH	11/9/2020	TH
7300 Modified	Cobalt	<1.1	1.1	µg/m³	11.	/9/2020	TH	11/9/2020	TH
7300 Modified	Copper	<2.2	2.2	μg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Lead	<1.1	1.1	µg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Molybdenum	<1.1	1.1	μg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Nickel	<2.2	2.2	μg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Selenium	<2.2	2.2	µg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Silver	<2.2	2.2	μg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Thallium	<2.2	2.2	µg/m³	11	/9/2020	TH	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	μg/m³	11.	/9/2020	TH	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	µg/m³	11.	/9/2020	TH	11/9/2020	TH
Client Sample Des	cription BB-D-4.2		Colle	cted:	10/22/2020	Lab	D:	332019288-	0004
	Near river and cemented	tailings							
Method	Parameter	Result	RL Units		L	Prep Date & An		Analys Date & Ar	
METALS									
7300 Modified	Antimony	<2.2	2.2	μg/m³	11/	/9/2020	TH	11/9/2020	TH
7300 Modified	Arsenic	23	2.2	μg/m³	11.	/9/2020	TH	11/9/2020	TH
7300 Modified	Barium	<11	11	μg/m³	11/	/9/2020	TH	11/9/2020	TH
7300 Modified	Beryllium	<0.22	0.22	μg/m³	11,	/9/2020	TH	11/9/2020	TH



LA Testing

5431 Industrial Drive, Huntington Beach, CA 92649

Phone/Fax: (714) 828-4999 / (714) 828-4944

http://www.LATesting.com

gardengrovelab@latesting.com

David Allison Environmental Cost Management, Inc. 3525 Hyland Avenue

Suite 200

Costa Mesa, CA 92626

Project: Big Blue Mill

LA Testing Order: CustomerID:

332019288 ENCM42

ProjectID:

CustomerPO:

(510) 964-4399 Fax: (510) 295-2656 10/28/2020 10:25 AM Received:

10/22/2020 Collected:

Analytical Results

Phone:

Client Sample Description BB-D-4.2 Collected: 10/22/2020 Lab ID: 332019288-0004 Near river and cemented tailings

		ŭ						
Method	Parameter	Result	RL	Units	Prep Date & Analys	Prep Date & Analyst		is alyst
METALS								
7300 Modified	Cadmium	<0.44 0.	.44	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Chromium	<2.2	2.2	μg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Cobalt	<1.1	1.1	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Copper	<2.2	2.2	μg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Lead	1.7	1.1	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Molybdenum	<1.1	1.1	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Nickel	<2.2	2.2	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Selenium	<2.2	2.2	μg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Silver	<2.2	2.2	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Thallium	<2.2	2.2	μg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Vanadium	<1.1	1.1	µg/m³	11/9/2020 T	Н	11/9/2020	TH
7300 Modified	Zinc	<2.2	2.2	µg/m³	11/9/2020 T	Н	11/9/2020	TH

Definitions:

MDL - method detection limit

RL - Reporting Limit (Analytical)

J - Result was below the reporting limit, but at or above the MDL

ND - indicates that the analyte was not detected at the reporting limit

D - Dilution Sample required a dilution which was used to calculate final results



Date of Report: 02/18/2021

David Allison

ECM Consultants - Costa Mesa 3525 Hyland Ave Costa Mesa, CA 92626

Client Project: [none]

BCL Project: USFS- Big Blue Mill

BCL Work Order: 2031364 Invoice ID: B398025

Enclosed are the results of analyses for samples received by the laboratory on 10/23/2020. If you have any questions concerning this report, please feel free to contact me.

Revised Report: This report supercedes Report ID 1001103210

Sincerely,

Contact Person: Tina Green

Client Services

Stuart Buttram
Technical Director

Certifications: CA ELAP #1186; NV #CA00014; OR ELAP #4032-001; AK UST101



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	25
Total Concentrations (TTLC)	25
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Report ID: 1001131481



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Report ID: 1001131481



Chain of Custody and Cooler Receipt Form for 2031364 Page 1 of 10 Chain of Custody ANALYSIS REQUESTED 8CL 102320 S37611HKS (1709F) -6174 PIA # જો-ઇાડાન CheckCashCard 00-13-180,80; 62,67; 60,67; Pbyno,14; 12,4,1,24, 030-56,145,50,71 Ö DISTRIBLITION Ď Š WY SWY SIN fe and Print Name NONE dallison@ecmconsults.com Tulore Co CDHS Presno Co Comments / Station Code CWW = Chorinated Wisets Water BW = Bottled Water

It Water SW = Storm Water DW = Drinking Water SO = Solid BLUE Menced Co Carbon Copies: MS/MSD WET Phone * #: 208-407-1440 Other 4100 Atlas Court Bakersfield, Ca. 93308 (661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com Cooling Method ¥ Ø 3870 | 5 Day - | 2 Day - | 10 Day Martix . R 0 R Å 8 Ŕ R ë majj Result Request ** Surcharge 92626 altilo Date Date Date * ekZ DCL Quote / Mail Outy õ David Allison OTHER ర CFW = Ctorinated Finished Water FW = Finished Water WW = W How would you like your completed results send? 📝 E-Mail 🔲 Fax 🛅 EDD STD Lewell Report Attention *; GSO WALK-IN SJVC FED EX QC Request Sample Description / Location EC. Costa Mesa 354235 BB-1M1-10 33~M-08 BB -1111-021 BB-M1-62 188-MI-03 BR-111-155 83-M-CT B3-14-68 135-MI-CH B3-m1-61 LABORATORIES teceived for Lab by: (Signature and Printed Name) M-31344 3525 Hyland Ave. Suite 200 533 P12/2 153 8 Į, **ECM Consultants** 147 1962/24 Jugs INTEL 1553 8521 PS/02/01 400 Pals 15 Pc Š CAO UPS USFS Big Blue Mill රුදුර philippi Sampler Name Printed / Signer 2/20/20 Client/Company Name Project Information: Shipping Method Required Fields Matrix Types:



Chain of Custody and Cooler Receipt Form for 2031364 Page 2 of 10 210-23-20 1215 Chain of Custody Ħ ANALYSIS REQUESTED 12 A (de O)(E) 13M ķ Jackson BCL \$29°5 484 Check/Cash/Card PIA # Packing Material: E#-A1T+1 Ď ure and Print Name Σ NONE red at Deliver dallison@ecmconsults.com Merced Co Tulare Co CDHS Presno Co Regulatory Compliance Electronic Data Transfer: System No. * Comments / Starlen Code BLUE SO - Solid とうこと Carhon Copies: Tala mela 100 Jak WET CWW = Chorinated Waste Water BW = Boxiled Water to Water SW = Storm Water DW = Drinking Water Phone * A: 208-407-1440 1000 Other 4100 Atlas Court Bakersfield, Ca. 93308 (661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com Cooling Method Zsro 🛮 s Day•• 🗘 Day•• 🛅 Day• Matrix * ŝ 20 20 Ŕ ŝ 2 3 ģ 25 3 E-mill 92626 4232 Date Danc edi2 BCL Quote # Mail Only WW - Waste Water õ State CA David Allison CAO UPS GSO WALK-IN SIVC FED EX OTHER How would you like your completed results sent? 🗸 E-Mail 🔝 Fax 📄 EDD STD | Lovel II - Clorinated Finished Water Report Attention *: 窓 BB-116-50-01-0.5 OC Request Sample Description / Locatio FW = Finished Water Costa Mesa 18-05-111-88 B8-025-0.5 RosafeBlan S. Shocke Blook BB-0% BB-043 BB-033-88-25 8800 P LABORATORIES Received for Lab by: (Signsture and Printed Name) 3525 Hyland Ave. Suite 200 73 ECM Consultants 88 3011 2012/0 USFS Big Blue Mill Sampler Name Printed / Signatu 5265 300 10/23/20 19/2013 of supe 0/22/0 9206 Date Client/Company Name Shipping Method: Required Fields 200 Matrix Types: shed by: Address * 2

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 6 of 166



Chain of Custody and Cooler Receipt Form for 2031364 Page 3 of 10 BCL 1023-20 1219 Chain of Custody LCLP-HOLD STUNGLES ANALYSIS REQUESTED PIA 8 Packing Material: Check/Cash/Card 601013-130, 80, Cd, Co. 126 mg, M., Mg. 6030-18 56, 126, 156, 15 12 XV 201 EPA Ď NONE Merced Co Tulane Co dallison@ecmconsults.com CDBIS Presso Co Regulatory Compliance Electronic Data Transfer. System No. 2 Comments / Station Cod SO = Solid BLUE Carbon Copies: ed by (Sign ms/msp WET CWW - Chorinated Wiste Water BW - Bonked Water to Water SW - Storm Water DW - Deinking Water Phone * 0:208-407-1440 4100 Atlas Court Bakersfield, Ca, 93308 (661) 327-4911 • FAX (661) 327-1918 • www.bclabs.com Cooling Method 3sro || s Day** || 2 Day** || 1 Day* Matrix * R 222 8 R ઉ શ ઝ 13 25.55 Result Request ** Surcharge 92626 Zip. BCL Quote # Mail Only WW - Waste Water õ David Allison CAO UPS GSO WALK-IN SIVC FED EX OTHER Sante CA STD | Level 11 Fax DDD Report Attention *; E.E. QC Request Sample Description / Location FW - Finished Water Costa Mesa BB-139:0 88-018 BB-127 88-030 88-123 TR--013 88*-0*35 BB-01 È 31364 LABORATORIES How would you like your completed results sent? Received for Lab by: (Signature and Printed Name) 3525 Hyland Ave. Suite 200 ECM Consultants b/m/b/ 1535 22 Christian 1440 C2H1 | Octobe 1. Masa | 1453 Ξ 1.Sh1 | actes | 0.1 CINI SERIES 1113 Sampler Name Printed / Signatur USFS Big Blue Mill d'20'0 ld Selso 25 Now 125 Sobside Wagio Date Shipping Method Required Fields Matrix Types: Address

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 7 of 166



Chain of Custody and Cooler Receipt Form for 2031364 Page 4 of 10 BACKSON PCL 1023-201215 Chain of Custody Ī ANALYSIS REQUESTED PIAA SH-HILL Packing Material: Check/Cash/Card δο Ιοθ-Βα_ιΒε, Δλ_ιζη ζου οδι Pb, Νb, λλι, μς, γ. κ: 20-32, Ας, Δε-32, κ: 20-32, Ας, Δε-32, ood Print Name) ٧ Ó c and Print Name Merced Co dallison@ecmconsults.com CDHS Presno Co Regulatory Compliance Electronic Data Transfer. System No. * Comments / Station Code BLUE SO - Solid lobel metals on Balo out Carbon Copies: Refelyed by (Sign WET Phone * #: 208-407-1440 CWW = Cherinated Waste Water BW = Builed Water ste Water BW = Stern Water BW = Drinking Water Other 4100 Atlas Court Bakersfield, Ca. 93308 (661) 327-4911 • FAX (661) 327-1918 • www.belabs.com Cooling Method: Stro ☐s bwy•• ☐2 bay•• ☐ bwy• Matrix * 3 B-mail: Time Š Ţ Result Request ** Surcharge 92626 ICAS DO Dit Dete ζģ BCL Queee # Mail Only õ Sure CA David Allison UPS GSO WALK-IN SIVC FED EX OTHER 9 Ísro □ Level II Report Attention *: How would you like your completed results sent? [7] E-Mail [7] Fax 图号 QC Request Sample Description / Location Company Costa Mesa 88-54-63 6000 B3-5w-0 LABORATORIES å 31364 ঠু 3525 Hyland Ave. Suite 200 ture and Printed Nag tockived for Lab by: (Signature and Printed 3 **ECM Consultants** Sampler Name Printed / Signature USFS Big Blue Mill CAO Client/Company Name Shipping Method: Project Information Required Fields Matrix Types: 3 5 3

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com



Chain of Custody and Cooler Receipt Form for 2031364 Page 5 of 10

Submission #: 20 - 31364			COOL	ER RECEI	PT FOR	M			P	age	_of ුට්
		-60									
Fed Ex UPS O Ontrac BC Lab Field Service O Other		and Deliv	ery 🖼	_ lce (SHIPPI Chest (S) Other (1)	N	ONTAI	NER Box □		YES 🗆	NO □ / S
Refrigerant: Ice 🖰 Blue Ice I) No	ne 🗆	Other	□ Cor	mments						
Custody Seals Ice Chest I	Contai Intest? Ye	ners □ s □ No I	No	ne 52 Co	mment	5:					•
All samples received? Yes 🗷 No 🗆	All sample	s contain	ers intact	? Yes	No 🗆		Descrip	tion(s) mat	ch COC	Yes	No 🗆
COC Received	nissivity: _	-97	Contain	er:_V00	Ther	moment 20	ter ID: _{	74_ °c	Date/		3-20 1215
SAMPLE CONTAINERS					SAI	MPLE N	UMBERS		13	15	19
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fml VOA VIAL	1	-	-		-				ļ		
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ml VOA VIAL-504	 	-			-	-				-	
T EPA 508/608/8080		+	-	-							
T EPA 515.1/8150		+	-		-						
T EPA 525		 	-	-	-	-					
T EPA 525 TRAVEL BLANK		-		-	+						
ml RPA 547	l	-	-	-	+	-				-	
ml BPA 531.1		1	-	-	-	-			-	-	
EPA 548	—	1	-	+		-			***************************************	-	
FEPA 549	i	 	-	-						-	
CEPA 8015M	l	1	-	-	-	-					
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t/16oz/32oz AMBER	_	1	 		+						
/160z/32oz JAR	A	Λ	A	A	A	-		~	6	1	1
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Chain of Custody and Cooler Receipt Form for 2031364

BC LABORATORIES INC.			CC	OOLER	RECEIP	FORM				Page 2	Of T
Submission #: 20-31364										age	_01
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Fed Ex □ UPS □ Ont	rac 🗆	Hànd De	livery '	(2-)		est 🖎		Box	- I	FREE L YES	
BC Lab Field Service □ Ot	her 🗆 (Sp	ecify)		-	Oth	er 🗖 (Sp	ecify)			W	
Politicana to La Tale Di I				Transaction of the last of the	11				1		
Refrigerant: Ice S Blue Ic	PART	lone 🗆	-	ther 🗆		ments:					
Custody Seals Ice Chest 🗇 🖠		ainers ⊏ Yes □ No		None	Con	ments:					
III samples received? Yes □ No Ø	All sam	ples conta	iners i	ntact? Y	es el No	. []	Descr	ription(s) m	etch CO	C? Yes O N	-
COC Received				The based below to		Carlo Carlo		274		/Time 10 - 25	
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TOTAL ORGANIC CARBON								-			
CHEMICAL OXYGEN DEMAND		-				ļ			-	-	
A PHENOLICS ml VOA VIAL TRAVEL BLANK							 				
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nl VOA VIAL- 504								-	-	-	-
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EPA 548											
EPA 549									1		
EPA 8015M								1			
EPA 8270											
160z/320z AMBER											Room
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LSLEEVE			_								
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Chain of Custody and Cooler Receipt Form for 2031364 Page 7 of 10

Submission #: 20 -31304			COOLE	R RECEI	PT FORM	n			Page 3	0f_5_
f SHIPPING INFOR		nd Deliv	ery 🖼	Ice C	SHIPPIN hest b	None	TAINER Box	0	FREE L YES D	NO 🗆
Refrigerant: Ice 😘 Blue Ice [) Nor	ne 🗆	Other [□ Cor	nments:					
Custody Seals Ice Chest 🗆	Contair	ners 🗆	Nor	ne 52 Co		:				•
All samples received? Yes No D	All sample	s containe	ers intact?	Yes B	do []	De	scription(s) r	eatch CC	C? Yes N	la ri
COC Received Em	issivity: _	05	Containe	100	-	nometer I	p: <u>274</u> •c	_ Dat	te/Time (U-25 alyst Init TY	3-20 1215
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NORGANIC CHEMICAL METALS 402 / 802 / 1602				-		-				-
T CYANIDE						1	-	-		
T NITROGEN FORMS			_			<u> </u>				
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loz. NITRATE/NITRITE	1	_			-	-				
T TOTAL ORGANIC CARBON	1							_		-
T CHEMICAL OXYGEN DEMAND	1		_	-		-		-		-
A PHENOLICS	1	+	+		-					
omi voa vial travel blank	1	+	-	-	-	-				
Omi VOA VIAL	 	-	-	-	-			_		
PT EPA 1664	1	-								
T ODOR		-	-	-						
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ADIOLOGICAL				-						
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ml VOA VIAL-504		-	-		-					
T EPA 508/608/8080		ļ	-	-	-					
T EPA 515.1/8150		-		-						
T EPA 525				-						
T EPA 525 TRAVEL BLANK										
ml EPA 547										
ml EPA 531.1		1								
z EPA 548				1						
Γ EPA 549				1		1				
T KPA 8015M					1			1		1
F RPA 8270					1					1
z/16oz/32ox AMBER			1		 	1		-		
z) 160z / 32oz JAR	Α	IA	IA	AB	AB	AB	AB	A	A	AB
IL SLEEVE	4		1	1	1.07	- File	- PU			Pu
B VIAL			1		-					
ASTIC BAG			1			-		-		+
DLAR BAG			-	-		+				
RROUS IRON		-	-	1	-	-		-		
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ART KIT										
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Chain of Custody and Cooler Receipt Form for 2031364 Page 8 of 10

Submission #: 20 -31364	1		COOLER	RECEIPT	FORM			Pag	e 4_ (Of _ D_
F SHIPPING INFOR	BOATION		- Constitution of the	T .				-	-	
Fed Ex UPS Ontrac		nd Delive	nr vGra	loo Ch	HIPPING est È		INER Box □		FREE LIO	
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					tobe				W /	5
Refrigerant: Ice 🖰 Blue Ice 🕻) Nor	ie 🗆	Other 🗆	Com	nents:					
Custody Seals Ice Chest 🗇	Contain			Çi∠Com	ments:					9
		The state of the s		Yes No	0	Descrip	tion(s) mate	h COC?	Yes D No	0
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oz/8oz/16oz PE UNPRES		-	-							
oz Cr*f			-	-						
T INORGANIC CHEMICAL METALS	-	-								
NORGANIC CHEMICAL METALS 40z / 80z / 160z		-	-							
T CYANIDE	 	-	-							
T NITROGEN FORMS		-	-							
T TOTAL SULFIDE		-	-			-				
OZ. NITRATE / NITRITE	-	-	-				-			
T TOTAL ORGANIC CARBON			-	-				-		
T CHEMICAL OXYGEN DEMAND	-	-							***************************************	
A PHENOLICS										
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ADIOLOGICAL			-							
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mi VOA VIAL-504	 		-							
F EPA 508/608/8080		-	-							
CEPA 515.1/8150		-								
TEPA 525										
PA 525 TRAVEL BLANK		-								
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Chain of Custody and Cooler Receipt Form for 2031364

BC LABORATORIES INC.			COOLER	RECEIP	FORM			Pag	_{1e} 5 (of 5
Submission #: 21-31304				,						
Fed Ex □ UPS □ Ontrac		nd Delive	ry 🖅	Ice Cl	SHIPPING lest (Sp. ler (Sp.	None	INER Box 🗆		FREE LIO YES D N	10 🗆
Refrigerant: Ice 🔂 Blue Ice I	⊃ Non	e 🗆	Other 🗆	Com	ments:					
Custody Seals Ice Chest	Contain Intact? Yes	ers 🗆	None	G≥ Con						
All samples received? Yes No 🗆	All samples	containe	s intact?	Yes 🛭 Ne	· 🗆	Descrip	tion(s) mate	h GOC?	Yes D No	4
Myre and	nissivity: _		Container 4.0		_ Thermon	meter ID:		Date/Tir	ne/0-23-	20 1215
	14	17	36	37		E NUMBERS			1111	
SAMPLE CONTAINERS	-17	1-1-		51	136	NOMBERS	40	41		T
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z. NITRATE / NITRITE		-	-		-					
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CHEMICAL OXYGEN DEMAND		-	-							
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EPA 508/608/8080				-	-					
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Chain of Custody and Cooler Receipt Form for 2031364 Page 10 of 10 ECM Consultants 1.20-31364



3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Informati	on		
2031364-01	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 14:47
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-01	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-02	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 14:58
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-02	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-03	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:13
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-03	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-04	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:17
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-04	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-05	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:22
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-05	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-06	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:28
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-06	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-07	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:35
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-07	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil

Page 15 of 166 Report ID: 1001131481



3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Informati	on		
2031364-08	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:53
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-08	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-09	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 16:00
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-09	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-10	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 16:05
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-M1-10	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-11	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 17:15
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-SW-01-Sed	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-12	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 16:23
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-023	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-13	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 16:28
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-022	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-14	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 17:15
	Sampling Location:		Sample Depth:	
	Sampling Point:	RinseateBlank-01	Lab Matrix:	Water
	Sampled By:	Jared Kemper	Sample Type:	Water

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information	on		
2031364-15	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/21/2020 11:08
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-025	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-16	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/21/2020 14:41
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-043	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-17	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/21/2020 17:45
	Sampling Location:		Sample Depth:	
		RinseateBlank-02		 Water
	Sampling Point:	Jared Kemper	Lab Matrix:	Water
	Sampled By:	Jaleu Kempei	Sample Type:	vvatei
2031364-18	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 12:13
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-023-1	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-19	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 09:08
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-025-0.5	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-20	COC Number:		Receive Date:	10/23/2020 12:15
				10/23/2020 12:15
	Project Number:		Sampling Date:	
	Sampling Location:	 DD 007	Sample Depth:	 Colido
	Sampling Point:	BB-097	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-21	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 10:28
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-116-SO-01	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none]

Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Informati	on		
2031364-22	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 10:33
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-116-SO-01-0.5	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-23	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/19/2020 15:35
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-B-Comp-01	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-24	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 11:08
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-025	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-25	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 11:13
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-020	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-26	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 12:23
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-123	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-27	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 14:14
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-011	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-28	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 14:32
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-012	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Informati	O n		
2031364-29	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 14:42
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-127	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-30	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 14:52
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-129	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-31	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 14:57
	Sampling Location:		Sample Depth:	
		BB-129-0.5		Solids
	Sampling Point:	Jared Kemper	Lab Matrix: Sample Type:	Soil
	Sampled By:	Jared Kemper	Sample Type:	3011
2031364-32	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 16:06
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-018	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-33	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/20/2020 16:06
	Sampling Location:		Sample Depth:	
	Sampling Point:	DUP-02	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil
2031364-34	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 12:13
	Sampling Location:		Sampling Date. Sample Depth:	10/22/2020 13.30
		BB-SW-02-Sed		Solids
	Sampling Point:		Lab Matrix:	Soil
	Sampled By:	Jared Kemper	Sample Type:	JUII
2031364-35	COC Number:		Receive Date:	10/23/2020 12:15
	Project Number:		Sampling Date:	10/22/2020 15:45
	Sampling Location:		Sample Depth:	
	Sampling Point:	BB-SW-03-Sed	Lab Matrix:	Solids
	Sampled By:	Jared Kemper	Sample Type:	Soil

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information	on			
2031364-36	COC Number:		Receive Date:	10/23/2020 12:15	
	Project Number:		Sampling Date:	10/22/2020 17:15	
	Sampling Location:		Sample Depth:		
		BB-SW-01	Lab Matrix:	Water	
	Sampling Point: Sampled By:	Jared Kemper	Sample Type:	Water	
	Sampled by.	barea Kemper	Metal Analysis: 2-		
			•		
			Acidified past 15 m	linute notaing time	
031364-37	COC Number:		Receive Date:	10/23/2020 12:15	
	Project Number:		Sampling Date:	10/22/2020 13:30	
	Sampling Location:		Sample Depth:		
	Sampling Point:	BB-SW-02	Lab Matrix:	Water	
	Sampled By:	Jared Kemper	Sample Type:	Water	
	Jampieu by.	ca.ca itompoi			
			Metal Analysis: 2-		
			Acidified past 15 m	inute nolaing time	
031364-38	COC Number:		Receive Date:	10/23/2020 12:15	
	Project Number:		Sampling Date:	10/22/2020 15:45	
	Sampling Location:		Sample Depth:		
	. •	BB-SW-03			
	Sampling Point:		Lab Matrix:		
	Sampled By:	Jared Kemper	Sample Type: Water		
			Metal Analysis: 2-Lab Filtered and		
			Acidified past 15 minute holding time		
031364-39	COC Number:		Receive Date:	10/23/2020 12:15	
	Project Number:		Sampling Date:	10/22/2020 13:35	
	•				
	Sampling Location:	 DUD 04	Sample Depth:		
	Sampling Point:	DUP-01	Lab Matrix:	Water	
	Sampled By:	Jared Kemper	Sample Type:	Water	
			Metal Analysis: 2-		
			Acidified past 15 m	inute holding time	
031364-40	COC Number:		Receive Date:	10/23/2020 12:15	
				10/22/2020 12:13	
	Project Number:		Sampling Date:		
	Sampling Location:	Discosto Blank 02	Sample Depth:	 \\/to_=	
	Sampling Point:	Rinseate-Blank-03	Lab Matrix:	Water	
	Sampled By:	Jared Kemper	Sample Type:	Water	
031364-41	COC Number:		Receive Date:	10/23/2020 12:15	
	Project Number:		Sampling Date: 10/22/2020		
	Sampling Location:				
		 Trip Blank	Sample Depth:		
	Sampling Point:	•	Lab Matrix: Water		
	Sampled By:	Jared Kemper	Sample Type:	Trip Blank	

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Laboratory / Client Sample Cross Reference

Laboratory	Client Sample Information						
2031364-42	COC Number:		Receive Date:	10/23/2020 12:15			
	Project Number:		Sampling Date:	10/20/2020 12:31			
	Sampling Location:		Sample Depth:				
	Sampling Point:	BB-123.05	Lab Matrix:	Solids			
	Sampled By:	Jared Kemper	Sample Type:	Soil			
2031364-43	COC Number:		Receive Date:	10/23/2020 12:15			
	Project Number:		Sampling Date:	10/22/2020 15:10			
	Sampling Location:		Sample Depth:				
	Sampling Point:	BB-M1-SED-01	Lab Matrix:	Solids			
	Sampled By:	Jared Kemper	Sample Type:	Soil			

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-01	Client Sampl	e Name:	BB-M1-01	, 10/22/20	20 2:47:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		8.8	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		34	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		9.1	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		5.2	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		6.1	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.022	mg/kg	0.16	0.016	EPA-7471A	20	J	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.4	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		32	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		24	mg/kg	25	0.87	EPA-6010B	5000	J,A07	2

		Run			QC			
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/30/20 18:15	ARD	PE-EL4	9.804	B091174	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:55	AS1	PE-OP3	9.804	B091174	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 08:24	TMT	CETAC3	0.962	B091357	EPA 7471A

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Report ID: 1001131481

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-02	Client Sampl	e Name:	BB-M1-02	2, 10/22/20	20 2:58:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		4.2	mg/kg	5.0	1.7	EPA-6020	500	J,A07	1
Barium		52	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		5.8	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		4.8	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		6.3	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.028	mg/kg	0.16	0.016	EPA-7471A	20	J	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		3.5	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		28	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		27	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:17	ARD	PE-EL4	9.615	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 00:57	AS1	PE-OP3	9.615	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 08:26	TMT	CETAC3	0.977	B091357	EPA 7471A	

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Report ID: 1001131481

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-03	Client Sampl	e Name:	BB-M1-03	3, 10/22/20	20 3:13:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		4.2	mg/kg	5.0	1.7	EPA-6020	500	J,A07	1
Barium		56	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		3.9	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	2
Cobalt		4.2	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		7.5	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		4.3	mg/kg	0.80	0.080	EPA-7471A	20	A07	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		3.5	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		19	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		32	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:19	ARD	PE-EL4	9.901	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 00:59	AS1	PE-OP3	9.901	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 08:58	TMT	CETAC3	5.040	B091357	EPA 7471A	

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Report ID: 1001131481

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-04	Client Sampl	e Name:	BB-M1-04	1, 10/22/20	20 3:17:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		6.4	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		93	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		0.62	mg/kg	5.0	0.47	EPA-6010B	75	J,A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		11	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		7.9	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		13	mg/kg	10	0.50	EPA-6010B	2500	A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.058	mg/kg	0.16	0.016	EPA-7471A	20	J	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		6.5	mg/kg	5.0	1.5	EPA-6010B	2000	A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		53	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		51	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:22	ARD	PE-EL4	9.804	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:01	AS1	PE-OP3	9.804	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 08:34	TMT	CETAC3	0.962	B091357	EPA 7471A	

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Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-05	Client Sampl	e Name:	BB-M1-05	5, 10/22/20	20 3:22:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		7.1	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		60	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		8.4	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		6.0	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		7.2	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.066	mg/kg	0.16	0.016	EPA-7471A	20	J	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		5.5	mg/kg	5.0	1.5	EPA-6010B	2000	A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		37	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		39	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:24	ARD	PE-EL4	9.346	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:03	AS1	PE-OP3	9.346	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 08:37	TMT	CETAC3	1.008	B091357	EPA 7471A	

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Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-06	Client Sampl	e Name:	BB-M1-06	6, 10/22/20	20 3:28:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		13	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		68	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		12	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		7.0	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		7.8	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		ND	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		5.2	mg/kg	5.0	1.5	EPA-6010B	2000	A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		65	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		38	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC			
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/30/20 18:26	ARD	PE-EL4	9.804	B091174	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 01:04	AS1	PE-OP3	9.804	B091174	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 08:39	TMT	CETAC3	0.962	B091357	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-07	Client Sampl	e Name:	BB-M1-07	7, 10/22/20	20 3:35:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		9.6	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		52	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		10	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		5.6	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		6.9	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		ND	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		9.5	mg/kg	5.0	1.5	EPA-6010B	2000	A07	2
Selenium		1.8	mg/kg	5.0	1.1	EPA-6020	100	J,A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		28	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		26	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:29	ARD	PE-EL4	9.259	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:06	AS1	PE-OP3	9.259	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 08:41	TMT	CETAC3	1.025	B091357	EPA 7471A	

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Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-08	Client Sampl	e Name:	BB-M1-08	3, 10/22/20	20 3:53:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		7.1	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		53	mg/kg	5.0	1.8	EPA-6010B	10000		2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		7.4	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		5.9	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		7.0	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		ND	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.2	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		1.6	mg/kg	5.0	1.1	EPA-6020	100	J,A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		32	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		35	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:31	ARD	PE-EL4	9.804	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:12	AS1	PE-OP3	9.804	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 08:43	TMT	CETAC3	0.962	B091357	EPA 7471A	

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Project: USFS- Big Blue Mill Project Number: [none]

Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-09	Client Sampl	e Name:	BB-M1-09	9, 10/22/20	20 4:00:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		17	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		36	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		9.3	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		5.3	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		13	mg/kg	10	0.50	EPA-6010B	2500	A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		ND	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.1	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		44	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		26	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:56	ARD	PE-EL4	9.091	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:13	AS1	PE-OP3	9.091	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 09:39	TMT	CETAC3	0.962	B091358	EPA 7471A	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-10	Client Sampl	e Name:	BB-M1-10), 10/22/20	20 4:05:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		ND	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		56	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		12	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		6.1	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		6.9	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.020	mg/kg	0.16	0.016	EPA-7471A	20	J	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.8	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		2.5	mg/kg	5.0	1.1	EPA-6020	100	J,A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		62	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		32	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 22:10	ARD	PE-EL4	10	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 00:41	AS1	PE-OP3	10	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 07:37	TMT	CETAC3	0.992	B091357	EPA 7471A	

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Report ID: 1001131481

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-11	Client Sampl	e Name:	BB-SW-0	1-Sed, 10/2	22/2020 5:15:00	DPM, Jared Ker	mper	
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		2.7	mg/kg	5.0	1.7	EPA-6020	500	J,A07	1
Barium		52	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		9.2	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		5.3	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		5.4	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		ND	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		3.9	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		57	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		30	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 18:58	ARD	PE-EL4	10	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:15	AS1	PE-OP3	10	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 09:41	TMT	CETAC3	0.992	B091358	EPA 7471A	

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Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-12	Client Sampl	e Name:	BB-023, 1	0/20/2020	4:23:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		21	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		30000	mg/kg	10	3.4	EPA-6020	500	A07	2
Barium		45	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		210	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		4.4	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	3
Cobalt		1.4	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		28	mg/kg	10	0.50	EPA-6010B	2500	A07	3
Lead		2200	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		72	mg/kg	16	1.6	EPA-7471A	20	A07	4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		1.8	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		30	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		8.8	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		120	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 20:49	ARD	PE-EL4	9.709	B091174	EPA 3050B	
2	EPA-6020	10/29/20 12:00	11/04/20 02:12	ARD	PE-EL4	19.417	B091174	EPA 3050B	
3	EPA-6010B	10/29/20 12:00	11/03/20 01:17	AS1	PE-OP3	9.709	B091174	EPA 3050B	
4	EPA-7471A	10/30/20 14:30	11/02/20 09:54	TMT	CETAC3	96.154	B091358	EPA 7471A	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID:	2031364-13	Client Sampl	e Name:	BB-022, 1	0/20/2020	4:28:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Benzene		0.0011	mg/kg	0.0055	0.00074	EPA-8260B		J,S08,Z1	1
Bromobenzene		ND	mg/kg	0.0055	0.00096	EPA-8260B		S08,Z1	1
Bromochloromethane		ND	mg/kg	0.0055	0.00089	EPA-8260B		S08,Z1	1
Bromodichloromethane		ND	mg/kg	0.0055	0.00086	EPA-8260B		S08,Z1	1
Bromoform		ND	mg/kg	0.0055	0.00077	EPA-8260B		S08,Z1	1
Bromomethane		ND	mg/kg	0.0055	0.0019	EPA-8260B		S08,Z1	1
n-Butylbenzene		ND	mg/kg	0.0055	0.00084	EPA-8260B		S08,Z1	1
sec-Butylbenzene		ND	mg/kg	0.0055	0.00078	EPA-8260B		S08,Z1	1
tert-Butylbenzene		ND	mg/kg	0.0055	0.00094	EPA-8260B		S08,Z1	1
Carbon tetrachloride		ND	mg/kg	0.0055	0.00086	EPA-8260B		S08,Z1	1
Chlorobenzene		ND	mg/kg	0.0055	0.00085	EPA-8260B		S08,Z1	1
Chloroethane		ND	mg/kg	0.0055	0.0012	EPA-8260B		S08,Z1	1
Chloroform		ND	mg/kg	0.0055	0.00099	EPA-8260B		S08,Z1	1
Chloromethane		ND	mg/kg	0.0055	0.0012	EPA-8260B		S08,Z1	1
2-Chlorotoluene		ND	mg/kg	0.0055	0.00096	EPA-8260B		S08,Z1	1
4-Chlorotoluene		ND	mg/kg	0.0055	0.00077	EPA-8260B		S08,Z1	1
Dibromochloromethane		ND	mg/kg	0.0055	0.00088	EPA-8260B		S08,Z1	1
1,2-Dibromo-3-chloroprop	pane	ND	mg/kg	0.0055	0.0011	EPA-8260B		S08,Z1	1
1,2-Dibromoethane		ND	mg/kg	0.0055	0.00090	EPA-8260B		S08,Z1	1
Dibromomethane		ND	mg/kg	0.0055	0.0015	EPA-8260B		S08,Z1	1
1,2-Dichlorobenzene		ND	mg/kg	0.0055	0.00087	EPA-8260B		S08,Z1	1
1,3-Dichlorobenzene		ND	mg/kg	0.0055	0.00080	EPA-8260B		S08,Z1	1
1,4-Dichlorobenzene		ND	mg/kg	0.0055	0.00080	EPA-8260B		S08,Z1	1
Dichlorodifluoromethane		ND	mg/kg	0.0055	0.00087	EPA-8260B		S08,Z1	1
1,1-Dichloroethane		ND	mg/kg	0.0055	0.00070	EPA-8260B		S08,Z1	1
1,2-Dichloroethane		ND	mg/kg	0.0055	0.00080	EPA-8260B		S08,Z1	1
1,1-Dichloroethene		ND	mg/kg	0.0055	0.0012	EPA-8260B		S08,Z1	1
cis-1,2-Dichloroethene		ND	mg/kg	0.0055	0.00059	EPA-8260B		S08,Z1	1
trans-1,2-Dichloroethene		ND	mg/kg	0.0055	0.0041	EPA-8260B		S08,Z1	1
1,2-Dichloropropane		ND	mg/kg	0.0055	0.00088	EPA-8260B		S08,Z1	1
1,3-Dichloropropane		ND	mg/kg	0.0055	0.00074	EPA-8260B		S08,Z1	1
2,2-Dichloropropane		ND	mg/kg	0.0055	0.00074	EPA-8260B		S08,Z1	1
1,1-Dichloropropene		ND	mg/kg	0.0055	0.00074	EPA-8260B		S08,Z1	1

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID:	2031364-13	Client Sample	e Name:	BB-022, 10	/20/2020	4:28:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
cis-1,3-Dichloropropene		ND	mg/kg	0.0055	0.00064	EPA-8260B	Lillito	S08,Z1	1
trans-1,3-Dichloropropene		ND	mg/kg	0.0055	0.00073	EPA-8260B		S08,Z1	1
Ethylbenzene		ND	mg/kg	0.0055	0.00076	EPA-8260B		S08,Z1	1
Hexachlorobutadiene		ND	mg/kg	0.0055	0.00074	EPA-8260B		S08,Z1	1
Isopropylbenzene		ND	mg/kg	0.0055	0.00088	EPA-8260B		S08,Z1	1
p-Isopropyltoluene		ND	mg/kg	0.0055	0.00065	EPA-8260B		S08,Z1	1
Methylene chloride		ND	mg/kg	0.011	0.0012	EPA-8260B		S08,Z1	1
Methyl t-butyl ether		ND	mg/kg	0.0055	0.00062	EPA-8260B		S08,Z1	1
Naphthalene		ND	mg/kg	0.0055	0.0011	EPA-8260B		S08,Z1	1
n-Propylbenzene		ND	mg/kg	0.0055	0.00078	EPA-8260B		S08,Z1	1
Styrene		ND	mg/kg	0.0055	0.00068	EPA-8260B		S08,Z1	1
1,1,1,2-Tetrachloroethane		ND	mg/kg	0.0055	0.0010	EPA-8260B		S08,Z1	1
1,1,2,2-Tetrachloroethane		ND	mg/kg	0.0055	0.00093	EPA-8260B		S08,Z1	1
Tetrachloroethene		ND	mg/kg	0.0055	0.0011	EPA-8260B		S08,Z1	1
Toluene		0.0012	mg/kg	0.0055	0.00076	EPA-8260B		J,S08,Z1	1
1,2,3-Trichlorobenzene		ND	mg/kg	0.0055	0.0017	EPA-8260B		S08,Z1	1
1,2,4-Trichlorobenzene		ND	mg/kg	0.0055	0.0015	EPA-8260B		S08,Z1	1
1,1,1-Trichloroethane		ND	mg/kg	0.0055	0.00074	EPA-8260B		S08,Z1	1
1,1,2-Trichloroethane		ND	mg/kg	0.0055	0.0010	EPA-8260B		S08,Z1	1
Trichloroethene		ND	mg/kg	0.0055	0.00081	EPA-8260B	2040	S08,Z1	1
Trichlorofluoromethane		ND	mg/kg	0.0055	0.0017	EPA-8260B		S08,Z1	1
1,2,3-Trichloropropane		ND	mg/kg	0.0055	0.0021	EPA-8260B		S08,Z1	1
1,1,2-Trichloro-1,2,2-trifluo	roethane	ND	mg/kg	0.0055	0.0011	EPA-8260B		S08,Z1	1
1,2,4-Trimethylbenzene		ND	mg/kg	0.0055	0.00088	EPA-8260B		S08,Z1	1
1,3,5-Trimethylbenzene		ND	mg/kg	0.0055	0.00073	EPA-8260B		S08,Z1	1
Vinyl chloride		ND	mg/kg	0.0055	0.00065	EPA-8260B		S08,Z1	1
Total Xylenes		ND	mg/kg	0.011	0.0028	EPA-8260B		S08,Z1	1
p- & m-Xylenes		ND	mg/kg	0.0055	0.0017	EPA-8260B		S08,Z1	1
o-Xylene		ND	mg/kg	0.0055	0.0010	EPA-8260B		S08,Z1	1
1,2-Dichloroethane-d4 (Su	rrogate)	114	%	70 - 121 (LCL	- UCL)	EPA-8260B			1
Toluene-d8 (Surrogate)		99.1	%	81 - 117 (LCL	- UCL)	EPA-8260B			1
4-Bromofluorobenzene (Su	ırrogate)	93.3	%	74 - 121 (LCL	- UCL)	EPA-8260B			1

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID: 2031364-13 Client Sample Name: BB-022, 10/20/2020 4:28						PM, Jared Ke	emper	
Run QC Run # Method Prep Date Date/Time Analyst Instrument Dilution Batch ID								
1	EPA-8260B	10/28/20 09:02	10/30/20 02:11	BYM	MS-V3	1.101	B091020	EPA 5035 Soil MS

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

BCL Sample ID:	2031364-13	Client Sampl	e Name:	BB-022, 1	0/20/2020	4:28:00PM, Jare	d Kemper		
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
Acenaphthene		ND	mg/kg	0.0030	0.00052	EPA-8270C-SIM	ND	Quais	1
Acenaphthylene		0.0012	mg/kg	0.0030	0.00047	EPA-8270C-SIM	ND	J	1
Anthracene		0.00077	mg/kg	0.0030	0.00073	EPA-8270C-SIM	ND	J	1
Benzo[a]anthracene		0.0056	mg/kg	0.0030	0.00053	EPA-8270C-SIM	ND		1
Benzo[b]fluoranthene		0.0087	mg/kg	0.0030	0.00056	EPA-8270C-SIM	ND		1
Benzo[k]fluoranthene		0.0037	mg/kg	0.0030	0.00073	EPA-8270C-SIM	ND		1
Benzo[a]pyrene		0.0085	mg/kg	0.0030	0.00034	EPA-8270C-SIM	ND		1
Benzo[g,h,i]perylene		0.0026	mg/kg	0.0030	0.00068	EPA-8270C-SIM	ND	J	1
Chrysene		0.0064	mg/kg	0.0030	0.00038	EPA-8270C-SIM	ND		1
Dibenzo[a,h]anthracene		0.0049	mg/kg	0.0030	0.00057	EPA-8270C-SIM	ND		1
Fluoranthene		0.0097	mg/kg	0.0030	0.00057	EPA-8270C-SIM	ND		1
Fluorene		ND	mg/kg	0.0030	0.00037	EPA-8270C-SIM	ND		1
Indeno[1,2,3-cd]pyrene		0.0055	mg/kg	0.0030	0.00055	EPA-8270C-SIM	ND		1
Naphthalene		ND	mg/kg	0.0030	0.00049	EPA-8270C-SIM	ND		1
Phenanthrene		0.0013	mg/kg	0.0030	0.00049	EPA-8270C-SIM	ND	J	1
Pyrene		0.0082	mg/kg	0.0030	0.00058	EPA-8270C-SIM	ND		1
Nitrobenzene-d5 (Surrog	ate)	69.1	%	30 - 130 (LC	L - UCL)	EPA-8270C-SIM			1
2-Fluorobiphenyl (Surrog	ate)	84.1	%	40 - 130 (LC	L - UCL)	EPA-8270C-SIM			1
p-Terphenyl-d14 (Surroga	ate)	86.2	%	30 - 130 (LC	L - UCL)	EPA-8270C-SIM			1

			Run					
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-8270C-SIM	10/29/20 17:20	10/30/20 10:21	OLH	MS-B7	0.967	B091256	EPA 3550B

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Report ID: 1001131481

3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-14	Client Sampl	e Name:	RinseateBlank-01, 10/20/2020 5:15:00PM, Jared Kemper							
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #		
Total Recoverable An	timony	0.18	ug/L	2.0	0.11	EPA-200.8	0.20	J	1		
Total Recoverable Ars	enic	ND	ug/L	2.0	0.70	EPA-200.8	ND		1		
Total Recoverable Ba	rium	0.44	ug/L	1.0	0.21	EPA-200.8	0.44	J	1		
Total Recoverable Bei	ryllium	ND	ug/L	1.0	0.14	EPA-200.8	ND		1		
Total Recoverable Ca	dmium	ND	ug/L	1.0	0.11	EPA-200.8	ND		1		
Total Recoverable Ch	romium	0.82	ug/L	3.0	0.50	EPA-200.8	0.54	J	1		
Total Recoverable Co	balt	ND	ug/L	1.0	0.10	EPA-200.8	ND		1		
Total Recoverable Co	pper	0.38	ug/L	2.0	0.22	EPA-200.8	0.27	J	1		
Total Recoverable Lea	ad	ND	ug/L	1.0	0.10	EPA-200.8	ND		1		
Total Recoverable Me	ercury	0.26	ug/L	0.20	0.022	EPA-245.1	ND		2		
Total Recoverable Mo	olybdenum	0.61	ug/L	1.0	0.11	EPA-200.8	ND	J	1		
Total Recoverable Nic	kel	ND	ug/L	2.0	0.19	EPA-200.8	ND		1		
Total Recoverable Sel	enium	ND	ug/L	2.0	0.19	EPA-200.8	ND		3		
Total Recoverable Silv	/er	ND	ug/L	1.0	0.10	EPA-200.8	ND		1		
Total Recoverable Tha	allium	ND	ug/L	1.0	0.10	EPA-200.8	ND		1		
Total Recoverable Var	nadium	ND	ug/L	3.0	0.78	EPA-200.8	ND		1		
Total Recoverable Zin	С	ND	ug/L	10	1.7	EPA-200.8	ND		1		

			Run					
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-200.8	10/29/20 19:50	10/31/20 05:19	ARD	PE-EL4	1	B091231	EPA 200.2
2	EPA-245.1	11/07/20 14:00	11/08/20 14:41	TMT	CETAC3	1	B091992	EPA 245.1
3	EPA-200.8	10/29/20 19:50	11/05/20 17:46	ARD	PE-EL2	1	B091231	EPA 200.2

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-15	Client Sampl	e Name:	BB-025, 1	0/21/2020	11:08:00AM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		120	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		7100	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		94	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		51	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		7.1	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		4.5	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		17	mg/kg	10	0.50	EPA-6010B	2500	A07	2
Lead		610	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		3.0	mg/kg	0.32	0.032	EPA-7471A	20	A07	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.9	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		11	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		21	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		360	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 19:03	ARD	PE-EL4	9.615	B091174	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 01:21	AS1	PE-OP3	9.615	B091174	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 10:34	TMT	CETAC3	1.923	B091358	EPA 7471A	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 2031364-16 Client Sample Name:				BB-043, 10/21/2020 2:41:00PM, Jared Kemper						
Constituent		Result	Units	PQL	MDL	Method	TTLC	Lab	Dun #	
Benzene		ND	mg/kg	0.0050	0.00067	EPA-8260B	Limits	Quals	Run #	
Bromobenzene		ND	mg/kg	0.0050	0.00087	EPA-8260B			1	
Bromochloromethane		ND	mg/kg	0.0050	0.00081	EPA-8260B			1	
Bromodichloromethane		ND	mg/kg	0.0050	0.00078	EPA-8260B			1	
Bromoform		ND	mg/kg	0.0050	0.00070	EPA-8260B			1	
Bromomethane		ND	mg/kg	0.0050	0.0017	EPA-8260B			1	
n-Butylbenzene		ND	mg/kg	0.0050	0.00076	EPA-8260B			1	
sec-Butylbenzene		ND	mg/kg	0.0050	0.00071	EPA-8260B			1	
tert-Butylbenzene		ND	mg/kg	0.0050	0.00085	EPA-8260B			1	
Carbon tetrachloride		ND	mg/kg	0.0050	0.00078	EPA-8260B			1	
Chlorobenzene		ND	mg/kg	0.0050	0.00077	EPA-8260B			1	
Chloroethane		ND	mg/kg	0.0050	0.0011	EPA-8260B			1	
Chloroform		ND	mg/kg	0.0050	0.00090	EPA-8260B			1	
Chloromethane		ND	mg/kg	0.0050	0.0011	EPA-8260B			1	
2-Chlorotoluene		ND	mg/kg	0.0050	0.00087	EPA-8260B			1	
4-Chlorotoluene		ND	mg/kg	0.0050	0.00070	EPA-8260B			1	
Dibromochloromethane		ND	mg/kg	0.0050	0.00080	EPA-8260B			1	
1,2-Dibromo-3-chloropropa	ine	ND	mg/kg	0.0050	0.00096	EPA-8260B			1	
1,2-Dibromoethane		ND	mg/kg	0.0050	0.00082	EPA-8260B			1	
Dibromomethane		ND	mg/kg	0.0050	0.0014	EPA-8260B			1	
1,2-Dichlorobenzene		ND	mg/kg	0.0050	0.00079	EPA-8260B			1	
1,3-Dichlorobenzene		ND	mg/kg	0.0050	0.00073	EPA-8260B			1	
1,4-Dichlorobenzene		ND	mg/kg	0.0050	0.00073	EPA-8260B			1	
Dichlorodifluoromethane		ND	mg/kg	0.0050	0.00079	EPA-8260B			1	
1,1-Dichloroethane		ND	mg/kg	0.0050	0.00064	EPA-8260B			1	
1,2-Dichloroethane		ND	mg/kg	0.0050	0.00073	EPA-8260B			1	
1,1-Dichloroethene		ND	mg/kg	0.0050	0.0011	EPA-8260B			1	
cis-1,2-Dichloroethene		ND	mg/kg	0.0050	0.00054	EPA-8260B			1	
trans-1,2-Dichloroethene		ND	mg/kg	0.0050	0.0037	EPA-8260B			1	
1,2-Dichloropropane		ND	mg/kg	0.0050	0.00080	EPA-8260B			1	
1,3-Dichloropropane		ND	mg/kg	0.0050	0.00067	EPA-8260B			1	
2,2-Dichloropropane		ND	mg/kg	0.0050	0.00067	EPA-8260B			1	
1,1-Dichloropropene		ND	mg/kg	0.0050	0.00067	EPA-8260B			1	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID: 2031364-16		Client Sample	Client Sample Name:		0/21/2020	2:41:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC	Lab	D #
cis-1,3-Dichloropropene		ND	mg/kg	0.0050	0.00058	EPA-8260B	Limits	Quals	Run # 1
trans-1,3-Dichloropropene)	ND	mg/kg	0.0050	0.00066	EPA-8260B			1
Ethylbenzene		ND	mg/kg	0.0050	0.00069	EPA-8260B			 1
Hexachlorobutadiene		ND	mg/kg	0.0050	0.00067	EPA-8260B			1
Isopropylbenzene		ND	mg/kg	0.0050	0.00080	EPA-8260B			1
p-Isopropyltoluene		ND	mg/kg	0.0050	0.00059	EPA-8260B			1
Methylene chloride		ND	mg/kg	0.010	0.0011	EPA-8260B			1
Methyl t-butyl ether		ND	mg/kg	0.0050	0.00056	EPA-8260B			1
Naphthalene		ND	mg/kg	0.0050	0.00099	EPA-8260B			1
n-Propylbenzene		ND	mg/kg	0.0050	0.00071	EPA-8260B			1
Styrene		ND	mg/kg	0.0050	0.00062	EPA-8260B			1
1,1,1,2-Tetrachloroethane		ND	mg/kg	0.0050	0.00095	EPA-8260B			1
1,1,2,2-Tetrachloroethane		ND	mg/kg	0.0050	0.00084	EPA-8260B			1
Tetrachloroethene		ND	mg/kg	0.0050	0.00097	EPA-8260B			1
Toluene		0.0014	mg/kg	0.0050	0.00069	EPA-8260B		J	1
1,2,3-Trichlorobenzene		ND	mg/kg	0.0050	0.0015	EPA-8260B			1
1,2,4-Trichlorobenzene		ND	mg/kg	0.0050	0.0014	EPA-8260B			1
1,1,1-Trichloroethane		ND	mg/kg	0.0050	0.00067	EPA-8260B			1
1,1,2-Trichloroethane		ND	mg/kg	0.0050	0.00094	EPA-8260B			1
Trichloroethene		ND	mg/kg	0.0050	0.00074	EPA-8260B	2040		1
Trichlorofluoromethane		ND	mg/kg	0.0050	0.0015	EPA-8260B			1
1,2,3-Trichloropropane		ND	mg/kg	0.0050	0.0019	EPA-8260B			1
1,1,2-Trichloro-1,2,2-triflu	oroethane	ND	mg/kg	0.0050	0.0010	EPA-8260B			1
1,2,4-Trimethylbenzene		ND	mg/kg	0.0050	0.00080	EPA-8260B			1
1,3,5-Trimethylbenzene		ND	mg/kg	0.0050	0.00066	EPA-8260B			1
Vinyl chloride		ND	mg/kg	0.0050	0.00059	EPA-8260B			1
Total Xylenes		ND	mg/kg	0.010	0.0025	EPA-8260B			1
p- & m-Xylenes		ND	mg/kg	0.0050	0.0015	EPA-8260B			1
o-Xylene		ND	mg/kg	0.0050	0.00093	EPA-8260B			1
1,2-Dichloroethane-d4 (Si	urrogate)	104	%	70 - 121 (LCI	L - UCL)	EPA-8260B			1
Toluene-d8 (Surrogate)		96.1	%	81 - 117 (LCI	- UCL)	EPA-8260B			1
4-Bromofluorobenzene (S	urrogate)	85.6	%	74 - 121 (LCI	L - UCL)	EPA-8260B			1

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID	2 031364-16	Client San	Client Sample Name: BB-043, 10/21/2020 2:4				20 2:41:00PM, Jared Kemper				
Run#	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID				
1	EPA-8260B	10/29/20 13:44	10/30/20 18:17	BYM	MS-V3	1	B091175	EPA 5030 Soil MS			

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

BCL Sample ID:	2031364-16	Client Sampl	e Name:	BB-043, 1	0/21/2020	2:41:00PM, Jare	d Kemper		
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
Acenaphthene		ND	mg/kg	0.015	0.0026	EPA-8270C-SIM	ND	A01	1
Acenaphthylene		ND	mg/kg	0.015	0.0024	EPA-8270C-SIM	ND	A01	<u>'</u> 1
Anthracene		ND	mg/kg	0.015	0.0036	EPA-8270C-SIM	ND	A01	1
Benzo[a]anthracene		0.0056	mg/kg	0.015	0.0026	EPA-8270C-SIM	ND	J,A01	1
Benzo[b]fluoranthene		0.021	mg/kg	0.015	0.0028	EPA-8270C-SIM	ND	A01	1
Benzo[k]fluoranthene		0.013	mg/kg	0.015	0.0036	EPA-8270C-SIM	ND	J,A01	1
Benzo[a]pyrene		0.025	mg/kg	0.015	0.0017	EPA-8270C-SIM	ND	A01	1
Benzo[g,h,i]perylene		ND	mg/kg	0.015	0.0034	EPA-8270C-SIM	ND	A01	1
Chrysene		0.0042	mg/kg	0.015	0.0019	EPA-8270C-SIM	ND	J,A01	1
Dibenzo[a,h]anthracene		ND	mg/kg	0.015	0.0028	EPA-8270C-SIM	ND	A01	1
Fluoranthene		0.0056	mg/kg	0.015	0.0028	EPA-8270C-SIM	ND	J,A01	1
Fluorene		ND	mg/kg	0.015	0.0018	EPA-8270C-SIM	ND	A01	1
Indeno[1,2,3-cd]pyrene		ND	mg/kg	0.015	0.0028	EPA-8270C-SIM	ND	A01	1
Naphthalene		ND	mg/kg	0.015	0.0024	EPA-8270C-SIM	ND	A01	1
Phenanthrene		ND	mg/kg	0.015	0.0024	EPA-8270C-SIM	ND	A01	1
Pyrene		0.0046	mg/kg	0.015	0.0029	EPA-8270C-SIM	ND	J,A01	1
Nitrobenzene-d5 (Surrog	ate)	72.9	%	30 - 130 (LC	L - UCL)	EPA-8270C-SIM		A01	1
2-Fluorobiphenyl (Surrog	ate)	55.2	%	40 - 130 (LC	L - UCL)	EPA-8270C-SIM		A01	1
p-Terphenyl-d14 (Surroga	ate)	53.8	%	30 - 130 (LC	L - UCL)	EPA-8270C-SIM		A01	1

			Run					
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-8270C-SIM	10/29/20 17:20	10/30/20 10:43	OLH	MS-B7	5.085	B091256	EPA 3550B

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. All results listed in this report are for the exclusive use of the submitting party. BC Laboratories, Inc. assumes no responsibility for report alteration, separation, detachment or third party interpretation.

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3525 Hyland Ave Costa Mesa, CA 92626 Reported:

02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-17	Client Sampl	e Name:	RinseateE	Blank-02, 1	0/21/2020 5:45	:00PM, Jared I	0PM, Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #	
Total Recoverable Antimo	ony	0.67	ug/L	2.0	0.11	EPA-200.8	0.20	J	1	
Total Recoverable Arsenic	;	ND	ug/L	2.0	0.70	EPA-200.8	ND		1	
Total Recoverable Bariur	n	0.28	ug/L	1.0	0.21	EPA-200.8	0.44	J	1	
Total Recoverable Berylliu	m	ND	ug/L	1.0	0.14	EPA-200.8	ND		1	
Total Recoverable Cadmit	ım	ND	ug/L	1.0	0.11	EPA-200.8	ND		1	
Total Recoverable Chron	ium	1.7	ug/L	3.0	0.50	EPA-200.8	0.54	J	1	
Total Recoverable Cobalt		ND	ug/L	1.0	0.10	EPA-200.8	ND		1	
Total Recoverable Coppe	r	0.32	ug/L	2.0	0.22	EPA-200.8	0.27	J	1	
Total Recoverable Lead		ND	ug/L	1.0	0.10	EPA-200.8	ND		1	
Total Recoverable Mercu	ry	0.029	ug/L	0.20	0.022	EPA-245.1	ND	J	2	
Total Recoverable Molybd	enum	ND	ug/L	1.0	0.11	EPA-200.8	ND		1	
Total Recoverable Nickel		0.23	ug/L	2.0	0.19	EPA-200.8	ND	J	1	
Total Recoverable Seleniu	im	ND	ug/L	2.0	0.19	EPA-200.8	ND		3	
Total Recoverable Silver		ND	ug/L	1.0	0.10	EPA-200.8	ND		1	
Total Recoverable Thalliur	n	ND	ug/L	1.0	0.10	EPA-200.8	ND		1	
Total Recoverable Vanadi	um	ND	ug/L	3.0	0.78	EPA-200.8	ND		1	
Total Recoverable Zinc		ND	ug/L	10	1.7	EPA-200.8	ND		1	

			Run		QC				
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-200.8	10/29/20 19:50	10/31/20 05:43	ARD	PE-EL4	1	B091231	EPA 200.2	
2	EPA-245.1	11/07/20 14:00	11/08/20 14:47	TMT	CETAC3	1	B091992	EPA 245.1	
3	EPA-200.8	10/29/20 19:50	11/05/20 18:06	ARD	PE-EL2	1	B091231	EPA 200.2	

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Modified WET Test (STLC)

BCL Sample ID:	2031364-18	Client Sample	e Name:	BB-023-1					
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
Arsenic		3.2	mg/L	0.050	0.0092	EPA-6010B	ND		1
Cadmium		0.041	mg/L	0.010	0.0011	EPA-6010B	ND		1
Lead		ND	mg/L	0.050	0.0035	EPA-6010B	ND		1
Mercury		ND	mg/L	0.0020	0.00022	EPA-7470A	ND		2

		_	Run		_	QC			
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6010B	02/07/21 14:00	02/08/21 14:35	JCC	PE-OP3	1	B099464	EPA 3005A	
2	EPA-7470A	02/16/21 14:40	02/17/21 11:56	TMT	CETAC3	1	B100161	EPA 7470A	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-18	Client Sampl	e Name:	BB-023-1	, 10/22/202	20 12:13:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		38	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		52000	mg/kg	10	3.4	EPA-6020	500	A07	2
Barium		41	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		350	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		2.3	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	3
Cobalt		5.8	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		35	mg/kg	10	0.50	EPA-6010B	2500	A07	3
Lead		2300	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		21	mg/kg	3.2	0.32	EPA-7471A	20	A07	4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		4.8	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		18	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		6.7	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		480	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run			QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method		
1	EPA-6020	10/29/20 12:00	10/30/20 20:52	ARD	PE-EL4	10	B091174	EPA 3050B		
2	EPA-6020	10/29/20 12:00	11/04/20 02:14	ARD	PE-EL4	20	B091174	EPA 3050B		
3	EPA-6010B	10/29/20 12:00	11/03/20 01:26	AS1	PE-OP3	10	B091174	EPA 3050B		
4	EPA-7471A	10/30/20 14:30	11/02/20 10:36	TMT	CETAC3	20.161	B091358	EPA 7471A		

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Modified WET Test (STLC)

BCL Sample ID:	2031364-19	Client Sampl	ent Sample Name: BB-025-0.5, 10/22/2020 9:08:00AM, Jared Kemper							
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #	
Arsenic		3.8	mg/L	0.050	0.0092	EPA-6010B	ND		1	
Cadmium		0.045	mg/L	0.010	0.0011	EPA-6010B	ND		1	
Lead		0.0095	mg/L	0.050	0.0035	EPA-6010B	ND	J	1	
Mercury		0.020	mg/L	0.0020	0.00022	EPA-7470A	ND		2	

			Run			QC			
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6010B	02/07/21 14:00	02/08/21 14:36	JCC	PE-OP3	1	B099464	EPA 3005A	
2	EPA-7470A	02/16/21 14:40	02/17/21 12:02	TMT	CETAC3	1	B100161	EPA 7470A	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-19	Client Sampl	e Name:	BB-025-0	.5, 10/22/2	020 9:08:00AM	, Jared Kempe	r	
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		58	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		26000	mg/kg	5.0	1.7	EPA-6020	500	A07	2
Barium		210	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		160	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		6.2	mg/kg	5.0	0.50	EPA-6010B	2500	A07	3
Cobalt		2.2	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		8.1	mg/kg	10	0.50	EPA-6010B	2500	J,A07	3
Lead		1800	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		7.5	mg/kg	1.6	0.16	EPA-7471A	20	A07	4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		2.7	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		36	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		14	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		51	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/30/20 20:54	ARD	PE-EL4	9.615	B091174	EPA 3050B
2	EPA-6020	10/29/20 12:00	11/04/20 02:16	ARD	PE-EL4	9.615	B091174	EPA 3050B
3	EPA-6010B	10/29/20 12:00	11/03/20 01:28	AS1	PE-OP3	9.615	B091174	EPA 3050B
4	EPA-7471A	10/30/20 14:30	11/02/20 10:38	TMT	CETAC3	9.766	B091358	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27
Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID:	2031364-20	Client Sampl	e Name:	BB-097, 1	0/22/2020	8:45:00AM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Benzene		ND	mg/kg	0.0050	0.00067	EPA-8260B	Lillits	Quais	1
Bromobenzene		ND	mg/kg	0.0050	0.00087	EPA-8260B			1
Bromochloromethane		ND	mg/kg	0.0050	0.00081	EPA-8260B			1
Bromodichloromethane		ND	mg/kg	0.0050	0.00078	EPA-8260B			1
Bromoform		ND	mg/kg	0.0050	0.00070	EPA-8260B			1
Bromomethane		ND	mg/kg	0.0050	0.0017	EPA-8260B			1
n-Butylbenzene		ND	mg/kg	0.0050	0.00076	EPA-8260B			1
sec-Butylbenzene		ND	mg/kg	0.0050	0.00071	EPA-8260B			1
tert-Butylbenzene		ND	mg/kg	0.0050	0.00085	EPA-8260B			1
Carbon tetrachloride		ND	mg/kg	0.0050	0.00078	EPA-8260B			1
Chlorobenzene		ND	mg/kg	0.0050	0.00077	EPA-8260B			1
Chloroethane		ND	mg/kg	0.0050	0.0011	EPA-8260B			1
Chloroform		ND	mg/kg	0.0050	0.00090	EPA-8260B			1
Chloromethane		ND	mg/kg	0.0050	0.0011	EPA-8260B			1
2-Chlorotoluene		ND	mg/kg	0.0050	0.00087	EPA-8260B			1
4-Chlorotoluene		ND	mg/kg	0.0050	0.00070	EPA-8260B			1
Dibromochloromethane		ND	mg/kg	0.0050	0.00080	EPA-8260B			1
1,2-Dibromo-3-chloroprop	ane	ND	mg/kg	0.0050	0.00096	EPA-8260B			1
1,2-Dibromoethane		ND	mg/kg	0.0050	0.00082	EPA-8260B			1
Dibromomethane		ND	mg/kg	0.0050	0.0014	EPA-8260B			1
1,2-Dichlorobenzene		ND	mg/kg	0.0050	0.00079	EPA-8260B			1
1,3-Dichlorobenzene		ND	mg/kg	0.0050	0.00073	EPA-8260B			1
1,4-Dichlorobenzene		ND	mg/kg	0.0050	0.00073	EPA-8260B			1
Dichlorodifluoromethane		ND	mg/kg	0.0050	0.00079	EPA-8260B			1
1,1-Dichloroethane		ND	mg/kg	0.0050	0.00064	EPA-8260B			1
1,2-Dichloroethane		ND	mg/kg	0.0050	0.00073	EPA-8260B			1
1,1-Dichloroethene		ND	mg/kg	0.0050	0.0011	EPA-8260B			1
cis-1,2-Dichloroethene		ND	mg/kg	0.0050	0.00054	EPA-8260B			1
trans-1,2-Dichloroethene		ND	mg/kg	0.0050	0.0037	EPA-8260B			1
1,2-Dichloropropane		ND	mg/kg	0.0050	0.00080	EPA-8260B			1
1,3-Dichloropropane		ND	mg/kg	0.0050	0.00067	EPA-8260B			1
2,2-Dichloropropane		ND	mg/kg	0.0050	0.00067	EPA-8260B			1
1,1-Dichloropropene		ND	mg/kg	0.0050	0.00067	EPA-8260B			1

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID:	2031364-20	Client Sampl	e Name:	BB-097, 1	0/22/2020	8:45:00AM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC	Lab	D #
cis-1,3-Dichloropropene		ND	mg/kg	0.0050	0.00058	EPA-8260B	Limits	Quals	Run # 1
trans-1,3-Dichloroproper	ne	ND	mg/kg	0.0050	0.00066	EPA-8260B			1
Ethylbenzene		ND	mg/kg	0.0050	0.00069	EPA-8260B			1
Hexachlorobutadiene		ND	mg/kg	0.0050	0.00067	EPA-8260B			1
Isopropylbenzene		ND	mg/kg	0.0050	0.00080	EPA-8260B			1
p-Isopropyltoluene		ND	mg/kg	0.0050	0.00059	EPA-8260B			1
Methylene chloride		ND	mg/kg	0.010	0.0011	EPA-8260B			1
Methyl t-butyl ether		ND	mg/kg	0.0050	0.00056	EPA-8260B			1
Naphthalene		ND	mg/kg	0.0050	0.00099	EPA-8260B			1
n-Propylbenzene		ND	mg/kg	0.0050	0.00071	EPA-8260B			1
Styrene		ND	mg/kg	0.0050	0.00062	EPA-8260B			1
1,1,1,2-Tetrachloroethan	e	ND	mg/kg	0.0050	0.00095	EPA-8260B			1
1,1,2,2-Tetrachloroethan	e	ND	mg/kg	0.0050	0.00084	EPA-8260B			1
Tetrachloroethene		ND	mg/kg	0.0050	0.00097	EPA-8260B			1
Toluene		ND	mg/kg	0.0050	0.00069	EPA-8260B			1
1,2,3-Trichlorobenzene		ND	mg/kg	0.0050	0.0015	EPA-8260B			1
1,2,4-Trichlorobenzene		ND	mg/kg	0.0050	0.0014	EPA-8260B			1
1,1,1-Trichloroethane		ND	mg/kg	0.0050	0.00067	EPA-8260B			1
1,1,2-Trichloroethane		ND	mg/kg	0.0050	0.00094	EPA-8260B			1
Trichloroethene		ND	mg/kg	0.0050	0.00074	EPA-8260B	2040		1
Trichlorofluoromethane		ND	mg/kg	0.0050	0.0015	EPA-8260B			1
1,2,3-Trichloropropane		ND	mg/kg	0.0050	0.0019	EPA-8260B			1
1,1,2-Trichloro-1,2,2-trifle	uoroethane	ND	mg/kg	0.0050	0.0010	EPA-8260B			1
1,2,4-Trimethylbenzene		ND	mg/kg	0.0050	0.00080	EPA-8260B			1
1,3,5-Trimethylbenzene		ND	mg/kg	0.0050	0.00066	EPA-8260B			1
Vinyl chloride		ND	mg/kg	0.0050	0.00059	EPA-8260B			1
Total Xylenes		ND	mg/kg	0.010	0.0025	EPA-8260B			1
p- & m-Xylenes		ND	mg/kg	0.0050	0.0015	EPA-8260B			1
o-Xylene		ND	mg/kg	0.0050	0.00093	EPA-8260B			1
1,2-Dichloroethane-d4 (\$	Surrogate)	110	%	70 - 121 (LC	L - UCL)	EPA-8260B			1
Toluene-d8 (Surrogate)		101	%	81 - 117 (LCI	L - UCL)	EPA-8260B			1
4-Bromofluorobenzene (Surrogate)	101	%	74 - 121 (LC	L - UCL)	EPA-8260B			1

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID: 2031364-20 Client Sample Name: BB-097, 10/22/2020 8:45:00AM, Jared Kemper									
Run#	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID		
1	EPA-8260B	10/28/20 09:02	10/28/20 18:52	BYM	MS-V3	0.982	B091020	EPA 5035 Soil MS	

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 51 of 166

3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

BCL Sample ID:	2031364-20	Client Sampl	Client Sample Name:		0/22/2020	0 8:45:00AM, Jared Kemper			
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Acenaphthene		ND	mg/kg	0.0030	0.00052	EPA-8270C-SIM	ND		1
Acenaphthylene		ND	mg/kg	0.0030	0.00047	EPA-8270C-SIM	ND		1
Anthracene		ND	mg/kg	0.0030	0.00073	EPA-8270C-SIM	ND		1
Benzo[a]anthracene		0.00070	mg/kg	0.0030	0.00053	EPA-8270C-SIM	ND	J	1
Benzo[b]fluoranthene		0.0033	mg/kg	0.0030	0.00056	EPA-8270C-SIM	ND		1
Benzo[k]fluoranthene		0.0023	mg/kg	0.0030	0.00073	EPA-8270C-SIM	ND	J	1
Benzo[a]pyrene		0.0042	mg/kg	0.0030	0.00034	EPA-8270C-SIM	ND		1
Benzo[g,h,i]perylene		ND	mg/kg	0.0030	0.00068	EPA-8270C-SIM	ND		1
Chrysene		0.00042	mg/kg	0.0030	0.00038	EPA-8270C-SIM	ND	J	1
Dibenzo[a,h]anthracene		ND	mg/kg	0.0030	0.00057	EPA-8270C-SIM	ND		1
Fluoranthene		0.00061	mg/kg	0.0030	0.00057	EPA-8270C-SIM	ND	J	1
Fluorene		ND	mg/kg	0.0030	0.00037	EPA-8270C-SIM	ND		1
Indeno[1,2,3-cd]pyrene		ND	mg/kg	0.0030	0.00055	EPA-8270C-SIM	ND		1
Naphthalene		ND	mg/kg	0.0030	0.00049	EPA-8270C-SIM	ND		1
Phenanthrene		ND	mg/kg	0.0030	0.00049	EPA-8270C-SIM	ND		1
Pyrene		0.00061	mg/kg	0.0030	0.00058	EPA-8270C-SIM	ND	J	1
Nitrobenzene-d5 (Surroga	ate)	66.5	%	30 - 130 (LCI	L - UCL)	EPA-8270C-SIM			1
2-Fluorobiphenyl (Surroga	ate)	81.3	%	40 - 130 (LCI	L - UCL)	EPA-8270C-SIM			1
p-Terphenyl-d14 (Surroga	te)	92.8	%	30 - 130 (LCI	L - UCL)	EPA-8270C-SIM			1

			Run					
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-8270C-SIM	10/29/20 17:20	10/30/20 09:36	OLH	MS-B7	0.970	B091256	EPA 3550B

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID:	2031364-21	Client Sample	e Name:	BB-116-SO-01, 10/22/2020 10:28:00AM, Jared Kemper							
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #		
Benzene		ND	mg/kg	0.0064	0.00086	EPA-8260B		S08,Z1	1		
Bromobenzene		ND	mg/kg	0.0064	0.0011	EPA-8260B		S08,Z1	1		
Bromochloromethane		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
Bromodichloromethane		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
Bromoform		ND	mg/kg	0.0064	0.00090	EPA-8260B		S08,Z1	1		
Bromomethane		ND	mg/kg	0.0064	0.0022	EPA-8260B		S08,Z1	1		
n-Butylbenzene		ND	mg/kg	0.0064	0.00097	EPA-8260B		S08,Z1	1		
sec-Butylbenzene		ND	mg/kg	0.0064	0.00091	EPA-8260B		S08,Z1	1		
tert-Butylbenzene		ND	mg/kg	0.0064	0.0011	EPA-8260B		S08,Z1	1		
Carbon tetrachloride		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
Chlorobenzene		ND	mg/kg	0.0064	0.00099	EPA-8260B		S08,Z1	1		
Chloroethane		ND	mg/kg	0.0064	0.0014	EPA-8260B		S08,Z1	1		
Chloroform		ND	mg/kg	0.0064	0.0012	EPA-8260B		S08,Z1	1		
Chloromethane		ND	mg/kg	0.0064	0.0014	EPA-8260B		S08,Z1	1		
2-Chlorotoluene		ND	mg/kg	0.0064	0.0011	EPA-8260B		S08,Z1	1		
4-Chlorotoluene		ND	mg/kg	0.0064	0.00090	EPA-8260B		S08,Z1	1		
Dibromochloromethane		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
1,2-Dibromo-3-chloropropa	ine	ND	mg/kg	0.0064	0.0012	EPA-8260B		S08,Z1	1		
1,2-Dibromoethane		ND	mg/kg	0.0064	0.0011	EPA-8260B		S08,Z1	1		
Dibromomethane		ND	mg/kg	0.0064	0.0018	EPA-8260B		S08,Z1	1		
1,2-Dichlorobenzene		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
1,3-Dichlorobenzene		ND	mg/kg	0.0064	0.00094	EPA-8260B		S08,Z1	1		
1,4-Dichlorobenzene		ND	mg/kg	0.0064	0.00094	EPA-8260B		S08,Z1	1		
Dichlorodifluoromethane		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
1,1-Dichloroethane		ND	mg/kg	0.0064	0.00082	EPA-8260B		S08,Z1	1		
1,2-Dichloroethane		ND	mg/kg	0.0064	0.00094	EPA-8260B		S08,Z1	1		
1,1-Dichloroethene		ND	mg/kg	0.0064	0.0014	EPA-8260B		S08,Z1	1		
cis-1,2-Dichloroethene		ND	mg/kg	0.0064	0.00069	EPA-8260B		S08,Z1	1		
trans-1,2-Dichloroethene		ND	mg/kg	0.0064	0.0047	EPA-8260B		S08,Z1	1		
1,2-Dichloropropane		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
1,3-Dichloropropane		ND	mg/kg	0.0064	0.00086	EPA-8260B		S08,Z1	1		
2,2-Dichloropropane		ND	mg/kg	0.0064	0.00086	EPA-8260B		S08,Z1	1		
1,1-Dichloropropene		ND	mg/kg	0.0064	0.00086	EPA-8260B		S08,Z1	1		

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27
Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID:	2031364-21	Client Sampl	e Name:	BB-116-SC	D-01, 10/22	2/2020 10:28:00	10:28:00AM, Jared Kemper				
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#		
cis-1,3-Dichloropropene		ND	mg/kg	0.0064	0.00074	EPA-8260B		S08,Z1	1		
trans-1,3-Dichloroproper	ne	ND	mg/kg	0.0064	0.00085	EPA-8260B		S08,Z1	1		
Ethylbenzene		ND	mg/kg	0.0064	0.00088	EPA-8260B		S08,Z1	1		
Hexachlorobutadiene		ND	mg/kg	0.0064	0.00086	EPA-8260B		S08,Z1	1		
Isopropylbenzene		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
p-Isopropyltoluene		ND	mg/kg	0.0064	0.00076	EPA-8260B		S08,Z1	1		
Methylene chloride		ND	mg/kg	0.013	0.0014	EPA-8260B		S08,Z1	1		
Methyl t-butyl ether		ND	mg/kg	0.0064	0.00072	EPA-8260B		S08,Z1	1		
Naphthalene		ND	mg/kg	0.0064	0.0013	EPA-8260B		S08,Z1	1		
n-Propylbenzene		ND	mg/kg	0.0064	0.00091	EPA-8260B		S08,Z1	1		
Styrene		ND	mg/kg	0.0064	0.00079	EPA-8260B		S08,Z1	1		
1,1,1,2-Tetrachloroethan	е	ND	mg/kg	0.0064	0.0012	EPA-8260B		S08,Z1	1		
1,1,2,2-Tetrachloroethan	е	ND	mg/kg	0.0064	0.0011	EPA-8260B		S08,Z1	1		
Tetrachloroethene		ND	mg/kg	0.0064	0.0012	EPA-8260B		S08,Z1	1		
Toluene		ND	mg/kg	0.0064	0.00088	EPA-8260B		S08,Z1	1		
1,2,3-Trichlorobenzene		ND	mg/kg	0.0064	0.0019	EPA-8260B		S08,Z1	1		
1,2,4-Trichlorobenzene		ND	mg/kg	0.0064	0.0018	EPA-8260B		S08,Z1	1		
1,1,1-Trichloroethane		ND	mg/kg	0.0064	0.00086	EPA-8260B		S08,Z1	1		
1,1,2-Trichloroethane		ND	mg/kg	0.0064	0.0012	EPA-8260B		S08,Z1	1		
Trichloroethene		ND	mg/kg	0.0064	0.00095	EPA-8260B	2040	S08,Z1	1		
Trichlorofluoromethane		ND	mg/kg	0.0064	0.0019	EPA-8260B		S08,Z1	1		
1,2,3-Trichloropropane		ND	mg/kg	0.0064	0.0024	EPA-8260B		S08,Z1	1		
1,1,2-Trichloro-1,2,2-trifl	uoroethane	ND	mg/kg	0.0064	0.0013	EPA-8260B		S08,Z1	1		
1,2,4-Trimethylbenzene		ND	mg/kg	0.0064	0.0010	EPA-8260B		S08,Z1	1		
1,3,5-Trimethylbenzene		ND	mg/kg	0.0064	0.00085	EPA-8260B		S08,Z1	1		
Vinyl chloride		ND	mg/kg	0.0064	0.00076	EPA-8260B		S08,Z1	1		
Total Xylenes		ND	mg/kg	0.013	0.0032	EPA-8260B		S08,Z1	1		
p- & m-Xylenes		ND	mg/kg	0.0064	0.0019	EPA-8260B		S08,Z1	1		
o-Xylene		ND	mg/kg	0.0064	0.0012	EPA-8260B		S08,Z1	1		
1,2-Dichloroethane-d4 (\$	Surrogate)	108	%	70 - 121 (LCL	- UCL)	EPA-8260B			1		
Toluene-d8 (Surrogate)		93.7	%	81 - 117 (LCL	UCL)	EPA-8260B			1		
4-Bromofluorobenzene (Surrogate)	90.6	%	74 - 121 (LCL	- UCL)	EPA-8260B			1		

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

BCL Sample ID: 2031364-21 Client Sample Name: BB-116-SO-01, 10/22/2020 10:28:00AM, Jared Kemper							•	
Run #	Method	Prep Date	Run Date/Time	Analyst	Instrument	Dilution	QC Batch ID	
1	EPA-8260B	10/28/20 09:02	10/28/20 19:16	BYM	MS-V3	1.282	B091020	EPA 5035 Soil MS

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 55 of 166

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

BCL Sample ID:	2031364-21	Client Sampl	e Name:	BB-116-S	BB-116-SO-01, 10/22/2020 10:28:00AM, Jared Kemper						
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #		
Acenaphthene		ND	mg/kg	0.0030	0.00052	EPA-8270C-SIM	ND		1		
Acenaphthylene		ND	mg/kg	0.0030	0.00047	EPA-8270C-SIM	ND		1		
Anthracene		ND	mg/kg	0.0030	0.00073	EPA-8270C-SIM	ND		1		
Benzo[a]anthracene		0.0011	mg/kg	0.0030	0.00053	EPA-8270C-SIM	ND	J	1		
Benzo[b]fluoranthene		0.0051	mg/kg	0.0030	0.00056	EPA-8270C-SIM	ND		1		
Benzo[k]fluoranthene		0.0028	mg/kg	0.0030	0.00073	EPA-8270C-SIM	ND	J	1		
Benzo[a]pyrene		0.0053	mg/kg	0.0030	0.00034	EPA-8270C-SIM	ND		1		
Benzo[g,h,i]perylene		0.0015	mg/kg	0.0030	0.00068	EPA-8270C-SIM	ND	J	1		
Chrysene		0.0020	mg/kg	0.0030	0.00038	EPA-8270C-SIM	ND	J	1		
Dibenzo[a,h]anthracen	е	0.0046	mg/kg	0.0030	0.00057	EPA-8270C-SIM	ND		1		
Fluoranthene		0.0024	mg/kg	0.0030	0.00057	EPA-8270C-SIM	ND	J	1		
Fluorene		ND	mg/kg	0.0030	0.00037	EPA-8270C-SIM	ND		1		
Indeno[1,2,3-cd]pyrene		0.0045	mg/kg	0.0030	0.00055	EPA-8270C-SIM	ND		1		
Naphthalene		ND	mg/kg	0.0030	0.00049	EPA-8270C-SIM	ND		1		
Phenanthrene		0.0011	mg/kg	0.0030	0.00049	EPA-8270C-SIM	ND	J	1		
Pyrene		0.0020	mg/kg	0.0030	0.00058	EPA-8270C-SIM	ND	J	1		
Nitrobenzene-d5 (Surro	gate)	55.4	%	30 - 130 (LC	CL - UCL)	EPA-8270C-SIM			1		
2-Fluorobiphenyl (Surro	gate)	62.1	%	40 - 130 (LC	CL - UCL)	EPA-8270C-SIM			1		
p-Terphenyl-d14 (Surrog	gate)	63.8	%	30 - 130 (LC	CL - UCL)	EPA-8270C-SIM			1		

			Run					
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-8270C-SIM	10/29/20 17:20	10/30/20 09:59	OLH	MS-B7	1.007	B091256	EPA 3550B

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Report ID: 1001131481

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-21	Client Sampl	e Name:	BB-116-S	O-01, 10/2	2/2020 10:28:00	AM, Jared Ker	nper	
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		23	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		13000	mg/kg	5.0	1.7	EPA-6020	500	A07	2
Barium		79	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		91	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		10	mg/kg	5.0	0.50	EPA-6010B	2500	A07	3
Cobalt		6.9	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		20	mg/kg	10	0.50	EPA-6010B	2500	A07	3
Lead		1300	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		8.8	mg/kg	1.6	0.16	EPA-7471A	20	A07	4
Molybdenum		4.3	mg/kg	25	0.50	EPA-6010B	3500	J,A07	3
Nickel		7.1	mg/kg	5.0	1.5	EPA-6010B	2000	A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		24	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		28	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		110	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run			QC			
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/30/20 20:56	ARD	PE-EL4	9.804	B091174	EPA 3050B	
2	EPA-6020	10/29/20 12:00	11/04/20 02:28	ARD	PE-EL4	9.804	B091174	EPA 3050B	
3	EPA-6010B	10/29/20 12:00	11/03/20 01:30	AS1	PE-OP3	9.804	B091174	EPA 3050B	
4	EPA-7471A	10/30/20 14:30	11/02/20 10:40	TMT	CETAC3	9.766	B091358	EPA 7471A	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-22	Client Sampl	e Name:	BB-116-SO-01-0.5, 10/22/2020 10:33:00AM, Jared Kemper							
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #		
Antimony		78	mg/kg	5.0	0.80	EPA-6020	500	A07	1		
Arsenic		30000	mg/kg	10	3.4	EPA-6020	500	A07	2		
Barium		110	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3		
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3		
Cadmium		210	mg/kg	5.0	0.52	EPA-6010B	100	A07	3		
Chromium		34	mg/kg	5.0	0.50	EPA-6010B	2500	A07	3		
Cobalt		2.6	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3		
Copper		43	mg/kg	10	0.50	EPA-6010B	2500	A07	3		
Lead		2300	mg/kg	25	4.1	EPA-6010B	1000	A07	3		
Mercury		40	mg/kg	8.0	0.80	EPA-7471A	20	A07	4		
Molybdenum		0.67	mg/kg	25	0.50	EPA-6010B	3500	J,A07	3		
Nickel		10	mg/kg	5.0	1.5	EPA-6010B	2000	A07	3		
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1		
Silver		69	mg/kg	5.0	0.67	EPA-6010B	500	A07	3		
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1		
Vanadium		11	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3		
Zinc		130	mg/kg	25	0.87	EPA-6010B	5000	A07	3		

			Run			QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method		
1	EPA-6020	10/29/20 12:00	10/30/20 20:59	ARD	PE-EL4	9.709	B091174	EPA 3050B		
2	EPA-6020	10/29/20 12:00	11/04/20 02:31	ARD	PE-EL4	19.417	B091174	EPA 3050B		
3	EPA-6010B	10/29/20 12:00	11/03/20 01:32	AS1	PE-OP3	9.709	B091174	EPA 3050B		
4	EPA-7471A	10/30/20 14:30	11/02/20 10:42	TMT	CETAC3	49.603	B091358	EPA 7471A		

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-23	Client Sampl	e Name:	BB-B-Cor	np-01, 10/1	19/2020 3:35:00	PM, Jared Ker	mper	
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run#
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		20	mg/kg	5.0	1.7	EPA-6020	500	A07	2
Barium		82	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		10	mg/kg	5.0	0.50	EPA-6010B	2500	A07	3
Cobalt		6.3	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		10	mg/kg	10	0.50	EPA-6010B	2500	A07	3
Lead		43	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		0.62	mg/kg	0.16	0.016	EPA-7471A	20		4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		4.9	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		30	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		78	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/30/20 21:01	ARD	PE-EL4	9.901	B091174	EPA 3050B
2	EPA-6020	10/29/20 12:00	11/04/20 02:33	ARD	PE-EL4	9.901	B091174	EPA 3050B
3	EPA-6010B	10/29/20 12:00	11/03/20 01:33	AS1	PE-OP3	9.901	B091174	EPA 3050B
4	EPA-7471A	10/30/20 14:30	11/02/20 10:11	TMT	CETAC3	1.025	B091358	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-25	Client Sampl	e Name:	BB-020, 1	0/20/2020	11:13:00AM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		160	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		7400	mg/kg	5.0	1.7	EPA-6020	500	A07	2
Barium		98	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		60	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		10	mg/kg	5.0	0.50	EPA-6010B	2500	A07	3
Cobalt		6.7	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		15	mg/kg	10	0.50	EPA-6010B	2500	A07	3
Lead		520	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		2.0	mg/kg	0.16	0.016	EPA-7471A	20		4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		8.1	mg/kg	5.0	1.5	EPA-6010B	2000	A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		8.5	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		28	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		150	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/30/20 21:03	ARD	PE-EL4	9.804	B091174	EPA 3050B
2	EPA-6020	10/29/20 12:00	11/04/20 02:35	ARD	PE-EL4	9.804	B091174	EPA 3050B
3	EPA-6010B	10/29/20 12:00	11/03/20 01:35	AS1	PE-OP3	9.804	B091174	EPA 3050B
4	EPA-7471A	10/30/20 14:30	11/02/20 10:14	TMT	CETAC3	1.008	B091358	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Modified WET Test (STLC)

BCL Sample ID:	2031364-26	Client Sampl	e Name:	BB-123, 1	0/20/2020	12:23:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Arsenic		17	mg/L	0.050	0.0092	EPA-6010B	ND		1
Cadmium		0.21	mg/L	0.010	0.0011	EPA-6010B	ND		1
Lead		0.50	mg/L	0.050	0.0035	EPA-6010B	ND		1
Mercury		0.069	mg/L	0.010	0.0011	EPA-7470A	ND	A07	2

		_	Run			QC			
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6010B	02/07/21 14:00	02/08/21 14:38	JCC	PE-OP3	1	B099464	EPA 3005A	
2	EPA-7470A	02/16/21 14:40	02/17/21 12:12	TMT	CETAC3	5	B100161	EPA 7470A	

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

TCLP Toxicity

BCL Sample ID:	CL Sample ID: 2031364-26 Client Sample Name: BB-123, 10/20/2020 12:23:00PM, Jared Kempe								
Constituent		Result	Units	PQL	MDL	Method	TCLP Limits	Lab Quals	Run #
Arsenic		2.2	mg/L	0.20	0.083	EPA-6010B	5.0		1
Cadmium		0.034	mg/L	0.10	0.0051	EPA-6010B	1.0	J	1
Lead		0.047	mg/L	0.50	0.030	EPA-6010B	5.0	J	1
Mercury		0.015	mg/L	0.0020	0.00022	EPA-7470A	0.2		2

		-	Run			QC			
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6010B	02/09/21 11:00	02/09/21 19:30	JCC	PE-OP3	1	B099577	EPA 3050B	
2	EPA-7470A	02/10/21 09:30	02/10/21 17:33	TMT	CETAC3	1	B099674	EPA 7470A	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-26	Client Sampl	e Name:	BB-123, 1	10/20/2020				
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		4.5	mg/kg	5.0	0.80	EPA-6020	500	J,A07	1
Arsenic		15000	mg/kg	5.0	1.7	EPA-6020	500	A07	2
Barium		41	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		110	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		3.7	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	3
Cobalt		2.2	mg/kg	25	0.98	EPA-6010B	8000	J,A07	3
Copper		4.6	mg/kg	10	0.50	EPA-6010B	2500	J,A07	3
Lead		1200	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		350	mg/kg	32	3.2	EPA-7471A	20	A07	4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		1.5	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	3
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	1
Silver		11	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		20	mg/kg	5.0	1.1	EPA-6010B	2400	A07	3
Zinc		36	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/30/20 21:06	ARD	PE-EL4	9.434	B091174	EPA 3050B
2	EPA-6020	10/29/20 12:00	11/04/20 02:38	ARD	PE-EL4	9.434	B091174	EPA 3050B
3	EPA-6010B	10/29/20 12:00	11/03/20 01:37	AS1	PE-OP3	9.434	B091174	EPA 3050B
4	EPA-7471A	10/30/20 14:30	11/02/20 10:44	TMT	CETAC3	192.31	B091358	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-27	Client Sampl	e Name:	BB-011, 1	0/20/2020	2:14:00PM, Jai	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		110	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		58	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		1.3	mg/kg	5.0	0.52	EPA-6010B	100	J,A07	2
Chromium		4.6	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	2
Cobalt		5.1	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		8.4	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		34	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.77	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		3.0	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		3.9	mg/kg	5.0	1.1	EPA-6020	100	J,A07	4
Silver		2.3	mg/kg	5.0	0.67	EPA-6010B	500	J,A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		21	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		44	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 02:40	ARD	PE-EL4	10	B091180	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:05	AS1	PE-OP3	10	B091180	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 09:25	TMT	CETAC3	1.008	B091358	EPA 7471A
4	EPA-6020	10/29/20 12:00	11/05/20 20:16	ARD	PE-EL2	10	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-28	Client Sampl	e Name:	BB-012, 1	0/20/2020	2:32:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		0.83	mg/kg	5.0	0.80	EPA-6020	500	J,A07	1
Arsenic		1100	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		57	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		8.5	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		6.8	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		5.1	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		7.4	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		66	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		7.1	mg/kg	0.80	0.080	EPA-7471A	20	A07	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.7	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		1.6	mg/kg	5.0	1.1	EPA-6020	100	J,A07	4
Silver		0.85	mg/kg	5.0	0.67	EPA-6010B	500	J,A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		28	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		64	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 02:59	ARD	PE-EL4	9.709	B091180	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:20	AS1	PE-OP3	9.709	B091180	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 10:46	TMT	CETAC3	5.040	B091358	EPA 7471A
4	EPA-6020	10/29/20 12:00	11/05/20 21:16	ARD	PE-EL2	9.709	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-29	Client Sampl	e Name:	BB-127, 1	0/20/2020	2:42:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		74	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		88000	mg/kg	25	8.5	EPA-6020	500		2
Barium		18	mg/kg	5.0	1.8	EPA-6010B	10000	A07	3
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	3
Cadmium		630	mg/kg	5.0	0.52	EPA-6010B	100	A07	3
Chromium		ND	mg/kg	5.0	0.50	EPA-6010B	2500	A07	3
Cobalt		ND	mg/kg	25	0.98	EPA-6010B	8000	A07	3
Copper		7.0	mg/kg	10	0.50	EPA-6010B	2500	J,A07	3
Lead		2400	mg/kg	25	4.1	EPA-6010B	1000	A07	3
Mercury		270	mg/kg	32	3.2	EPA-7471A	20	A07	4
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	3
Nickel		ND	mg/kg	5.0	1.5	EPA-6010B	2000	A07	3
Selenium		ND	mg/kg	25	5.5	EPA-6020	100	A07	5
Silver		45	mg/kg	5.0	0.67	EPA-6010B	500	A07	3
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		3.3	mg/kg	5.0	1.1	EPA-6010B	2400	J,A07	3
Zinc		190	mg/kg	25	0.87	EPA-6010B	5000	A07	3

			Run				QC	
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 03:01	ARD	PE-EL4	9.804	B091180	EPA 3050B
2	EPA-6020	10/29/20 12:00	11/06/20 13:25	ARD	PE-EL4	49.020	B091180	EPA 3050B
3	EPA-6010B	10/29/20 12:00	11/03/20 00:21	AS1	PE-OP3	9.804	B091180	EPA 3050B
4	EPA-7471A	10/30/20 14:30	11/02/20 11:37	TMT	CETAC3	195.31	B091358	EPA 7471A
5	EPA-6020	10/29/20 12:00	11/05/20 21:17	ARD	PE-EL2	49.020	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-30	Client Sampl	e Name:	BB-129, 1	0/20/2020	2:52:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		3.3	mg/kg	5.0	0.80	EPA-6020	500	J,A07	1
Arsenic		19000	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		47	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		140	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		4.4	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	2
Cobalt		2.3	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		3.0	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		990	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		20	mg/kg	3.2	0.32	EPA-7471A	20	A07	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		ND	mg/kg	5.0	1.5	EPA-6010B	2000	A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	4
Silver		2.2	mg/kg	5.0	0.67	EPA-6010B	500	J,A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		24	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		19	mg/kg	25	0.87	EPA-6010B	5000	J,A07	2

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 03:03	ARD	PE-EL4	9.524	B091180	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:23	AS1	PE-OP3	9.524	B091180	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 11:39	TMT	CETAC3	19.841	B091358	EPA 7471A
4	EPA-6020	10/29/20 12:00	11/05/20 21:19	ARD	PE-EL2	9.524	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-31	Client Sampl	e Name:	BB-129-0	BB-129-0.5, 10/20/2020 2:57:00PM, Jared Kemper					
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #	
Antimony		1.0	mg/kg	5.0	0.80	EPA-6020	500	J,A07	1	
Arsenic		11000	mg/kg	5.0	1.7	EPA-6020	500	A07	1	
Barium		59	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2	
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2	
Cadmium		86	mg/kg	5.0	0.52	EPA-6010B	100	A07	2	
Chromium		3.7	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	2	
Cobalt		3.0	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2	
Copper		3.9	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2	
Lead		210	mg/kg	25	4.1	EPA-6010B	1000	A07	2	
Mercury		3.8	mg/kg	0.32	0.032	EPA-7471A	20	A07	3	
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2	
Nickel		2.0	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2	
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	4	
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2	
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1	
Vanadium		18	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2	
Zinc		26	mg/kg	25	0.87	EPA-6010B	5000	A07	2	

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 03:06	ARD	PE-EL4	10	B091180	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:25	AS1	PE-OP3	10	B091180	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 11:41	TMT	CETAC3	1.984	B091358	EPA 7471A
4	EPA-6020	10/29/20 12:00	11/05/20 21:21	ARD	PE-EL2	10	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-32	Client Sampl	e Name:	BB-018, 1	0/20/2020	4:06:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		2.2	mg/kg	5.0	0.80	EPA-6020	500	J,A07	1
Arsenic		1900	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		54	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		14	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		8.6	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		4.8	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		87	mg/kg	10	0.50	EPA-6010B	2500	A07	2
Lead		13000	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		7.9	mg/kg	0.80	0.080	EPA-7471A	20	A07	3
Molybdenum		1.8	mg/kg	25	0.50	EPA-6010B	3500	J,A07	2
Nickel		6.3	mg/kg	5.0	1.5	EPA-6010B	2000	A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	4
Silver		4.6	mg/kg	5.0	0.67	EPA-6010B	500	J,A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		25	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		140	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 03:08	ARD	PE-EL4	9.709	B091180	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:27	AS1	PE-OP3	9.709	B091180	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 11:52	TMT	CETAC3	5.040	B091358	EPA 7471A
4	EPA-6020	10/29/20 12:00	11/05/20 21:23	ARD	PE-EL2	9.709	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-33	Client Sampl	e Name:	DUP-02,	10/20/2020	4:06:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		1.6	mg/kg	5.0	0.80	EPA-6020	500	J,A07	1
Arsenic		1200	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		41	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		9.1	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		5.9	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		3.5	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		40	mg/kg	10	0.50	EPA-6010B	2500	A07	2
Lead		7100	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		5.7	mg/kg	0.80	0.080	EPA-7471A	20	A07	3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		4.5	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		ND	mg/kg	5.0	1.1	EPA-6020	100	A07	4
Silver		4.7	mg/kg	5.0	0.67	EPA-6010B	500	J,A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		17	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		110	mg/kg	25	0.87	EPA-6010B	5000	A07	2

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	10/29/20 12:00	10/31/20 03:10	ARD	PE-EL4	9.524	B091180	EPA 3050B
2	EPA-6010B	10/29/20 12:00	11/03/20 00:29	AS1	PE-OP3	9.524	B091180	EPA 3050B
3	EPA-7471A	10/30/20 14:30	11/02/20 11:54	TMT	CETAC3	4.960	B091358	EPA 7471A
4	EPA-6020	10/29/20 12:00	11/05/20 21:24	ARD	PE-EL2	9.524	B091180	EPA 3050B

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-34	Client Sampl	e Name:	BB-SW-0	2-Sed, 10/2	22/2020 1:30:00	DPM, Jared Ker	mper	
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		32	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		31	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		5.8	mg/kg	5.0	0.50	EPA-6010B	2500	A07	2
Cobalt		3.4	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		3.8	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.55	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		2.8	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		1.8	mg/kg	5.0	1.1	EPA-6020	100	J,A07	4
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		31	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		24	mg/kg	25	0.87	EPA-6010B	5000	J,A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/31/20 03:13	ARD	PE-EL4	9.901	B091180	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 00:30	AS1	PE-OP3	9.901	B091180	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 13:34	TMT	CETAC3	0.992	B091358	EPA 7471A	
4	EPA-6020	10/29/20 12:00	11/05/20 21:26	ARD	PE-EL2	9.901	B091180	EPA 3050B	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-35	Client Sampl	e Name:	BB-SW-0	3-Sed, 10/2	22/2020 3:45:00	DPM, Jared Ker	mper	
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		ND	mg/kg	5.0	0.80	EPA-6020	500	A07	1
Arsenic		13	mg/kg	5.0	1.7	EPA-6020	500	A07	1
Barium		24	mg/kg	5.0	1.8	EPA-6010B	10000	A07	2
Beryllium		ND	mg/kg	5.0	0.47	EPA-6010B	75	A07	2
Cadmium		ND	mg/kg	5.0	0.52	EPA-6010B	100	A07	2
Chromium		4.4	mg/kg	5.0	0.50	EPA-6010B	2500	J,A07	2
Cobalt		2.3	mg/kg	25	0.98	EPA-6010B	8000	J,A07	2
Copper		2.8	mg/kg	10	0.50	EPA-6010B	2500	J,A07	2
Lead		ND	mg/kg	25	4.1	EPA-6010B	1000	A07	2
Mercury		0.17	mg/kg	0.16	0.016	EPA-7471A	20		3
Molybdenum		ND	mg/kg	25	0.50	EPA-6010B	3500	A07	2
Nickel		3.3	mg/kg	5.0	1.5	EPA-6010B	2000	J,A07	2
Selenium		1.2	mg/kg	5.0	1.1	EPA-6020	100	J,A07	4
Silver		ND	mg/kg	5.0	0.67	EPA-6010B	500	A07	2
Thallium		ND	mg/kg	2.5	0.49	EPA-6020	700	A07	1
Vanadium		17	mg/kg	5.0	1.1	EPA-6010B	2400	A07	2
Zinc		15	mg/kg	25	0.87	EPA-6010B	5000	J,A07	2

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-6020	10/29/20 12:00	10/31/20 03:15	ARD	PE-EL4	10	B091180	EPA 3050B	
2	EPA-6010B	10/29/20 12:00	11/03/20 00:32	AS1	PE-OP3	10	B091180	EPA 3050B	
3	EPA-7471A	10/30/20 14:30	11/02/20 13:36	TMT	CETAC3	1.008	B091358	EPA 7471A	
4	EPA-6020	10/29/20 12:00	11/05/20 21:28	ARD	PE-EL2	10	B091180	EPA 3050B	

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3525 Hyland Ave Costa Mesa, CA 92626



Project Number: [none] Project Manager: David Allison

Project: USFS- Big Blue Mill

Metals Analysis

BCL Sample ID:	2031364-36	Client Sampl	BB-SW-0	1, 10/22/20	·				
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Antimony		ND	ug/L	2.0	0.23	EPA-200.8	ND	quaio	1
Dissolved Arsenic		6.4	ug/L	2.0	0.38	EPA-200.8	ND		1
Dissolved Barium		18	ug/L	1.0	0.066	EPA-200.8	ND		1
Dissolved Beryllium		ND	ug/L	1.0	0.050	EPA-200.8	ND		1
Dissolved Cadmium		ND	ug/L	1.0	0.034	EPA-200.8	ND		1
Dissolved Chromium		ND	ug/L	3.0	0.15	EPA-200.8	ND		1
Dissolved Cobalt		0.059	ug/L	1.0	0.011	EPA-200.8	0.015	J	1
Dissolved Copper		ND	ug/L	2.0	0.32	EPA-200.8	ND		1
Dissolved Lead		ND	ug/L	1.0	0.021	EPA-200.8	ND		1
Dissolved Mercury		0.12	ug/L	0.20	0.022	EPA-245.1	0.046	J	2
Dissolved Molybdenu	m	6.5	ug/L	1.0	0.033	EPA-200.8	ND		1
Dissolved Nickel		0.48	ug/L	2.0	0.15	EPA-200.8	ND	J	1
Dissolved Selenium		ND	ug/L	2.0	0.25	EPA-200.8	ND		1
Dissolved Silver		ND	ug/L	1.0	0.015	EPA-200.8	ND		1
Dissolved Thallium		ND	ug/L	1.0	0.025	EPA-200.8	ND		1
Dissolved Vanadium		0.67	ug/L	3.0	0.39	EPA-200.8	ND	J	1
Dissolved Zinc		ND	ug/L	5.0	2.2	EPA-200.8	ND		1
Total Recoverable Ant	imony	0.30	ug/L	2.0	0.11	EPA-200.8	0.20	J	3
Total Recoverable Ars	enic	5.7	ug/L	2.0	0.70	EPA-200.8	ND		3
Total Recoverable Bar	ium	18	ug/L	1.0	0.21	EPA-200.8	0.44		3
Total Recoverable Bery	/llium	ND	ug/L	1.0	0.14	EPA-200.8	ND		3
Total Recoverable Cad	mium	ND	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Chi	omium	0.55	ug/L	3.0	0.50	EPA-200.8	0.54	J	3
Total Recoverable Cob	alt	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Co	oper	0.62	ug/L	2.0	0.22	EPA-200.8	0.27	J	3
Total Recoverable Lea	d	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Me	rcury	0.21	ug/L	0.20	0.022	EPA-245.1	ND		4
Total Recoverable Mo	ybdenum	7.3	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Nic	kel	0.44	ug/L	2.0	0.19	EPA-200.8	ND	J	3
Total Recoverable Sele	enium	ND	ug/L	2.0	0.19	EPA-200.8	ND		5
Total Recoverable Silve	er	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Tha	lium	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Van	adium	ND	ug/L	3.0	0.78	EPA-200.8	ND		3

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-36	Client Sampl	e Name:	BB-SW-01, 10/22/2020 5:15:00PM, Jared Kemper						
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #	
Total Recoverable Zinc		ND	ug/L	10	1.7	EPA-200.8	ND		3	

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-200.8	11/02/20 15:53	11/05/20 19:48	ARD	PE-EL2	1	B091493	EPA 200.8 Dissolved	
2	EPA-245.1	11/07/20 14:00	11/08/20 17:14	TMT	CETAC3	1	B091995	EPA 245.1	
3	EPA-200.8	10/29/20 19:50	10/31/20 05:45	ARD	PE-EL4	1	B091231	EPA 200.2	
4	EPA-245.1	11/07/20 14:00	11/08/20 14:49	TMT	CETAC3	1	B091992	EPA 245.1	
5	EPA-200.8	10/29/20 19:50	11/05/20 18:07	ARD	PE-EL2	1	B091231	EPA 200.2	

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-37	Client Sampl	e Name:	BB-SW-0	2, 10/22/20	20 1:30:00PM,	Jared Kemper	·	
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
Dissolved Antimony		ND	ug/L	2.0	0.23	EPA-200.8	ND	Quais	1
Dissolved Arsenic		5.9	ug/L	2.0	0.38	EPA-200.8	ND		1
Dissolved Barium		18	ug/L	1.0	0.066	EPA-200.8	ND		1
Dissolved Beryllium		ND	ug/L	1.0	0.050	EPA-200.8	ND		1
Dissolved Cadmium		ND	ug/L	1.0	0.034	EPA-200.8	ND		1
Dissolved Chromium		ND	ug/L	3.0	0.15	EPA-200.8	ND		1
Dissolved Cobalt		0.051	ug/L	1.0	0.011	EPA-200.8	0.015	J	1
Dissolved Copper		ND	ug/L	2.0	0.32	EPA-200.8	ND		1
Dissolved Lead		0.024	ug/L	1.0	0.021	EPA-200.8	ND	J	1
Dissolved Mercury		0.25	ug/L	0.20	0.022	EPA-245.1	0.046		2
Dissolved Molybdenum		6.6	ug/L	1.0	0.033	EPA-200.8	ND		1
Dissolved Nickel		0.45	ug/L	2.0	0.15	EPA-200.8	ND	J	1
Dissolved Selenium		ND	ug/L	2.0	0.25	EPA-200.8	ND		1
Dissolved Silver		ND	ug/L	1.0	0.015	EPA-200.8	ND		1
Dissolved Thallium		ND	ug/L	1.0	0.025	EPA-200.8	ND		1
Dissolved Vanadium		0.66	ug/L	3.0	0.39	EPA-200.8	ND	J	1
Dissolved Zinc		ND	ug/L	5.0	2.2	EPA-200.8	ND		1
Total Recoverable Antimo	ny	0.19	ug/L	2.0	0.11	EPA-200.8	0.20	J	3
Total Recoverable Arsenic	;	6.0	ug/L	2.0	0.70	EPA-200.8	ND		3
Total Recoverable Barium		17	ug/L	1.0	0.21	EPA-200.8	0.44		3
Total Recoverable Berylliur	n	ND	ug/L	1.0	0.14	EPA-200.8	ND		3
Total Recoverable Cadmiui	n	ND	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Chromiu	m	ND	ug/L	3.0	0.50	EPA-200.8	0.54		3
Total Recoverable Cobalt		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Copper		0.62	ug/L	2.0	0.22	EPA-200.8	0.27	J	3
Total Recoverable Lead		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Mercur	/	0.39	ug/L	0.20	0.022	EPA-245.1	ND		4
Total Recoverable Molybd	enum	7.5	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Nickel		0.44	ug/L	2.0	0.19	EPA-200.8	ND	J	3
Total Recoverable Seleniur	n	ND	ug/L	2.0	0.19	EPA-200.8	ND		5
Total Recoverable Silver		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Thallium		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Vanadiu	m	ND	ug/L	3.0	0.78	EPA-200.8	ND		3

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-37	Client Sampl	e Name:						
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
Total Recoverable Zinc	:	1.9	ug/L	10	1.7	EPA-200.8	ND	J	3

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-200.8	11/02/20 15:53	11/05/20 19:50	ARD	PE-EL2	1	B091493	EPA 200.8 Dissolved	
2	EPA-245.1	11/07/20 14:00	11/08/20 17:16	TMT	CETAC3	1	B091995	EPA 245.1	
3	EPA-200.8	10/29/20 19:50	10/31/20 05:47	ARD	PE-EL4	1	B091231	EPA 200.2	
4	EPA-245.1	11/09/20 10:30	11/10/20 13:29	TMT	CETAC3	1	B090599	EPA 245.1	
5	EPA-200.8	10/29/20 19:50	11/05/20 18:09	ARD	PE-EL2	1	B091231	EPA 200.2	

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3525 Hyland Ave Costa Mesa, CA 92626



Project Number: [none] Project Manager: David Allison

Project: USFS- Big Blue Mill

Metals Analysis

BCL Sample ID:	2031364-38	Client Sampl	BB-SW-0	3, 10/22/20	· 				
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
Dissolved Antimony		ND	ug/L	2.0	0.23	EPA-200.8	ND	quaio	1
Dissolved Arsenic		7.3	ug/L	2.0	0.38	EPA-200.8	ND		1
Dissolved Barium		18	ug/L	1.0	0.066	EPA-200.8	ND		1
Dissolved Beryllium		ND	ug/L	1.0	0.050	EPA-200.8	ND		1
Dissolved Cadmium		0.050	ug/L	1.0	0.034	EPA-200.8	ND	J	1
Dissolved Chromium		ND	ug/L	3.0	0.15	EPA-200.8	ND		1
Dissolved Cobalt		0.046	ug/L	1.0	0.011	EPA-200.8	0.015	J	1
Dissolved Copper		0.34	ug/L	2.0	0.32	EPA-200.8	ND	J	1
Dissolved Lead		0.059	ug/L	1.0	0.021	EPA-200.8	ND	J	1
Dissolved Mercury		0.25	ug/L	0.20	0.022	EPA-245.1	0.046		2
Dissolved Molybdenur	n	6.8	ug/L	1.0	0.033	EPA-200.8	ND		1
Dissolved Nickel		0.40	ug/L	2.0	0.15	EPA-200.8	ND	J	1
Dissolved Selenium		ND	ug/L	2.0	0.25	EPA-200.8	ND		1
Dissolved Silver		ND	ug/L	1.0	0.015	EPA-200.8	ND		1
Dissolved Thallium		ND	ug/L	1.0	0.025	EPA-200.8	ND		1
Dissolved Vanadium		0.66	ug/L	3.0	0.39	EPA-200.8	ND	J	1
Dissolved Zinc		ND	ug/L	5.0	2.2	EPA-200.8	ND		1
Total Recoverable Anti	mony	0.13	ug/L	2.0	0.11	EPA-200.8	0.20	J	3
Total Recoverable Arse	enic	6.7	ug/L	2.0	0.70	EPA-200.8	ND		3
Total Recoverable Bari	um	18	ug/L	1.0	0.21	EPA-200.8	0.44		3
Total Recoverable Bery	llium	ND	ug/L	1.0	0.14	EPA-200.8	ND		3
Total Recoverable Cadr	nium	ND	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Chro	mium	ND	ug/L	3.0	0.50	EPA-200.8	0.54		3
Total Recoverable Coba	alt	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Cop	per	0.53	ug/L	2.0	0.22	EPA-200.8	0.27	J	3
Total Recoverable Lead		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Mer	cury	0.16	ug/L	0.20	0.022	EPA-245.1	ND	J	4
Total Recoverable Mol	ybdenum	7.9	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Nick	rel	0.46	ug/L	2.0	0.19	EPA-200.8	ND	J	3
Total Recoverable Sele	nium	ND	ug/L	2.0	0.19	EPA-200.8	ND		5
Total Recoverable Silve	r	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Thall	ium	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Vana	dium	ND	ug/L	3.0	0.78	EPA-200.8	ND		3

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-38	Client Sampl	e Name:	BB-SW-03	3, 10/22/20	20 3:45:00PM,			
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Total Recoverable Zinc		ND	ug/L	10	1.7	EPA-200.8	ND		3

			Run				QC	
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-200.8	11/02/20 15:53	11/05/20 19:51	ARD	PE-EL2	1	B091493	EPA 200.8 Dissolved
2	EPA-245.1	11/07/20 14:00	11/08/20 17:22	TMT	CETAC3	1	B091995	EPA 245.1
3	EPA-200.8	10/29/20 19:50	10/31/20 05:50	ARD	PE-EL4	1	B091231	EPA 200.2
4	EPA-245.1	11/09/20 10:30	11/10/20 13:31	TMT	CETAC3	1	B090599	EPA 245.1
5	EPA-200.8	10/29/20 19:50	11/05/20 18:11	ARD	PE-EL2	1	B091231	EPA 200.2

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported: Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-39	Client Sampl	e Name:	DUP-01,	10/22/2020	1:35:00PM, Ja	red Kemper		
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Dissolved Antimony		ND	ug/L	2.0	0.23	EPA-200.8	ND	Quais	1
Dissolved Arsenic		6.5	ug/L	2.0	0.38	EPA-200.8	ND		1
Dissolved Barium		18	ug/L	1.0	0.066	EPA-200.8	ND		1
Dissolved Beryllium		ND	ug/L	1.0	0.050	EPA-200.8	ND		1
Dissolved Cadmium		0.034	ug/L	1.0	0.034	EPA-200.8	ND	J	1
Dissolved Chromium		ND	ug/L	3.0	0.15	EPA-200.8	ND		1
Dissolved Cobalt		0.047	ug/L	1.0	0.011	EPA-200.8	0.015	J	1
Dissolved Copper		ND	ug/L	2.0	0.32	EPA-200.8	ND		1
Dissolved Lead		ND	ug/L	1.0	0.021	EPA-200.8	ND		1
Dissolved Mercury		0.24	ug/L	0.20	0.022	EPA-245.1	0.046		2
Dissolved Molybdenum		6.6	ug/L	1.0	0.033	EPA-200.8	ND		1
Dissolved Nickel		0.35	ug/L	2.0	0.15	EPA-200.8	ND	J	1
Dissolved Selenium		ND	ug/L	2.0	0.25	EPA-200.8	ND		1
Dissolved Silver		ND	ug/L	1.0	0.015	EPA-200.8	ND		1
Dissolved Thallium		ND	ug/L	1.0	0.025	EPA-200.8	ND		1
Dissolved Vanadium		0.56	ug/L	3.0	0.39	EPA-200.8	ND	J	1
Dissolved Zinc		ND	ug/L	5.0	2.2	EPA-200.8	ND		1
Total Recoverable Antime	ony	0.11	ug/L	2.0	0.11	EPA-200.8	0.20	J	3
Total Recoverable Arsen	ic	5.9	ug/L	2.0	0.70	EPA-200.8	ND		3
Total Recoverable Bariur	n	18	ug/L	1.0	0.21	EPA-200.8	0.44		3
Total Recoverable Berylliu	ım	ND	ug/L	1.0	0.14	EPA-200.8	ND		3
Total Recoverable Cadmin	ım	ND	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Chromi	um	ND	ug/L	3.0	0.50	EPA-200.8	0.54		3
Total Recoverable Cobalt		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Coppe	er	0.66	ug/L	2.0	0.22	EPA-200.8	0.27	J	3
Total Recoverable Lead		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Mercu	ry	0.22	ug/L	0.20	0.022	EPA-245.1	ND		4
Total Recoverable Molyb	denum	7.8	ug/L	1.0	0.11	EPA-200.8	ND		3
Total Recoverable Nickel		0.48	ug/L	2.0	0.19	EPA-200.8	ND	J	3
Total Recoverable Seleniu	ım	ND	ug/L	2.0	0.19	EPA-200.8	ND		5
Total Recoverable Silver		ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Thallium	n	ND	ug/L	1.0	0.10	EPA-200.8	ND		3
Total Recoverable Vanadi	um	ND	ug/L	3.0	0.78	EPA-200.8	ND		3

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-39	Client Sample	Client Sample Name: DUP-01, 10/22/2020				1:35:00PM, Jared Kemper				
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #		
Total Recoverable Zinc		ND	ug/L	10	1.7	EPA-200.8	ND		3		

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-200.8	11/02/20 15:53	11/05/20 19:53	ARD	PE-EL2	1	B091493	EPA 200.8 Dissolved	
2	EPA-245.1	11/07/20 14:00	11/08/20 17:24	TMT	CETAC3	1	B091995	EPA 245.1	
3	EPA-200.8	10/29/20 19:50	10/31/20 05:52	ARD	PE-EL4	1	B091231	EPA 200.2	
4	EPA-245.1	11/09/20 10:30	11/10/20 13:33	TMT	CETAC3	1	B090599	EPA 245.1	
5	EPA-200.8	10/29/20 19:50	11/05/20 18:13	ARD	PE-EL2	1	B091231	EPA 200.2	

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3525 Hyland Ave Costa Mesa, CA 92626

02/18/2021 9:27 Reported:

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Metals Analysis

BCL Sample ID:	2031364-40	Client Sampl	e Name:	Rinseate-	Blank-03,	10/22/2020 11:3	0:00AM, Jared	Kemper	
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Total Recoverable Antir	nony	0.12	ug/L	2.0	0.11	EPA-200.8	0.20	J	1
Total Recoverable Arse	nic	4.0	ug/L	2.0	0.70	EPA-200.8	ND		1
Total Recoverable Bari	ım	2.1	ug/L	1.0	0.21	EPA-200.8	0.44		1
Total Recoverable Beryl	ium	ND	ug/L	1.0	0.14	EPA-200.8	ND		1
Total Recoverable Cadn	nium	ND	ug/L	1.0	0.11	EPA-200.8	ND		1
Total Recoverable Chro	mium	0.55	ug/L	3.0	0.50	EPA-200.8	0.54	J	1
Total Recoverable Coba	lt	ND	ug/L	1.0	0.10	EPA-200.8	ND		1
Total Recoverable Cop	per	0.43	ug/L	2.0	0.22	EPA-200.8	0.27	J	1
Total Recoverable Lead	I	1.0	ug/L	1.0	0.10	EPA-200.8	ND		1
Total Recoverable Merc	ury	0.21	ug/L	0.20	0.022	EPA-245.1	ND		2
Total Recoverable Moly	bdenum	0.20	ug/L	1.0	0.11	EPA-200.8	ND	J	1
Total Recoverable Nicke	I	ND	ug/L	2.0	0.19	EPA-200.8	ND		1
Total Recoverable Seler	ium	ND	ug/L	2.0	0.19	EPA-200.8	ND		3
Total Recoverable Silver		ND	ug/L	1.0	0.10	EPA-200.8	ND		1
Total Recoverable Thalli	um	ND	ug/L	1.0	0.10	EPA-200.8	ND		1
Total Recoverable Vana	dium	ND	ug/L	3.0	0.78	EPA-200.8	ND		1
Total Recoverable Zinc		ND	ug/L	10	1.7	EPA-200.8	ND		1

			Run		QC				
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method	
1	EPA-200.8	10/29/20 19:50	10/31/20 05:54	ARD	PE-EL4	1	B091231	EPA 200.2	
2	EPA-245.1	11/09/20 10:30	11/10/20 13:41	TMT	CETAC3	1	B090599	EPA 245.1	
3	EPA-200.8	10/29/20 19:50	11/05/20 18:14	ARD	PE-EL2	1	B091231	EPA 200.2	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID:	2031364-41	Client Sampl	e Name:	Trip Blank	x, 10/22/20	20 12:00:00PM,	Jared Kemper		
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run #
Benzene		ND	ug/L	0.50	0.083	EPA-8260B	ND	Qualo	1
Bromobenzene		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
Bromochloromethane		ND	ug/L	0.50	0.24	EPA-8260B	ND		1
Bromodichloromethane		ND	ug/L	0.50	0.14	EPA-8260B	ND		1
Bromoform		ND	ug/L	0.50	0.27	EPA-8260B	ND		1
Bromomethane		ND	ug/L	1.0	0.25	EPA-8260B	ND		1
n-Butylbenzene		ND	ug/L	0.50	0.11	EPA-8260B	ND		1
sec-Butylbenzene		ND	ug/L	0.50	0.15	EPA-8260B	ND		1
tert-Butylbenzene		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
Carbon tetrachloride		ND	ug/L	0.50	0.18	EPA-8260B	ND		1
Chlorobenzene		ND	ug/L	0.50	0.093	EPA-8260B	ND		1
Chloroethane		ND	ug/L	0.50	0.14	EPA-8260B	ND		1
Chloroform		ND	ug/L	0.50	0.12	EPA-8260B	ND		1
Chloromethane		ND	ug/L	0.50	0.14	EPA-8260B	ND		1
2-Chlorotoluene		ND	ug/L	0.50	0.20	EPA-8260B	ND		1
4-Chlorotoluene		ND	ug/L	0.50	0.15	EPA-8260B	ND		1
Dibromochloromethane		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
1,2-Dibromo-3-chloropropa	ine	ND	ug/L	1.0	0.44	EPA-8260B	ND		1
1,2-Dibromoethane		ND	ug/L	0.50	0.16	EPA-8260B	ND		1
Dibromomethane		ND	ug/L	0.50	0.24	EPA-8260B	ND		1
1,2-Dichlorobenzene		ND	ug/L	0.50	0.072	EPA-8260B	ND		1
1,3-Dichlorobenzene		ND	ug/L	0.50	0.15	EPA-8260B	ND		1
1,4-Dichlorobenzene		ND	ug/L	0.50	0.062	EPA-8260B	ND		1
Dichlorodifluoromethane		ND	ug/L	0.50	0.099	EPA-8260B	ND		1
1,1-Dichloroethane		ND	ug/L	0.50	0.11	EPA-8260B	ND		1
1,2-Dichloroethane		ND	ug/L	0.50	0.17	EPA-8260B	ND		1
1,1-Dichloroethene		ND	ug/L	0.50	0.18	EPA-8260B	ND		1
cis-1,2-Dichloroethene		ND	ug/L	0.50	0.085	EPA-8260B	ND		1
trans-1,2-Dichloroethene		ND	ug/L	0.50	0.15	EPA-8260B	ND		1
1,2-Dichloropropane		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
1,3-Dichloropropane		ND	ug/L	0.50	0.086	EPA-8260B	ND		1
2,2-Dichloropropane		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
1,1-Dichloropropene		ND	ug/L	0.50	0.085	EPA-8260B	ND		1

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID:	2031364-41	Client Sampl	e Name:	Trip Blank	k, 10/22/20	20 12:00:00PM,	Jared Kemper	-	
Constituent		Result	Units	PQL	MDL	Method	MB Bias	Lab Quals	Run#
cis-1,3-Dichloropropene		ND	ug/L	0.50	0.14	EPA-8260B	ND	Quais	1
trans-1,3-Dichloropropene		ND	ug/L	0.50	0.079	EPA-8260B	ND		1
Ethylbenzene		ND	ug/L	0.50	0.098	EPA-8260B	ND		1
Hexachlorobutadiene		ND	ug/L	0.50	0.17	EPA-8260B	ND		1
Isopropylbenzene		ND	ug/L	0.50	0.14	EPA-8260B	ND		1
p-Isopropyltoluene		ND	ug/L	0.50	0.12	EPA-8260B	ND		1
Methylene chloride		ND	ug/L	1.0	0.48	EPA-8260B	ND		1
Methyl t-butyl ether		ND	ug/L	0.50	0.11	EPA-8260B	ND		1
Naphthalene		ND	ug/L	0.50	0.36	EPA-8260B	ND		1
n-Propylbenzene		ND	ug/L	0.50	0.11	EPA-8260B	ND		1
Styrene		ND	ug/L	0.50	0.068	EPA-8260B	ND		1
1,1,1,2-Tetrachloroethane		ND	ug/L	0.50	0.18	EPA-8260B	ND		1
1,1,2,2-Tetrachloroethane		ND	ug/L	0.50	0.17	EPA-8260B	ND		1
Tetrachloroethene		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
Toluene		ND	ug/L	0.50	0.093	EPA-8260B	ND		1
1,2,3-Trichlorobenzene		ND	ug/L	0.50	0.16	EPA-8260B	ND		1
1,2,4-Trichlorobenzene		ND	ug/L	0.50	0.19	EPA-8260B	ND		1
1,1,1-Trichloroethane		ND	ug/L	0.50	0.11	EPA-8260B	ND		1
1,1,2-Trichloroethane		ND	ug/L	0.50	0.16	EPA-8260B	ND		1
Trichloroethene		ND	ug/L	0.50	0.085	EPA-8260B	ND		1
Trichlorofluoromethane		ND	ug/L	0.50	0.13	EPA-8260B	ND		1
1,2,3-Trichloropropane		ND	ug/L	1.0	0.24	EPA-8260B	ND		1
1,1,2-Trichloro-1,2,2-trifluc	roethane	ND	ug/L	0.50	0.15	EPA-8260B	ND		1
1,2,4-Trimethylbenzene		ND	ug/L	0.50	0.12	EPA-8260B	ND		1
1,3,5-Trimethylbenzene		ND	ug/L	0.50	0.12	EPA-8260B	ND		1
Vinyl chloride		ND	ug/L	0.50	0.12	EPA-8260B	ND		1
Total Xylenes		ND	ug/L	1.0	0.36	EPA-8260B	ND		1
p- & m-Xylenes		ND	ug/L	0.50	0.28	EPA-8260B	ND		1
o-Xylene		ND	ug/L	0.50	0.082	EPA-8260B	ND		1
1,2-Dichloroethane-d4 (Su	rrogate)	101	%	75 - 125 (LC	CL - UCL)	EPA-8260B			1
Toluene-d8 (Surrogate)		94.6	%	80 - 120 (LC	CL - UCL)	EPA-8260B			1
4-Bromofluorobenzene (S	urrogate)	102	%	80 - 120 (LC	CL - UCL)	EPA-8260B			1

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

BCL Sample ID	D : 2031364-41	Client San	nple Name:	Trip Blank, 10	/22/2020 12:00:	00PM, Jared	Kemper	
Run#	Method	Analyst	Instrument	Dilution	QC Batch ID			
1	EPA-8260B	Prep Date 10/28/20 16:00	Date/Time 10/30/20 09:40		MS-V14	1	B091080	EPA 5030 Water MS

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-42	Client Sampl	e Name:	BB-123.0	-				
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #
Antimony		3.1	mg/kg	2.5	0.40	EPA-6020	500		1
Arsenic		6300	mg/kg	2.5	0.85	EPA-6020	500		1
Barium		32	mg/kg	0.50	0.18	EPA-6010B	10000		2
Beryllium		0.19	mg/kg	0.50	0.047	EPA-6010B	75	J	2
Cadmium		84	mg/kg	0.50	0.052	EPA-6010B	100		2
Chromium		5.3	mg/kg	0.50	0.050	EPA-6010B	2500		2
Cobalt		1.8	mg/kg	2.5	0.098	EPA-6010B	8000	J	2
Copper		8.1	mg/kg	1.0	0.050	EPA-6010B	2500		2
Lead		820	mg/kg	2.5	0.41	EPA-6010B	1000		2
Mercury		0.064	mg/kg	0.16	0.016	EPA-7471A	20	J	3
Molybdenum		ND	mg/kg	2.5	0.050	EPA-6010B	3500		2
Nickel		1.7	mg/kg	0.50	0.15	EPA-6010B	2000		2
Selenium		ND	mg/kg	2.5	0.55	EPA-6020	100		1
Silver		7.0	mg/kg	0.50	0.067	EPA-6010B	500		2
Thallium		ND	mg/kg	1.2	0.24	EPA-6020	700		1
Vanadium		18	mg/kg	0.50	0.11	EPA-6010B	2400		2
Zinc		60	mg/kg	2.5	0.087	EPA-6010B	5000		2

			Run					
Run#	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	11/05/20 11:00	11/06/20 14:49	ARD	PE-EL2	4.950	B091813	EPA 3050B
2	EPA-6010B	11/05/20 14:45	11/06/20 13:07	JCC	PE-OP3	1	B091765	EPA 3050B
3	EPA-7471A	11/05/20 11:00	11/05/20 13:12	TMT	CETAC3	0.992	B091770	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Total Concentrations (TTLC)

BCL Sample ID:	2031364-43	Client Sampl	e Name:	BB-M1-SED-01, 10/22/2020 3:10:00PM, Jared Kemper							
Constituent		Result	Units	PQL	MDL	Method	TTLC Limits	Lab Quals	Run #		
Antimony		0.13	mg/kg	0.50	0.080	EPA-6020	500	J	1		
Arsenic		22	mg/kg	0.50	0.17	EPA-6020	500		1		
Barium		21	mg/kg	0.50	0.18	EPA-6010B	10000		2		
Beryllium		0.22	mg/kg	0.50	0.047	EPA-6010B	75	J	2		
Cadmium		0.31	mg/kg	0.50	0.052	EPA-6010B	100	J	2		
Chromium		7.2	mg/kg	0.50	0.050	EPA-6010B	2500		2		
Cobalt		3.0	mg/kg	2.5	0.098	EPA-6010B	8000		2		
Copper		3.0	mg/kg	1.0	0.050	EPA-6010B	2500		2		
Lead		2.6	mg/kg	2.5	0.41	EPA-6010B	1000		2		
Mercury		0.080	mg/kg	0.16	0.016	EPA-7471A	20	J	3		
Molybdenum		ND	mg/kg	2.5	0.050	EPA-6010B	3500		2		
Nickel		2.2	mg/kg	0.50	0.15	EPA-6010B	2000		2		
Selenium		ND	mg/kg	0.50	0.11	EPA-6020	100		1		
Silver		ND	mg/kg	0.50	0.067	EPA-6010B	500		2		
Thallium		0.10	mg/kg	0.25	0.049	EPA-6020	700	J	1		
Vanadium		35	mg/kg	0.50	0.11	EPA-6010B	2400		2		
Zinc		16	mg/kg	2.5	0.087	EPA-6010B	5000		2		

			Run				QC	
Run #	Method	Prep Date	Date/Time	Analyst	Instrument	Dilution	Batch ID	Prep Method
1	EPA-6020	11/05/20 11:00	11/06/20 14:41	ARD	PE-EL2	0.990	B091813	EPA 3050B
2	EPA-6010B	11/05/20 14:45	11/06/20 13:09	JCC	PE-OP3	0.909	B091765	EPA 3050B
3	EPA-7471A	11/05/20 11:00	11/05/20 13:14	TMT	CETAC3	0.977	B091770	EPA 7471A

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27
Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091080						
Benzene	B091080-BLK1	ND	ug/L	0.50	0.083	
Bromobenzene	B091080-BLK1	ND	ug/L	0.50	0.13	
Bromochloromethane	B091080-BLK1	ND	ug/L	0.50	0.24	
Bromodichloromethane	B091080-BLK1	ND	ug/L	0.50	0.14	
Bromoform	B091080-BLK1	ND	ug/L	0.50	0.27	
Bromomethane	B091080-BLK1	ND	ug/L	1.0	0.25	
n-Butylbenzene	B091080-BLK1	ND	ug/L	0.50	0.11	
sec-Butylbenzene	B091080-BLK1	ND	ug/L	0.50	0.15	
tert-Butylbenzene	B091080-BLK1	ND	ug/L	0.50	0.13	
Carbon tetrachloride	B091080-BLK1	ND	ug/L	0.50	0.18	
Chlorobenzene	B091080-BLK1	ND	ug/L	0.50	0.093	
Chloroethane	B091080-BLK1	ND	ug/L	0.50	0.14	
Chloroform	B091080-BLK1	ND	ug/L	0.50	0.12	
Chloromethane	B091080-BLK1	ND	ug/L	0.50	0.14	
2-Chlorotoluene	B091080-BLK1	ND	ug/L	0.50	0.20	
4-Chlorotoluene	B091080-BLK1	ND	ug/L	0.50	0.15	
Dibromochloromethane	B091080-BLK1	ND	ug/L	0.50	0.13	
1,2-Dibromo-3-chloropropane	B091080-BLK1	ND	ug/L	1.0	0.44	
1,2-Dibromoethane	B091080-BLK1	ND	ug/L	0.50	0.16	
Dibromomethane	B091080-BLK1	ND	ug/L	0.50	0.24	
1,2-Dichlorobenzene	B091080-BLK1	ND	ug/L	0.50	0.072	
1,3-Dichlorobenzene	B091080-BLK1	ND	ug/L	0.50	0.15	
1,4-Dichlorobenzene	B091080-BLK1	ND	ug/L	0.50	0.062	
Dichlorodifluoromethane	B091080-BLK1	ND	ug/L	0.50	0.099	
1,1-Dichloroethane	B091080-BLK1	ND	ug/L	0.50	0.11	
1,2-Dichloroethane	B091080-BLK1	ND	ug/L	0.50	0.17	
1,1-Dichloroethene	B091080-BLK1	ND	ug/L	0.50	0.18	
cis-1,2-Dichloroethene	B091080-BLK1	ND	ug/L	0.50	0.085	
trans-1,2-Dichloroethene	B091080-BLK1	ND	ug/L	0.50	0.15	
1,2-Dichloropropane	B091080-BLK1	ND	ug/L	0.50	0.13	
1,3-Dichloropropane	B091080-BLK1	ND	ug/L	0.50	0.086	
2,2-Dichloropropane	B091080-BLK1	ND	ug/L	0.50	0.13	
1,1-Dichloropropene	B091080-BLK1	ND	ug/L	0.50	0.085	
cis-1,3-Dichloropropene	B091080-BLK1	ND	ug/L	0.50	0.14	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091080						
trans-1,3-Dichloropropene	B091080-BLK1	ND	ug/L	0.50	0.079	
Ethylbenzene	B091080-BLK1	ND	ug/L	0.50	0.098	
Hexachlorobutadiene	B091080-BLK1	ND	ug/L	0.50	0.17	
Isopropylbenzene	B091080-BLK1	ND	ug/L	0.50	0.14	
p-Isopropyltoluene	B091080-BLK1	ND	ug/L	0.50	0.12	
Methylene chloride	B091080-BLK1	ND	ug/L	1.0	0.48	
Methyl t-butyl ether	B091080-BLK1	ND	ug/L	0.50	0.11	
Naphthalene	B091080-BLK1	ND	ug/L	0.50	0.36	
n-Propylbenzene	B091080-BLK1	ND	ug/L	0.50	0.11	
Styrene	B091080-BLK1	ND	ug/L	0.50	0.068	
1,1,1,2-Tetrachloroethane	B091080-BLK1	ND	ug/L	0.50	0.18	
1,1,2,2-Tetrachloroethane	B091080-BLK1	ND	ug/L	0.50	0.17	
Tetrachloroethene	B091080-BLK1	ND	ug/L	0.50	0.13	
Toluene	B091080-BLK1	ND	ug/L	0.50	0.093	
1,2,3-Trichlorobenzene	B091080-BLK1	ND	ug/L	0.50	0.16	
1,2,4-Trichlorobenzene	B091080-BLK1	ND	ug/L	0.50	0.19	
1,1,1-Trichloroethane	B091080-BLK1	ND	ug/L	0.50	0.11	
1,1,2-Trichloroethane	B091080-BLK1	ND	ug/L	0.50	0.16	
Trichloroethene	B091080-BLK1	ND	ug/L	0.50	0.085	
Trichlorofluoromethane	B091080-BLK1	ND	ug/L	0.50	0.13	
1,2,3-Trichloropropane	B091080-BLK1	ND	ug/L	1.0	0.24	
1,1,2-Trichloro-1,2,2-trifluoroethane	B091080-BLK1	ND	ug/L	0.50	0.15	
1,2,4-Trimethylbenzene	B091080-BLK1	ND	ug/L	0.50	0.12	
1,3,5-Trimethylbenzene	B091080-BLK1	ND	ug/L	0.50	0.12	
Vinyl chloride	B091080-BLK1	ND	ug/L	0.50	0.12	
Total Xylenes	B091080-BLK1	ND	ug/L	1.0	0.36	
p- & m-Xylenes	B091080-BLK1	ND	ug/L	0.50	0.28	
o-Xylene	B091080-BLK1	ND	ug/L	0.50	0.082	
1,2-Dichloroethane-d4 (Surrogate)	B091080-BLK1	107	%	75 - 12	5 (LCL - UCL)	
Toluene-d8 (Surrogate)	B091080-BLK1	97.4	%	80 - 12	0 (LCL - UCL)	
4-Bromofluorobenzene (Surrogate)	B091080-BLK1	98.6	%	80 - 12	0 (LCL - UCL)	
QC Batch ID: B091175						
Benzene	B091175-BLK1	ND	mg/kg	0.0050	0.00067	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL Lab Quals	
QC Batch ID: B091175						
Bromobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00087	
Bromochloromethane	B091175-BLK1	ND	mg/kg	0.0050	0.00081	
Bromodichloromethane	B091175-BLK1	ND	mg/kg	0.0050	0.00078	
Bromoform	B091175-BLK1	ND	mg/kg	0.0050	0.00070	
Bromomethane	B091175-BLK1	ND	mg/kg	0.0050	0.0017	
n-Butylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00076	
sec-Butylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00071	
tert-Butylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00085	
Carbon tetrachloride	B091175-BLK1	ND	mg/kg	0.0050	0.00078	
Chlorobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00077	
Chloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.0011	
Chloroform	B091175-BLK1	ND	mg/kg	0.0050	0.00090	
Chloromethane	B091175-BLK1	ND	mg/kg	0.0050	0.0011	
2-Chlorotoluene	B091175-BLK1	ND	mg/kg	0.0050	0.00087	
4-Chlorotoluene	B091175-BLK1	ND	mg/kg	0.0050	0.00070	
Dibromochloromethane	B091175-BLK1	ND	mg/kg	0.0050	0.00080	
1,2-Dibromo-3-chloropropane	B091175-BLK1	ND	mg/kg	0.0050	0.00096	
1,2-Dibromoethane	B091175-BLK1	ND	mg/kg	0.0050	0.00082	
Dibromomethane	B091175-BLK1	ND	mg/kg	0.0050	0.0014	
1,2-Dichlorobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00079	
1,3-Dichlorobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00073	
1,4-Dichlorobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00073	
Dichlorodifluoromethane	B091175-BLK1	ND	mg/kg	0.0050	0.00079	
1,1-Dichloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.00064	
1,2-Dichloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.00073	
1,1-Dichloroethene	B091175-BLK1	ND	mg/kg	0.0050	0.0011	
cis-1,2-Dichloroethene	B091175-BLK1	ND	mg/kg	0.0050	0.00054	
trans-1,2-Dichloroethene	B091175-BLK1	ND	mg/kg	0.0050	0.0037	
1,2-Dichloropropane	B091175-BLK1	ND	mg/kg	0.0050	0.00080	
1,3-Dichloropropane	B091175-BLK1	ND	mg/kg	0.0050	0.00067	
2,2-Dichloropropane	B091175-BLK1	ND	mg/kg	0.0050	0.00067	
1,1-Dichloropropene	B091175-BLK1	ND	mg/kg	0.0050	0.00067	
cis-1,3-Dichloropropene	B091175-BLK1	ND	mg/kg	0.0050	0.00058	
trans-1,3-Dichloropropene	B091175-BLK1	ND	mg/kg	0.0050	0.00066	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091175						
Ethylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00069	
Hexachlorobutadiene	B091175-BLK1	ND	mg/kg	0.0050	0.00067	
Isopropylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00080	
p-Isopropyltoluene	B091175-BLK1	ND	mg/kg	0.0050	0.00059	
Methylene chloride	B091175-BLK1	ND	mg/kg	0.010	0.0011	
Methyl t-butyl ether	B091175-BLK1	ND	mg/kg	0.0050	0.00056	
Naphthalene	B091175-BLK1	ND	mg/kg	0.0050	0.00099	
n-Propylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00071	
Styrene	B091175-BLK1	ND	mg/kg	0.0050	0.00062	
1,1,1,2-Tetrachloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.00095	
1,1,2,2-Tetrachloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.00084	
Tetrachloroethene	B091175-BLK1	ND	mg/kg	0.0050	0.00097	
Toluene	B091175-BLK1	ND	mg/kg	0.0050	0.00069	
1,2,3-Trichlorobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.0015	
1,2,4-Trichlorobenzene	B091175-BLK1	ND	mg/kg	0.0050	0.0014	
1,1,1-Trichloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.00067	
1,1,2-Trichloroethane	B091175-BLK1	ND	mg/kg	0.0050	0.00094	
Trichloroethene	B091175-BLK1	ND	mg/kg	0.0050	0.00074	
Trichlorofluoromethane	B091175-BLK1	ND	mg/kg	0.0050	0.0015	
1,2,3-Trichloropropane	B091175-BLK1	ND	mg/kg	0.0050	0.0019	
1,1,2-Trichloro-1,2,2-trifluoroethane	B091175-BLK1	ND	mg/kg	0.0050	0.0010	
1,2,4-Trimethylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00080	
1,3,5-Trimethylbenzene	B091175-BLK1	ND	mg/kg	0.0050	0.00066	
Vinyl chloride	B091175-BLK1	ND	mg/kg	0.0050	0.00059	
Total Xylenes	B091175-BLK1	ND	mg/kg	0.010	0.0025	
p- & m-Xylenes	B091175-BLK1	ND	mg/kg	0.0050	0.0015	
o-Xylene	B091175-BLK1	ND	mg/kg	0.0050	0.00093	
1,2-Dichloroethane-d4 (Surrogate)	B091175-BLK1	96.6	%	70 - 12	1 (LCL - UCL)	
Toluene-d8 (Surrogate)	B091175-BLK1	101	%	81 - 11	7 (LCL - UCL)	
4-Bromofluorobenzene (Surrogate)	B091175-BLK1	96.0	%	74 - 12	1 (LCL - UCL)	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported:

02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Laboratory Control Sample

								Control L	imits	
Comptituent	OC Samula ID	Time	Desult	Spike	l luite	Percent	BDD	Percent	DDC	Lab
Constituent	QC Sample ID	Туре	Result	Level	Units	Recovery	RPD	Recovery	RPD	Quals
QC Batch ID: B091080										
Benzene	B091080-BS1	LCS	25.975	25.000	ug/L	104		70 - 130		
Bromodichloromethane	B091080-BS1	LCS	27.299	25.000	ug/L	109		70 - 130		
Chlorobenzene	B091080-BS1	LCS	25.182	25.000	ug/L	101		70 - 130		
Chloroethane	B091080-BS1	LCS	29.426	25.000	ug/L	118		70 - 130		
1,4-Dichlorobenzene	B091080-BS1	LCS	25.532	25.000	ug/L	102		70 - 130		
1,1-Dichloroethane	B091080-BS1	LCS	24.914	25.000	ug/L	99.7		70 - 130		
1,1-Dichloroethene	B091080-BS1	LCS	27.836	25.000	ug/L	111		70 - 130		
Toluene	B091080-BS1	LCS	27.188	25.000	ug/L	109		70 - 130		
Trichloroethene	B091080-BS1	LCS	28.248	25.000	ug/L	113		70 - 130		
1,2-Dichloroethane-d4 (Surrogate)	B091080-BS1	LCS	9.6900	10.000	ug/L	96.9		75 - 125		
Toluene-d8 (Surrogate)	B091080-BS1	LCS	10.200	10.000	ug/L	102		80 - 120		
4-Bromofluorobenzene (Surrogate)	B091080-BS1	LCS	10.210	10.000	ug/L	102		80 - 120		
QC Batch ID: B091175										
Benzene	B091175-BS1	LCS	0.14267	0.12500	mg/kg	114		70 - 130		
Bromodichloromethane	B091175-BS1	LCS	0.12408	0.12500	mg/kg	99.3		70 - 130		
Chlorobenzene	B091175-BS1	LCS	0.12822	0.12500	mg/kg	103		70 - 130		
Chloroethane	B091175-BS1	LCS	0.11504	0.12500	mg/kg	92.0		70 - 130		
1,4-Dichlorobenzene	B091175-BS1	LCS	0.12224	0.12500	mg/kg	97.8		70 - 130		
1,1-Dichloroethane	B091175-BS1	LCS	0.14328	0.12500	mg/kg	115		70 - 130		
1,1-Dichloroethene	B091175-BS1	LCS	0.12431	0.12500	mg/kg	99.4		70 - 130		
Toluene	B091175-BS1	LCS	0.13384	0.12500	mg/kg	107		70 - 130		
Trichloroethene	B091175-BS1	LCS	0.12384	0.12500	mg/kg	99.1		70 - 130		
1,2-Dichloroethane-d4 (Surrogate)	B091175-BS1	LCS	0.049970	0.050000	mg/kg	99.9		70 - 121		
Toluene-d8 (Surrogate)	B091175-BS1	LCS	0.051610	0.050000	mg/kg	103		81 - 117		
4-Bromofluorobenzene (Surrogate)	B091175-BS1	LCS	0.049830	0.050000	mg/kg	99.7		74 - 121		

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
	Lloc	ed client samp	lo: N								
QC Batch ID: B091080 Benzene		2030363-23	ND	26.046	25.000	//		104		70 - 130	
belizerie	MS MSD	2030363-23	ND	24.724	25.000	ug/L ug/L	5.2	98.9	20	70 - 130 70 - 130	
							0.2		20		
Bromodichloromethane	MS	2030363-23	ND	26.621	25.000	ug/L	<i>5</i> 7	106	20	70 - 130	
	MSD	2030363-23	ND	25.157	25.000	ug/L	5.7	101	20	70 - 130	
Chlorobenzene	MS	2030363-23	ND	24.394	25.000	ug/L		97.6		70 - 130	
	MSD	2030363-23	ND	23.262	25.000	ug/L	4.8	93.0	20	70 - 130	
Chloroethane	MS	2030363-23	ND	34.391	25.000	ug/L		138		70 - 130	Q03
	MSD	2030363-23	ND	26.758	25.000	ug/L	25.0	107	20	70 - 130	Q02
1,4-Dichlorobenzene	MS	2030363-23	ND	22.951	25.000	ug/L		91.8		70 - 130	
	MSD	2030363-23	ND	24.010	25.000	ug/L	4.5	96.0	20	70 - 130	
1,1-Dichloroethane	MS	2030363-23	ND	25.253	25.000	ug/L		101		70 - 130	
	MSD	2030363-23	ND	23.464	25.000	ug/L	7.3	93.9	20	70 - 130	
1,1-Dichloroethene	MS	2030363-23	ND	27.696	25.000	ug/L		111		70 - 130	
	MSD	2030363-23	ND	25.533	25.000	ug/L	8.1	102	20	70 - 130	
Toluene	MS	2030363-23	ND	24.998	25.000	ug/L		100		70 - 130	
Totalia	MSD	2030363-23	ND	25.276	25.000	ug/L	1.1	101	20	70 - 130	
Trichloroethene	MS	2030363-23	ND	26.508	25.000	ug/L		106		70 - 130	
menioroethene	MSD	2030363-23	ND	26.243	25.000	ug/L	1.0	105	20	70 - 130	
1.2 Diablaracthona d4 (Surrageta)											
1,2-Dichloroethane-d4 (Surrogate)	MS MSD	2030363-23 2030363-23	ND ND	10.450 9.9500	10.000 10.000	ug/L ug/L	4.9	104 99.5		75 - 125 75 - 125	
							4.5				
Toluene-d8 (Surrogate)	MS	2030363-23	ND	10.160	10.000	ug/L	0.0	102		80 - 120	
	MSD	2030363-23	ND	10.220	10.000	ug/L	0.6	102		80 - 120	
4-Bromofluorobenzene (Surrogate)	MS	2030363-23	ND	9.4200	10.000	ug/L		94.2		80 - 120	
	MSD	2030363-23	ND	10.100	10.000	ug/L	7.0	101		80 - 120	
QC Batch ID: B091175	Use	d client samp	le: N								
Benzene	」 MS	2030363-46	ND	0.14756	0.12500	mg/kg		118		70 - 130	
	MSD	2030363-46	ND	0.14016	0.12500	mg/kg	5.1	112	20	70 - 130	
Bromodichloromethane	MS	2030363-46	ND	0.12388	0.12500	mg/kg		99.1		70 - 130	
	MSD	2030363-46	ND	0.12653	0.12500	mg/kg	2.1	101	20	70 - 130	
Chlorobenzene	MS	2030363-46	ND	0.12605	0.12500	mg/kg		101		70 - 130	
	MSD	2030363-46	ND	0.12557	0.12500	mg/kg	0.4	100	20	70 - 130	
Chloroethane		2030363-46	ND	0.12759	0.12500	mg/kg		102		70 - 130	
- Inc. octilatio	MS MSD	2030363-46	ND	0.099070	0.12500	mg/kg	25.2	79.3	20	70 - 130 70 - 130	Q02
1.4 Dieblerchenzer											
1,4-Dichlorobenzene	MS	2030363-46	ND	0.12452 0.11834	0.12500 0.12500	mg/kg	5 1	99.6 94.7	20	70 - 130 70 - 130	
	MSD	2030363-46	ND			mg/kg	5.1		20	70 - 130	
1,1-Dichloroethane	MS	2030363-46	ND	0.15049	0.12500	mg/kg	0.0	120	00	70 - 130	
	MSD	2030363-46	ND	0.14130	0.12500	mg/kg	6.3	113	20	70 - 130	

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

All results listed in this report are for the exclusive use of the submitting party. BC Laboratories, Inc. assumes no responsibility for report alteration, separation, detachment or third party interpretation.

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 92 of 166



3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B)

Quality Control Report - Precision & Accuracy

	•		•		·		•	·	Cont	rol Limits	•
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091175	Use	d client samp	ole: N								
1,1-Dichloroethene	MS MS	2030363-46	ND	0.13031	0.12500	mg/kg		104		70 - 130	
	MSD	2030363-46	ND	0.12117	0.12500	mg/kg	7.3	96.9	20	70 - 130	
Toluene	MS	2030363-46	ND	0.12950	0.12500	mg/kg		104		70 - 130	
	MSD	2030363-46	ND	0.13228	0.12500	mg/kg	2.1	106	20	70 - 130	
Trichloroethene	MS	2030363-46	ND	0.12134	0.12500	mg/kg		97.1		70 - 130	
	MSD	2030363-46	ND	0.12410	0.12500	mg/kg	2.2	99.3	20	70 - 130	
1,2-Dichloroethane-d4 (Surrogate)	MS	2030363-46	ND	0.052500	0.050000	mg/kg		105		70 - 121	
	MSD	2030363-46	ND	0.049390	0.050000	mg/kg	6.1	98.8		70 - 121	
Toluene-d8 (Surrogate)	MS	2030363-46	ND	0.050850	0.050000	mg/kg		102		81 - 117	
	MSD	2030363-46	ND	0.052450	0.050000	mg/kg	3.1	105		81 - 117	
4-Bromofluorobenzene (Surrogate)	MS	2030363-46	ND	0.049160	0.050000	mg/kg		98.3		74 - 121	
	MSD	2030363-46	ND	0.048330	0.050000	mg/kg	1.7	96.7		74 - 121	

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 93 of 166



3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

Quality Control Report - Method Blank Analysis

Bromobenzene B091020-BLK1 ND n Bromochloromethane B091020-BLK1 ND n Bromodichloromethane B091020-BLK1 ND n Bromoform B091020-BLK1 ND n Bromomethane B091020-BLK1 ND n n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00067 0.00087 0.00081 0.00078 0.00070 0.0017 0.00071 0.00071 0.00078 0.00077 0.0011 0.00090 0.0011 0.00087	
Benzene B091020-BLK1 ND n Bromobenzene B091020-BLK1 ND n Bromochloromethane B091020-BLK1 ND n Bromodichloromethane B091020-BLK1 ND n Bromoform B091020-BLK1 ND n Bromomethane B091020-BLK1 ND n n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chloroform B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00087 0.00081 0.00078 0.00070 0.0017 0.00076 0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
Bromochloromethane B091020-BLK1 ND n Bromodichloromethane B091020-BLK1 ND n Bromoform B091020-BLK1 ND n Bromomethane B091020-BLK1 ND n n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00081 0.00078 0.00070 0.0017 0.00076 0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
Bromodichloromethane B091020-BLK1 ND n Bromoform B091020-BLK1 ND n Bromomethane B091020-BLK1 ND n n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chlorotethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00078 0.00070 0.0017 0.00076 0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
Bromoform B091020-BLK1 ND n Bromomethane B091020-BLK1 ND n n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00070 0.0017 0.00076 0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
Bromomethane B091020-BLK1 ND n n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.0017 0.00076 0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
n-Butylbenzene B091020-BLK1 ND n sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00076 0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
sec-Butylbenzene B091020-BLK1 ND n tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chloromethane B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00071 0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
tert-Butylbenzene B091020-BLK1 ND n Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chlorotoluene B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050 0.0050	0.00085 0.00078 0.00077 0.0011 0.00090 0.0011	
Carbon tetrachloride B091020-BLK1 ND n Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chloromethane B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050 0.0050	0.00078 0.00077 0.0011 0.00090 0.0011	
Chlorobenzene B091020-BLK1 ND n Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chloromethane B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050 0.0050	0.00077 0.0011 0.00090 0.0011	
Chloroethane B091020-BLK1 ND n Chloroform B091020-BLK1 ND n Chloromethane B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg mg/kg	0.0050 0.0050 0.0050	0.0011 0.00090 0.0011	
Chloroform B091020-BLK1 ND n Chloromethane B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg mg/kg	0.0050 0.0050	0.00090	
Chloromethane B091020-BLK1 ND n 2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg mg/kg	0.0050	0.0011	
2-Chlorotoluene B091020-BLK1 ND n 4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg			
4-Chlorotoluene B091020-BLK1 ND n Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n		0.0050	0.00087	
Dibromochloromethane B091020-BLK1 ND n 1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	ma/ka			
1,2-Dibromo-3-chloropropane B091020-BLK1 ND n 1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg	0.0050	0.00070	
1,2-Dibromoethane B091020-BLK1 ND n Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg	0.0050	0.00080	
Dibromomethane B091020-BLK1 ND n 1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg	0.0050	0.00096	
1,2-Dichlorobenzene B091020-BLK1 ND n 1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg	0.0050	0.00082	
1,3-Dichlorobenzene B091020-BLK1 ND n	mg/kg	0.0050	0.0014	
	mg/kg	0.0050	0.00079	
1,4-Dichlorobenzene B091020-BLK1 ND n	mg/kg	0.0050	0.00073	
	mg/kg	0.0050	0.00073	
Dichlorodifluoromethane B091020-BLK1 ND n	mg/kg	0.0050	0.00079	
1,1-Dichloroethane B091020-BLK1 ND n	mg/kg	0.0050	0.00064	
1,2-Dichloroethane B091020-BLK1 ND n	mg/kg	0.0050	0.00073	
1,1-Dichloroethene B091020-BLK1 ND n	mg/kg	0.0050	0.0011	
cis-1,2-Dichloroethene B091020-BLK1 ND n	mg/kg	0.0050	0.00054	
trans-1,2-Dichloroethene B091020-BLK1 ND n	mg/kg	0.0050	0.0037	
1,2-Dichloropropane B091020-BLK1 ND n	mg/kg	0.0050	0.00080	
1,3-Dichloropropane B091020-BLK1 ND n	mg/kg	0.0050	0.00067	
2,2-Dichloropropane B091020-BLK1 ND n	mg/kg	0.0050	0.00067	
1,1-Dichloropropene B091020-BLK1 ND n	mg/kg	0.0050	0.00067	
cis-1,3-Dichloropropene B091020-BLK1 ND n	mg/kg	0.0050	0.00058	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27
Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091020						
trans-1,3-Dichloropropene	B091020-BLK1	ND	mg/kg	0.0050	0.00066	
Ethylbenzene	B091020-BLK1	ND	mg/kg	0.0050	0.00069	
Hexachlorobutadiene	B091020-BLK1	ND	mg/kg	0.0050	0.00067	
Isopropylbenzene	B091020-BLK1	ND	mg/kg	0.0050	0.00080	
p-Isopropyltoluene	B091020-BLK1	ND	mg/kg	0.0050	0.00059	
Methylene chloride	B091020-BLK1	ND	mg/kg	0.010	0.0011	
Methyl t-butyl ether	B091020-BLK1	ND	mg/kg	0.0050	0.00056	
- Naphthalene	B091020-BLK1	ND	mg/kg	0.0050	0.00099	
n-Propylbenzene	B091020-BLK1	ND	mg/kg	0.0050	0.00071	
Styrene	B091020-BLK1	ND	mg/kg	0.0050	0.00062	
1,1,1,2-Tetrachloroethane	B091020-BLK1	ND	mg/kg	0.0050	0.00095	
1,1,2,2-Tetrachloroethane	B091020-BLK1	ND	mg/kg	0.0050	0.00084	
Tetrachloroethene	B091020-BLK1	ND	mg/kg	0.0050	0.00097	
Toluene	B091020-BLK1	ND	mg/kg	0.0050	0.00069	
1,2,3-Trichlorobenzene	B091020-BLK1	ND	mg/kg	0.0050	0.0015	
1,2,4-Trichlorobenzene	B091020-BLK1	ND	mg/kg	0.0050	0.0014	
1,1,1-Trichloroethane	B091020-BLK1	ND	mg/kg	0.0050	0.00067	
1,1,2-Trichloroethane	B091020-BLK1	ND	mg/kg	0.0050	0.00094	
Trichloroethene	B091020-BLK1	ND	mg/kg	0.0050	0.00074	
Trichlorofluoromethane	B091020-BLK1	ND	mg/kg	0.0050	0.0015	
1,2,3-Trichloropropane	B091020-BLK1	ND	mg/kg	0.0050	0.0019	
1,1,2-Trichloro-1,2,2-trifluoroethane	B091020-BLK1	ND	mg/kg	0.0050	0.0010	
1,2,4-Trimethylbenzene	B091020-BLK1	ND	mg/kg	0.0050	0.00080	
1,3,5-Trimethylbenzene	B091020-BLK1	ND	mg/kg	0.0050	0.00066	
Vinyl chloride	B091020-BLK1	ND	mg/kg	0.0050	0.00059	
Total Xylenes	B091020-BLK1	ND	mg/kg	0.010	0.0025	
p- & m-Xylenes	B091020-BLK1	ND	mg/kg	0.0050	0.0015	
o-Xylene	B091020-BLK1	ND	mg/kg	0.0050	0.00093	
1,2-Dichloroethane-d4 (Surrogate)	B091020-BLK1	90.3	%	70 - 12		
Toluene-d8 (Surrogate)	B091020-BLK1	98.4	%	81 - 11	7 (LCL - UCL)	
4-Bromofluorobenzene (Surrogate)	B091020-BLK1	96.2	%	74 - 12	1 (LCL - UCL)	

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

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

Quality Control Report - Laboratory Control Sample

	_		-		-		-			
Constituent	QC Sample ID	Type	Result	Spike Level	Units	Percent Recovery	RPD	Control I Percent Recovery	<u>imits</u>	Lab Quals
Γ	T QO Gample ID	Турс	Nesuit	Level	Office	Recovery		Recovery	INI D	Quais
QC Batch ID: B091020										
Benzene	B091020-BS1	LCS	0.14041	0.12500	mg/kg	112		70 - 130		
Bromodichloromethane	B091020-BS1	LCS	0.12228	0.12500	mg/kg	97.8		70 - 130		
Chlorobenzene	B091020-BS1	LCS	0.13119	0.12500	mg/kg	105		70 - 130		
Chloroethane	B091020-BS1	LCS	0.13255	0.12500	mg/kg	106		70 - 130		
1,4-Dichlorobenzene	B091020-BS1	LCS	0.13522	0.12500	mg/kg	108		70 - 130		
1,1-Dichloroethane	B091020-BS1	LCS	0.13192	0.12500	mg/kg	106		70 - 130		
1,1-Dichloroethene	B091020-BS1	LCS	0.12592	0.12500	mg/kg	101		70 - 130		
Toluene	B091020-BS1	LCS	0.13410	0.12500	mg/kg	107		70 - 130		
Trichloroethene	B091020-BS1	LCS	0.12808	0.12500	mg/kg	102		70 - 130		
1,2-Dichloroethane-d4 (Surrogate)	B091020-BS1	LCS	0.045190	0.050000	mg/kg	90.4		70 - 121		
Toluene-d8 (Surrogate)	B091020-BS1	LCS	0.050370	0.050000	mg/kg	101		81 - 117		
4-Bromofluorobenzene (Surrogate)	B091020-BS1	LCS	0.049700	0.050000	mg/kg	99.4		74 - 121		

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Volatile Organic Analysis (EPA Method 8260B/5035)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091020	Use	d client samp	le: N								
Benzene	MS	2030363-32	ND	0.15068	0.12500	mg/kg		121		70 - 130	
	MSD	2030363-32	ND	0.14035	0.12500	mg/kg	7.1	112	20	70 - 130	
Bromodichloromethane	MS	2030363-32	ND	0.13453	0.12500	mg/kg		108		70 - 130	
	MSD	2030363-32	ND	0.12910	0.12500	mg/kg	4.1	103	20	70 - 130	
Chlorobenzene	MS	2030363-32	ND	0.13895	0.12500	mg/kg		111		70 - 130	
	MSD	2030363-32	ND	0.13333	0.12500	mg/kg	4.1	107	20	70 - 130	
Chloroethane	MS	2030363-32	ND	0.13987	0.12500	mg/kg		112		70 - 130	
	MSD	2030363-32	ND	0.13870	0.12500	mg/kg	0.8	111	20	70 - 130	
1,4-Dichlorobenzene	MS	2030363-32	ND	0.14305	0.12500	mg/kg		114		70 - 130	
	MSD	2030363-32	ND	0.14033	0.12500	mg/kg	1.9	112	20	70 - 130	
1,1-Dichloroethane	MS	2030363-32	ND	0.14397	0.12500	mg/kg		115		70 - 130	
	MSD	2030363-32	ND	0.13390	0.12500	mg/kg	7.2	107	20	70 - 130	
1,1-Dichloroethene	MS	2030363-32	ND	0.12952	0.12500	mg/kg		104		70 - 130	
	MSD	2030363-32	ND	0.12132	0.12500	mg/kg	6.5	97.1	20	70 - 130	
Toluene	MS	2030363-32	ND	0.14264	0.12500	mg/kg		114		70 - 130	
	MSD	2030363-32	ND	0.13418	0.12500	mg/kg	6.1	107	20	70 - 130	
Trichloroethene	MS	2030363-32	ND	0.13361	0.12500	mg/kg		107		70 - 130	
	MSD	2030363-32	ND	0.12798	0.12500	mg/kg	4.3	102	20	70 - 130	
1,2-Dichloroethane-d4 (Surrogate)	MS	2030363-32	ND	0.050330	0.050000	mg/kg		101		70 - 121	
	MSD	2030363-32	ND	0.047770	0.050000	mg/kg	5.2	95.5		70 - 121	
Toluene-d8 (Surrogate)	MS	2030363-32	ND	0.051370	0.050000	mg/kg		103		81 - 117	
	MSD	2030363-32	ND	0.049660	0.050000	mg/kg	3.4	99.3		81 - 117	
4-Bromofluorobenzene (Surrogate)	MS	2030363-32	ND	0.050390	0.050000	mg/kg		101		74 - 121	
	MSD	2030363-32	ND	0.049650	0.050000	mg/kg	1.5	99.3		74 - 121	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091256						
Acenaphthene	B091256-BLK1	ND	mg/kg	0.0030	0.00052	
Acenaphthylene	B091256-BLK1	ND	mg/kg	0.0030	0.00047	
Anthracene	B091256-BLK1	ND	mg/kg	0.0030	0.00073	
Benzo[a]anthracene	B091256-BLK1	ND	mg/kg	0.0030	0.00053	
Benzo[b]fluoranthene	B091256-BLK1	ND	mg/kg	0.0030	0.00056	
Benzo[k]fluoranthene	B091256-BLK1	ND	mg/kg	0.0030	0.00073	
Benzo[a]pyrene	B091256-BLK1	ND	mg/kg	0.0030	0.00034	
Benzo[g,h,i]perylene	B091256-BLK1	ND	mg/kg	0.0030	0.00068	
Chrysene	B091256-BLK1	ND	mg/kg	0.0030	0.00038	
Dibenzo[a,h]anthracene	B091256-BLK1	ND	mg/kg	0.0030	0.00057	
Fluoranthene	B091256-BLK1	ND	mg/kg	0.0030	0.00057	
Fluorene	B091256-BLK1	ND	mg/kg	0.0030	0.00037	
Indeno[1,2,3-cd]pyrene	B091256-BLK1	ND	mg/kg	0.0030	0.00055	
Naphthalene	B091256-BLK1	ND	mg/kg	0.0030	0.00049	
Phenanthrene	B091256-BLK1	ND	mg/kg	0.0030	0.00049	
Pyrene	B091256-BLK1	ND	mg/kg	0.0030	0.00058	
Nitrobenzene-d5 (Surrogate)	B091256-BLK1	73.1	%	30 - 130 (LCL - UCL)		
2-Fluorobiphenyl (Surrogate)	B091256-BLK1	86.7	%	40 - 13	0 (LCL - UCL)	
p-Terphenyl-d14 (Surrogate)	B091256-BLK1	102	%	30 - 13	0 (LCL - UCL)	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

Quality Control Report - Laboratory Control Sample

								Control Limits		
				Spike		Percent		Percent		Lab
Constituent	QC Sample ID	Туре	Result	Level	Units	Recovery	RPD	Recovery	RPD	Quals
QC Batch ID: B091256										
Acenaphthene	B091256-BS1	LCS	0.029034	0.033113	mg/kg	87.7		60 - 130		
Acenaphthylene	B091256-BS1	LCS	0.031580	0.033113	mg/kg	95.4		60 - 130		
Anthracene	B091256-BS1	LCS	0.032511	0.033113	mg/kg	98.2		60 - 130		
Benzo[a]anthracene	B091256-BS1	LCS	0.029167	0.033113	mg/kg	88.1		60 - 130		
Benzo[b]fluoranthene	B091256-BS1	LCS	0.027957	0.033113	mg/kg	84.4		50 - 130		
Benzo[k]fluoranthene	B091256-BS1	LCS	0.033953	0.033113	mg/kg	103		60 - 130		
Benzo[a]pyrene	B091256-BS1	LCS	0.033320	0.033113	mg/kg	101		60 - 130		
Benzo[g,h,i]perylene	B091256-BS1	LCS	0.027395	0.033113	mg/kg	82.7		50 - 130		
Chrysene	B091256-BS1	LCS	0.032511	0.033113	mg/kg	98.2		50 - 130		
Dibenzo[a,h]anthracene	B091256-BS1	LCS	0.037127	0.033113	mg/kg	112		50 - 130		
Fluoranthene	B091256-BS1	LCS	0.031756	0.033113	mg/kg	95.9		60 - 130		
Fluorene	B091256-BS1	LCS	0.032134	0.033113	mg/kg	97.0		50 - 130		
Indeno[1,2,3-cd]pyrene	B091256-BS1	LCS	0.030556	0.033113	mg/kg	92.3		50 - 130		
Naphthalene	B091256-BS1	LCS	0.027552	0.033113	mg/kg	83.2		50 - 130		
Phenanthrene	B091256-BS1	LCS	0.026229	0.033113	mg/kg	79.2		50 - 130		
Pyrene	B091256-BS1	LCS	0.029242	0.033113	mg/kg	88.3		50 - 130		
Nitrobenzene-d5 (Surrogate)	B091256-BS1	LCS	0.093575	0.13245	mg/kg	70.6		30 - 130		
2-Fluorobiphenyl (Surrogate)	B091256-BS1	LCS	0.11393	0.13245	mg/kg	86.0		40 - 130		
p-Terphenyl-d14 (Surrogate)	B091256-BS1	LCS	0.12791	0.13245	mg/kg	96.6		30 - 130		

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill
Project Number: [none]
Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

Quality Control Report - Precision & Accuracy

									<u>Cont</u>	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091256	Use	ed client samp	ole: N								
Acenaphthene	 MS	2030363-84	ND	0.031171	0.033445	mg/kg		93.2		50 - 130	
	MSD	2030363-84	ND	0.031200	0.033557	mg/kg	0.1	93.0	30	50 - 130	
Acenaphthylene	MS	2030363-84	ND	0.034864	0.033445	mg/kg		104		50 - 130	
. ,	MSD	2030363-84	ND	0.034034	0.033557	mg/kg	2.4	101	30	50 - 130	
Anthracene	MS	2030363-84	ND	0.034656	0.033445	mg/kg		104		50 - 130	
	MSD	2030363-84	ND	0.034128	0.033557	mg/kg	1.5	102	30	50 - 130	
Benzo[a]anthracene	MS	2030363-84	ND	0.032445	0.033445	mg/kg		97.0		50 - 130	
	MSD	2030363-84	ND	0.031522	0.033557	mg/kg	2.9	93.9	30	50 - 130	
Benzo[b]fluoranthene	MS	2030363-84	ND	0.031915	0.033445	mg/kg		95.4		40 - 130	
. ,	MSD	2030363-84	ND	0.030651	0.033557	mg/kg	4.0	91.3	30	40 - 130	
Benzo[k]fluoranthene	MS	2030363-84	ND	0.034082	0.033445	mg/kg		102		40 - 130	
	MSD	2030363-84	ND	0.033427	0.033557	mg/kg	1.9	99.6	30	40 - 130	
Benzo[a]pyrene	MS	2030363-84	ND	0.035903	0.033445	mg/kg		107		40 - 130	
261126[d]pyrene	MSD	2030363-84	ND	0.035688	0.033557	mg/kg	0.6	106	30	40 - 130	
Benzo[g,h,i]perylene	MS	2030363-84	ND	0.028054	0.033445	mg/kg		83.9		40 - 130	
Donzolg, ii, ilporyiono	MSD	2030363-84	ND	0.027206	0.033557	mg/kg	3.1	81.1	30	40 - 130	
Chrysene	MS	2030363-84	ND	0.033188	0.033445	mg/kg		99.2		40 - 130	
Onlysene	MSD	2030363-84	ND	0.033440	0.033557	mg/kg	0.8	99.7	30	40 - 130	
Dibenzo[a,h]anthracene	MS	2030363-84	ND	0.039122	0.033445	mg/kg		117		40 - 130	
Discrizo[a,n]anamacene	MSD	2030363-84	ND	0.037437	0.033557	mg/kg	4.4	112	30	40 - 130	
Fluoranthene	MS	2030363-84	ND	0.033994	0.033445	mg/kg		102		40 - 130	
Tuorantiiche	MSD	2030363-84	ND	0.033594	0.033557	mg/kg	1.2	100	30	40 - 130	
Fluorene	MS	2030363-84	ND	0.035106	0.033445	mg/kg		105		40 - 130	
Tuorene	MSD	2030363-84	ND	0.035166	0.033443	mg/kg	0.1	103	30	40 - 130	
Indeno[1,2,3-cd]pyrene		2030363-84	ND	0.032376	0.033445			96.8		30 - 130	
indeno[1,2,3-cd]pyrene	MS MSD	2030363-84	ND	0.032376	0.033445	mg/kg mg/kg	3.2	93.4	30	30 - 130	
Nachthalana							0.2				
Naphthalene	MS MSD	2030363-84 2030363-84	ND ND	0.029695 0.029636	0.033445 0.033557	mg/kg mg/kg	0.2	88.8 88.3	30	50 - 130 50 - 130	
Discounting							0.2		- 30		
Phenanthrene	MS	2030363-84 2030363-84	ND ND	0.028846 0.028699	0.033445 0.033557	mg/kg mg/kg	0.5	86.2 85.5	30	40 - 130 40 - 130	
	MSD						0.5		30		
Pyrene	MS	2030363-84	ND ND	0.030694	0.033445	mg/kg	2.6	91.8	30	40 - 130 40 - 130	
	MSD	2030363-84	ND	0.031497	0.033557	mg/kg	2.6	93.9	30		
Nitrobenzene-d5 (Surrogate)	MS	2030363-84	ND	0.10293	0.13378	mg/kg		76.9		30 - 130	
	MSD	2030363-84	ND	0.10033	0.13423	mg/kg	2.6	74.7		30 - 130	
2-Fluorobiphenyl (Surrogate)	MS	2030363-84	ND	0.12429	0.13378	mg/kg	. =	92.9		40 - 130	
	MSD	2030363-84	ND	0.12224	0.13423	mg/kg	1.7	91.1		40 - 130	

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Project: USFS- Big Blue Mill

Project Number: [none] Project Manager: David Allison

Polynuclear Aromatic Hydrocarbons (EPA Method 8270C-SIM)

Quality Control Report - Precision & Accuracy

								Control Limits					
		Source	Source		Spike			Percent		Percent	Lab		
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals		
QC Batch ID: B091256	Use	Jsed client sample: N											
p-Terphenyl-d14 (Surrogate)	→ MS	2030363-84	ND	0.13509	0.13378	mg/kg		101	3	30 - 130			
	MSD	2030363-84	ND	0.13722	0.13423	mg/kg	1.6	102	3	30 - 130			

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Modified WET Test (STLC)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B099464						
Arsenic	B099464-BLK1	ND	mg/L	0.050	0.0092	
Cadmium	B099464-BLK1	ND	mg/L	0.010	0.0011	
Lead	B099464-BLK1	ND	mg/L	0.050	0.0035	
QC Batch ID: B100161						
Mercury	B100161-BLK1	ND	mg/L	0.0020	0.00022	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Modified WET Test (STLC)

Quality Control Report - Laboratory Control Sample

							Control Limits						
				Spike		Percent		Percent		Lab			
Constituent	QC Sample ID	Type	Result	Level	Units	Recovery	RPD	Recovery	RPD	Quals			
QC Batch ID: B099464													
Arsenic	B099464-BS1	LCS	0.34597	0.40000	mg/L	86.5		85 - 115					
Cadmium	B099464-BS1	LCS	0.19089	0.20000	mg/L	95.4		85 - 115					
Lead	B099464-BS1	LCS	2.0632	2.0000	mg/L	103		85 - 115					
QC Batch ID: B100161													
Mercury	B100161-BS1	LCS	0.0093250	0.010000	mg/L	93.2		85 - 115					

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Modified WET Test (STLC)

Quality Control Report - Precision & Accuracy

								Control Limits			
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B099464	Use	d client samp	ole: N								
Arsenic	DUP	2103665-01	0.010949	0.015899		mg/L	36.9		20		J,A02
	MS	2103665-01	0.010949	0.36825	0.40816	mg/L		87.5		75 - 125	
	MSD	2103665-01	0.010949	0.36174	0.40816	mg/L	1.8	85.9	20	75 - 125	
Cadmium	DUP	2103665-01	ND	ND		mg/L			20		
	MS	2103665-01	ND	0.20197	0.20408	mg/L		99.0		75 - 125	
	MSD	2103665-01	ND	0.20104	0.20408	mg/L	0.5	98.5	20	75 - 125	
Lead	DUP	2103665-01	ND	ND		mg/L			20		
	MS	2103665-01	ND	2.1602	2.0408	mg/L		106		75 - 125	
	MSD	2103665-01	ND	2.1348	2.0408	mg/L	1.2	105	20	75 - 125	
QC Batch ID: B100161	Use	d client samp	ole: N								
Mercury	DUP	2103665-01	ND	ND		mg/L			20		
	MS	2103665-01	ND	0.0099000	0.010000	mg/L		99.0		70 - 130	
	MSD	2103665-01	ND	0.0095750	0.010000	mg/L	3.3	95.8	20	70 - 130	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

TCLP Toxicity

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B099577						
Arsenic	B099577-BLK1	ND	mg/L	0.20	0.083	
Cadmium	B099577-BLK1	ND	mg/L	0.10	0.0051	
Lead	B099577-BLK1	0.085374	mg/L	0.50	0.030	J
QC Batch ID: B099674						
Mercury	B099674-BLK1	ND	mg/L	0.0020	0.00022	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

TCLP Toxicity

Quality Control Report - Laboratory Control Sample

							Control Limits					
				Spike		Percent		Percent		Lab		
Constituent	QC Sample ID	Type	Result	Level	Units	Recovery	RPD	Recovery	RPD	Quals		
QC Batch ID: B099577												
Arsenic	B099577-BS1	LCS	3.6567	4.0000	mg/L	91.4		85 - 115				
Cadmium	B099577-BS1	LCS	2.0349	2.0000	mg/L	102		85 - 115				
Lead	B099577-BS1	LCS	20.754	20.000	mg/L	104		85 - 115				
QC Batch ID: B099674												
Mercury	B099674-BS1	LCS	0.010400	0.010000	mg/L	104		85 - 115				

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

TCLP Toxicity

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B099577	Use	d client samp	ole: N								
Arsenic	DUP	2103307-01	ND	ND		mg/L			20		
	MS	2103307-01	ND	3.7242	4.0000	mg/L		93.1		75 - 125	
	MSD	2103307-01	ND	3.8209	4.0000	mg/L	2.6	95.5	20	75 - 125	
Cadmium	DUP	2103307-01	ND	0.0063262		mg/L			20		J
	MS	2103307-01	ND	2.0687	2.0000	mg/L		103		75 - 125	
	MSD	2103307-01	ND	2.0675	2.0000	mg/L	0.1	103	20	75 - 125	
Lead	DUP	2103307-01	0.066669	0.072389		mg/L	8.2		20		J
	MS	2103307-01	0.066669	21.014	20.000	mg/L		105		75 - 125	
	MSD	2103307-01	0.066669	21.038	20.000	mg/L	0.1	105	20	75 - 125	
QC Batch ID: B099674	Use	d client samp	ole: N								
Mercury	DUP	2103307-01	ND	ND		mg/L			20		
	MS	2103307-01	ND	0.010700	0.010000	mg/L		107		70 - 130	
	MSD	2103307-01	ND	0.011025	0.010000	mg/L	3.0	110	20	70 - 130	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091174						
Antimony	B091174-BLK1	ND	mg/kg	0.50	0.080	
Arsenic	B091174-BLK1	ND	mg/kg	0.50	0.17	
Barium	B091174-BLK3	ND	mg/kg	0.50	0.18	
Beryllium	B091174-BLK3	ND	mg/kg	0.50	0.047	
Cadmium	B091174-BLK3	ND	mg/kg	0.50	0.052	
Chromium	B091174-BLK3	ND	mg/kg	0.50	0.050	
Cobalt	B091174-BLK3	ND	mg/kg	2.5	0.098	
Copper	B091174-BLK3	ND	mg/kg	1.0	0.050	
Lead	B091174-BLK3	ND	mg/kg	2.5	0.41	
Molybdenum	B091174-BLK3	ND	mg/kg	2.5	0.050	
Nickel	B091174-BLK3	ND	mg/kg	0.50	0.15	
Selenium	B091174-BLK1	ND	mg/kg	0.50	0.11	
Silver	B091174-BLK3	ND	mg/kg	0.50	0.067	
- Thallium	B091174-BLK1	ND	mg/kg	0.25	0.049	
Vanadium	B091174-BLK3	ND	mg/kg	0.50	0.11	
Zinc	B091174-BLK3	0.43851	mg/kg	2.5	0.087	J
QC Batch ID: B091180						
Antimony	B091180-BLK1	ND	mg/kg	0.50	0.080	
Arsenic	B091180-BLK1	0.17175	mg/kg	0.50	0.17	J
Barium	B091180-BLK3	ND	mg/kg	0.50	0.18	
Beryllium	B091180-BLK3	ND	mg/kg	0.50	0.047	
Cadmium	B091180-BLK3	ND	mg/kg	0.50	0.052	
Chromium	B091180-BLK3	ND	mg/kg	0.50	0.050	
Cobalt	B091180-BLK3	ND	mg/kg	2.5	0.098	
Copper	B091180-BLK3	ND	mg/kg	1.0	0.050	
Lead	B091180-BLK3	ND	mg/kg	2.5	0.41	
Molybdenum	B091180-BLK3	ND	mg/kg	2.5	0.050	
Nickel	B091180-BLK3	ND	mg/kg	0.50	0.15	
Selenium	B091180-BLK2	ND	mg/kg	0.50	0.11	
Silver	B091180-BLK3	ND	mg/kg	0.50	0.067	
Thallium	B091180-BLK1	ND	mg/kg	0.25	0.049	
Vanadium	B091180-BLK3	ND	mg/kg	0.50	0.11	
Zinc	B091180-BLK3	0.17918	mg/kg	2.5	0.087	J

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 108 of 166

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27
Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091357						
Mercury	B091357-BLK1	ND	mg/kg	0.16	0.016	
OO Datability Doodors						
QC Batch ID: B091358 Mercury	B091358-BLK1	ND	mg/kg	0.16	0.016	
Mercury	D031030-DERT	ND	mg/kg	0.10	0.010	
QC Batch ID: B091765						
Barium	B091765-BLK1	ND	mg/kg	0.50	0.18	
Beryllium	B091765-BLK1	ND	mg/kg	0.50	0.047	
Cadmium	B091765-BLK1	ND	mg/kg	0.50	0.052	
Chromium	B091765-BLK1	0.059982	mg/kg	0.50	0.050	J
Cobalt	B091765-BLK1	ND	mg/kg	2.5	0.098	
Copper	B091765-BLK1	ND	mg/kg	1.0	0.050	
Lead	B091765-BLK1	ND	mg/kg	2.5	0.41	
Molybdenum	B091765-BLK1	ND	mg/kg	2.5	0.050	
Nickel	B091765-BLK1	ND	mg/kg	0.50	0.15	
Silver	B091765-BLK1	ND	mg/kg	0.50	0.067	
Vanadium	B091765-BLK1	ND	mg/kg	0.50	0.11	
Zinc	B091765-BLK1	0.16309	mg/kg	2.5	0.087	J
QC Batch ID: B091770						
Mercury	B091770-BLK1	0.042880	mg/kg	0.16	0.016	J
QC Batch ID: B091813						
Antimony	B091813-BLK1	ND	mg/kg	0.50	0.080	
Arsenic	B091813-BLK1	0.20350	mg/kg	0.50	0.17	J
Selenium	B091813-BLK1	ND	mg/kg	0.50	0.11	
Thallium	B091813-BLK1	ND	mg/kg	0.25	0.049	

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 109 of 166

3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Laboratory Control Sample

			•				•	Control Lim	its	
				Spike		Percent		Percent	Lab	
Constituent	QC Sample ID	Туре	Result	Level	Units	Recovery	RPD	Recovery R	PD Quals	
QC Batch ID: B091174										
Antimony	B091174-BS1	LCS	9.9435	10.000	mg/kg	99.4		75 - 125		
Arsenic	B091174-BS1	LCS	26.102	25.000	mg/kg	104		75 - 125		
Barium	B091174-BS3	LCS	102.79	100.00	mg/kg	103		75 - 125		
Beryllium	B091174-BS3	LCS	9.9975	10.000	mg/kg	100		75 - 125		
Cadmium	B091174-BS3	LCS	9.7818	10.000	mg/kg	97.8		75 - 125		
Chromium	B091174-BS3	LCS	98.991	100.00	mg/kg	99.0		75 - 125		
Cobalt	B091174-BS3	LCS	99.415	100.00	mg/kg	99.4		75 - 125		
Copper	B091174-BS3	LCS	94.459	100.00	mg/kg	94.5		75 - 125		
Lead	B091174-BS3	LCS	104.59	100.00	mg/kg	105		75 - 125		
Molybdenum	B091174-BS3	LCS	96.968	100.00	mg/kg	97.0		75 - 125		
Nickel	B091174-BS3	LCS	98.146	100.00	mg/kg	98.1		75 - 125		
Selenium	B091174-BS1	LCS	26.703	25.000	mg/kg	107		75 - 125		
Silver	B091174-BS3	LCS	9.4860	10.000	mg/kg	94.9		75 - 125		
Thallium	B091174-BS1	LCS	10.546	10.000	mg/kg	105		75 - 125		
Vanadium	B091174-BS3	LCS	97.664	100.00	mg/kg	97.7		75 - 125		
Zinc	B091174-BS3	LCS	98.682	100.00	mg/kg	98.7		75 - 125		
QC Batch ID: B091180										
Antimony	B091180-BS1	LCS	10.657	10.000	mg/kg	107		75 - 125		
Arsenic	B091180-BS1	LCS	26.294	25.000	mg/kg	105		75 - 125		
Barium	B091180-BS3	LCS	105.34	100.00	mg/kg	105		75 - 125		
Beryllium	B091180-BS3	LCS	10.547	10.000	mg/kg	105		75 - 125		
Cadmium	B091180-BS3	LCS	10.234	10.000	mg/kg	102		75 - 125		
Chromium	B091180-BS3	LCS	105.12	100.00	mg/kg	105		75 - 125		
Cobalt	B091180-BS3	LCS	105.24	100.00	mg/kg	105		75 - 125		
Copper	B091180-BS3	LCS	100.73	100.00	mg/kg	101		75 - 125		
Lead	B091180-BS3	LCS	109.76	100.00	mg/kg	110		75 - 125		
Molybdenum	B091180-BS3	LCS	103.10	100.00	mg/kg	103		75 - 125		
Nickel	B091180-BS3	LCS	103.78	100.00	mg/kg	104		75 - 125		
Selenium	B091180-BS2	LCS	26.618	25.000	mg/kg	106		75 - 125		
Silver	B091180-BS3	LCS	10.085	10.000	mg/kg	101		75 - 125		
Thallium	B091180-BS1	LCS	11.034	10.000	mg/kg	110		75 - 125		
Vanadium	B091180-BS3	LCS	103.75	100.00	mg/kg	104		75 - 125		
Zinc	B091180-BS3	LCS	103.86	100.00	mg/kg	104		75 - 125		

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Laboratory Control Sample

			<u> </u>								
				<u> </u>				Control I	imits		
				Spike		Percent		Percent		Lab	
Constituent	QC Sample ID	Туре	Result	Level	Units	Recovery	RPD	Recovery	RPD	Quals	
QC Batch ID: B091357											
Mercury	B091357-BS1	LCS	0.76160	0.80000	mg/kg	95.2		80 - 120			
QC Batch ID: B091358											
Mercury	B091358-BS1	LCS	0.81440	0.80000	mg/kg	102		80 - 120			
QC Batch ID: B091765											
Barium	B091765-BS1	LCS	107.68	100.00	mg/kg	108		75 - 125			
Beryllium	B091765-BS1	LCS	10.759	10.000	mg/kg	108		75 - 125			
Cadmium	B091765-BS1	LCS	10.982	10.000	mg/kg	110		75 - 125			
Chromium	B091765-BS1	LCS	111.89	100.00	mg/kg	112		75 - 125			
Cobalt	B091765-BS1	LCS	109.12	100.00	mg/kg	109		75 - 125			
Copper	B091765-BS1	LCS	104.52	100.00	mg/kg	105		75 - 125			
Lead	B091765-BS1	LCS	109.90	100.00	mg/kg	110		75 - 125			
Molybdenum	B091765-BS1	LCS	107.70	100.00	mg/kg	108		75 - 125			
Nickel	B091765-BS1	LCS	115.58	100.00	mg/kg	116		75 - 125			
Silver	B091765-BS1	LCS	10.592	10.000	mg/kg	106		75 - 125			
Vanadium	B091765-BS1	LCS	106.12	100.00	mg/kg	106		75 - 125			
Zinc	B091765-BS1	LCS	108.59	100.00	mg/kg	109		75 - 125			
QC Batch ID: B091770											
Mercury	B091770-BS1	LCS	0.78080	0.80000	mg/kg	97.6		80 - 120			
QC Batch ID: B091813											
Antimony	B091813-BS1	LCS	11.279	10.000	mg/kg	113		75 - 125			
Arsenic	B091813-BS1	LCS	27.706	25.000	mg/kg	111		75 - 125			
Selenium	B091813-BS1	LCS	29.360	25.000	mg/kg	117		75 - 125			
Thallium	B091813-BS1	LCS	11.330	10.000	mg/kg	113		75 - 125			

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 111 of 166

3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
O	-	Source	Source	D 14	Spike	11.24.	DDD	Percent	DDD	Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091174	Use	d client samp	ole: Y - Des	cription: BB	-M1-10, 10/2	22/2020 16	6:05				
Antimony	DUP	2031364-10	ND	ND		mg/kg			20		
	MS	2031364-10	ND	3.1075	10.000	mg/kg		31.1		16 - 119	J
	MSD	2031364-10	ND	3.5550	10.000	mg/kg	13.4	35.6	20	16 - 119	J
Arsenic	DUP	2031364-10	ND	1.8550		mg/kg			20		J
	MS	2031364-10	ND	24.065	25.000	mg/kg		96.3		75 - 125	
	MSD	2031364-10	ND	29.110	25.000	mg/kg	19.0	116	20	75 - 125	
Barium	DUP	2031364-10	56.171	46.054		mg/kg	19.8		20		
	MS	2031364-10	56.171	136.24	100.00	mg/kg		80.1		75 - 125	
	MSD	2031364-10	56.171	150.24	100.00	mg/kg	9.8	94.1	20	75 - 125	
	DUP	2031364-10	ND	ND		mg/kg			20		
	MS	2031364-10	ND	10.297	10.000	mg/kg		103		75 - 125	
	MSD	2031364-10	ND	10.818	10.000	mg/kg	4.9	108	20	75 - 125	
Cadmium	DUP	2031364-10	ND	ND		mg/kg			20		
	MS	2031364-10	ND	10.006	10.000	mg/kg		100		75 - 125	
	MSD	2031364-10	ND	10.827	10.000	mg/kg	7.9	108	20	75 - 125	
Chromium	DUP	2031364-10	12.137	9.2613		mg/kg	26.9		20		A02
	MS	2031364-10	12.137	121.13	100.00	mg/kg		109		75 - 125	
	MSD	2031364-10	12.137	111.22	100.00	mg/kg	8.5	99.1	20	75 - 125	
Cobalt	DUP	2031364-10	6.1360	4.8871		mg/kg	22.7		20		J,A02
	MS	2031364-10	6.1360	110.03	100.00	mg/kg		104		75 - 125	
	MSD	2031364-10	6.1360	114.08	100.00	mg/kg	3.6	108	20	75 - 125	
Copper	DUP	2031364-10	6.9397	5.8144		mg/kg	17.6		20		J
	MS	2031364-10	6.9397	102.42	100.00	mg/kg		95.5		75 - 125	
	MSD	2031364-10	6.9397	107.15	100.00	mg/kg	4.5	100	20	75 - 125	
 _ead	DUP	2031364-10	ND	ND		mg/kg			20		
	MS	2031364-10	ND	105.24	100.00	mg/kg		105		75 - 125	
	MSD	2031364-10	ND	110.38	100.00	mg/kg	4.8	110	20	75 - 125	
Molybdenum	DUP	2031364-10	ND	ND		mg/kg			20		
	MS	2031364-10	ND	93.982	100.00	mg/kg		94.0		75 - 125	
	MSD	2031364-10	ND	99.128	100.00	mg/kg	5.3	99.1	20	75 - 125	
	DUP	2031364-10	4.8267	4.4162		mg/kg	8.9		20		J
	MS	2031364-10	4.8267	113.55	100.00	mg/kg		109		75 - 125	
	MSD	2031364-10	4.8267	114.00	100.00	mg/kg	0.4	109	20	75 - 125	
	DUP	2031364-10	2.4800	ND		mg/kg			20		
	MS	2031364-10	2.4800	21.005	25.000	mg/kg		74.1		75 - 125	Q03
	MSD	2031364-10	2.4800	23.585	25.000	mg/kg	11.6	84.4	20	75 - 125	
	DUP	2031364-10	ND	ND		mg/kg			20		
	MS	2031364-10	ND	9.6926	10.000	mg/kg		96.9		75 - 125	
	MSD	2031364-10	ND	10.012	10.000	mg/kg	3.2	100	20	75 - 125	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091174	Use	d client samp	ole: Y - Des	cription: BB	-M1-10, 10/2	22/2020 16	3:05				
Thallium	 DUP	2031364-10	ND	, ND	,	mg/kg			20		
	MS	2031364-10	ND	10.475	10.000	mg/kg		105		75 - 125	
	MSD	2031364-10	ND	10.915	10.000	mg/kg	4.1	109	20	75 - 125	
Vanadium	DUP	2031364-10	61.599	48.731		mg/kg	23.3		20		A02
	MS	2031364-10	61.599	138.76	100.00	mg/kg		77.2		75 - 125	
	MSD	2031364-10	61.599	145.55	100.00	mg/kg	4.8	84.0	20	75 - 125	
Zinc	DUP	2031364-10	31.878	27.194		mg/kg	15.9		20		
	MS	2031364-10	31.878	135.20	100.00	mg/kg		103		75 - 125	
	MSD	2031364-10	31.878	139.53	100.00	mg/kg	3.1	108	20	75 - 125	
QC Batch ID: B091180	Use	d client samp	ole: Y - Des	cription: BB	-011, 10/20/	2020 14:1	4				
Antimony	 DUP	2031364-27	ND	, ND	•	mg/kg			20		
-	MS	2031364-27	ND	3.9375	10.000	mg/kg		39.4		16 - 119	J
	MSD	2031364-27	ND	3.0600	10.000	mg/kg	25.1	30.6	20	16 - 119	J,Q02
Arsenic	DUP	2031364-27	109.93	178.35		mg/kg	47.5		20		Q01
	MS	2031364-27	109.93	197.22	25.000	mg/kg		349		75 - 125	A03
	MSD	2031364-27	109.93	296.19	25.000	mg/kg	40.1	745	20	75 - 125	A03,Q 02
Barium	DUP	2031364-27	58.203	68.534		mg/kg	16.3		20		
	MS	2031364-27	58.203	167.24	100.00	mg/kg		109		75 - 125	
	MSD	2031364-27	58.203	158.51	100.00	mg/kg	5.4	100	20	75 - 125	
Beryllium	DUP	2031364-27	ND	ND		mg/kg			20		
	MS	2031364-27	ND	10.931	10.000	mg/kg		109		75 - 125	
	MSD	2031364-27	ND	11.038	10.000	mg/kg	1.0	110	20	75 - 125	
Cadmium	DUP	2031364-27	1.3127	1.5020		mg/kg	13.4		20		J
	MS	2031364-27	1.3127	11.904	10.000	mg/kg		106		75 - 125	
	MSD	2031364-27	1.3127	11.823	10.000	mg/kg	0.7	105	20	75 - 125	
Chromium	DUP	2031364-27	4.5828	6.5959		mg/kg	36.0		20		A02
	MS	2031364-27	4.5828	109.38	100.00	mg/kg		105		75 - 125	
	MSD	2031364-27	4.5828	110.90	100.00	mg/kg	1.4	106	20	75 - 125	
Cobalt	DUP	2031364-27	5.0599	5.9449		mg/kg	16.1		20		J
	MS	2031364-27	5.0599	114.47	100.00	mg/kg		109		75 - 125	
	MSD	2031364-27	5.0599	117.78	100.00	mg/kg	2.8	113	20	75 - 125	
Copper	DUP	2031364-27	8.3944	8.9196	<u> </u>	mg/kg	6.1		20		J
	MS	2031364-27	8.3944	110.39	100.00	mg/kg		102		75 - 125	
	MSD	2031364-27	8.3944	109.60	100.00	mg/kg	0.7	101	20	75 - 125	
Lead	DUP	2031364-27	34.079	44.683		mg/kg	26.9		20		Q01
	MS	2031364-27	34.079	151.49	100.00	mg/kg		117		75 - 125	
	MSD	2031364-27	34.079	143.03	100.00	mg/kg	5.7	109	20	75 - 125	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091180	Use	ed client samp	ole: Y - Des	cription: BB	-011, 10/20/2	2020 14:14	4				
Molybdenum	J DUP	2031364-27	ND	ND		mg/kg			20		
	MS	2031364-27	ND	97.516	100.00	mg/kg		97.5		75 - 125	
	MSD	2031364-27	ND	102.00	100.00	mg/kg	4.5	102	20	75 - 125	
Nickel	DUP	2031364-27	3.0440	3.8778		mg/kg	24.1		20		J,A02
	MS	2031364-27	3.0440	114.40	100.00	mg/kg		111		75 - 125	
	MSD	2031364-27	3.0440	117.00	100.00	mg/kg	2.2	114	20	75 - 125	
Selenium	DUP	2031364-27	3.9250	1.5600		mg/kg	86.2		20		J,A02
	MS	2031364-27	3.9250	30.572	25.000	mg/kg		107		75 - 125	
	MSD	2031364-27	3.9250	28.845	25.000	mg/kg	5.8	99.7	20	75 - 125	
Silver	DUP	2031364-27	2.2771	ND		mg/kg			20		
	MS	2031364-27	2.2771	10.569	10.000	mg/kg		82.9		75 - 125	
	MSD	2031364-27	2.2771	10.252	10.000	mg/kg	3.0	79.7	20	75 - 125	
Thallium	DUP	2031364-27	ND	ND		mg/kg			20		
	MS	2031364-27	ND	11.105	10.000	mg/kg		111		75 - 125	
	MSD	2031364-27	ND	11.370	10.000	mg/kg	2.4	114	20	75 - 125	
Vanadium	DUP	2031364-27	20.697	28.129		mg/kg	30.4		20		Q01
	MS	2031364-27	20.697	125.68	100.00	mg/kg		105		75 - 125	
	MSD	2031364-27	20.697	124.78	100.00	mg/kg	0.7	104	20	75 - 125	
Zinc	DUP	2031364-27	43.995	59.227		mg/kg	29.5		20		Q01
	MS	2031364-27	43.995	161.68	100.00	mg/kg		118		75 - 125	
	MSD	2031364-27	43.995	160.43	100.00	mg/kg	0.8	116	20	75 - 125	
QC Batch ID: B091357	Use	ed client samp	ole: Y - Des	cription: BB	-M1-10, 10/2	22/2020 16	3:05				
Mercury	DUP	2031364-10	0.020317	0.022698		mg/kg	11.1		20		J
	MS	2031364-10	0.020317	0.85873	0.79365	mg/kg		106		80 - 120	
	MSD	2031364-10	0.020317	0.85556	0.79365	mg/kg	0.4	105	20	80 - 120	
QC Batch ID: B091358	Use	ed client samp	ole: Y - Des	cription: BB	-011, 10/20/2	2020 14:14	4				
Mercury	DUP	2031364-27	0.76774	0.76935		mg/kg	0.2		20		
	MS	2031364-27	0.76774	1.4839	0.80645	mg/kg		88.8		80 - 120	
	MSD	2031364-27	0.76774	1.5419	0.80645	mg/kg	3.8	96.0	20	80 - 120	
QC Batch ID: B091765	Use	ed client samp	ole: N								
Barium	D UP	2031569-21	105.75	124.20		mg/kg	16.0		20		
	MS	2031569-21	105.75	199.18	100.00	mg/kg		93.4		75 - 125	
	MSD	2031569-21	105.75	215.25	100.00	mg/kg	7.8	110	20	75 - 125	
Beryllium	DUP	2031569-21	0.30755	0.33007		mg/kg	7.1		20		J
	MS	2031569-21	0.30755	10.088	10.000	mg/kg		97.8		75 - 125	
	MSD	2031569-21	0.30755	10.629	10.000	mg/kg	5.2	103	20	75 - 125	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091765	Use	ed client samp	le· N								
Cadmium	DUP	2031569-21	0.99590	1.2695		mg/kg	24.2		20		A02
	MS	2031569-21	0.99590	10.927	10.000	mg/kg		99.3		75 - 125	
	MSD	2031569-21	0.99590	11.663	10.000	mg/kg	6.5	107	20	75 - 125	
Chromium	DUP	2031569-21	16.118	16.823		mg/kg	4.3		20		
	MS	2031569-21	16.118	114.94	100.00	mg/kg		98.8		75 - 125	
	MSD	2031569-21	16.118	121.37	100.00	mg/kg	5.4	105	20	75 - 125	
Cobalt	DUP	2031569-21	6.8353	7.5738		mg/kg	10.3		20		
	MS	2031569-21	6.8353	103.06	100.00	mg/kg		96.2		75 - 125	
	MSD	2031569-21	6.8353	107.80	100.00	mg/kg	4.5	101	20	75 - 125	
Copper	DUP	2031569-21	22.171	23.420		mg/kg	5.5		20		
	MS	2031569-21	22.171	122.28	100.00	mg/kg		100		75 - 125	
	MSD	2031569-21	22.171	130.50	100.00	mg/kg	6.5	108	20	75 - 125	
 Lead	DUP	2031569-21	108.89	116.75		mg/kg	7.0		20		
	MS	2031569-21	108.89	191.40	100.00	mg/kg		82.5		75 - 125	
	MSD	2031569-21	108.89	216.62	100.00	mg/kg	12.4	108	20	75 - 125	
Molybdenum	DUP	2031569-21	ND	ND		mg/kg			20		
, 223.12	MS	2031569-21	ND	92.449	100.00	mg/kg		92.4		75 - 125	
	MSD	2031569-21	ND	96.355	100.00	mg/kg	4.1	96.4	20	75 - 125	
Nickel	DUP	2031569-21	10.802	11.188		mg/kg	3.5		20		
Hicker	MS	2031569-21	10.802	110.64	100.00	mg/kg	0.0	99.8	20	75 - 125	
	MSD	2031569-21	10.802	116.32	100.00	mg/kg	5.0	106	20	75 - 125 75 - 125	
Silver	DUP	2031569-21	ND	ND		mg/kg			20		
Oliver	MS	2031569-21	ND	9.6823	10.000	mg/kg		96.8	20	75 - 125	
	MSD	2031569-21	ND	10.085	10.000	mg/kg	4.1	101	20	75 - 125 75 - 125	
 Vanadium	DUP	2031569-21	33.477	36.289		mg/kg	8.1		20		
variacium		2031569-21	33.477	134.86	100.00		0.1	101	20	75 - 125	
	MS MSD	2031569-21	33.477	143.04	100.00	mg/kg mg/kg	5.9	110	20	75 - 125 75 - 125	
					100.00			110		75-125	
Zinc	DUP	2031569-21	211.94	240.48	400.00	mg/kg	12.6	07.0	20	75 405	
	MS MSD	2031569-21 2031569-21	211.94 211.94	299.86 325.82	100.00 100.00	mg/kg mg/kg	8.3	87.9 114	20	75 - 125 75 - 125	
	_			020.02	100.00			117		70 120	
QC Batch ID: B091770	Use	ed client samp									
Mercury	DUP	2032263-01	0.11629	0.11823		mg/kg	1.7		20		J
	MS	2032263-01	0.11629	0.77097	0.80645	mg/kg		81.2		80 - 120	
	MSD	2032263-01	0.11629	0.76452	0.80645	mg/kg	8.0	80.4	20	80 - 120	
QC Batch ID: B091813	Use	ed client samp	le: N								
Antimony	 DUP	2029141-02RE	0.43925	0.47300		mg/kg	7.4		20		J
-	MS	2029141-02RE	0.43925	6.1510	10.000	mg/kg		57.1		16 - 119	
	MSD	2029141-02RE	0.43925	6.6395	10.000	mg/kg	7.6	62.0	20	16 - 119	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Total Concentrations (TTLC)

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091813	Use	ed client samp	le: N								
Arsenic	DUP	2029141-02RE1	33.330	32.700		mg/kg	1.9		20		
	MS	2029141-02RE1	33.330	60.939	25.000	mg/kg		110		75 - 125	
	MSD	2029141-02RE1	33.330	65.248	25.000	mg/kg	6.8	128	20	75 - 125	Q03
Selenium	DUP	2029141-02RE	0.15975	0.16550		mg/kg	3.5		20		J
	MS	2029141-02RE	0.15975	27.504	25.000	mg/kg		109		75 - 125	
	MSD	2029141-02RE	0.15975	26.808	25.000	mg/kg	2.6	107	20	75 - 125	
Thallium	DUP	2029141-02RE	0.11775	0.10975		mg/kg	7.0		20		J
	MS	2029141-02RE	0.11775	10.420	10.000	mg/kg		103		75 - 125	
	MSD	2029141-02RE	0.11775	10.578	10.000	mg/kg	1.5	105	20	75 - 125	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
OC Peteb ID. Basses	-					
QC Batch ID: B090599 Total Recoverable Mercury	B090599-BLK1	ND	ug/L	0.20	0.022	
	2000000 22.11		~9·=	0.20	0.022	
QC Batch ID: B091231						
Total Recoverable Antimony	B091231-BLK1	0.20100	ug/L	2.0	0.11	J
Total Recoverable Arsenic	B091231-BLK1	ND	ug/L	2.0	0.70	
Total Recoverable Barium	B091231-BLK1	0.43600	ug/L	1.0	0.21	J
Total Recoverable Beryllium	B091231-BLK1	ND	ug/L	1.0	0.14	
Total Recoverable Cadmium	B091231-BLK1	ND	ug/L	1.0	0.11	
Total Recoverable Chromium	B091231-BLK1	0.54100	ug/L	3.0	0.50	J
Total Recoverable Cobalt	B091231-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Copper	B091231-BLK1	0.27300	ug/L	2.0	0.22	J
Total Recoverable Lead	B091231-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Molybdenum	B091231-BLK1	ND	ug/L	1.0	0.11	
Total Recoverable Nickel	B091231-BLK1	ND	ug/L	2.0	0.19	
Total Recoverable Selenium	B091231-BLK2	ND	ug/L	2.0	0.19	
Total Recoverable Silver	B091231-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Thallium	B091231-BLK1	ND	ug/L	1.0	0.10	
Total Recoverable Vanadium	B091231-BLK1	ND	ug/L	3.0	0.78	
Total Recoverable Zinc	B091231-BLK1	ND	ug/L	10	1.7	
QC Batch ID: B091493						
Dissolved Antimony	B091493-BLK1	ND	ug/L	2.0	0.23	
Dissolved Arsenic	B091493-BLK1	ND	ug/L	2.0	0.38	
Dissolved Barium	B091493-BLK1	ND	ug/L	1.0	0.066	
Dissolved Beryllium	B091493-BLK1	ND	ug/L	1.0	0.050	
Dissolved Cadmium	B091493-BLK1	ND	ug/L	1.0	0.034	
Dissolved Chromium	B091493-BLK1	ND	ug/L	3.0	0.15	
Dissolved Cobalt	B091493-BLK1	0.015000	ug/L	1.0	0.011	J
Dissolved Copper	B091493-BLK1	ND	ug/L	2.0	0.32	
Dissolved Lead	B091493-BLK1	ND	ug/L	1.0	0.021	
Dissolved Molybdenum	B091493-BLK1	ND	ug/L	1.0	0.033	
Dissolved Nickel	B091493-BLK1	ND	ug/L	2.0	0.15	
Dissolved Selenium	B091493-BLK1	ND	ug/L	2.0	0.25	
Dissolved Silver	B091493-BLK1	ND	ug/L	1.0	0.015	
	B091493-BLK1	ND	ug/L	1.0	0.025	

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Method Blank Analysis

Constituent	QC Sample ID	MB Result	Units	PQL	MDL	Lab Quals
QC Batch ID: B091493						
Dissolved Vanadium	B091493-BLK1	ND	ug/L	3.0	0.39	
Dissolved Zinc	B091493-BLK1	ND	ug/L	5.0	2.2	
QC Batch ID: B091992						
Total Recoverable Mercury	B091992-BLK1	ND	ug/L	0.20	0.022	
QC Batch ID: B091995						
Dissolved Mercury	B091995-BLK1	0.045750	ug/L	0.20	0.022	J

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27
Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Laboratory Control Sample

	-		•					A
				0		Dans t		Control Limits Borcont Lab
Constituent	QC Sample ID	Туре	Result	Spike Level	Units	Percent Recovery	RPD	Percent Lab Recovery RPD Quals
QC Batch ID: B090599	 							-
Total Recoverable Mercury	B090599-BS1	LCS	0.91750	1.0000	ug/L	91.8		85 - 115
QC Batch ID: B091231								
Total Recoverable Antimony	B091231-BS1	LCS	43.016	40.000	ug/L	108		85 - 115
Total Recoverable Arsenic	B091231-BS1	LCS	106.46	100.00	ug/L	106		85 - 115
Total Recoverable Barium	B091231-BS1	LCS	43.959	40.000	ug/L	110		85 - 115
Total Recoverable Beryllium	B091231-BS1	LCS	45.004	40.000	ug/L	113		85 - 115
Total Recoverable Cadmium	B091231-BS1	LCS	42.561	40.000	ug/L	106		85 - 115
Total Recoverable Chromium	B091231-BS1	LCS	42.454	40.000	ug/L	106		85 - 115
Total Recoverable Cobalt	B091231-BS1	LCS	40.627	40.000	ug/L	102		85 - 115
Total Recoverable Copper	B091231-BS1	LCS	113.33	100.00	ug/L	113		85 - 115
Total Recoverable Lead	B091231-BS1	LCS	113.56	100.00	ug/L	114		85 - 115
Total Recoverable Molybdenum	B091231-BS1	LCS	40.958	40.000	ug/L	102		85 - 115
Total Recoverable Nickel	B091231-BS1	LCS	101.33	100.00	ug/L	101		85 - 115
Total Recoverable Selenium	B091231-BS2	LCS	112.52	100.00	ug/L	113		85 - 115
Total Recoverable Silver	B091231-BS1	LCS	43.975	40.000	ug/L	110		85 - 115
Total Recoverable Thallium	B091231-BS1	LCS	44.502	40.000	ug/L	111		85 - 115
Total Recoverable Vanadium	B091231-BS1	LCS	40.968	40.000	ug/L	102		85 - 115
Total Recoverable Zinc	B091231-BS1	LCS	112.67	100.00	ug/L	113		85 - 115
QC Batch ID: B091493								
Dissolved Antimony	B091493-BS1	LCS	39.875	40.000	ug/L	99.7		85 - 115
Dissolved Arsenic	B091493-BS1	LCS	104.31	100.00	ug/L	104		85 - 115
Dissolved Barium	B091493-BS1	LCS	42.010	40.000	ug/L	105		85 - 115
Dissolved Beryllium	B091493-BS1	LCS	39.487	40.000	ug/L	98.7		85 - 115
Dissolved Cadmium	B091493-BS1	LCS	40.993	40.000	ug/L	102		85 - 115
Dissolved Chromium	B091493-BS1	LCS	42.511	40.000	ug/L	106		85 - 115
Dissolved Cobalt	B091493-BS1	LCS	42.666	40.000	ug/L	107		85 - 115
Dissolved Copper	B091493-BS1	LCS	104.81	100.00	ug/L	105		85 - 115
Dissolved Lead	B091493-BS1	LCS	102.09	100.00	ug/L	102		85 - 115
Dissolved Molybdenum	B091493-BS1	LCS	38.895	40.000	ug/L	97.2		85 - 115
Dissolved Nickel	B091493-BS1	LCS	107.70	100.00	ug/L	108		85 - 115
Dissolved Selenium	B091493-BS1	LCS	105.14	100.00	ug/L	105		85 - 115
Dissolved Silver	B091493-BS1	LCS	40.404	40.000	ug/L	101		85 - 115
Dissolved Thallium	B091493-BS1	LCS	40.438	40.000	ug/L	101		85 - 115
-								_

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Laboratory Control Sample

							Control Limits			
				Spike		Percent		Percent		Lab
Constituent	QC Sample ID	Туре	Result	Level	Units	Recovery	RPD	Recovery	RPD	Quals
QC Batch ID: B091493										
Dissolved Vanadium	B091493-BS1	LCS	40.279	40.000	ug/L	101		85 - 115		
Dissolved Zinc	B091493-BS1	LCS	104.49	100.00	ug/L	104		85 - 115		
QC Batch ID: B091992										
Total Recoverable Mercury	B091992-BS1	LCS	0.96250	1.0000	ug/L	96.2		85 - 115		
QC Batch ID: B091995										
Dissolved Mercury	B091995-BS1	LCS	1.0100	1.0000	ug/L	101		85 - 115		

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3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Precision & Accuracy

		<u></u>							Control Limits		
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Туре	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B090599	Use	ed client samp	ole: N								
Total Recoverable Mercury	 DUP	2031912-01	0.36000	0.34500		ug/L	4.3		20		
•	MS	2031912-01	0.36000	1.1575	1.0000	ug/L		79.8		70 - 130	
	MSD	2031912-01	0.36000	1.1725	1.0000	ug/L	1.3	81.2	20	70 - 130	
QC Batch ID: B091231	Use	ed client samp	ole: Y - Des	scription: Rin	seateBlank-	-01, 10/20/	2020 1	7:15			
Total Recoverable Antimony	 DUP	2031364-14	0.18400	0.22000		ug/L	17.8		20		J
•	MS	2031364-14	0.18400	41.719	40.000	ug/L		104		70 - 130	
	MSD	2031364-14	0.18400	44.306	40.000	ug/L	6.0	110	20	70 - 130	
Total Recoverable Arsenic	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	104.02	100.00	ug/L		104		70 - 130	
	MSD	2031364-14	ND	105.81	100.00	ug/L	1.7	106	20	70 - 130	
Total Recoverable Barium	DUP	2031364-14	0.43700	0.39300		ug/L	10.6		20		J
	MS	2031364-14	0.43700	43.474	40.000	ug/L		108		70 - 130	
	MSD	2031364-14	0.43700	44.442	40.000	ug/L	2.2	110	20	70 - 130	
Total Recoverable Beryllium	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	44.519	40.000	ug/L		111		70 - 130	
	MSD	2031364-14	ND	46.609	40.000	ug/L	4.6	117	20	70 - 130	
Total Recoverable Cadmium	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	41.892	40.000	ug/L		105		70 - 130	
	MSD	2031364-14	ND	43.540	40.000	ug/L	3.9	109	20	70 - 130	
Total Recoverable Chromium	DUP	2031364-14	0.81700	1.3480		ug/L	49.1		20		J,A02
	MS	2031364-14	0.81700	42.760	40.000	ug/L		105		70 - 130	
	MSD	2031364-14	0.81700	43.448	40.000	ug/L	1.6	107	20	70 - 130	
Total Recoverable Cobalt	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	41.038	40.000	ug/L		103		70 - 130	
	MSD	2031364-14	ND	41.450	40.000	ug/L	1.0	104	20	70 - 130	
Total Recoverable Copper	DUP	2031364-14	0.38000	0.54600		ug/L	35.9		20		J,A02
	MS	2031364-14	0.38000	111.18	100.00	ug/L		111		70 - 130	
	MSD	2031364-14	0.38000	114.23	100.00	ug/L	2.7	114	20	70 - 130	
Total Recoverable Lead	DUP	2031364-14	ND	0.16200		ug/L			20		J
	MS	2031364-14	ND	111.70	100.00	ug/L		112		70 - 130	
	MSD	2031364-14	ND	115.16	100.00	ug/L	3.0	115	20	70 - 130	
Total Recoverable Molybdenum	DUP	2031364-14	0.61300	0.18200		ug/L	108		20		J,A02
	MS	2031364-14	0.61300	39.366	40.000	ug/L		96.9		70 - 130	
	MSD	2031364-14	0.61300	41.812	40.000	ug/L	6.0	103	20	70 - 130	
Total Recoverable Nickel	DUP	2031364-14	ND	0.28400		ug/L			20		J
	MS	2031364-14	ND	99.430	100.00	ug/L		99.4		70 - 130	
	MSD	2031364-14	ND	103.47	100.00	ug/L	4.0	103	20	70 - 130	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091231	Use	ed client samp	ole: Y - Des	cription: Rin	seateBlank-	01, 10/20/	2020 1	7:15			
Total Recoverable Selenium	─ DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	112.70	100.00	ug/L		113		70 - 130	
	MSD	2031364-14	ND	116.40	100.00	ug/L	3.2	116	20	70 - 130	
Total Recoverable Silver	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	41.884	40.000	ug/L		105		70 - 130	
	MSD	2031364-14	ND	42.854	40.000	ug/L	2.3	107	20	70 - 130	
Total Recoverable Thallium	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	44.047	40.000	ug/L		110		70 - 130	
	MSD	2031364-14	ND	45.141	40.000	ug/L	2.5	113	20	70 - 130	
Total Recoverable Vanadium	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	40.007	40.000	ug/L		100		70 - 130	
	MSD	2031364-14	ND	43.022	40.000	ug/L	7.3	108	20	70 - 130	
Total Recoverable Zinc	DUP	2031364-14	ND	ND		ug/L			20		
	MS	2031364-14	ND	111.09	100.00	ug/L		111		70 - 130	
	MSD	2031364-14	ND	114.61	100.00	ug/L	3.1	115	20	70 - 130	
	Lloc	d aliant camp	No: N								
QC Batch ID: B091493		ed client samp		ND		/1			20		
Dissolved Antimony	DUP	2031808-01	ND	ND	204.00	ug/L		404	20	70 - 130	
	MS	2031808-01 2031808-01	ND ND	206.59 207.79	204.08 204.08	ug/L	0.6	101 102	20	70 - 130 70 - 130	
	MSD				204.00	ug/L		102		70 - 130	
Dissolved Arsenic	DUP	2031808-01	8.2300	15.525	E40.00	ug/L	61.4	400	20	TO 400	A02
	MS	2031808-01	8.2300	566.87 570.24	510.20 510.20	ug/L	0.6	109 110	20	70 - 130 70 - 130	
	MSD	2031808-01	8.2300	570.34	510.20	ug/L	0.6	110		70 - 130	
Dissolved Barium	DUP	2031808-01	15.315	15.980		ug/L	4.2		20		
	MS	2031808-01	15.315	222.92	204.08	ug/L	0.4	102	00	70 - 130	
	MSD	2031808-01	15.315	223.22	204.08	ug/L	0.1	102	20	70 - 130	
Dissolved Beryllium	DUP	2031808-01	ND	ND		ug/L			20		
	MS	2031808-01	ND	199.48	204.08	ug/L		97.7		70 - 130	
	MSD	2031808-01	ND	206.76	204.08	ug/L	3.6	101	20	70 - 130	
Dissolved Cadmium	DUP	2031808-01	ND	ND		ug/L			20		
	MS	2031808-01	ND	201.29	204.08	ug/L		98.6		70 - 130	
	MSD	2031808-01	ND	197.81	204.08	ug/L	1.7	96.9	20	70 - 130	
Dissolved Chromium	DUP	2031808-01	2.6750	2.8300		ug/L	5.6		20		J
	MS	2031808-01	2.6750	197.56	204.08	ug/L		95.5		70 - 130	
	MSD	2031808-01	2.6750	198.33	204.08	ug/L	0.4	95.9	20	70 - 130	
Dissolved Cobalt	DUP	2031808-01	1.6200	1.7500		ug/L	7.7		20		J
	MS	2031808-01	1.6200	187.49	204.08	ug/L		91.1		70 - 130	
	MSD	2031808-01	1.6200	190.30	204.08	ug/L	1.5	92.5	20	70 - 130	

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3525 Hyland Ave Costa Mesa, CA 92626 **Reported:** 02/18/2021 9:27 Project: USFS- Big Blue Mill

Project Number: [none]

Project Number: [none]
Project Manager: David Allison

Metals Analysis

Quality Control Report - Precision & Accuracy

									Cont	rol Limits	
		Source	Source		Spike			Percent		Percent	Lab
Constituent	Type	Sample ID	Result	Result	Added	Units	RPD	Recovery	RPD	Recovery	Quals
QC Batch ID: B091493	Use	ed client samp	ole: N								
Dissolved Copper	D UP	2031808-01	8.4100	8.7700		ug/L	4.2		20		J
	MS	2031808-01	8.4100	502.70	510.20	ug/L		96.9		70 - 130	
	MSD	2031808-01	8.4100	505.90	510.20	ug/L	0.6	97.5	20	70 - 130	
Dissolved Lead	DUP	2031808-01	0.10000	ND		ug/L			20		
	MS	2031808-01	0.10000	480.24	510.20	ug/L		94.1		70 - 130	
	MSD	2031808-01	0.10000	488.11	510.20	ug/L	1.6	95.7	20	70 - 130	
Dissolved Molybdenum	DUP	2031808-01	9.6150	9.0700		ug/L	5.8		20		
•	MS	2031808-01	9.6150	220.51	204.08	ug/L		103		70 - 130	
	MSD	2031808-01	9.6150	223.21	204.08	ug/L	1.2	105	20	70 - 130	
Dissolved Nickel	DUP	2031808-01	16.425	17.290		ug/L	5.1		20		
	MS	2031808-01	16.425	466.16	510.20	ug/L		88.1		70 - 130	
	MSD	2031808-01	16.425	475.27	510.20	ug/L	1.9	89.9	20	70 - 130	
Dissolved Selenium	DUP	2031808-01	67.840	62.045		ug/L	8.9		20		
	MS	2031808-01	67.840	593.55	510.20	ug/L	0.0	103		70 - 130	
	MSD	2031808-01	67.840	619.72	510.20	ug/L	4.3	108	20	70 - 130	
Dissolved Silver	DUP	2031808-01	0.16500	ND		ug/L			20		
	MS	2031808-01	0.16500	198.84	204.08	ug/L		97.4		70 - 130	
	MSD	2031808-01	0.16500	195.46	204.08	ug/L	1.7	95.7	20	70 - 130	
	DUP	2031808-01	ND	ND		ug/L			20		
Jissoived Ittaliidiii	MS	2031808-01	ND	194.23	204.08	ug/L ug/L		95.2	20	70 - 130	
	MSD	2031808-01	ND	197.28	204.08	ug/L	1.6	96.7	20	70 - 130	
 Dissolved Vanadium	DUP	2031808-01	4.9750	2.6550		ug/L	60.8		20		J,A02
	MS	2031808-01	4.9750	205.82	204.08	ug/L		98.4		70 - 130	-, -
	MSD	2031808-01	4.9750	204.66	204.08	ug/L	0.6	97.8	20	70 - 130	
Dissolved Zinc	DUP	2031808-01	11.185	11.560		ug/L	3.3		20		J
	MS	2031808-01	11.185	512.85	510.20	ug/L	3.0	98.3		70 - 130	ŭ
	MSD	2031808-01	11.185	504.31	510.20	ug/L	1.7	96.7	20	70 - 130	
QC Batch ID: B091992	Use	ed client samp	ole: N								
Total Recoverable Mercury	DUP	2031529-01	0.16625	0.14050		ug/L	16.8		20		J
	MS	2031529-01	0.16625	1.1100	1.0000	ug/L		94.4		70 - 130	-
	MSD	2031529-01	0.16625	1.0825	1.0000	ug/L	2.5	91.6	20	70 - 130	
QC Batch ID: B091995	Use	ed client samp	ole: N								
Dissolved Mercury	⊥ DUP	2031228-01	0.35250	0.29750		ug/L	16.9		20		
•	MS	2031228-01	0.35250	1.3225	1.0000	ug/L		97.0		70 - 130	
	MSD	2031228-01	0.35250	1.3150	1.0000	ug/L	0.6	96.2	20	70 - 130	

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ALS Environmental ALS Group USA, Corp 1317 South 13th Avenue Kelso, WA 98626 T:+1360 577 7222

F:+1 360 636 1068 www.alsglobal.com

Analytical Report for Service Request No: K2009986

December 02, 2020

Tina Green BC Laboratories, Inc. 4100 Atlas Court Bakersfield, CA 93308

RE: EPA 1340 IVBA Metals

Dear Tina,

Enclosed are the results of the sample(s) submitted to our laboratory November 02, 2020 For your reference, these analyses have been assigned our service request number K2009986.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3364. You may also contact me via email at howard.holmes@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Howard Holmes Project Manager

RIGHT SOLUTIONS I RIGHT PARTNER

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ALS Environmental ALS Group USA, Corp 1317 South 13th Avenue Kelso, WA 98626

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Chain of Custody

Metals

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Acronyms

ASTM American Society for Testing and Materials

A2LA American Association for Laboratory Accreditation

CARB California Air Resources Board

CAS Number Chemical Abstract Service registry Number

CFC Chlorofluorocarbon CFU Colony-Forming Unit

DEC Department of Environmental Conservation DEQ Department of Environmental Quality

DHS Department of Health Services

DOE Department of Ecology DOH Department of Health

EPA U. S. Environmental Protection Agency

ELAP Environmental Laboratory Accreditation Program

GCGas Chromatography

GC/MS Gas Chromatography/Mass Spectrometry

LOD Limit of Detection LOQ Limit of Quantitation

LUFT Leaking Underground Fuel Tank

M Modified

MCL Maximum Contaminant Level is the highest permissible concentration of a substance

allowed in drinking water as established by the USEPA.

Method Detection Limit MDL Most Probable Number MPN Method Reporting Limit MRL

NA Not Applicable NC Not Calculated

NCASI National Council of the Paper Industry for Air and Stream Improvement

ND Not Detected

NIOSH National Institute for Occupational Safety and Health

PQL Practical Quantitation Limit

Resource Conservation and Recovery Act RCRA

SIM Selected Ion Monitoring

TPH Total Petroleum Hydrocarbons

Trace level is the concentration of an analyte that is less than the PQL but greater than or

equal to the MDL.

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Inorganic Data Qualifiers

- The result is an outlier. See case narrative.
- The control limit criteria is not applicable. See case narrative.
- The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- The result is an estimate amount because the value exceeded the instrument calibration range.
- The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. DOD-QSM 4.2 definition: Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- The MRL/MDL or LOO/LOD is elevated due to a matrix interference.
- See case narrative
- See case narrative. One or more quality control criteria was outside the limits.
- The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- The result is an estimated value.
- The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See ease narrative.
- The reported value was determined by the Method of Standard Additions (MSA).
- The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. DOD-QSM 4.2 definition: Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike
- The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- х
- The correlation coefficient for the MSA is less than 0.995.
- See case narrative. One or more quality control criteria was outside the limits

Organic Data Qualifiers

- The result is an outlier. See case narrative.
- The control limit criteria is not applicable. See case narrative.
- A tentatively identified compound, a suspected aldol-condensation product
- The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GCMS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- The result is an estimated value
- The result is an estimated value.
- The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results
- The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL. DOD-QSM 4.2 definition: Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference
- See case narrative.
- See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard
- The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- The chromatographic fingerprint of the sample resembles a petroleum product cluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- The chromatographic fingerprint does not resemble a petroleum product.

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. All results listed in this report are for the exclusive use of the submitting party. BC Laboratories, Inc. assumes no responsibility for report alteration, separation, detachment or third party interpretation Page 127 of 166

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ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csapproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L16-58-R4
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://bealth.hawaii.gov/	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources- data/water-sciences-home-page/laboratory-certification-branch/non-field-lab- certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon – DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.ALSGlobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/anlayte is offered by that state.

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Case Narrative

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S) Environmental

Client: BC Laboratories, Incorporated Service Request: K2009986

Project: EPA 1340 IVBA Metals Date Received: 11/02/2020

Sample Matrix: Soil

CASE NARRATIVE

1317 South 13th Ave, Kelso, WA 98626 | 1-360-577-7222 | www.alsglobal.com

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples for the Tier II level requested by the client.

Sample Receipt:

Two soil samples were received for analysis at ALS Environmental on 11/02/2020. Any discrepancies upon initial sample inspection are annotated on the sample receipt and preservation form included within this report. The samples were stored at minimum in accordance with the analytical method requirements.

Metals:

Method 6020A, 11/30/2020: The matrix spike recovery of Antimony for sample 2031364-29 was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. The matrix spike outlier suggested a potential low bias in this matrix. No further corrective action was appropriate.

Method 7471B, 11/23/2020: The matrix spike recovery of Mercury for sample 2031364-29 was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. The matrix spike outlier suggested a potential high bias in this matrix. No further corrective action was appropriate.

Approved by Awald Commen

Date 12/02/2020

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Chain of Custody

ALS Environmental-Kelso Laboratory 1317 South 13th Avenue, Kelso, WA 98626 Phone (360)577-7222 Fax (360)636-1068 www.alsglobal.com

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 9 of 35 K 2009986 To: ALS Chain of Custody Form LABORATORIES, INC. 4100 Atlas Ct. - Bakersfield, CA 93308 - 661.327.4911 - Fax: 661.327.1918 - www.bclabs.com **Analysis Requested** Client: BC 1965 Project #: Attn: TM GREEN Comments: Project Name: City, State, Zip: BAK · (A 93308 SamplerIs): Phone: Sample Matrix Email: 1 Mebolans Man Result Request "Surcharge Studge
Drinking Water
Ground Water
Waste Water STD [] 5 Day" [] 4 Day" Work Order #: 3 Day" 2 Day" 1 Day" Sample Description Sampled Notes Global ID Billing *Send Copy to EDF Required Geotracker Same as above State of CA? (EDT) Client: 1. Received By Time Yes War Address: 2. Received By Time 2. Relinquished, By System # City: State... (Needed for EDT) Attn: 3. Relinquished By Date 3. Received By P.O. #: "For Drinking Water, mark "EDT - yes or no." If marked no, BCL will not upload at a future date. Page 9 of 35

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ceived:	Labs		Cooler Receipt a	nd Pres		n Form	K20 6 €	798G	1.41	1-1
	2 70	Opened: _	11/2/20	By: A	0	Unloaded:	117	170 By	N	
Samples we	re received via?	USPS	Fed Ex UI	PS	DHL.	PDX	Cour	ier Hond D	elivered	
Samples we	re received in: (cir	role) C	foler Box	Envelop	æ	Other			NA.	
	ly scals on coolers?		The state of the s			there?				
	ere custody seals i		- And the same of			ned and dated		Y	N	
	rature Blank prese		NA Y N If sample bottle contained					column below:		
			stample bottle contained cified temperature ranges		cooler; no	tate in the col	umn "San	nple Temp"; NA Y	(N))
	ney received on ice ssue samples were		as collected? If not, not			and notify the	e PM.	NA Y	N)
mp Blank	Sample Temp	IR Gun	Cooler N/COC ID/ NA		of temp	PM Notific	ed	Tracking Nun	nhar Må	File
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			nbroken) s, preservation, etc.)?					NA CY NA CY NA CY	N N	
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Metals

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 12 of 35

ALS Group USA, Corp. dba ALS Environmental Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Sample Matrix: Soil

Service Request: K2009986 Date Collected: 10/22/2020 Date Received: 11/2/2020 Date Extracted: NA Date Analyzed: NA

Bioaccessibility Value Analyte: Antimony Units: Percent (%)

 Sample Name
 Lab Code
 Result

 2033164-22
 K2009986-001
 2.7

 2031364-29
 K2009986-002
 <1.0</td>

K2009996iqu spl - Antimorty 12/1/2020 Buge No.

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 13 of 35

ALS Group USA, Corp. dba ALS Environmental Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Sample Matrix: Soil

Service Request: K2009986
Date Collected: 10/22/2020
Date Received: 11/2/2020
Date Extracted: NA
Date Analyzed: NA

Bioaccessibility Value Analyte: Arsenic Units: Percent (%)

 Sample Name
 Lab Code
 Result

 2033164-22
 K2009986-001
 3.2

 2031364-29
 K2009986-002
 <1.0</td>

K20099986igt spl - Assenie 12/1/2020 Buge No.

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ALS Group USA, Corp. dba ALS Environmental Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Sample Matrix: Soil

Service Request: K2009986
Date Collected: 10/22/2020
Date Received: 11/2/2020
Date Extracted: NA
Date Analyzed: NA

Bioaccessibility Value Analyte: Lead Units: Percent (%)

Sample Name	Lab Code	Result
2033164-22	K2009986-001	15.8
2031364-29	K2009986-002	92.4

K20099986pp spl - Lead 12/1/2020 Page No.

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ALS Group USA, Corp. dba ALS Environmental Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Sample Matrix: Soil

Service Request: K2009986 Date Collected: 10/22/2020 Date Received: 11/2/2020 Date Extracted: NA Date Analyzed: NA

Bioaccessibility Value Analyte: Mercury Units: Percent (%)

 Sample Name
 Lab Code
 Result

 2033164-22
 K2009986-001
 <1.0</td>

 2031364-29
 K2009986-002
 1.1

K2009996iqu spl - Mercury 12/1/2020 Buge No.

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 16 of 35

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Project: EPA 1340 IVB Sample Matrix: Soil

Sample Name: 2033164-22 Lab Code: K2009986-001 Service Request: K2009986

Date Collected: 10/22/20 10:33 **Date Received:** 11/02/20 10:00

Basis: Dry

Total Metals - IVBA Analysis

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	76.1	mg/Kg	0.19	20	11/30/20 16:51	11/18/20	
Arsenic	6020A	35200	mg/Kg	97	1000	11/30/20 17:04	11/18/20	
Lead	6020A	3220	mg/Kg	0.19	20	11/30/20 16:51	11/18/20	
Mercury	7471B	67.6	mg/Kg	2.0	100	11/17/20 13:03	11/17/20	

Printed 12/1/2020 5:10:33 PM Superset Reference:

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ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated Project:

EPA 1340 IVBA Metals

Sample Matrix: Soil

Sample Name: 2033164-22 Lab Code: K2009986-001 Service Request: K2009986

Date Collected: 10/22/20 10:33 Date Received: 11/02/20 10:00

Basis: Dry

IVBA Metals

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	2,06	mg/Kg	0.20	20	11/30/20 15:17	11/19/20	
Arsenic	6020A	1120	mg/Kg	2.0	20	11/30/20 15:17	11/19/20	
Lead	6020A	510	mg/Kg	0.20	20	11/30/20 15:17	11/19/20	
Mercury	7471B	ND U	mg/Kg	0.40	20	11/23/20 14:31	11/20/20	

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ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Project: EPA 1340 IVBA Metals Sample Matrix: Soil

Sample Name: 2031364-29 Lab Code: K2009986-002 Service Request: K2009986

Date Collected: 10/20/20 14:42 Date Received: 11/02/20 10:00

Basis: Dry

Total Metals - IVBA Analysis

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	47.8	mg/Kg	0.20	20	11/30/20 16:53	11/18/20	
Arsenic	6020A	58800	mg/Kg	100	1000	11/30/20 17:07	11/18/20	
Lead	6020A	2250	mg/Kg	0.20	20	11/30/20 16:53	11/18/20	
Mercury	7471B	956	mg/Kg	80	4000	11/17/20 13:26	11/17/20	

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 19 of 35

ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated

Project: EPA 1340 IVBA Metals

Sample Matrix: Soil

Sample Name: 2031364-29 Lab Code: K2009986-002 Service Request: K2009986

Date Collected: 10/20/20 14:42 Date Received: 11/02/20 10:00

Basis: Dry

IVBA Metals

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	0.43	mg/Kg	0.20	20	11/30/20 15:19	11/19/20	
Arsenic	6020A	109	mg/Kg	2.0	20	11/30/20 15:19	11/19/20	
Lead	6020A	2080	mg/Kg	0.20	20	11/30/20 15:19	11/19/20	
Mercury	7471B	10.8	mg/Kg	0.40	20	11/23/20 14:33	11/20/20	

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ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated EPA 1340 IVBA Metals

Project: Sample Matrix: Soil

Sample Name: Method Blank Lab Code: KQ2018111-01 Service Request: K2009986

Date Collected: NA Date Received: NA

Basis: Dry

Total Metals - IVBA Analysis

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/Kg	0.050	5	11/30/20 16:47	11/18/20	
Arsenic	6020A	ND U	mg/Kg	0.50	5	11/30/20 16:47	11/18/20	
Lead	6020A	ND U	mg/Kg	0.050	5	11/30/20 16:47	11/18/20	

Printed 12/1/2020 5:10:34 PM Superset Reference:

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Report ID: 1001131481



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ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Project: EPA 1340 IVBA M Sample Matrix: Soil

Sample Name: Method Blank Lab Code: KQ2018110-01 Service Request: K2009986

Date Collected: NA Date Received: NA

Basis: Dry

IVBA Metals

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Antimony	6020A	ND U	mg/Kg	0.050	5	11/30/20 15:11	11/19/20	
Arsenic	6020A	ND U	mg/Kg	0.50	5	11/30/20 15:11	11/19/20	
Lead	6020A	ND U	mg/Kg	0.050	5	11/30/20 15:11	11/19/20	

Printed 12/1/2020 5:10:34 PM Superset Reference:

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ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated EPA 1340 IVBA Metals Project:

Service Request: K2009986 Date Collected: NA

Sample Matrix: Soil Date Received: NA

Method Blank

Sample Name: Lab Code: KQ2018050-01 Basis: Dry

Total Metals - IVBA Analysis

	Analysis							
Analyte Name	Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	me/Ke	0.020	1	11/17/20 12:40	11/17/20	

Printed 12/1/2020 5:10:35 PM Superset Reference:

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ALS Group USA, Corp. dba ALS Environmental

Analytical Report

Client: BC Laboratories, Incorporated EPA 1340 IVBA Metals Project:

Service Request: K2009986 Date Collected: NA

Sample Matrix: Soil Date Received: NA

Basis: Dry

Sample Name: Method Blank Lab Code: KQ2018397-01

IVBA Metals

Analysis Analyte Name Method MRL Dil. Date Extracted Q Result Units Date Analyzed Mercury 7471B ND U mg/Kg 0.40 20 11/23/20 14:26 11/20/20

Printed 12/1/2020 5:10:35 PM Superset Reference:

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated

Project EPA 1340 IVBA Metals Sample Matrix:

Soil

Service Request: K2009986

Date Collected: 10/20/20 Date Received: 11/02/20

Date Analyzed: 11/30/20

Replicate Sample Summary Total Metals - IVBA Analysis

Sample Name: 2031364-29 K2009986-002 Lab Code:

Units: mg/Kg Basis: Dry

				Duplicate Sample			
	Analysis		Sample	KQ2018111-03			
Analyte Name	Method	MRL	Result	Result	Average	RPD	RPD Limit
Antimony	6020A	0.20	47.8	44.4	46.1	7	20
Arsenic	6020A	99	58800	57600	58200	2	20
Lead	6020A	0.20	2250	2110	2180	6	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Report ID: 1001131481



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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project EPA 1340 IVBA Metals

Date Collected: 10/20/20 Date Received: 11/02/20

Sample Matrix: Soil

Date Analyzed: 11/30/20

Service Request: K2009986

Replicate Sample Summary IVBA Metals

2031364-29 Sample Name: Lab Code: K2009986-002 Units: mg/Kg Basis: Dry

Duplicate Sample KQ2018110-04 Analysis Sample RPD Limit Analyte Name Method MRL Result Result RPD Average Antimony 6020A 0.20 0.43 0.41 0.42 20 Arsenic 6020A 2.0 109 104 107 5 20 2060 20 Lead 6020A 0.20 2080 2040 2

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Report ID: 1001131481

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 26 of 35

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project EPA 1340 IVBA Metals

Date Collected: 10/20/20 Date Received: 11/02/20

Service Request: K2009986

Sample Matrix: Soil

Date Analyzed: 11/17/20

Replicate Sample Summary Total Metals - IVBA Analysis

2031364-29 Sample Name: K2009986-002 Lab Code:

Units: mg/Kg Basis: Dry

Duplicate Sample

KQ2018050-03 Analysis Sample Analyte Name Method MRL Result Result RPD RPD Limit Average Mercury 7471B 956 988 20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Report ID: 1001131481



Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 27 of 35

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project EPA 1340 IVBA Metals

Date Collected: 10/20/20 Date Received: 11/02/20

Sample Matrix: Soil

Date Analyzed: 11/23/20

Service Request: K2009986

Replicate Sample Summary

IVBA Metals

2031364-29 Sample Name: Lab Code: K2009986-002 Units: mg/Kg Basis: Dry

Duplicate Sample

KQ2018397-04 Analysis Sample Analyte Name Method MRL Result Result RPD RPD Limit Average Mercury 7471B 0.39 10.8 10.5 10.7 20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Report ID: 1001131481 Page 150 of 166



Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 28 of 35

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated EPA 1340 IVBA Metals Project:

Sample Matrix: Soil Service Request: Date Collected:

K2009986 10/20/20

Date Received: 11/02/20

Date Analyzed: 11/30/20

Date Extracted: 11/18/20

Matrix Spike Summary Total Metals - IVBA Analysis

Sample Name: 2031364-29 Lab Code: K2009986-002

Analysis Method: 6020A Prep Method: EPA 3050B Units: mg/Kg Basis: Dry

Matrix Spike KQ2018111-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Antimony	47,8	141	99.0	94	75-125
Arsenic	58800	58100	99	-687 #	75-125
Lead	2250	2390	99.0	135 #	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Matrix Spike and Matrix Spike Duplicate Data is presented for information purposes only. The matrix may or may not be relevant to samples reported in this report. The laboratory evaluates system performance based on the LCS and LCSD control limits.

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals

Sample Matrix: Soil

Service Request: Date Collected: K2009986 10/20/20

Date Received: 11/02/20

Date Analyzed: 11/30/20 Date Extracted: 11/19/20

Matrix Spike Summary IVBA Metals

Sample Name: 2031364-29 Lab Code: K2009986-002

Analysis Method: 6020A

Prep Method: EPA 9200.2-86

Units: mg/Kg Basis: Dry

Matrix Spike KQ2018110-05

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Antimony	0.43	72.1	98.0	73 N	75-125
Arsenic	109	199	98.0	92	75-125
Lead	2080	2070	98.0	-8 #	75-125

Results flagged with an asterisk (*) indicate values outside control criteria.

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 30 of 35

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated
Project: EPA 1340 IVBA Metals

EPA 1340 IVBA Metals Soil Service Request: Date Collected: K2009986 10/20/20

Date Received: Date Analyzed: 11/02/20 11/17/20

Date Extracted: 11/17/20

Matrix Spike Summary Total Metals - IVBA Analysis

Sample Name: 2031364-29 Lab Code: K2009986-002

Analysis Method: 7471B Prep Method: Method

Sample Matrix:

Units: mg/Kg Basis: Dry

Matrix Spike KQ2018050-04

 Analyte Name
 Sample Result
 Result
 Spike Amount
 % Rec
 % Rec Limits

 Mercury
 956
 1000
 0.5
 9776 #
 80-120

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated EPA 1340 IVBA Metals Project:

Sample Matrix: Soil Date Received: 11/02/20 Date Analyzed: 11/23/20 Date Extracted: 11/20/20

Service Request:

Date Collected:

Matrix Spike Summary IVBA Metals

Sample Name: 2031364-29 Lab Code: K2009986-002

Analysis Method: 7471B Prep Method: Method Units: mg/Kg Basis: Dry

K2009986

10/20/20

Matrix Spike KQ2018397-05

Sample Result Analyte Name Result Spike Amount % Rec % Rec Limits Mercury 10.8 26.3 11.8 131 N 80-120

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Matrix Spike and Matrix Spike Duplicate Data is presented for information purposes only. The matrix may or may not be relevant to samples reported in this report. The laboratory evaluates system performance based on the LCS and LCSD control limits.

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Report ID: 1001131481



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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals Service Request: K2009986 Date Analyzed: 11/30/20

Sample Matrix: Soil

Lab Control Sample Summary Total Metals – IVBA Analysis

> Units:mg/Kg Basis:Dry

Lab Control Sample KQ2018111-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony	6020A	82.6	228	36	10-132
Arsenic	6020A	93.8	104	90	64-119
Lead	6020A	102	92.4	110	70-130

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Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_CLMBK.pdf Page 33 of 35

ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals Service Request: K2009986 Date Analyzed: 11/30/20

Sample Matrix: Soil

Lab Control Sample Summary IVBA Metals

> Units:mg/Kg Basis:Dry

Lab Control Sample KQ2018110-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Antimony	6020A	102	100	102	80-120
Arsenic	6020A	97.7	100	98	80-120
Lead	6020A	106	100	106	80-120

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals Service Request: K2009986 Date Analyzed: 11/17/20

Sample Matrix: Soil

Lab Control Sample Summary Total Metals - IVBA Analysis

> Units:mg/Kg Basis:Dry

Lab Control Sample KQ2018050-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	18.5	26.6	70	41-110

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ALS Group USA, Corp. dba ALS Environmental

QA/QC Report

Client: BC Laboratories, Incorporated Project: EPA 1340 IVBA Metals Service Request: K2009986 Date Analyzed: 11/23/20

Sample Matrix: So

Lab Control Sample Summary IVBA Metals

> Units:mg/Kg Basis:Dry

Lab Control Sample KQ2018397-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	10.3	12.0	86	80-120

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Kellogg, ID 83837-0929

(208) 784-1258

www.svl.net

 BC Laboratories
 Project Name: No Project

 4100 Atlas Court
 Work Order:
 X0K0037

 Bakersfield, CA 93308
 Reported:
 12-Nov-20 11:47

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
2031364-12	X0K0037-01	Solid	20-Oct-20 16:23	03-Nov-2020	
2031364-18	X0K0037-02	Solid	22-Oct-20 12:13	03-Nov-2020	
2031364-22	X0K0037-03	Solid	22-Oct-20 10:33	03-Nov-2020	
2031364-29	X0K0037-04	Solid	20-Oct-20 14:42	03-Nov-2020	

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.

Sample preparation is defined by the client as per their Data Quality Objectives.

This report supercedes any previous reports for this Work Order. The complete report includes pages for each sample, a full QC report, and a notes section.

Analyses were performed in accordance with SVL standard operating procedures and calibrations were performed and met SVL internal OC criteria.

The results presented in this report relate only to the samples, and meet all requirements of the NELAC Standards unless otherwise noted. This report shall not be reproduced except in full, without the written approval of SVL Analytical, Inc.

Case Narrative: X0K0037

The state of origin is not indicated on the COC.

SVL holds the following certifications:

AZ 0538, ID ID00019 & ID00965 (Microbiology), NV:ID000192007A, SC:58004001, UT(TNI):ID000192015-1, WA:C573

Page 1 of 7

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Report ID: 1001131481 4100 Atla

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One Government Gulch - PO Box 929

Kellogg, ID 83837-0929

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4100 Atlas Court Bakersfield, CA 93308

Project Name: No Project Work Order:

Reported:

X0K0037 12-Nov-20 11:47

Client Sample ID: 2031364-12

SVL Sample ID: X0K0037-01 (Solid)

Sample Report Page 1 of 1

Sampled: 20-Oct-20 16:23 Received: 03-Nov-20 Sampled By

		-			<u> </u>			Drawing-to	ou by.	
Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Acid/Base Accoun	nting & Sulfur Forms									
Modified Sobek	ABA	-0.8	TCaCO3/kT	0.3			N/A		11/11/20 09:55	
Modified Sobek	AGP	0.8	TCaCO3/kT	0.3			N/A		11/10/20 16:33	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3			X046057	PRM	11/11/20 09:55	
Modified Sobek	Non-extractable Sulfur	< 0.0100	96	0.0100	0.0084		X045086	PRM	11/10/20 15:02	
Modified Sobek	Non-Sulfate Sulfur	0:0268	96	0.0100	0.0084		X045086	PRM	11/10/20 16:33	
Modified Sobek	Pyritic Sulfur	0:03	%	0:0100			N/A		11/10/20 16:33	
Modified Sobek	Sulfate Sulfur	0:08	%	0:0100			N/A		11/10/20 16:33	
Modified Sobek	Total Sulfur	0.102	%	0:0100	0.0084		X045086	PRM	11/04/20 16:27	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Herman J. Haring Project Manager

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Kellogg, ID 83837-0929

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4100 Atlas Court Bakersfield, CA 93308

Project Name: No Project Work Order:

Reported:

X0K0037 12-Nov-20 11:47

Client Sample ID: 2031364-18

SVL Sample ID: X0K0037-02 (Solid)

Sample Report Page 1 of 1

Sampled: 22-Oct-20 12:13 Received: 03-Nov-20 Sampled By

	•	-						aniiipo	ou sy.	
Method	Analyte	Result	Units	RL.	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Acid/Base Accoun	nting & Sulfur Forms									
Modified Sobek	ABA	-0.3	TCaCO3/kT	0.3			N/A		11/11/20 09:55	
Modified Sobek	AGP	0.3	TCaCO3/kT	0.3			N/A		11/10/20 16:36	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3			X046057	PRM	11/11/20 09:55	
Modified Sobek	Non-extractable Sulfur	< 0.0100	96	0:0100	0.0084		X045086	PRM	11/10/20 15:05	
Modified Sobek	Non-Sulfate Sulfur	0.0100	96	0:0100	0.0084		X045086	PRM	11/10/20 16:36	
Modified Sobek	Pyritic Sulfur	0:01	%	0:0100			N/A		11/10/20 16:36	
Modified Sobek	Sulfate Sulfur	0.08	%	0:0100			N/A		11/10/20 16:36	
Modified Sobek	Total Sulfur	0:0902	96	0:0100	0.0084		X045086	PRM	11/04/20 16:30	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Herman J. Haring Project Manager

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4100 Atlas Court Bakersfield, CA 93308

Project Name: No Project Work Order:

Reported:

X0K0037 12-Nov-20 11:47

Client Sample ID: 2031364-22

SVL Sample ID: X0K0037-03 (Solid)

Sample Report Page 1 of 1

Sampled: 22-Oct-20 10:33 Received: 03-Nov-20 Sampled By

		-						Drawing-to	ou say.	
Method	Analyte	Result	Units	RL.	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Acid/Base Accoun	nting & Sulfur Forms									
Modified Sobek	ABA	-1.5	TCaCO3/kT	0.3			N/A		11/11/20 09:55	
Modified Sobek	AGP	1.5	TCaCO3/kT	0.3			N/A		11/10/20 16:39	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3			X046057	PRM	11/11/20 09:55	
Modified Sobek	Non-extractable Sulfur	< 0.0100	96	0.0100	0.0084		X045086	PRM	11/10/20 15:08	
Modified Sobek	Non-Sulfate Sulfur	0:0484	96	0.0100	0.0084		X045086	PRM	11/10/20 16:39	
Modified Sobek	Pyritic Sulfur	0:05	%	0.0100			N/A		11/10/20 16:39	
Modified Sobek	Sulfate Sulfur	0.16	%	0:0100			N/A		11/10/20 16:39	
Modified Sobek	Total Sulfur	0.205	%	0:0100	0.0084		X045086	PRM	11/04/20 16:33	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

Herman J. Haring Project Manager

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4100 Atlas Court

Project Name: No Project Work Order:

Reported:

X0K0037 12-Nov-20 11:47

Bakersfield, CA 93308

Client Sample ID: 2031364-29 SVL Sample ID: X0K0037-04 (Solid)

Sample Report Page 1 of 1

Sampled: 20-Oct-20 14:42 Received: 03-Nov-20 Sampled By:

Method	Analyte	Result	Units	RL.	MDL	Dilution	Batch	Analyst	Analyzed	Notes
Acid/Base Accoun	ting & Sulfur Forms									
Modified Sobek	ABA	-0.4	TCaCO3/kT	0.3			N/A		11/11/20 09:55	
Modified Sobek	AGP	0.4	TCaCO3/kT	0.3			N/A		11/10/20 16:42	
Modified Sobek	ANP	< 0.3	TCaCO3/kT	0.3			X046057	PRM	11/11/20 09:55	
Modified Sobek	Non-extractable Sulfur	0.0171	96	0.0100	0.0084		X045086	PRM	11/10/20 15:11	
Modified Sobek	Non-Sulfate Sulfur	0.0292	96	0.0100	0.0084		X045086	PRM	11/10/20 16:42	
Modified Sobek	Pyritic Sulfur	0:01	%	0:0100			N/A		11/10/20 16:42	
Modified Sobek	Sulfate Sulfur	0.23	%	0:0100			N/A		11/10/20 16:42	
Modified Sobek	Total Sulfur	0.257	%	0:0100	0.0084		X045086	PRM	11/04/20 16:36	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

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Kellogg, ID 83837-0929

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Project Name: No Project Work Order: 4100 Atlas Court X0K0037 Bakersfield, CA 93308 Reported: 12-Nov-20 11:47

Quality Contro	l - BLANK Data							
Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
Acid/Base Acco	ounting & Sulfur For	ms						
Modified Sobek	ANP	TCaCO3/kT	< 0.3		0.3	X046057	11-Nov-20	
Modified Sobek	Non-extractable	%	< 0.0100	0.0084	0.0100	X045086	10-Nov-20	
	Sulfur							
Modified Sobek	Non-Sulfate Sulfur	%	< 0.0100	0.0084	0.0100	X045086	10-Nov-20	
Modified Sobek	Total Sulfur	%	< 0.0100	0:0084	0.0100	X045086	04-Nov-20	

Quality Contro	ol - LABORATORY	CONTROL SAMI	PLE Data						
Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
Acid/Base Acce	ounting & Sulfur Fo	rms							
Acid/Base Acco	ounting & Sulfur Fo	rms TCaCO3/kT	1050	1000	105	80 - 120	X046057	11-Nov-20	

Quality Contro	d - DUPLICATE Dat	a							
Method	Analyte	Units	Duplicate Result	Sample Result	RPD	RPD Limit	Batch and Source ID	Analyzed	Notes
Acid/Base Acco	ounting & Sulfur For	ms							
Modified Sobek	ANP	TCaCO3/kT	10.5	10.8	2.4	20	X046057 - X0J0484-02	11-Nov-20	
Modified Sobek	Non-extractable Sulfur	56	< 0.0100	<0.0100	UDL	20	X045086 - X0J0484-0]	10-Nov-20	
Modified Sobek	Non-Sulfate Sulfur	16	0.120	0.0387	102.0	20	X045086 - X0J0484-01	10-Nov-20	R2B
Modified Sobek	Total Sulfer	96	0.497	0.487	1.9	20	X045086 - X0J0484-01	04-Nov-20	

SVL holds the following certifications:

AZ 0538, ID: ID00019 & ID00965 (Microbiology), NV: ID000192007A, SC:58004001, UT(TNI): ID000192015-1, WA: C573

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. All results listed in this report are for the exclusive use of the submitting party. BC Laboratories, Inc. assumes no responsibility for report alteration, separation, detachment or third party interpretation. 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com

Report ID: 1001131481



Subcontract Report for 2031364 PDF File Name: WO_2031364_SUB_SVLNL.pdf Page 7 of 7



One Government Gulch - PO Box 929

Kellogg, ID 83837-0929

X0K0037

12-Nov-20 11:47

(208) 784-1258

www.svl.net

Project Name: No Project Work Order: 4100 Atlas Court Bakersfield, CA 93308 Reported:

Notes and Definitions

R2B RPD exceeded the laboratory acceptance limit. LCS Laboratory Control Sample (Blank Spike)

RPD Relative Percent Difference

UDL A result is less than the detection limit

0.30R>S % recovery not applicable; spike level is less than 30% of the sample concentration

A result is less than the reporting limit <RL

MRL Method Reporting Limit MDL Method Detection Limit N/ANot Applicable

SVL holds the following certifications:

AZ 0538, ID: ID00019 & ID00965 (Microbiology), NV: ID000192007A, SC 58004001, UT(TNI): ID000192015-1, WA: C573

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Report ID: 1001131481

ECM Consultants - Costa Mesa

Estimated Value (CLP Flag)

3525 Hyland Ave Costa Mesa, CA 92626 Reported: 02/18/2021 9:27

Project: USFS- Big Blue Mill

Project Number: [none]
Project Manager: David Allison

Notes And Definitions

S08

Z1

	3,
MDL	Method Detection Limit
ND	Analyte Not Detected
PQL	Practical Quantitation Limit
A01	Detection and quantitation limits are raised due to sample dilution.
A02	The difference between duplicate readings is less than the quantitation limit.
A03	The sample concentration was more than 4 times the spike level.
A07	Detection and quantitation limits were raised due to sample dilution caused by high analyte concentration or matrix interference.
Q01	Sample precision is not within the control limits.
Q02	Matrix spike precision is not within the control limits.
Q03	Matrix spike recovery(s) was(were) not within the control limits.

The internal standard on the sample was not within the control limits.

Sample was analysed twice and both times internal standards were low.

Report ID: 1001131481 4100 Atlas Court Bakersfield, CA 93308 (661) 327-4911 FAX (661) 327-1918 www.bclabs.com Page 166 of 166

Appendix G XRF and Laboratory Correlation Graphs

Figure G1

Correlation of XRF Sample Field Readings and Analytical Results for Lead

Big Blue Mill Site

Site Inspection

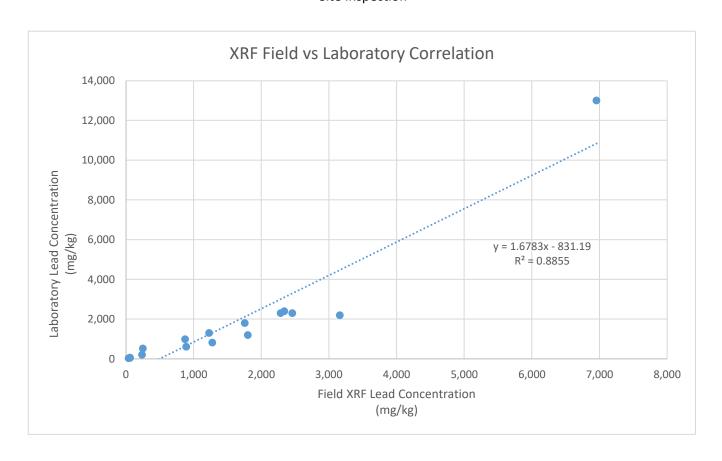


Figure G2
Correlation of XRF Sample Field Readings and Analytical Results for Arsenic
Big Blue Mill Site
Site Inspection

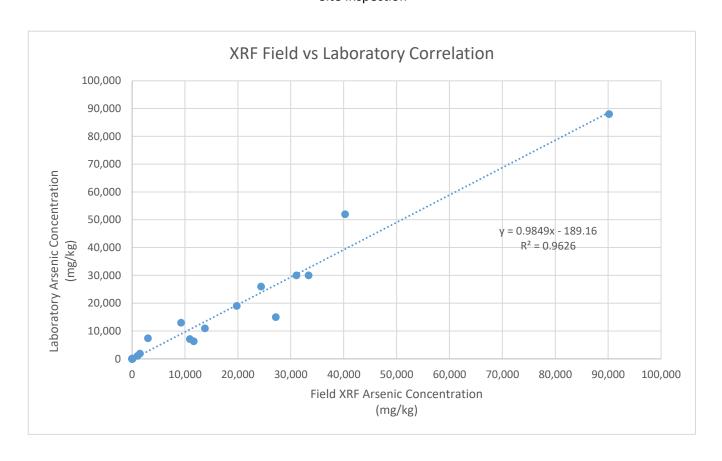


Figure G3

Correlation of XRF Sample Field Readings and Analytical Results for Mercury

Big Blue Mill Site

Site Inspection

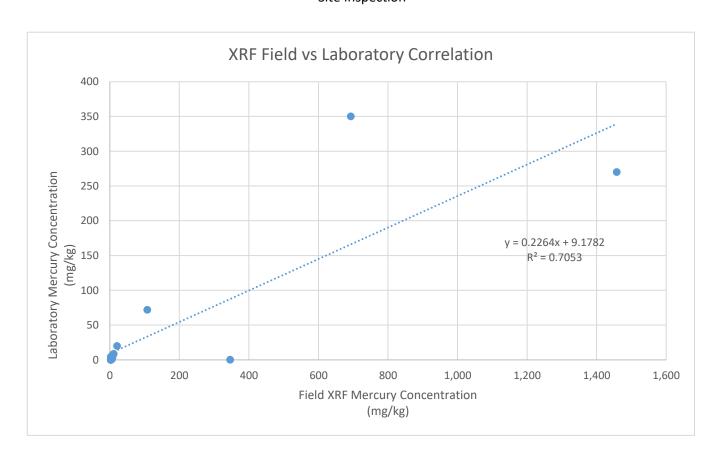


Figure G4
Correlation of XRF Sample Field Readings and Analytical Results for Mercury
Big Blue Mill Site
Site Inspection

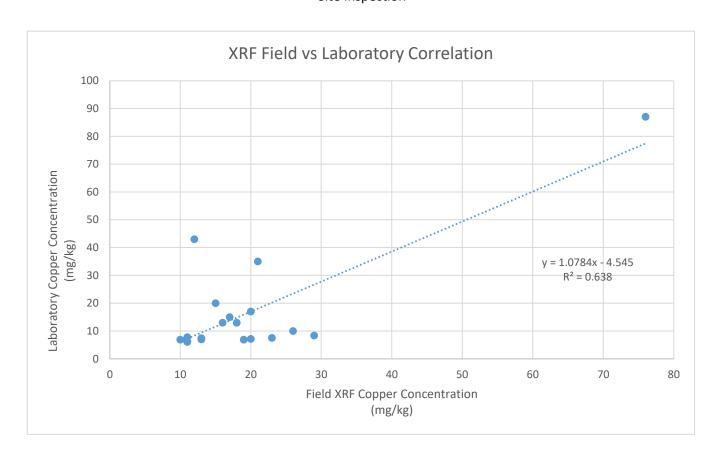


Figure G5
Correlation of XRF Sample Field Readings and Analytical Results for Antimony
Big Blue Mill Site
Site Inspection

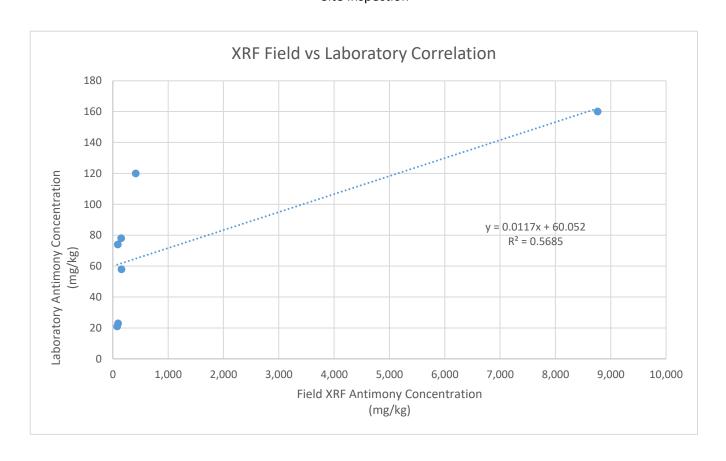
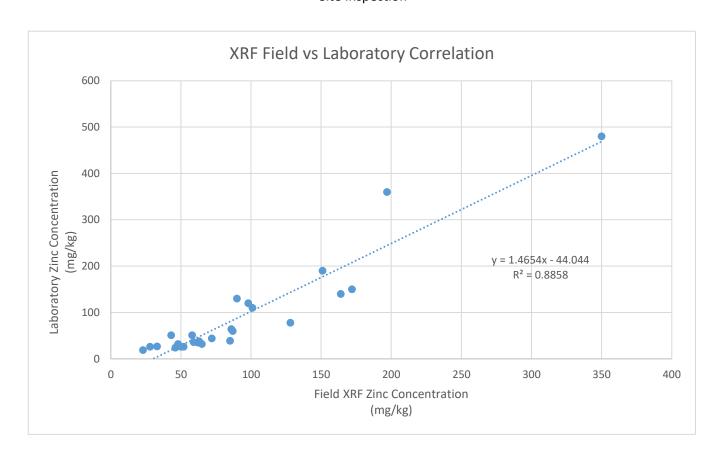


Figure G6
Correlation of XRF Sample Field Readings and Analytical Results for Zinc
Big Blue Mill Site
Site Inspection



Appendix H Risk Assessment Tables

Soil COPC and COPEC Selection Summary (XRF Data) Big Blue Mill Kern County, CA

-									Kern County, C	Α					
Analyte	Number of Detections	Number of Samples	Percent Detections (%)	Max Concentration or Max DL (mg/kg)	Background Screening Criteria (mg/kg)	EPA Residential RSL (mg/kg)	ESV (mg/kg)	Percent Detections > 5%?	Max > Background?	Max > HH RSL?	Max > ESV?	R ≥ 0.7	HH COPC?	ECO COPEC?	Selection Rationale
Antimony	18	233	8%	8,764	0.8	31	0.27	Y	Y	Υ	Y	Y	Y	Y	Maximum concentration exceeds background (labortory) and both human and ecological screening values. XRF background value not available.
Arsenic	233	233	100.0%	90,189	57	0.68	18	Y	Y	Υ	Υ	Y	Y	Y	Maximum concentration exceeds background and both human and ecological screening values.
Barium	0	0	0.0%		246	15000	110	N	N	Ν	N		N	N	Not retained - less than 5% detections.
Beryllium	0	0	0.0%		0.47	160	2.5	N	N	N	N		N	N	Not retained - less than 5% detections.
Cadmium	4	233	1.7%	17	0.52	71	0.36	N	Y	N	Υ	N	N	N	Maximum concentration exceeds background (laboratory value) and ecological screening value. XRF background value not available.
Chromium	108	233	46.4%	62	72	120000	0.4	Y	N	N	Y	N	N	N	Maximum concentration less than background laboratory value.
Cobalt	0	233	0.0%	104	18.9	23	13	N	Y	Y	Y		N	N	Not retained - less than 5% detections.
Copper	218	233	93.6%	88	78	3,100	28	Y	Y	N	Υ	N	N	Υ	Maximum concentration exceeds background and ecological screening value.
Lead	233	233	100.0%	6,956	177	80	11	Y	Y	Y	Υ	Y	Y	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Mercury	156	233	67.0%	1,458	9	1	0.013	Y	Y	Υ	Υ	Y	Y	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Molybdenum	149	233	63.9%	18	18	390	0.52	Y	N	N	Υ		N	N	Maximum concentration less than background (laboratory value). XRF background value not available.
Nickel	219	233	94.0%	37	39	820	38	Y	N	N	N	N	N	N	Not retained; maximum concentration less than background and human health and ecological screening criteria.
Selenium	6	233	2.6%	4	1.1	390	0.52	N	Υ	N	Υ		N	N	Not retained - less than 5% detections.
Silver	32	233	13.7%	210	0.67	390	4.2	Υ	Y	N	Υ		N	Υ	Maximum concentration exceeds background and ecological screening value.
Thallium	0	0	0.0%		0.49	0.78	0.42	N	N	N	N		N	N	Not retained - less than 5% detections.
Vanadium	229	233	98.3%	365	627	390	2	Y	N	N	Y	N	N	N	Maximum concentration less than background (laboratory value). XRF background value not available.
Zinc	233	233	100.0%	550	384	23,000	46	Y	Y	N	Y	Y	N	Y	Maximum concentration exceeds background and ecological screening value.

Notes:

red text is DTSC number
BG = Background (3 times laboratory result or RL if ND)
COPEC = contaminant of potential ecological concern

COPC = contaminant of potential concern EPA = Environmental Protection Agency ESV = Ecological Screening Value
DL = Detection Limit
mg/kg = milligram per kilogram

RSL = Regional Screening Level

Max > BG? = Is the maximum concentration greater than Background Screening Criterion (3 X XRF result or 3 x Lab result if XRF not available)?

Max > HH RSL? = Is the maximum concentration greater than Human Health Regional Screening Level?

Max > ESV? = Is the maximum concentration greater than the Ecological Screening Value?

HH COPC? = Is analyte retained as a human health contaminant of potential concern?

ECO COPEC? = Is analyte retained as a contaminant of potential ecological concern?

Soil COPC and COPEC Selection Summary (Laboratory Data) Big Blue Mill Kern County, California

Analyte	Number of Detections	Number of Samples	Percent Detections (%)	Max Concentration or Max DL (mg/kg)	Background Screening Criteria (mg/kg)	EPA Residential RSL (mg/kg)	ESV (mg/kg)	Percent Detections > 5%?	Max > Background?	Max > HH RSL?	Max > ESV?	$R \ge 0.7$ $R^2 \ge 0.8$	HH COPC?	ECO COPEC?	Selection Rationale
Antimony	15	26	58%	160	0.8	31	0.27	Υ	Y	Y	Υ	N	Υ	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Arsenic	25	26	96.2%	88,000	60	0.68	18	Y	Y	Υ	Y	Y	Y	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Barium	25	26	96.2%	210	246	15000	110	Υ	N	N	Υ		N	N	Not retained; maximum concentration less than the background screening criterion.
Beryllium	2	26	7.7%	0.620	0.47	160	2.5	Y	Y	N	N		N	N	Not retained; maximum concentration less than human and ecological screening values.
Cadmium	16	26	61.5%	630	0.52	71	0.36	Y	Y	Y	Υ	N	Y	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Chromium	25	26	96.2%	34	30	120000	0.4	Y	Y	N	Υ	N	N	Y	Maximum concentration exceeds background and ecological screening value.
Cobalt	25	26	96.2%	7.9	18.9	23	13	Y	N	N	N		N	N	Not retained; maximum concentration less than the background screening criterion.
Copper	26	26	100.0%	87	30	3,100	28	Y	Y	N	Υ	N	N	Y	Maximum concentration exceeds background and ecological screening value.
Lead	16	26	61.5%	13,000	129	80	11	Y	Y	Υ	Υ	Y	Y	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Mercury	22	26	84.6%	350	1.86	1	0.013	Y	Y	Y	Y	Υ	Y	Υ	Maximum concentration exceeds background and both human and ecological screening values.
Molybdenum	3	26	11.5%	4.3	0.5	390	0.52	Y	Y	N	Y		N	Υ	Maximum concentration exceeds background and ecological screening value.
Nickel	24	26	92.3%	10	14.7	820	38	Y	N	N	N	N	N	N	Not retained; maximum concentration less than background screening criterion.
Selenium	5	26	19.2%	3.9	1.1	390	0.52	Y	Y	N	Y		N	Y	Maximum concentration exceeds background and ecological screening value.
Silver	15	26	57.7%	69	0.67	390	4.2	Y	Y	N	Y		N	Y	Maximum concentration exceeds background and ecological screening value.
Thallium	0	26	0.0%	0.49	0.49	0.78	0.42	N	N	N	Y		N	N	Not retained - less than 5% detections.
Vanadium	26	26	100.0%	65	90	390	2	Y	N	N	Y	N	N	N	Not retained; maximum concentration less than background screening criterion.
Zinc	26	26	100.0%	480	234	23,000	46	Y	Y	N	Y	Y	N	Y	Maximum concentration exceeds background and ecological screening value.
Benzene	1	4	25.0%	0.0011	N/A	0.33	24	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Toluene	2	4	50.0%	0.0014	N/A	1,100	23	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Acenaphthylene	1	4	25.0%	0.0012	N/A		120	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Anthracene	1	4	25.0%	0.00077	N/A	17,000	6.8	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Benzo[a]anthracene	4	4	100.0%	0.0056	N/A	1.1	0.73	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Benzo[a]pyrene	4	4	100.0%	0.021	N/A	0.11	62	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Benzo[b]fluoranthene	4	4	100.0%	0.013	N/A	1.1	18	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Benzo[g,h,i]perylene	4	4	100.0%	0.025	N/A		25	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Benzo[k]fluoranthene	2	4	50.0%	0.0026	N/A	11	71	Υ	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.
Chrysene	4	4	100.0%	0.0064	N/A	110	3.1	Y	N/A	N	N	N/A	N	N	Not retained; maximum concentration less than human and ecological screening values.

USFS - Site Inspection Table H1-2 June 2021

Soil COPC and COPEC Selection Summary (Laboratory Data) Big Blue Mill

Kern County, California

Analyte	Number of Detections	Number of Samples	Percent Detections (%)	or May III	Background Screening Criteria (mg/kg)	EPA Residential RSL (mg/kg)	ESV (mg/kg)	Percent Detections > 5%?	Max > Background?	Max > HH RSL?	Max > ESV?	$R \ge 0.7$ $R^2 \ge 0.8$	HH COPC?	ECO COPEC?	Selection Rationale
Dibenz(a,h)anthracene	2	4	50.0%	0.0049	N/A	0.028		Y	N/A	N	N	N/A	N	I N I	Not retained; maximum concentration less than human and ecological screening values.
Fluoranthene	4	4	100.0%	0.0097	N/A	2,400	10	Y	N/A	N	N	N/A	N	l N I	Not retained; maximum concentration less than human and ecological screening values.
Indeno[1,2,3-cd]pyrene	2	4	50.0%	0.0055	N/A	1.1	71	Y	N/A	N	N	N/A	N	IN I	Not retained; maximum concentration less than human and ecological screening values.
Phenanthrene	2	4	50.0%	0.0013	N/A		6	Y	N/A	N	N	N/A	N	NI	Not retained; maximum concentration less than human and ecological screening values.
Pyrene	4	4	100.0%	0.0082	N/A	1,800	10	Y	N/A	N	N	N/A	N	l N I	Not retained; maximum concentration less than human and ecological screening values.

Notes:

BG = Background (3 times laboratory result or RL if ND) COPEC = contaminant of potential ecological concern COPC = contaminant of potential concern EPA = Environmental Protection Agency

ESV = Ecological Screening Value DL = Detection Limit mg/kg = milligram per kilogram RSL = Regional Screening Level

Max > BG? = Is the maximum concentration greater than Background Screening Criterion (3 X laboratory result or RL if ND)? Max > HH RSL? = Is the maximum concentration greater than Human Health Regional Screening Level? Max > ESV? = Is the maximum concentration greater than the Ecological Screening Value? HH COPC? = Is analyte retained as a human health contaminant of potential concern? ECO COPEC? = Is analyte retained as a contaminant of potential ecological concern?

Sediment COPC and COPEC Selection Summary (Laboratory Data) Bia Blue Mill

	5.9	Diac	
Kern	Cou	ınty,	California

-									Julity, Calliornia							
Analyte	Number of Detections	Number of Samples	Percent Detections (%)	Max Concentration or Max DL (mg/kg)	Background Screening Criteria (mg/kg)	EPA Residential RSL (mg/kg)	ESV (mg/kg)	Percent Detections > 5%?	Max > Background?	Max > HH RSL?	Max > ESV?	HH COPC?	ECO COPEC?	Selection Rationale		
Antimony	1	3	33%	0.13	<0.8	31	NE	Y	Y	N	N	N	N	Not retained; maximum concentration less than human screening value and no ecological screening value established.		
Arsenic	3	3	100.0%	32	2.7	0.11	9.79	Y	Y	Y	Y	Y	Y	Maximum concentration exceeds background and both human and ecological screening values.		
Barium	3	3	100.0%	31	52	15000	NE	Y	N	N	N	N	N	Not retained; maximum concentration less than the background screening criterion.		
Beryllium	1	3	33.3%	0.22	<0.47	16	NE	Υ	Y	N	N	N	N	Not retained; maximum concentration less than human screening value and no ecological screening value established.		
Cadmium	1	3	33.3%	0.31	<0.52	71	0.99	Y	Y	N	N	N	N	Not retained; maximum concentration less than human and ecological screening values.		
Chromium	3	3	100.0%	7.2	9.2	120000	43.4	Y	N	N	N	N	N	Not retained; maximum concentration less than background screening criterion.		
Cobalt	3	3	100.0%	3.4	5.3	23	NE	Y	N	N	N	N	N	Not retained; maximum concentration less than the background screening criterion.		
Copper	3	3	100.0%	3.8	5.4	3,100	31.6	Y	N	N	N	N	N	Not retained; maximum concentration less than background screening criterion.		
Lead	1	3	33.3%	2.6	<4.1	80	35.8	Y	Y	N	N	N	N	Not retained; maximum concentration less than human and ecological screening values.		
Mercury	3	3	100.0%	0.55	<0.016	1	0.18	Y	Y	N	Y	N	Y	Maximum concentration exceeds background and ecological screening value.		
Molybdenum	0	3	0.0%	0.5	<0.5	390	NE	N	N	N	N	N	N	Not retained - less than 5% detections.		
Nickel	3	3	100.0%	3.3	3.9	820	22.7	Y	N	N	N	N	N	Not retained; maximum concentration less than background screening criterion.		
Selenium	2	3	66.7%	1.8	<1.1	390	0.9	Y	Y	N	Y	N	Y	Maximum concentration exceeds background and ecological screening value.		
Silver	0	3	0.0%	0.67	<0.67	390	1	N	N	N	N	N	N	Not retained - less than 5% detections.		
Thallium	1	3	33.3%	0.1	<0.49	0.78	NE	Y	Y	N	N	N	N	Not retained; maximum concentration less than human screening value no ecological screening value established.		
Vanadium	3	3	100.0%	35	57	390	NE	Y	N	N	N	N	N	Not retained; maximum concentration less than background screening criterion.		
Zinc	3	3	100.0%	24	30	23,000	121	Y	N	N	N	N	N	Not retained; maximum concentration less than background screening criterion.		

Notes:

BG = Background (3 times laboratory result or RL if ND) COPEC = contaminant of potential ecological concern COPC = contaminant of potential concern EPA = Environmental Protection Agency

ESV = Ecological Screening Value DL = Detection Limit mg/kg = milligram per kilogram RSL = Regional Screening Level

Max > BG? = Is the maximum concentration greater than Background Screening Criterion (3 X laboratory result or RL if ND)?

Max > HH RSL? = Is the maximum concentration greater than Human Health Regional Screening Level?

Max > ESV? = Is the maximum concentration greater than the Ecological Screening Value?

HH COPC? = Is analyte retained as a human health contaminant of potential concern?

ECO COPEC? = Is analyte retained as a contaminant of potential ecological concern?

Surface Water COPEC Selection Summary (Laboratory Data) Bia Blue Mill

	Dig Diao	
Kern	County,	California

								ourity, California							
Number of Detections	Number of Samples	Percent Detections (%)	Max Concentration or Max DL (mg/kg)	Background Screening Criteria (mg/kg)	EPA Residential RSL (mg/kg)	ESV (mg/kg)	Percent Detections > 5%?	Max > Background?	Max > HH RSL?	Max > ESV?	HH COPC?	ECO COPEC?	Selection Rationale		
0	3	0%	0.23	<0.23	N/A	30	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
3	3	100.0%	7.3	6.4	N/A	150	Y	Y	N/A	N	N	N	Not retained; maximum concentration less than ecological screening value.		
3	3	100.0%	18	18	N/A	NE	Y	N	N/A	N	N	N	Not retained; maximum concentration less than the background screening criterion.		
0	3	0.0%	0.05	<0.05	N/A	NE	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
2	3	66.7%	0.05	<0.034	N/A	0.25	Y	Y	N/A	N	N	N	Not retained; maximum concentration less than ecological screening value.		
0	3	0.0%	0.15	<0.15	N/A	74	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
3	3	100.0%	0.051	0.059	N/A	NE	Y	N	N/A	N	N	N	Not retained; maximum concentration less than the background screening criterion.		
1	3	33.3%	0.34	<0.32	N/A	9	Y	Y	N/A	N	N	N	Not retained; maximum concentration less than ecological screening value.		
2	3	66.7%	0.059	<0.021	N/A	2.5	Y	Y	N/A	N	N	N	Not retained; maximum concentration less than ecological screening value.		
3	3	100.0%	0.25	0.12	N/A	0.77	Y	Y	N/A	N	N	N	Not retained; maximum concentration less than ecological screening value.		
3	3	100.0%	6.8	6.5	N/A	NE	Y	Y	N/A	N	N	N	Not retained; maximum concentration less than ecological screening value.		
3	3	100.0%	0.45	0.48	N/A	52	Y	N	N/A	N	N	N	Not retained; maximum concentration less than background screening criterion.		
0	3	0.0%	0.25	<0.25	N/A	5	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
0	3	0.0%	0.015	<0.015	N/A	3.2	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
0	3	0.0%	0.025	<0.025	N/A	NE	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
3	3	100.0%	0.66	0.67	N/A	NE	Y	N	N/A	N	N	N	Not retained; maximum concentration less than background screening criterion.		
0	3	0.0%	2.2	<2.2	N/A	120	N	N	N/A	N	N	N	Not retained - less than 5% detections.		
	Detections 0 3 3 0 2 0 3 1 2 3 3 0 0 0 0 0 0 3	Detections Samples 0 3 3 3 0 3 2 3 0 3 3 3 1 3 2 3 3 3 3 3 0 3 0 3 0 3 0 3 3 3	Number of Detections Number of Samples Detections (%) 0 3 0% 3 3 100.0% 3 3 100.0% 0 3 0.0% 2 3 66.7% 0 3 100.0% 1 3 33.3% 2 3 66.7% 3 3 100.0% 3 3 100.0% 3 3 100.0% 0 3 0.0% 0 3 0.0% 0 3 0.0% 0 3 0.0% 0 3 0.0% 0 3 0.0% 0 3 0.0% 0 3 0.0%	Number of Detections Number of Samples Percent Detections (%) Concentration or Max DL (mg/kg) 0 3 0% 0.23 3 3 100.0% 7.3 3 3 100.0% 18 0 3 0.0% 0.05 2 3 66.7% 0.05 0 3 0.0% 0.15 3 3 100.0% 0.051 1 3 33.3% 0.34 2 3 66.7% 0.059 3 3 100.0% 0.25 3 3 100.0% 0.45 0 3 0.0% 0.25 0 3 0.0% 0.015 0 3 0.0% 0.015 0 3 0.0% 0.025 3 3 100.0% 0.66	Number of Detections Number of Samples Percent Detections (%) Concentration or Max DL (mg/kg) Background Screening Criteria (mg/kg) 0 3 0% 0.23 <0.23	Number of Detections Detections Detections Concentration or Max DL (mg/kg) Background Criteria (mg/kg) Residential RSL (mg/kg) 0 3 0% 0.23 <0.23	Number of Detections Number of Detections Concentration or Max DL (mg/kg) Background Criteria (mg/kg) Residential RSL (mg/kg) ESV (mg/kg) 0 3 0% 0.23 <0.23	Number of Detections Number of Detections (%) Concentration or Max DL (mg/kg) Screening Criteria (mg/kg) Residential RSL (mg/kg) ESV (mg/kg) Percent Detections >5%? 0 3 0% 0.23 <0.23	Number of Detections Number of Samples Number of Detections (%) Concentration of Max DL (mg/kg) Residential RSL (mg/kg) ESV (mg/kg) Percent Detections betections >5%? Background? 0 3 0% 0.23 <0.23	Number of Detections Detections Detections Particular Detections Particular (%) Concentration or Max DL (mg/kg) Residential RSL (mg/kg) ESV (mg/kg) Detection Detections (mg/kg) Max > HI Max >	Number of Detections	Number of Number of Detections Detec	Number of Detections Samples Percent Detections Samples Percent Operations		

Notes:

BG = Background (3 times laboratory result or RL if ND) COPEC = contaminant of potential ecological concern

COPC = contaminant of potential concern

EPA = Environmental Protection Agency

ESV = Ecological Screening Value DL = Detection Limit mg/kg = milligram per kilogram RSL = Regional Screening Level

N/A = Dissolved concentrations do not apply to human health surface water screening criteria which are based on total concentrations.

Max > BG? = Is the maximum concentration greater than Background Screening Criterion (3 X laboratory result or RL if ND)?

Max > HH RSL? = Is the maximum concentration greater than Human Health Regional Screening Level?

Max > ESV? = Is the maximum concentration greater than the Ecological Screening Value?

HH COPC? = Is analyte retained as a human health contaminant of potential concern?

ECO COPEC? = Is analyte retained as a contaminant of potential ecological concern?

Surface Water COPC Selection Summary (Laboratory Data) Bia Blue Mill

Kern	County,	California

Analyte	Number of Detections	Number of Samples	Percent Detections (%)	Max Concentration or Max DL (mg/L)	Background Screening Criteria (mg/L)	EPA Residential RSL (mg/L)	ESV (mg/L)	Percent Detections > 5%?	Max > Background?	Max > HH RSL?	Max > ESV?	HH COPC?	ECO COPEC?	Selection Rationale		
Antimony	3	3	100%	0.19	0.30	5.6	N/A	Y	N	N	N/A	N	N	Not retained; maximum concentration less than the background screening criterion.		
Arsenic	3	3	100.0%	6.7	5.7	0.018	N/A	Y	Y	Υ	N/A	Υ	N	Maximum concentration exceeds background and human screening value.		
Barium	3	3	100.0%	18	18	1000	N/A	Y	N	N	N/A	N	N	Not retained; maximum concentration less than the background screening criterion.		
Beryllium	0	3	0.0%	0.14	<0.14	NE	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Cadmium	0	3	0.0%	0.11	<0.11	NE	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Chromium	0	3	0.0%	0.5	0.55	NE	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Cobalt	1	3	33.3%	0.1	<0.1	NE	N/A	Υ	N	N	N/A	N	N	Not retained; maximum concentration less than the background screet criterion.		
Copper	3	3	100.0%	0.66	0.62	1,300	N/A	Y	Y	N	N/A	N	N	Not retained; maximum concentration less than human screening value.		
Lead	0	3	0.0%	0.1	<0.1	NE	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Mercury	3	3	100.0%	0.39	0.21	0.05	N/A	Y	Y	Υ	N/A	Y	N	Maximum concentration exceeds background and human screening value.		
Molybdenum	3	3	100.0%	7.9	7.3	NE	N/A	Y	Y	N	N/A	N	N	Not retained; maximum concentration less than human screening value.		
Nickel	3	3	100.0%	0.48	0.44	610	N/A	Y	Y	N	N/A	N	N	Not retained; maximum concentration less than human screening value.		
Selenium	0	3	0.0%	0.19	<0.19	170	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Silver	0	3	0.0%	0.1	<0.1	NE	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Thallium	0	3	0.0%	0.1	<0.1	0.24	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Vanadium	0	3	0.0%	0.78	<0.78	NE	N/A	N	N	N	N/A	N	N	Not retained - less than 5% detections.		
Zinc	1	3	33.3%	1.9	<1.7	120	N/A	Y	Y	N	N/A	N	N	Not retained; maximum concentration less than human screening value.		

Notes:

BG = Background (3 times laboratory result or RL if ND) COPEC = contaminant of potential ecological concern COPC = contaminant of potential concern

EPA = Environmental Protection Agency

ESV = Ecological Screening Value DL = Detection Limit mg/kg = milligram per kilogram RSL = Regional Screening Level

N/A = Total concentrations do not apply to ecological surface water screening criteria which are based on dissolved concentrations.

Max > BG? = Is the maximum concentration greater than Background Screening Criterion (3 X laboratory result or RL if ND)?

Max > HH RSL? = Is the maximum concentration greater than Human Health Regional Screening Level?

Max > ESV? = Is the maximum concentration greater than the Ecological Screening Value?

HH COPC? = Is analyte retained as a human health contaminant of potential concern?

ECO COPEC? = Is analyte retained as a contaminant of potential ecological concern?

USFS - Site Inspection Table H2-1 Risk Characterization for Background

Background Evaluation Surface Soil (composite sample concentration, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Background Concentrations (mg/kg)	-	57	1	-		72.0		78.0	177	9	18	39.0		1	;	627.0	384
BB-B-COMP-01 10/19/2020 Background Area	<376	19			<164	24	<80	26	59	3	6	13	<3	<131		209	128

Background Evaluation Surface Soil (composite sample concentration, Lab)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Three X Background Concentrations (mg/kg)	<0.8	60	246	<0.47	<0.52	30.0	18.9	30.0	129	1.86	<0.5	14.7	<1.1	<0.67	<0.49	90.0	234
BB-B-COMP-01 10/19/2020 Background Area	<0.8	20	82	<0.47	<0.52	10	6.3	10	43	0.6200	<0.5	4.9	<1.1	<0.67	<0.49	30	78

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitle	ess			
Antimony	<376	31	782	5	78	0.27		NA	NA						
Arsenic	19	0.11	30.6	18	60	46	43	2E-04	6E-07	46	0	1	0	0	
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	<164	71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Chromium	24	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt	<80	23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	26	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	1	
_ead	59	80	800	120	1700	56	11	NA	NA	1	0	0	0	1	
Mercury	3	1	271	0.3	0.1	1.7	0.013	NA	NA	3	0	10	30	2	23
Molybdenum	6	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC		Not a COC	Not a CO
Vickel	13	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium	<3	390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver	<131	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	209	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC		Not a COC	Not a CO
Zinc	128	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
	· · · · · · · · · · · · · · · · · · ·				•			-	Н	50	٥	13	32	5	24

USFS - Site Inspection Table H2-1

Risk Characterization for Background Big Blue Mill Kern County, California

			Recreational		ESV			Residential	Recreational	Residential	Recreational		Invertebrate		
Constituents	EPC (mean)	Residential SL	Visitor RSL	ESV Plant	Invertebrate	ESV Mammals	ESV Avian	Risk	Visitor Risk	HQ	Visitor HQ	Plant HQ	HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		•		unitle	ess			
Antimony	<0.8	31	782	5	78	0.27		NA	NA						-
Arsenic	20.0	0.11	30.6	18	60	46	43	2E-04	7E-07	49	0	1	0	0	
Barium	82	15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium	<0.47	16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium	<0.52	71.0	1,780	32	140	0.36	0.77	NA	NA		-				-
Chromium	10.0	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	10	25	0	(
Cobalt	6.3	23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	10.0	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	(
_ead	43.0	80	800	120	1700	56	11	NA	NA	1	0	0	0	1	4
Mercury	0.62	1	271	0.3	0.1	1.7	0.013	NA	NA	1	0	2	6	0	48
Molybdenum	<0.5	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC				-
Vickel	4.90	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium	<1.1	390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC				-
Silver	<0.67	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				-
Γhallium	<0.49	0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
/anadium	30	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	78	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	0	1	1	
			•		•			-	HI	50	0	14	32	3	5

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020). HQs rounded to the nearest whole number.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management COC = chemical of concern

DTSC = Departement of Toxic Substances Control

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

ESV = ecological screening value

HI = hazard index

HQ = hazard quotient

mg/kg = milligrams per kilogram

NA = not applicable

RSL = regional screening level

-- = screening criterion not available

ppm = parts per million

Source

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

Los Alamos National Laboratory (LANL). 2017. ECORISK Database (Release 4.1). https://www.lanl.gov/environment/protection/eco-risk-assessment.php

DTSC. 2020. DTSC-modified Screening Levels (DTSC-SLs). HERO HHRA Note Number 3. June.

USFS - Site Inspection Table H2-2

RIsk Characterization for AOC 1 Big Blue Mill Kern County, California

AOC 1 Surface Soil (mean concentrations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Background Concentrations (mg/kg)		57	-	_		72.0		78.0	177	9	18	39.0			;	627.0	384
EPC (95% UCL)		12.60		-		34.73		21.72	11.42	3.90	7.56	22.22				242.10	95.40

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	-			unitles	s	•		
Antimony		31	782	5	78	0.27	-	NA	NA						
Arsenic	12.60	0.11	30.6	18	60	46	43	1E-04	4E-07	31	0	1	0	0	
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Chromium	34.73	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	21.72	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
_ead	11.42	80	800	120	1700	56	11	NA	NA	0	0	0	0	0	
Mercury	3.90	1	271	0.3	0.1	1.7	0.013	NA	NA	4	0	13	39	2	30
Molybdenum	7.56	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vickel	22.22	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	242.10	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	95.40	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	1	
									HI	35	Λ	15	40	4	304

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020).

HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management

COC = chemical of concern

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration ESV = ecological screening value HI = hazard index HQ = hazard quotient

mg/kg = milligrams per kilogram

NA = not applicable ppm = parts per million RSL = regional screening level

-- = screening criterion not available

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

Table H2-3 USFS - Site Inspection June 2021

Risk Characterization for AOC 2 Big Blue Mill Kern County, California

AOC 2 Surface Soil (mean concentrations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Background Concentrations (mg/kg)		57		-		72.0	-	78.0	177	9	18	39.0			;	627.0	384
EPC (95% UCL)		77.46				31.73		29.69	102.30	9.76	6.50	21.83				224.80	143.80

RSL = regional screening level

-- = screening criterion not available

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony		31	782	5	78	0.27		NA	NA	-				I	
Arsenic	77.46	0.11	30.6	18	60	46	43	7E-04	3E-06	189	0	4	1	2	
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Chromium	31.73	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	29.69	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	1	
ead	102.30	80	800	120	1700	56	11	NA	NA	1	0	1	0	2	
Mercury	9.76	1	271	0.3	0.1	1.7	0.013	NA	NA	10	0	33	98	6	75
Molybdenum	6.50	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	21.83	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	224.80	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	143.80	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
					•	•			Н	200	٥	39	101	12	76

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020). HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management

COC = chemical of concern

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

ESV = ecological screening value

HI = hazard index HQ = hazard quotient

mg/kg = milligrams per kilogram

NA = not applicable

ppm = parts per million

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

USFS - Site Inspection Table H2-4

RIsk Characterization for AOC 3 Big Blue Mill Kern County, California

Surface S	AOC 3 oil (mean concent	trations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three	X Background Co	ncentrations (mg/kg)		57				72.0	-	78.0	177	9	18	39.0		-	;	627.0	384
	EPC (95% UCL	.)		647.30				36.84		37.24	153.80	33.80	8.78	21.74				235.30	157.50

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony		31	782	5	78	0.27		NA	NA	-	-			I	
Arsenic	647.30	0.11	30.6	18	60	46	43	6E-03	2E-05	1579	1	36	11	14	1
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Chromium	36.84	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	37.24	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	1	0	1	
.ead	153.80	80	800	120	1700	56	11	NA	NA	2	0	1	0	3	1-
/lercury	33.80	1	271	0.3	0.1	1.7	0.013	NA	NA	34	0	113	338	20	260
/lolybdenum	8.78	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	21.74	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				
hallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	235.30	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
inc inc	157.50	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
									н	1615	1	151	351	39	263

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020). HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management

COC = chemical of concern

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration ESV = ecological screening value HI = hazard index HQ = hazard quotient

mg/kg = milligrams per kilogram

NA = not applicable ppm = parts per million RSL = regional screening level
-- = screening criterion not available

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

USFS - Site Inspection Table H2-5 RIsk Characterization for AOC 4 June 2021

AOC 4 Surface Soil (mean concentrations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Background Concentrations (mg/kg)		57		-		72.0		78.0	177	9	18	39.0	-		;	627.0	384
EPC (95% UCL)	8764.0	10663.00				38.34		19.29	458.10	8.11	7.02	20.07		17.0		236.40	202.90

	Surface Soi	AOC 4 I (mean concer	trations, Lab)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
S	ample ID	Sample Date	Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Three X	Background Co	ncentrations (mg/kg)	<0.8	60	246	<0.47	<0.52	30.0	18.9	30.0	129	1.86	<0.5	14.7	<1.1	<0.67	<0.49	90.0	234
	BB-020	10/20/2020		160	7400	98	<0.47	60	10.0	6.7	15.0	520	2	<0.5	8.1	<1.1	8.500	<0.49	28.0	150
	BB-025	10/21/2020		120	7100	94	<0.47	51	7.1	4.5	17	610	3	<0.5	4.9	<1.1	11	<0.49	21	360
	EPC ((maximum conce	entration)	160	7400	98	0	60	10	6.7	17	610	3	0	8.1	0	11	0	28	360

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony	8764	31	782	5	78	0.27		NA	NA	283	11	1753	112	32459	-
Arsenic	10663	0.11	30.6	18	60	46	43	1E-01	3E-04	26007	12	592	178	232	248
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Chromium	38.34	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	19.29	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
_ead	458.10	80	800	120	1700	56	11	NA	NA	6	1	4	0	8	42
Mercury	8.11	1	271	0.3	0.1	1.7	0.013	NA	NA	8	0	27	81	5	624
Molybdenum	7.02	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	20.07	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver	17.0	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0		1	4
Γhallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
/anadium	236.40	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Zinc	202.90	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	2	3	4
	•	•			•	•	•		HI	26304	24	2378	373	32708	922

USFS - Site Inspection Table H2-5 June 2021

RIsk Characterization for AOC 4 Big Blue Mill Kern County, California

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony	160	31	782	5	78	0.27		NA	NA	5	0	32	2	593	
Arsenic	7400.0	0.11	30.6	18	60	46	43	7E-02	2E-04	18049	8	411	123	161	17
Barium	98.00	15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium	0.00	16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	60	71.0	1,780	32	140	0.36	0.77	NA	NA	1	0	2	. 0	167	7
Chromium	10.0	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	10	25	0	
Cobalt	6.7	23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	17.00	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
.ead	610.00	80	800	120	1700	56	11	NA	NA	8	1	5	0	11	5
/lercury	3	1	271	0.3	0.1	1.7	0.013	NA	NA	3	0	10	30	2	23
/lolybdenum	0.00	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	0		0	
Nickel	8.10	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium	0	390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	0	0	0	
Silver	11	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0		1	
hallium	0.00	0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	28.00	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
inc inc	360.00	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	2	3	5	
	I .								н	18065	9	473	184	939	54

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020).

HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management
COC = chemical of concern
EPA = U.S. Environmental Protection Agency
EPC = exposure point concentration

ESV = ecological screening value

HI = hazard index HQ = hazard quotient mg/kg = milligrams per kilogram

NA = not applicable ppm = parts per million RSL = regional screening level
-- = screening criterion not available

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

USFS - Site Inspection Table H2-6 RIsk Characterization for AOC 5

AOC 5 Surface Soil (mean concentrations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Background Concentrations (mg/kg)		57				72.0		78.0	177	9	18	39.0	-		;	627.0	384
EPC (95% UCL)	85.8	36217				39.80		37.62	3042	1373	13.06	19.21		130.9		211.50	189.60

	Surface Soil	AOC 5 I (mean concent	rations, Lab)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	Sample ID S	Sample Date	Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Three X	Background Con	centrations (mg/kg)	<0.8	60	246	<0.47	<0.52	30.0	18.9	30.0	129	1.86	<0.5	14.7	<1.1	< 0.67	<0.49	90.0	234
T		EPC (95% UCL)	69.11	40475	59.31		289.7	7.989	5.179	43.63	12584	350	4.3	6.197		26.03		25.35	136.4

											Recreational				
			Recreational		ESV			Residential	Recreational	Residential	Visitor	Plant			Avian
Constituents	EPC (mean)	Residential SL	Visitor RSL	ESV Plant	Invertebrate	ESV Mammals	ESV Avian	Risk	Visitor Risk	HQ	HQ	HQ	Invertebrate HQ	Mammal HQ	HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony	86	31	782	5	78	0.27		NA	NA	3	0	17	1	318	
Arsenic	36217	0.11	30.6	18	60	46	43	3E-01	1E-03	88334	41	2012	604	787	842
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Chromium	39.80	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	37.62	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	1	0	1	1
Lead	3042	80	800	120	1700	56	11	NA	NA	38	4	25	2	54	277
Mercury	1373	1	271	0.3	0.1	1.7	0.013	NA	NA	1373	5	4577	13730	808	105615
Molybdenum	13.06	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	19.21	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver	130.9	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0		9	31
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Vanadium	211.50	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Zinc	189.60	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	2	2	4
	•		•		•		•		HI	89748	50	6633	14339	1980	106771

USFS - Site Inspection Table H2-6

RIsk Characterization for AOC 5 Big Blue Mill Kern County, California

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony	69.11	31	782	5	78	0.27		NA	NA	2	0	14	1	256	
Arsenic	40475	0.11	30.6	18	60	46	43	4E-01	1E-03	98720	46	2249	675	880	94
Barium	59.31	15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21	-	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	289.7	71.0	1,780	32	140	0.36	0.77	NA	NA	4	0	9	2	805	37
Chromium	8.0	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	8	20	0	
Cobalt	5.179	23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	43.63	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	1	1	1	
Lead	12584.00	80	800	120	1700	56	11	NA	NA	157	16	105	7	225	114
Mercury	350	1	271	0.3	0.1	1.7	0.013	NA	NA	350	1	1167	3500	206	2692
Molybdenum	4.30	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	2		8	
Nickel	6.20	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC				
Silver	26.03	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0		2	
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	25.35	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	136.40	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
	•				•	•			н	99233	64	3555	4207	2384	2939

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020).

HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management
COC = chemical of concern
EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration ESV = ecological screening value HI = hazard index HQ = hazard quotient mg/kg = milligrams per kilogram

NA = not applicable ppm = parts per million RSL = regional screening level
-- = screening criterion not available

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

USFS - Site Inspection Table H2-7 RIsk Characterization for AOC 6

AOC 6 Surface Soil (mean concentrations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Background Concentrations (mg/kg)		57				72.0		78.0	177	9	18	39.0			;	627.0	384
EPC (95% UCL)		154.60				40.68		34.23	31.48	6.99	9.32	23.07				257.40	100.10

AOC 6 Surface Soil (mean concentrations, Lab)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Three X Background Concentrations (mg/kg)	<0.8	60	246	<0.47	<0.52	30.0	18.9	30.0	129	1.86	<0.5	14.7	<1.1	<0.67	<0.49	90.0	234
BB-020 10/20/2020	<0.8	110	58	<0.47	1.3	4.6	5.1	8.4	34	0.77	<0.5	3.0	4	2.300	<0.49	21.0	44
EPC (as reported)	<0.8	110	58	<0.47	1.3	4.6	5.1	8.4	34	0.77	<0.5	3	3.9	2.3	<0.49	21	44

											Recreational				
			Recreational		ESV			Residential	Recreational	Residential	Visitor	Plant			Avian
Constituents	EPC (mean)	Residential SL	Visitor RSL	ESV Plant	Invertebrate	ESV Mammals	ESV Avian	Risk	Visitor Risk	HQ	HQ	HQ	Invertebrate HQ	Mammal HQ	HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony		31	782	5	78	0.27		NA	NA		-	-	-		-
Arsenic	155	0.11	30.6	18	60	46	43	1E-03	5E-06	377	0	9	3	3	4
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Chromium	40.68	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	34.23	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	1	1
Lead	31.48	80	800	120	1700	56	11	NA	NA	0	0	0	0	1	;
Mercury	6.99	1	271	0.3	0.1	1.7	0.013	NA	NA	7	0	23	70	4	538
Molybdenum	9.32	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	23.07	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC		-		-
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Vanadium	257.4	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Zinc	100.1	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	1	1
									HI	384	0	33	74	10	548

USFS - Site Inspection June 2021

RIsk Characterization for AOC 6 Big Blue Mill Kern County, California

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony	<0.8	31	782	5	78	0.27		NA	NA						
Arsenic	110.0	0.11	30.6	18	60	46	43	1E-03	4E-06	268	0	6	2	2	
Barium	58.00	15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium	<0.47	16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	1.3	71.0	1,780	32	140	0.36	0.77	NA	NA	0	0	0	0	4	
Chromium	4.6	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	5	12	0	
Cobalt	5.1	23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	8.40	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
_ead	34	80	800	120	1700	56	11	NA	NA	0	0	0	0	1	
Mercury	1	1	271	0.3	0.1	1.7	0.013	NA	NA	1	0	3	8	0	5
Molybdenum	<0.5	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC				
Nickel	3	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium	3.9	390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	8	1	6	
Silver	2.3	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0		0	
Γhallium	<0.49	0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	21	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	44	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	0	0	1	
			•			,			н	270	0	22	22	14	7

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020).

HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management
COC = chemical of concern
EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration ESV = ecological screening value HI = hazard index HQ = hazard quotient mg/kg = milligrams per kilogram

NA = not applicable ppm = parts per million RSL = regional screening level
-- = screening criterion not available

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

USFS - Site Inspection Table H2-8 RIsk Characterization for AOC 7

Surface Sc	AOC 7 oil (mean concen	trations, XRF)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Location	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three 2	X Background Cor	ncentrations (mg/kg)		57	-	-		72.0		78.0	177	9	18	39.0	-	-	;	627.0	384
	EPC (95% UCL	.)		17						17.87	8.475	3.5		22.39		-		319.30	64.30

AOC 7 Surface Soil (mean concentrations, Lab)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID Sample Date Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Three X Background Concentrations (mg/l	g) <0.8	60	246	<0.47	<0.52	30.0	18.9	30.0	129	1.86	<0.5	14.7	<1.1	<0.67	<0.49	90.0	234
EPC (95% UCL)		11.18	68.04			10.41	6.417	9.674		4.3		6.16		-		48.98	37.76

KISK CHAFACTERIA	Zation for ACC	7 (95% UCL, XRF)									Recreational				
Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		•	•	unitles	S	•	· · · · · · · · · · · · · · · · · · ·	
Antimony		31	782	5	78	0.27		NA	NA						
Arsenic	17	0.11	30.6	18	60	46	43	2E-04	6E-07	42	0	1	0	0	0
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Chromium		120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	17.87	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	1
Lead	8	80	800	120	1700	56	11	NA	NA	0	0	0	0	0	1
Mercury	4	1	271	0.3	0.1	1.7	0.013	NA	NA	4	0	12	35	2	269
Molybdenum		390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	22.39	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	-			
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Vanadium	319.3	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Zinc	64.3	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	0	1	1	1
									HI	45	0	13	36	4	273

USFS - Site Inspection Table H2-8

RIsk Characterization for AOC 7 Big Blue Mill Kern County, California

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitles	s			
Antimony		31	782	5	78	0.27		NA	NA		-				
Arsenic	11	0.11	30.6	18	60	46	43	1E-04	4E-07	27	0	1	0	0	
Barium	68.04	15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA		-				
Chromium	10.4	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	10	26	0	
Cobalt	6.417	23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	9.67	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
_ead		80	800	120	1700	56	11	NA	NA						
Mercury	4.3	1	271	0.3	0.1	1.7	0.013	NA	NA	4	0	14	43	3	33
Molybdenum		390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC				
Vickel	6.16	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC				
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				
Γhallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
/anadium	49.0	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	37.8	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	0	0	0	
	•		•		8	•			HI	32	0	26	70	4	33

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020).

HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management
COC = chemical of concern
EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration ESV = ecological screening value HI = hazard index HQ = hazard quotient mg/kg = milligrams per kilogram

mg/kg = milligrams per kilograr
NA = not applicable
ppm = parts per million

RSL = regional screening level
-- = screening criterion not available

Sources: BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

Oak Ridge National Laboratory (ORNL). 2018. RAIS - The Risk Assessment Information System Ecological Benchmark Tool. https://rais.ornl.gov/tools/eco_search

Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5 Big Blue Mill

Kern County, California

AOC 4 Depth In	nvestigation, surface (XRF)	soil samples	Antimony	Arsenic	Barium	Beryllium	Cadmium*	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X Bac	kground Concentration	ns (mg/kg)	-	57	-	-		72		78	177	9	18	39			;	627	384
	0 feet																		
BB-025	10/20/2020	0	414	10929	Not Penarted	Not Reported	51	38	<82	20	891	<52	<26	11	<7	26		138	197
BB-025-SO-01	10/22/2020	0	224	4678	Not Reported	Not Reported	N/A	28	<79	29	461	7	5	24	<5	<123		187	185
	EPC (mean)		319.00	7803.50			51.00	33.00		24.50	676.00	7.00	5.00	17.50		26.00		162.50	191.00
	EPC (maximum)		414	10929	0.0	0.0	51	38	0	29	891	7	5	24	0	26	0	187	197

AOC 4 Depth Inve	estigation, 0-1 fee (XRF)	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium*	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	>0-1 feet bgs																		
BB-025-0.5	10/22/2020	0.5	157	24390			160	45	<84	<9	1757	<64	<22	6	<9	45		144	43
BB-025-1	10/22/2020	1	27	3179	Not Doported	Not Reported	N/A	22	<83	24	131	<34	<29	15	<5	10	Not Reported	227	118
BB-025-SO-01-0	10/22/2020	0.5	111	11422	Not Reported	Not Reported	N/A	29	<87	<10	782	<50	<26	17	<7	18	Not Reported	220	103
BB-025-SO-01-1	10/22/2020	1	40	2483			N/A	28	<85	31	299	15	5	23	<5	<128		218	538
	EPC (mean)		83.75	10368.50			160.00	31.00		27.50	742.25	15.00	5.00	15.25		24.33		202.25	200.50
	EPC (maximum)		157	24390	0	0	160	45	0	31	1757	15	5	23	0	45	0	227	538

AOC 4 Depth	Investigation, 1-2 fe (XRF)	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	1-2 feet bgs																		
BB-025-1.5	10/22/2020	1.5	<396	546	Not Reported	Not Reported	13	45	<70	24	59	<30	<31	26	<4	<136	Not Reported	275	377
	EPC (mean)		-	546			13	45	-	24	59			26		-	-	275	377
	EPC (maximum)		0	546	0	0	13	45	0	24	59	0	0	26	0	0	0	275	377

AOC 5 Depth In	vestigation, surface (XRF)	soil samples	Antimony	Arsenic	Barium	Beryllium	Cadmium*	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Three X	Background Concen	trations (mg/kg)	<0.8	60	246	<0.47	<0.52	30	18.9	30	129	1.86	<0.5	14.7	<1.1	< 0.67	<0.49	90	234
	0 feet																		
BB-123	10/20/2020	0	<272	27168			N/A	33	<96	<9	1801	693	<21	<11	<9	39		98	59
BB-129	10/20/2020	0	<306	19793			140	37	<92	<9	874	21	<23	<11	<8	17	Ī	114	23
BB-116	5/21/2020	0	28	1833	Not Reported	Not Reported	N/A	<28	<79	33	1002	19	18	16	2	<127	Not Reported	216	189
BB-116-SO-01	10/22/2020	0	95	9270			91	<28	<83	15	1229	11	12	10	<1	34	Ī	144	101
BB-023	10/20/2020	0	79	31092			210	29	<74	<11	3162	108	<23	<11	4	68	Ī	<49	98
	EPC (mean)		67.33	17831.20	-		147.00	33.00		24.00	1613.60	170.40	15.00	13.00		39.50		143.00	94.00
	EPC (maximum)		95	31092	0.0	0.0	210	37	0	33	3162	693	18	16	4	68	0	216	189

AOC 5 Depth Inv	estigation, 0-1 fe (XRF)	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium*	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	>0-1 feet bgs																		
BB-123-0.5	10/20/2020	0.5	<343	11670			84	29	<89	<10	1276	346	<26	<12	<8	15		170	87
BB-123-1	10/20/2020	1	<376	5632]		N/A	20	<74	5	313	79	<28	6	<6	10	Ī	151	44
BB-129-0.5	10/20/2020	0.5	<343	13786]		86	22	<86	<9	237	8	<26	<12	<7	10	Ī	161	28
BB-129-1	10/20/2020	1	<368	10103]		N/A	20	<73	<9	154	<52	<28	<12	<7	<127	Ī	159	24
BB-116-0.5	10/22/2020	0.5	367	64693	Not Reported	Not Reported	N/A	53	<89	<10	6211	<90	6	<10	<2	210	Not Reported	<44	111
BB-116-SO-01-0	. 10/22/2020	0.5	152	33372]		210	62	<90	12	2459	<71	<20	<10	<9	71	Ī	81	90
BB-116-SO-01-1	10/22/2020	1	58	15474	1		N/A	37	<86	54	1289	12	4	14	<8	30	Ī	65	475
BB-023-0.5	10/22/2020	0.5	42	15526]		N/A	25	<75	27	884	72	<27	<12	<8	24	Ī	61	99
BB-023-1	10/22/2020	1	<10	40262	1		350	<26	<99	21	2287	<79	<20	<11	<10	68	Ī	<47	350
	EPC (mean)		154.75	23390.89			182.50	33.50		23.80	1678.89	103.40	5.00	10.00		54.75		121.14	145.33
	EPC (maximum)		367	64693	0	0	350	62	0	54	6211	346	6	14	0	210	0	170	475

USFS - Site Inspection June 2021

Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5 Big Blue Mill

Kern County, California

AOC 5 Depth Inv	vestigation, 1-2 fee (XRF)	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	1-2 feet bgs																		
BB-123-2	10/20/2020	2	<396	1097			<171	<29	<77	14	38	17	4	11	<4	<136		254	108
BB-129-2	10/20/2020	2	<366	9430			<157	33	<72	<9	50	<50	<27	11	<6	12	Ĭ	218	23
BB-116-SO-01-1.5	10/22/2020	1.5	40	6260	Not Reported	Not Reported	<149	30	<88	36	566	47	<26	12	<6	17	Not Reported	162	131
BB-116-SO-01-2	10/22/2020	2	<367	3997			<157	32	<83	27	129	8	<28	24	<5	<124	Ī	191	211
BB-023-2	10/22/2020	2	<295	25511			<126	30	<90	<10	902	156	<23	<11	<9	33	Ī	114	326
	EPC (mean)		40	9259	-	-		31	-	26	337	57	4	15	-	21	-	188	160
	EPC (maximum)		40	25511	0	0	0	33	0	36	902	156	4	24	0	33	0	254	326

AOC 5 Depth Inv	vestigation, 2-3 fee (XRF)	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	2-3 feet bgs																		
BB-123-3	10/20/2020	3	<373	1086			<161	33	<86	25	59	51	<29	25	<4	<127		272	194
BB-129-3	10/20/2020	3	<372	8493	Not Doported	Not Dopostod	<160	30	<76	<10	62	<47	<28	13	<6	<127	Not Reported	223	40
BB-116-SO-01-2.5	10/22/2020	2.5	<353	5954	Not Reported	Not Reported	<152	34	<88	33	298	65	<27	15	<5	<121	Not keported	161	251
BB-023-3	10/22/2020	3	<307	13761			<131	62	<100	14	375	40	<23	10	<6	<103	Ī	234	222
	EPC (mean)			7323.50				39.75		24.00	198.50	52.00		15.75				222.50	176.75
	EPC (maximum)		0	13761	0	0	0	62	0	33	375	65	0	25	0	0	0	272	251

AOC 5 Depth In	vestigation, 3-4 fee (XRF)	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	3-4 feet bgs																		
BB-123-4	10/20/2020	4	<368	3186			<159	<27	<80	6	62	40	<27	11	<4	<125		184	110
BB-129-4	10/20/2020	4	<389	4822	Not Reported	Not Reported	<168	34	<66	6	22	<40	<28	13	<5	<133	Not Reported	192	38
BB-023-4	10/22/2020	4	<343	4647			<146	37	<89	37	172	35	<26	26	<5	<116		225	209
	EPC (mean)			4218.33	-			35.50		16.33	85.33	37.50		16.67				200.33	119.00
	EPC (maximum)		0	4822	0	0	0	37	0	37	172	40	0	26	0	0	0	225	209

AOC 5 Depth Ir	nvestigation, 4-5 fe	et bgs samples	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Depth (ft)	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
	4-5 feet bgs																		
BB-129-5	10/20/2020	5	<343	10622	Not Reported	Not Poported	<148	<29	<94	<9	38	<47	6	11	<6	<118	Not Reported	188	61
BB-023-5	10/22/2020	5	<375	1105	Not keported	Not keported	<161	42	<86	46	24	<29	<28	14	<4	<128	Not Reported	242	219
	EPC (mean)		-	5863.50				42.00	-	46.00	31.00	-	6.00	12.50		-		215.00	140.00
	EPC (maximum)		0	10622	0	0	0	42	0	46	38	0	6	14	0	0	0	242	219

Zero values for XRF data were below the limit of detection (LOD). LOD for each sample is shown in Table 1.

USFS - Site Inspection Table H2-9 Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5

	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony	319	31	782	5	78	0.27		NA	NA	10	0	64	4	1181	
Arsenic	7804	0.11	30.6	18	60	46	43	7E-02	3E-04	19033	9	434	130	170	1
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CC
Beryllium		16	3,910	2.5	40	21	-	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CC
Cadmium	51	71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	2	0	142	(
Chromium	33	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	25	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	1	
Lead	676	80	800	120	1700	56	11	NA	NA	8	1	6	0	12	6
Mercury	7	1	271	0.3	0.1	1.7	0.013	NA	NA	7	0	23	70	4	53
Molybdenum	5	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	18	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver	26	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0	-	2	
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	163	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CC
Zinc	191	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	2	2	
		•			•		•		Н	19059	10	529	207	1514	85

	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony	83.8	31	782	5	78	0.27	-	NA	NA	3	0	17	1	310	
Arsenic	10368.5	0.11	30.6	18	60	46	43	9E-02	3E-04	25289	12	576	173	225	24
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21	-	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	160.0	71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	5	1	444	20
Chromium	31.0	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13	-	230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	27.5	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	1	
Lead	742.3	80	800	120	1700	56	11	NA	NA	9	1	6	0	13	6
Mercury	15.0	1	271	0.3	0.1	1.7	0.013	NA	NA	15	0	50	150	9	115
Molybdenum	5.0	390	9780	2	-	0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	15.3	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver	24.3	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0	-	2	(
Thallium		0.78	19.6	1	-	0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	202.3	390	9,850	2	-	280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	200.5	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	2	3	
			•						HI	25316	13	656	327	1007	168

USFS - Site Inspection Table H2-9 June 2021 Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5

Big Blue Mill unty, California

Kern	County	Californi
Kern	County.	Californi

Constituents	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony		31	782	5	78	0.27		NA	NA	-		-	-		
Arsenic	546	0.11	30.6	18	60	46	43	5E-03	2E-05	1332	1	30	9	12	1
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	13	71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	0	0	36	1
Chromium	45	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	24	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
Lead	59	80	800	120	1700	56	11	NA	NA	1	0	0	0	1	
Mercury		1	271	0.3	0.1	1.7	0.013	NA	NA		-		-		
Molybdenum	-	390	9780	2	-	0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	26	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium	-	390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	-		-	
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	275	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	377	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	2	3	5	
	•								н	1332	1	34	13	54	4

	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony	67.3	31	782	5	78	0.27	-	NA	NA	2	0	13	1	249	
Arsenic	17831.2	0.11	30.6	18	60	46	43	2E-01	6E-04	43491	20	991	297	388	41
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21	-	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium	147.0	71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	5	1	408	191
Chromium	33.0	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13	_	230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	24.0	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	1
Lead	1613.6	80	800	120	1700	56	11	NA	NA	20	2	13	1	29	147
Mercury	170.4	1	271	0.3	0.1	1.7	0.013	NA	NA	170	1	568	1704	100	13108
Molybdenum	15.0	390	9780	2	-	0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	13.0	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver	39.5	390	9,780	560	-	14	4.2	NA	NA	Not a COC	Not a COC	0	-	3	è
Thallium		0.78	19.6	1	_	0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Vanadium	143.0	390	9,850	2	-	280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	94.0	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	1	
	•	8	•				•		HI	43683	23	1591	2005	1179	13872

USFS - Site Inspection Table H2-9 Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5

Big Blue Mill

Kern County, California

	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony	154.8	31	782	5	78	0.27	-	NA	NA	5	0	31	2	573	
Arsenic	23390.9	0.11	30.6	18	60	46	43	2E-01	8E-04	57051	27	1299	390	508	54
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium	182.5	71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	6	1	507	23
Chromium	33.5	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13	-	230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	23.8	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
Lead	1678.9	80	800	120	1700	56	11	NA	NA	21	2	14	1	30	15
Mercury	103.4	1	271	0.3	0.1	1.7	0.013	NA	NA	103	0	345	1034	61	795
Molybdenum	5.0	390	9780	2	-	0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	10.0	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver	54.8	390	9,780	560	-	14	4.2	NA	NA	Not a COC	Not a COC	0		4	1
Thallium		0.78	19.6	1	-	0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	121.1	390	9,850	2	-	280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	145.3	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
	•	•			•				Ы	57180	29	1696	1430	1686	890

			Recreational		ESV	ESV		Residential	Recreational	Residential	Recreational				
Constituents	EPC (mean)	Residential SL	Visitor RSL	ESV Plant	Invertebrate	Mammals	ESV Avian	Risk	Visitor Risk	HQ	Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unit	ess			
Antimony	40.0	31	782	5	78	0.27	-	NA	NA	1	0	8	1	148	-
Arsenic	9259.0	0.11	30.6	18	60	46	43	8E-02	3E-04	22583	11	514	154	201	215
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	-	-	-	-
Chromium	31.3	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13	-	230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	25.7	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	1	1
Lead	337.0	80	800	120	1700	56	11	NA	NA	4	0	3	0	6	31
Mercury	57.0	1	271	0.3	0.1	1.7	0.013	NA	NA	57	0	190	570	34	4385
Molybdenum	4.0	390	9780	2	-	0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	14.5	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver	20.7	390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC	0	-	1	5
Thallium		0.78	19.6	1	-	0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Vanadium	187.8	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Zinc	159.8	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	3
			•						HI	22645	11	717	727	393	4640

USFS - Site Inspection Table H2-9 Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5

Big Blue Mill

Kern County, California

	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony		31	782	5	78	0.27	-	NA	NA	-	-	-	-	-	
Arsenic	7323.5	0.11	30.6	18	60	46	43	7E-02	2E-04	17862	8	407	122	159	17
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	-		-	
Chromium	39.8	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Copper	24.0	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	
Lead	198.5	80	800	120	1700	56	11	NA	NA	2	0	2	0	4	1
Mercury	52.0	1	271	0.3	0.1	1.7	0.013	NA	NA	52	0	173	520	31	400
Molybdenum		390	9780	2	-	0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	15.8	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver		390	9,780	560	-	14	4.2	NA	NA	Not a COC	Not a COC	-	-	-	
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	222.5	390	9,850	2	-	280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	176.8	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
	•	8					•		HI	17917	9	583	644	196	419

Risk Characteriza	tion for Acc 3 (J-4 leet bys/ Alti	` '		FSV	FCV	_	Decidential	Degraphical	Decidential	Degraphical				
	EDO (******)	De elelemente l'Ol	Recreational	E01/ DI	ESV	ESV	E01/ A. de	Residential	Recreational	Residential	Recreational	DI4 110			4
	EPC (mean)	Residential SL	Visitor RSL	ESV Plant	Invertebrate	Mammals	ESV Avian	Risk	Visitor Risk	HQ	Visitor HQ		Invertebrate HQ	Mammai HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony		31	782	5	78	0.27		NA	NA	-	-	-	-	-	1
Arsenic	4218.3	0.11	30.6	18	60	46	43	4E-02	1E-04	10289	5	234	70	92	98
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21		NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	-	-	-	-
Chromium	35.5	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cobalt		23	586	13	-	230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	16.3	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	0	0	0	1
Lead	85.3	80	800	120	1700	56	11	NA	NA	1	0	1	0	2	8
Mercury	37.5	1	271	0.3	0.1	1.7	0.013	NA	NA	38	0	125	375	22	2885
Molybdenum		390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Nickel	16.7	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC				-
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Vanadium	200.3	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Zinc	119.0	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	;
	•	ī.							н	10327	5	361	447	117	2994

Risk Characterization for Depth Assessment Samples, AOC 4 and AOC 5 Big Blue Mill

Kern County, California

	EPC (mean)	Residential SL	Recreational Visitor RSL	ESV Plant	ESV Invertebrate	ESV Mammals	ESV Avian	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Plant HQ	Invertebrate HQ	Mammal HQ	Avian HQ
Constituents	ppm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg				unitl	ess			
Antimony		31	782	5	78	0.27	-	NA	NA	-	-	-	-	-	+
Arsenic	5863.5	0.11	30.6	18	60	46	43	5E-02	2E-04	14301	7	326	98	127	136
Barium		15,000	390,000	110	330	2000	720	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Beryllium		16	3,910	2.5	40	21	-	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Cadmium		71.0	1,780	32	140	0.36	0.77	NA	NA	Not a COC	Not a COC	-	-	-	,
Chromium	42.0	120,000	1,000,000	1	0.4	34	26	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Cobalt		23	586	13		230	120	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC
Copper	46.0	3,100	78,200	70	80	49	28	NA	NA	Not a COC	Not a COC	1	1	1	
Lead	31.0	80	800	120	1700	56	11	NA	NA	0	0	0	0	1	
Mercury		1	271	0.3	0.1	1.7	0.013	NA	NA	-	-	-	-	-	
Molybdenum	6.0	390	9780	2		0.52	15	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Nickel	12.5	820	39,000	38	280	130	210	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Selenium		390	9,780	0.52	4.1	0.63	1.2	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Silver		390	9,780	560		14	4.2	NA	NA	Not a COC	Not a COC		-	-	
Thallium		0.78	19.6	1		0.42	4.5	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Vanadium	215.0	390	9,850	2		280	7.8	NA	NA	Not a COC	Not a COC	Not a COC	Not a COC	Not a COC	Not a CO
Zinc	140.0	23000	587,000	160	120	79	46	NA	NA	Not a COC	Not a COC	1	1	2	
									HI	14302	7	328	99	131	144

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020). HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

* Laboratory results for cadmium have been used where available since XRF interference may have prevented detection of low-level cadmium concentrations.

Abbreviations:

BLM = Bureau of Land Management

HI = hazard index HQ = hazard quotient RSL = regional screening level

EPA = U.S. Environmental Protection Agency

NA = not applicable

EPC = exposure point concentration

COC = chemical of concern

ppm = parts per million

ESV = ecological screening value

-- = screening criterion not available

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

EPA ECOTOX Website. Ecological Screening Levels (EcoSSLs). 2020. https://cfpub.epa.gov/.ecotox/

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USFS - Site Inspection Table H2-10 Risk Characterization for Kern River Sediment Samples

Big Blue Mill Kern County, California

	Sediment		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Sample ID	Sample Date	Location	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BB-SW-01-SED	10/22/2020	Upriver of Site	<0.8	2.7	52	<0.47	<0.52	9.2	5.3	5.4	<4.1	<0.016	<0.5	3.9	<1.1	<0.67	< 0.49	57	30
BB-SW-02-SED	10/22/2020	Adjacent to Site	<0.8	32	31	<0.47	<0.52	5.8	3.4	3.8	<4.1	0.55	<0.5	2.8	1.8	<0.67	<0.49	31	24
BB-SW-03-SED	10/22/2020	Downriver of Site in sandy deposits (Mod area)	<0.8	13	24	<0.47	<0.52	4.4	2.3	2.8	<4.1	0.17	<0.5	3.3	1.2	<0.67	<0.49	17	15
BB-M1-SED-01	10/22/2020	Downriver of MOD area	0.13	22	21	0.22	0.31	7.2	3	3	2.6	0.08	<0.05	2.2	<0.11	<0.067	0.1	35	16

Bolded values were reported above the method detection limit. Values in italics were reported below the reporting limit. The value shown is the method detection limit.

Constituents	EPC	Residential SL	Recreational Visitor RSL	Aquatic Invertebrate	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Aquatic Invertebrate
	mg/kg	mg/kg	mg/kg	mg/kg			unitless		
Antimony	<0.8	31	782		NA	NA	Not a COC	Not a COC	Not a COO
Arsenic	2.7	0.11	30.6	9.79	2E-05	9E-08	7	0	(
Barium	52	15,000	390,000		NA	NA	Not a COC	Not a COC	Not a COC
Beryllium	<0.47	16	3,910		NA	NA	Not a COC	Not a COC	Not a COC
Cadmium	<0.52	71.0	1,780	0.99	NA	NA	Not a COC	Not a COC	Not a COC
Chromium	9.2	120,000	1,000,000	43.4	NA	NA	Not a COC	Not a COC	Not a COC
Cobalt	5.3	23	586		NA	NA	Not a COC	Not a COC	Not a COC
Copper	5.4	3,100	78,200	31.6	NA	NA	Not a COC	Not a COC	Not a COC
Lead	<4.1	80	800	35.8	NA	NA	Not a COC	Not a COC	Not a COC
Mercury	<0.016	1	271	0.18	NA	NA	Not a COC	Not a COC	-
Molybdenum	<0.5	390	9780		NA	NA	Not a COC	Not a COC	Not a COC
Nickel	3.9	820	39,000	22.7	NA	NA	Not a COC	Not a COC	Not a COC
Selenium	<1.1	390	9,780	0.9	NA	NA	Not a COC	Not a COC	-
Silver	<0.67	390	9,780	1	NA	NA	Not a COC	Not a COC	Not a COC
Thallium	<0.49	0.78	19.6		NA	NA	Not a COC	Not a COC	Not a COC
Jun-21	57	390	9,850		NA	NA	Not a COC	Not a COC	Not a COC
Zinc	30	23000	587,000	121	NA	NA	Not a COC	Not a COC	Not a COC
		•	8			HI	7	0	(

		Residential	Recreational	Aquatic	Residential	Recreational	Residential	Recreational	Aquatic
Constituents	EPC	SL	Visitor RSL	Invertebrate	Risk	Visitor Risk	HQ	Visitor HQ	Invertebrate
	mg/kg	mg/kg	mg/kg	mg/kg			unitless		
Antimony	<0.8	31	782		NA	NA	Not a COC	Not a COC	Not a COC
Arsenic	32	0.11	30.6	9.79	3E-04	1E-06	78	0	3
Barium	31	15,000	390,000		NA	NA	Not a COC	Not a COC	Not a COC
Beryllium	<0.47	16	3,910		NA	NA	Not a COC	Not a COC	Not a COC
Cadmium	<0.52	71.0	1,780	0.99	NA	NA	Not a COC	Not a COC	Not a COC
Chromium	5.8	120,000	1,000,000	43.4	NA	NA	Not a COC	Not a COC	Not a COC
Cobalt	3.4	23	586		NA	NA	Not a COC	Not a COC	Not a COC
Copper	3.8	3,100	78,200	31.6	NA	NA	Not a COC	Not a COC	Not a COC
Lead	<4.1	80	800	35.8	NA	NA	Not a COC	Not a COC	Not a COC
Mercury	0.55	1	271	0.18	NA	NA	Not a COC	Not a COC	3
Molybdenum	<0.5	390	9780		NA	NA	Not a COC	Not a COC	Not a COC
Nickel	2.8	820	39,000	22.7	NA	NA	Not a COC	Not a COC	Not a COC
Selenium	1.8	390	9,780	0.9	NA	NA	Not a COC	Not a COC	2
Silver	<0.67	390	9,780	1	NA	NA	Not a COC	Not a COC	Not a COC
Thallium	<0.49	0.78	19.6		NA	NA	Not a COC	Not a COC	Not a COC
Vanadium	31	390	9,850		NA	NA	Not a COC	Not a COC	Not a COC
Zinc	24	23000	587,000	121	NA	NA	Not a COC	Not a COC	Not a COC

USFS - Site Inspection Table H2-10 Risk Characterization for Kern River Sediment Samples

Constituents	EPC	Residential SL	Recreational Visitor RSL	Aquatic Invertebrate	Residential Risk	Recreational Visitor Risk	Residential HQ	Recreational Visitor HQ	Aquatic Invertebrate
	mg/kg	mg/kg	mg/kg	mg/kg	,		unitless		-
Antimony	<0.8	31	782		NA	NA	Not a COC	Not a COC	Not a COO
Arsenic	13	0.11	30.6	9.79	1E-04	4E-07	32	0	
Barium	24	15,000	390,000		NA	NA	Not a COC	Not a COC	Not a COC
Beryllium	<0.47	16	3,910		NA	NA	Not a COC	Not a COC	Not a COC
Cadmium	<0.52	71.0	1,780	0.99	NA	NA	Not a COC	Not a COC	Not a COC
Chromium	4.4	120,000	1,000,000	43.4	NA	NA	Not a COC	Not a COC	Not a COC
Cobalt	2.3	23	586		NA	NA	Not a COC	Not a COC	Not a COC
Copper	2.8	3,100	78,200	31.6	NA	NA	Not a COC	Not a COC	Not a COC
Lead	<4.1	80	800	35.8	NA	NA	Not a COC	Not a COC	Not a COC
Mercury	0.17	1	271	0.18	NA	NA	Not a COC	Not a COC	1
Molybdenum	<0.5	390	9780		NA	NA	Not a COC	Not a COC	Not a COC
Nickel	3.3	820	39,000	22.7	NA	NA	Not a COC	Not a COC	Not a COC
Selenium	1.2	390	9,780	0.9	NA	NA	Not a COC	Not a COC	1
Silver	<0.67	390	9,780	1	NA	NA	Not a COC	Not a COC	Not a COC
Thallium	<0.49	0.78	19.6		NA	NA	Not a COC	Not a COC	Not a COC
Vanadium	17	390	9,850		NA	NA	Not a COC	Not a COC	Not a COC
Zinc	15	23000	587,000	121	NA	NA	Not a COC	Not a COC	Not a COC
•						HI	32	0	

		Residential	Recreational	Aquatic	Residential	Recreational	Residential	Recreational	Aquatic
Constituents	EPC	SL	Visitor RSL	Invertebrate	Risk	Visitor Risk	HQ	Visitor HQ	Invertebrate
	mg/kg	mg/kg	mg/kg	mg/kg			unitless		
Antimony	0.13	31	782		NA	NA	Not a COC	Not a COC	Not a COC
Arsenic	22	0.11	30.6	9.79	2E-04	7E-07	54	0	:
Barium	21	15,000	390,000		NA	NA	Not a COC	Not a COC	Not a COC
Beryllium	0.22	16	3,910		NA	NA	Not a COC	Not a COC	Not a COC
Cadmium	0.31	71.0	1,780	0.99	NA	NA	Not a COC	Not a COC	Not a COC
Chromium	7.2	120,000	1,000,000	43.4	NA	NA	Not a COC	Not a COC	Not a COC
Cobalt	3	23	586		NA	NA	Not a COC	Not a COC	Not a COC
Copper	3	3,100	78,200	31.6	NA	NA	Not a COC	Not a COC	Not a COC
Lead	2.6	80	800	35.8	NA	NA	Not a COC	Not a COC	Not a COC
Mercury	0.08	1	271	0.18	NA	NA	Not a COC	Not a COC	(
Molybdenum	<0.05	390	9780		NA	NA	Not a COC	Not a COC	Not a COC
Nickel	2.2	820	39,000	22.7	NA	NA	Not a COC	Not a COC	Not a COC
Selenium	<0.11	390	9,780	0.9	NA	NA	Not a COC	Not a COC	-
Silver	<0.067	390	9,780	1	NA	NA	Not a COC	Not a COC	Not a COC
Thallium	0.1	0.78	19.6		NA	NA	Not a COC	Not a COC	Not a COC
Vanadium	35	390	9,850		NA	NA	Not a COC	Not a COC	Not a COC
Zinc	16	23000	587,000	121	NA	NA	Not a COC	Not a COC	Not a CO
•		•		•		HI	54	0	

Table H2-10 USFS - Site Inspection June 2021

Risk Characterization for Kern River Sediment Samples Big Blue Mill Kern County, California

Notes:

RSLs for arsenic noncancer endpoints were 0.41 mg/kg for the residential exposure scenario (DTSC, 2020) and 874 mg/kg for the recreational visitor exposure scenario (RSL calculator, EPA, 2020).

HQs rounded to the nearest whole number.

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

BLM = Bureau of Land Management HI = hazard index RSL = regional screening level

COC = chemical of concern HQ = hazard quotient

EPA = U.S. Environmental Protection Agency mg/kg = milligrams per kilogram

EPC = exposure point concentration NA = not applicable

-- = screening criterion not available ESV = ecological screening value

Sources:

BLM (2017). BLM Technical Memorandum, Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites

EPA (2020). Regional Screening Levels (RSLs) - Generic Tables (Industrial Soil) and RSL Calculator. May 2020 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2020

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USFS - Site Inspection Table H2-11 June 2021

Risk Characterization Summary for Metals in Surface Water Big Blue Mill

Kern County, California

Surface	Water (Upriver o	f Site)		Arsenic	Mercury
Sample ID	Sample Date	Matrix	Type	μg/L	μg/L
BB-SW-01 - Total	10/22/2020	Surface Water		5.7	0.21
Surface '	Water (Adjacent	to Site)		Arsenic	Mercury
Sample ID	Sample Date	Matrix	Type	μg/L	μg/L
BB-SW-02 - Total	10/22/2020	Surface Water		6	0.39
Dup-01 - Total (BB-SW-02)	10/22/2020	Surface Water	Duplicate	5.9	0.22
Surface Water (Downriver of Site	- AOC 7 area)		Arsenic	Mercury
Sample ID	Sample Date	Matrix	Type	μg/L	μg/L
BB-SW-03 - Total	10/22/2020	Surface Water		6.7	0.16

Analytes with detections only are shown.

Constituents	EPC (As Reported)	EPA National Water Quality Criteria (cancer) 1	B-SW-01 (Single Point California Toxics Rule ²	EPA National Water Quality Criteria Risk	California Toxics Rule HQ
	μg/L	μg/L	μg/L	unitle	ess
Arsenic	5.7	0.018	-	3E-04	
Mercury	0.21	NA	0.05		4
				Н	4

Constituents	EPC (As Reported)	EPA National Water Quality Criteria (cancer) 1	California Toxics Rule ²	EPA National Water Quality Criteria Risk	California Toxics Rule HQ
	μg/L	μg/L	μg/L	unitle	ess
Arsenic	6	0.018	-	3E-04	
Mercury	0.39	NA	0.05		8
				HI	8

Constituents	EPC (As Reported)	EPA National Water Quality Criteria (cancer) 1	California Toxics Rule ²	EPA National Water Quality Criteria Risk	California Toxics Rule HQ
	μg/L	μg/L	μg/L	unitl	ess
Arsenic	6.7	0.018		4E-04	
Mercury	0.16	NA	0.05		
				Н	3

Notes:

HQs rounded to the nearest whole number. Risk shown as 0 is between 0.49 and 0. $\,$

Bold values indicate cancer risk exceeds 1 x 10⁻⁶ or HQ exceeds 1.

Abbreviations:

μg/L = micrograms per liter

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

ESV = ecological screening value

HI = hazard index

HQ = hazard quotient

MCL = maximum contaminant level

NA = not applicable

Sources:

¹ EPA. 2020a. National Recommended Water Quality Criteria - Human Health Criteria Table Consumption of Water and Organisms and Aquatic Life Criteria Tables. February.

² EPA. 2000. 40 Code of Federal Regulations Part 131, Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Rule.

															,		
	D_Arsenic		D_Chromium	Copper		Lead	D_Lead	-	D_Mercury	Molybdenum	D_Molybdenum				D_Vanadium	Zinc	D_Zinc
43.0	1	26.0		16		31	1	3.0	1			21.0		244.0	1	139	1
162.0	1	28.0	1	20		56 75	1	3.00	1	7.0	4	23.0		227.0	1	106	1
35.0 16.0	1			18 22		75 34.0	1	4.00 3.00	1	7.0 5.0		20.0 20.0		205.0 197.0	1	121 100.0	1
20.0	1			31	1	34.0 85	1	31.0	<u></u>	5.0		25.0		197.0	1	119	1
87.0	1			16	1	26	1	3.00	1	3.0		28.0		236	1	98	
37.0	1	32.0	1	21	1	61	1	4.0	<u>'</u> 1	3.0		25.0		225	1	119	1
53.0	1	02.0		23	1	85.0	1	5.0	<u>.</u> 1	3.0		27.0		250.0	1	114.0	1
17.0	1	21.0	1	14		22	1	3.00	<u>.</u> 1	0.0		16.0		231.0	1	77.0	1
18.0	1	24.0		14		27	1	3.00	1			18.0		256.0	1	89	1
40	1	-		24		74	1	3	1	5	1	22		233	1	165	1
22	1	44	1	24		89	1	3	1			25		257	1	197	1
28	1	28		40	1	99	1	6	1	3	1	20		233	1	159	1
50	1	29	1	17	1	33	1	3	1			19	1	224	1	85	1
70	1			24	1	94	1	13	1	8	1	18	1	175	1	139	1
47	1	22	1	30	1	119	1	15	1	5	1	22	1	227	1	152	1
55	1	39	1	26	1	87	1	8	1	6	1	19	1	206	1	161	1
20	1			30	1	90	1	9	1	6	1	24	1	232	1	142	1
69	1			33	1	202	1	11	1	4	1	19	1	191	1	175	1
24	1	23	1	24	1	40	1	3	1	8	1	18	1	189	1	127	1
32	1			24	1	62	1	3	1	11	1	16	1	118	1	162	1
26	1	27	1	32	1	193	1	16	1	4	1	20	1	204	1	129	1
43	1			15	1	76	1	9	1	3	1	17		191	1	116	1
25	1			20		37	1	4	1			21		264	1	95	1
24	1	34		20		25	1	3	1			17		212	1	100	1
22	1	29		22		43	1	4	1	3	1	22		223	1	93	1
21	1	39	1	18		23	1	5	1			23		248		110	1
249	1			57		185	1	12	1	6		25		198	1	176	1
56	1			31		52	1	4	1	6		22		221	1	131	1
26	1	00		29		20	1			10		22		232		155	1
47	1	29		36		75	1	5	1	3	1	30		205	1	145	1
41	1	40		77		91	1	/	1		4	35		271	1	165	1
27	1	23 27		22		41	1	5	1	5		23		208		131	1
58 14	1	28		54 14		179 12	1	3	1	5	1	18 21		254 188		376 64	1
15	1	25		20		29	1	3	<u> </u>			21		235		105	1
81	1	20	1	29		90	1	6	1	11	1	21		176		142	1
12	1	37	1	12		18	1	0	I	3		15		272		95	1
132	1		<u>'</u>	38		234	1	6	1	9		14		151	1	228	1
58	1			68		280	1	14	1	7	1	21		213	1	176	1
116	1	35	1	19		53	1	5	<u>.</u> 1	4	1	19		178		124	1
42	1			21		31	1		·	4	1	18		205		88	1
297	1	24	1	28		92	1	7	1	5	1	19		178		148	1
13	1		<u> </u>	15		22	1	•		6	1	12		224		74	1
29	1			26		24	1	4	1	6	1	26		269		137	1
43	1	26	1	17		25	1	4	1			23		203		99	1
78	1	32		18		32	1	3	1			16		248		91	1
368	1			27	1	38	1	5	1	12	1	16	1	123	1	149	1
200	1			23	1	480	1	5	1	6		17	1	261	1	105	1
200	ı				<u>'</u>	1 700		<u> </u>		<u> </u>	<u>'</u>	1 17	<u>'</u>	201	1	100	

March 2021

Arsenic	D Arsenic	Chromium	D_Chromium	Copper	D_Copper	Lead	D_Lead	Mercury	D Mercury	Molybdenum	D_Molybdenum	Nickel	D Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
13.0		34.0		15	1	12		4.0	1	o.y.buomum		29.0	1	299.0		65	
25.0	1	0 1.0		25	1	19		3.00	1	3.0	1	25.0	1	243.0		112	
15.0	1	40.0	1	23	1	12	1			5.0	1	29.0	1	277.0	1	105	1
13.0	1			17	1	16.0	1			3.0		24.0	1	300.0		72.0	
21.0	1			35	1	10				9.0		29.0	1	203.0		127	
20.0	1			36 13	1	9		2.0	1	11.0	1	26.0 23.0	1	219 286		148 55	
9.0	1			20	1	7.0		3.0 4.0	1	4.0	1	17.0	1	271.0		73.0	
13.0	1			15	1	9		3.00	1	7.0		15.0	1	214.0		70.0	
24.0	1			31	1	11	1			10.0		23.0	1	182.0		115	
11	1			16	1	8				7	1	17	1	245		85	
10	1			16	1	11		4	1	4	1	22	1	268		67	
15	1	32	1	27	1	9		5	1	7	1	26	1	235		108	
11 15	1			13 17	1	9 10		4	I	5	1	22 26	1	295 291	1	72 75	
25	1			22	1	21				9	1	22	1	224	1	122	
9	1	39	1	23	1	10						24	1	308		80	
20	1	32		20	1	15	1	3	1	4	1	21	1	212		84	
7	1			18	1	9		3	1			25	1	258		71	
6	1	22		12	1	9		4	1	7	1	23	1	225		56	
9	1	33	1	18	1	7	'					29 18	1	273 242		63 54	
14	1			14 32	1	7	-			9	1	29	1	242		54 115	
9	1			22	1	8				6	1	19	1	227		102	
8	1			27	1	7				11	1	22	1	158		118	
9	1			21	1	4	1	3	1	7	1	21	1	122	1	108	1
18		35	1	18		21						21	1	265	1	86	
10	1	0.5		14	1	13		4	1	3	1	16	1	241	1	64	
10	1	25	1	19 24	1	8 8		1	1	5	1	18 24	1	280 302		68 105	
9	1	26	1	17	1	9		- 4	<u>'</u>	7	1	19	1	194		91	
12	1	37		22	1	10		4	1	4	1	25	1	257	1	89	
10	1	33	1	23	1	8	1	4	1	3	1	24	1	243	1	95	
12	1			26	1	11				7	1	26	1	231	1	114	
9	1			26	1	11				6	-	27	1	215		110	
9	1	22	1	24	1	8 16		4	1	10	1	22	1	212		114	
12	1	23	I	28 10	1	8				<u>6</u>	1	21 16	1	236 235		122 45	
11	1	23	1	20	1	10		5	1	5	1	31	1	254		94	
6	1			9	1	10		3	1	3	1	12	1	242		43	
7	1	28	1	14	1	8				5	1	17	1	241	1	66	
5	1			9	1	7						16	1	238		38	
13	1	0.4	4	36	1	10	1		4	9	1	26	1	177		182	
10	1	24	1	31 18	1	10 8	1	3	1	5	1	29 19	1	253 186		97 83	
10	1			28	1	8		3	1	8	1	21	1	255		110	
13	1			13	1	13		3	1	5	1	15	1	208		70	
10	1			14	1	11	1			4	1	18	1	248		63	
8	1			10	1	8		3	1	5	1	9	1	203		37	
12	1			25	1	8		4	1	9	·	19	1	185		114	
9	1			18 26	1	<u> </u>		2	4	15 10		7 20	1	93 189		122 100	
6	1				1	5		3	I	3		12	1	189		78	
9	1			23	1	11		4	1	5	1	27	1	218		101	
13	1			27	1	11				10	1	17	1	185		129	
8	1			8	1	6				5	1	12	1	252		45	
7	1			19	1	9				11	1	12	1	252		83	
9	1	33	1	18		8						27	1	237		68	1
37	1			8 15	1	7 10		4	1	8	1	15 29	1	265 272		44 75	
7	1	33	1	16	1	6		4	1	<u> </u>	1	29	1	286		75	
18	1			22	1	18		т	<u>'</u>	10	1	17		129		148	
14	1			26	1	16				8		16	1	195		104	
9	1			11	1	6	1	4	1	3	1	27	1	315	1	48	1

Kern County, California

AOC 2 - XRF UCL Big Blue Mill Kern County, California

11	1			31	1	3	1			18	1	12	1	86	1	156	1
10	1			21	1	9	1			7	1	16	1	208	1	97	1
7	1			18	1	7	1	4	1	8	1	17	1	197	1	78	1
10	1			23	1	9	1	3	1	8	1	26	1	257	1	93	1
11	1	51	1	20	1	8	1	4	1		1	29	1	288	1	68	1
7	1	30	1	18	1	10	1	4	1	6	1	20	1	294	1	65	1
14	1	32	1	34	1	9	1	4	1	8	1	27	1	276	1	130	1
8	1	<u> </u>		27	1	5	1	5	1	12	1	15	1	142	1	118	1

Arsenic	D_Arsenic	Chromium	D_Chromium	Copper	D_Copper	Lead	D_Lead	Mercury	D_Mercury	Molybdenum	D_Molybdenum	Nickel	D_Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
699.0	1	29.0	1	22	1	105	1	8.0	1			18.0	1	236.0	1	100	1
220.0	1			39	1	130	1	5.00	1	11.0	1	31.0	1	153.0	1	266	1
272.0	1	27.0	1	51	1	31	1	10.00	1	4.0	1	18.0	1	266.0	1	109	1
941.0	1	39.0	1	22	1	272.0	1	5.00	1			18.0	1	260.0	1	128.0	1
276.0	1			22	1	62	1	18.0	1	11.0	1	16.0	1	176.0	1	180	1
1105.0	1	33.0	1	18	1	128	1	5.00	1			21.0	1	242	1	110	1
634.0	1	24.0	1	17	1	111	1			5.0	1	19.0	1	208	1	97	1
130.0	1	28.0	1	23	1	43.0	1	8.0	1	5.0	1	15.0	1	297.0	1	135.0	1
192.0	1			39	1	56	1			11.0	1	32.0	1	170.0	1	162.0	1
332.0	1	26.0	1	29	1	123	1	5.00	1	5.0	1	25.0	1	193.0	1	184	1
120	1	46	1	24	1	70	1			4	1	22	1	251	1	273	1
483	1	42	1	77	1	264	1	6	1			17	1	179	1	144	1
139	1	49	1	11	1	24	1	3	1			18	1	265	1	90	1
83	1			14	1	16	1							246	1	96	1
230	1			28	1	101	1	7	1			17	1	206	1	111	1
70	1			31	1	23	1			8	1	23	1	217	1	112	1
13	1	27	1	12	1	12	1			7	1	16	1	316	1	63	1
67	1	31	1	18	1	23	1	6	1			20	1	303	1	71	1
170	1			22	1	24	1	4	1	13	1	20	1	151	1	146	1
173	1			88	1	282	1	76	1	5	1	18	1	231	1	171	1
410	1			53	1	435	1	47	1	6	1	21	1	142	1	173	1
123	1			34	1	61	1	5	1	13	1	22	1	147	1	163	1
496	1			14	1	35	1	3	1			20	1	228	1	79	1
2183	1	22	1	21	1	90	1			4	1	22	1	162	1	167	1
1314	1			25	1	172	1			5	1	17	1	204	1	154	1

Antimony	D_Antimon y		D_Arsenic	Chromium	D_Chromium	Copper	D_Copper	Lead	D_Lead	Mercury	D_Mercury	Molybdenum	D_Molybdenum	Nickel	D_Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
		178.0	1			14	1	116	1	4.0	1	10.0	1	12.0	1	224.0	1	124	1
		35.0	1	26.0	1	8	1	590	1	4.00	1	7.0	1	15.0	1	207.0	1	100	1
		263.0	1	27.0	1	19	1	20	1	4.00	1	4.0	1	13.0	1	241.0	1	112	1
30.00	1	224.0	1			10	1	59.0	1	3.00	1	6.0	1	11.0	1	198.0	1	82.0	1
142.0	1	623.0	1			11	1	98	1	4.0	1	6.0	1	15.0	1	174.0	1	116	1
		364.0	1			19	1	87	1	8.00	1	9.0	1	14.0	1	249	1	209	1
23.0	1	425.0	1			15	1	64	1			5.0	1	16.0	1	172	1	245	1
		160.0	1			11	1	12.0	1			3.0	1	15.0	1	237.0	1	75.0	1
414.0	1	10929.0	1	38.0	1	20	1	891	1					11.0	1	138.0	1	197.0	1
224.0	1	4678.0	1	28.0	1	29	1	461	1	7.00	1	5.0	1	24.0	1	187.0	1	185	1
1172	1	8226	1	25	1	7	1	590	1			5	1	7	1	196	1	82	1
		250	1	50	1	32	1	31	1	16	1	9	1	37	1	247	1	444	1
		104	1			13	1	10	1	9	1	4	1	21	1	264	1	81	1
		590	1	27	1	16	1	99	1	5	1	4	1	21	1	288	1	169	1
8764	1	2997	1			17	1	249	1	0	1			20	1	247	1	172	1

Antimony	D_Antimony	Arsenic	D_Arsenic	Chromium	D_Chromium	Copper	D_Copper	Lead	D_Lead	Mercury	D_Mercury	Molybdenum	D_Molybdenum	Nickel	D_Nickel	Silver	D_Silver	Vanadium	D_Vanadium	Zinc	D_Zinc
		1045.0	1			13	1	61	1	8.0	1	3.0	1	23.0	1			261.0	1	86	1
		183.0	1			21	1	79	1	7.00	1	8.0	1	20.0	1			250.0	1	106	1
		132.0	1			25	1	38	1	6.00	1	4.0	1	20.0	1			257.0	1	87	1
		1273.0	1			44	1	412.0	1	16.00	1			23.0	1			186.0	1	550.0	1
		65.0	1			11	1	8	1					16.0	1			192.0	1	47	1
79.0	1	31092.0	1	29.0	1			3162	1	108.00	1					68.0	1			98	1
28.0	1	1833.0	1			33	1	1002	1	19.0	1	18.0	1	16.0	1			216	1	189	1
95.0	1	9270.0	1			15	1	1229.0	1	11.0	1	12.0	1	10.0	1	34.00	1	144.0	1	101.0	1
		1488.0	1	23.0	1	76	1	6956	1	10.00	1	5.0	1	11.0	1			189.0	1	164.0	1
		27168.0	1	33.0	1			1801	1	693.00	1					39.00	1	98.0	1	59	1
32	1	10745	1	41	1	7	1	445	1					8	1	15	1			82	1
		19793	1	37	1			874	1	21	1			<11	1	17	1	114	1	23	1
		1171	1			7	1	306	1	39	1			14	1	10	1	140	1	38	1
91	1	90189	1	46	1			2340	1	1458	1			<9	1	190	1			151	1
27	1	11395	1	29	1			1685	1	275	1			<11	1	19	1	145	1	64	1

Antimony	D_Antimony	Arsenic	D_Arsenic	Barium	D_Barium	Cadmiu m		Chromium	D_Chromium	Cobalt	D_Cobalt	Copper	D_Copper	Lead	D_Lead	Mercury	D_Mercury	Nickel	D_Nickel	Silver	D_Silver	Vanadium	D_Vanadium	Zinc	D_Zinc
2.20	1	1900.0	1	54.0	1	14.00	1	8.6	1	4.8	1	87	1	13000	1	7.9	1	6.3	1	4.6	1	25.0	1	140	1
1.60	1	1200.0	1	41.0	1	9.10	1	5.9	1	3.5	1	40	1	7100	1	5.70	1	4.5	1	4.7	1	17.0	1	110	1
0.83	1	1100.0	1	57.0	1	8.50	1	6.8	1	5.1	1	7	1	66	1	7.10	1	4.7	1	0.9	1	28.0	1	64	1
4.50	1	15000.0	1	41.0	1	110.00	1	3.7	1	2.2	1	5	1	1200.0	1	350.00	1	1.5	1	11.0	1	20.0	1	36.0	1
3.3	1	19000.0	1	47.0	1	140.0	1	4.4	1	2.3	1	3	1	990	1	20.0	1			2.2	1	24.0	1	19	1
74.0	1	0.00088	1	18.0	1	630.0	1	<0.5	1			7	1	2400	1	270.00	1			45.0	1	3	1	190	1
21.0	1	30000.0	1	45.0	1	210.0	1	4.4	1	1.4	1	28	1	2200	1	72.0	1	1.8	1	30.0	1	9	1	120	1
23.0	1	13000.0	1	79.0	1	91.0	1	10.0	1	6.9	1	20	1	1300.0	1	8.8	1	7.1	1	24.00	1	28.0	1	110.0	1

Arconio	D Arconio	Chromium	D_Chromium	Copper	D_Copper	Lead	D_Lead	Mercury	D. Moreury	Molyhdonum	D_Molybdenum	Nickel	D Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
		Cilionilani	D_Ciliolillulii				D_Leau	•	D_Wercury	-	D_Worybaeriaiii		D_INICKEI				D_ZIIIC
151.0				22	1	22	1	6.0	1	6.0	1	23.0	1	287.0		70	1
75.0	1			19	1	26	1			8.0	1	9.0	1	190.0	1	125	1
44.0	1			15	1	14	1	4.00	1	4.0	1	18.0	1	243.0	1	75	1
60.0	1			72	1	56.0	1	17.00	1	15.0	1	15.0	1	254.0	1	92.0	1
265.0	1			14	1	44	1	3.0	1	4.0	1	16.0	1	249.0	1	86	1
369.0	1			24	1	33	1					21.0	1	214	1	72	1
35.0	1			17	1	12	1	5.0	1	5.0	1	28.0	1	223	1	73	1
84.0	1	27.0	1	18	1	15.0	1					18.0	1	212.0	1	73.0	1
86.0	1	24.0	1	27	1	32	1	3.00	1			18.0	1	190.0	1	183.0	1
122.0	1	40.0	1	29	1	38	1	6.00	1			17.0	1	233.0	1	72	1
129	1			66	1	21	1	5	1			21	1	269	1	98	1
63	1			12	1	15	1	3	1			20	1	220	1	63	1
43	1			26	1	19	1	4	1	8	1	28	1	295	1	90	1
42	1	44	1	18	1	42	1	4	1	5	1	24	1	284	1	87	1
22	1	23	1	11	1	8	1	4	1			27	1	235	1	72	1
22	1	40	1	17	1	6	1	3	1			28	1	283	1	60	1

AOC / - XRF UCL
Big Blue Mill
Kern County, California

Arsenic	D_Arsenic	Copper	D_Copper	Lead	D_Lead	Mercury	D_Mercury	Nickel	D_Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
8.0	1	11	1	6	1	3.0	1	15.0	1	289.0	1	46	1
6.0	1	11	1	10	1	3.00	1	14.0	1	259.0	1	33	1
4.0	1	23	1	8	1	3.00	1	17.0	1	228.0	1	48	1
7.0	1	16	1	7.0	1	3.00	1	16.0	1	254.0	1	58.0	1
16.0	1	20	1	6	1			30.0	1	339.0	1	85	1
22.0	1	11	1	9	1	4.00	1	20.0	1	365	1	63	1
21.0	1	10	1	7	1			22.0	1	325	1	50	1
8.0	1	13	1	7.0	1	3.0	1	22.0	1	268.0	1	62.0	1
26.0	1	18	1	9	1			21.0	1	293.0	1	52.0	1
7.0	1	19	1	8	1			20.0	1	323.0	1	65	1

Arsenic	D_Arsenic	Barium	D_Barium	Chromium	D_Chromium	Cobalt	D_Cobalt	Copper	D_Copper	Mercury	D_Mercury	Nickel	D_Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
8.8	1			9.1	1	5.2	1	6	1	0.022	1	4.4	1	32.0	1	24	1
4.2	1	52.0	1	5.8	1	4.8	1	6	1	0.028	1	3.5	1	28.0	1	27	1
4.2	1	56.0	1	3.9	1	4.2	1	8	1	4.3	1	3.5	1	19.0	1	32	1
6.4	1	93.0	1	11.0	1	7.9	1	13	1	0.058	1	6.5	1	53.0	1	51.0	1
7.1	1	60.0	1	8.4	1	6.0	1	7	1	0.066	1	5.5	1	37.0	1	39	1
13.0	1	68.0	1	12.0	1	7.0	1	8	1			5.2	1	65	1	38	1
9.6	1	52.0	1	10.0	1	5.6	1	7	1			9.5	1	28	1	26	1
7.1	1	53.0	1	7.4	1	5.9	1	7	1			4.2	1	32.0	1	35.0	1
17.0	1	36	1	9.3	1	5.3	1	13	1			4.1	1	44.0	1	26.0	1
		56.0	1	12.0	1	6.1	1	7	1	0.02	1	4.8	1	62.0	1	32	1

	A B C	D E	F		Н	ı	J	K	L		
1		UCL Statis	tics for Unc	ensored Full Data	Sets						
2	Llean Calantad Ontion										
3	User Selected Option		.47.40 004								
4	Date/Time of Computation From File			Divo o vio							
5			USFS BIG B	Jue_a.xis							
6	Full Precision Confidence Coefficient										
7	Number of Bootstrap Operations										
8	Number of Bootstrap Operations	2000									
9											
10	Arsenic										
11											
12			General	Statistics							
13	Tota	al Number of Observations	49			Numbe	er of Distinc	t Observations	41		
14	100	ai ivalibel of Observations	70					g Observations	0		
15		Minimum	12			Numbe	i oi missiit	Mean	63.43		
16		Maximum	368					Median	41		
17		SD	73.83				Std	. Error of Mean	10.55		
18		Coefficient of Variation	1.164				Oid.	Skewness	2.679		
19		Cocmoloni or Variation	1.104					Chewness			
20			Normal (GOF Test							
21		Shapiro Wilk Test Statistic		201 1001		Shaniro W	ilk GOF Te				
22		Shapiro Wilk Critical Value		D		-		cance Level			
23		Lilliefors Test Statistic					GOF Test				
24	50/100/100/100/100/100/100/100/100/100/1										
25				 5% Significance Le		- Tromial at	- O Olgriille				
26	 								-		
27	+	As	sumina Norr	mal Distribution							
28	95% 1	Normal UCL			95% l	JCLs (Adi	usted for S	kewness)			
29		95% Student's-t UCL	81.12			• •		L (Chen-1995)	85.09		
30								Johnson-1978)	81.79		
31 32								,			
33			Gamma (GOF Test							
34		A-D Test Statistic			Anders	on-Darling	g Gamma G	OF Test			
35		5% A-D Critical Value	0.77					Significance Leve	el e		
36		K-S Test Statistic	0.183					GOF Test			
37		5% K-S Critical Value	0.129					Significance Leve	əl		
38		Data Not Gamr	na Distribute	∣ ed at 5% Significar							
39											
40			Gamma	Statistics							
41		k hat (MLE)	1.399			k	star (bias o	corrected MLE)	1.327		
42		Theta hat (MLE)				Theta	star (bias o	corrected MLE)	47.81		
43		nu hat (MLE)					•	bias corrected)	130		
44	1	MLE Mean (bias corrected)					MLE Sd (I	bias corrected)	55.07		
45					A	pproximat	e Chi Squa	re Value (0.05)	104.7		
46	Adjı	usted Level of Significance	0.0451			Α	djusted Ch	i Square Value	104		
47											
48		Ass	suming Gam	nma Distribution							
49	95% Approximate Gamm	na UCL (use when n>=50))	78.78	9:	5% Adjı	usted Gam	ma UCL (u	se when n<50)	79.3		
50				L							
51			Lognorma	I GOF Test							
52		Shapiro Wilk Test Statistic	0.937		Shapi	ro Wilk Lo	gnormal G	OF Test			
53	5%	Shapiro Wilk Critical Value	0.947	Dat	ta Not Lo	ognormal a	at 5% Signif	ficance Level			
54		Lilliefors Test Statistic	0.109		Lillie	efors Logn	ormal GOF	Test			
7 T											

55	Α	В	<u> </u>	C 5		D iefors C	E Critical Value	e 0.1	- 126	G	D	H Oata appe	ear Lo	l gnorma	al at 59	J % Signif	ficar	K nce Lev	vel	L
56						Data a	appear Appr	oximate	Logr	ormal at 5	% S	ignifican	nce Le	evel						
57				-																
58								Logi	norma	l Statistics	;									
59					Minim	num of l	Logged Data	a 2.4	185						ľ	Mean of	flog	ged Da	ata	3.752
60					Maxim	num of l	Logged Data	a 5.9	908							SD of	f log	ged Da	ata	0.825
61																				
62			-	-	-		Ass	suming	Logno	rmal Distri	ibuti	on						-		
63							95% H-UC	L 77.	46					90%	6 Cheb	yshev ((MV	UE) U	CL	82.97
64				95%	Cheb	yshev ((MVUE) UC	L 93.	67					97.5%	6 Cheb	yshev ((MV	UE) U	CL	108.5
65				99%	Cheb	yshev ((MVUE) UC	L 137.	.7										-	
66																				
67							Nonparam	netric Di	stribu	tion Free U	JCL	Statistic	s							
68					Data	appea	r to follow a	Discer	nible	Distribution	n at !	5% Sign	nifican	ce Lev	el					
69																				
70							Nonp	arametr	ic Dis	tribution Fr	ree l	JCLs								
71						95	5% CLT UC	L 80.	78							95% Ja	ackk	nife U	CL	81.12
72				95%	Stand	dard Bo	ootstrap UC	L 80.	43						9	5% Boo	otstr	ap-t U(CL	90.16
73							ootstrap UC		54					95%		entile Bo		•		81.22
74					95% F	3CA Bo	ootstrap UC	L 85.	08										_	
75			ç	90% CI	hebysł	hev(Me	an, Sd) UC	L 95.	07					95% C	Chebys	shev(Me	ean,	Sd) U(CL	109.4
76			97	.5% CI	hebysł	hev(Me	an, Sd) UC	L 129.	.3					99% C	Chebys	hev(Me	ean,	Sd) U(CL	168.4
77						•										•				
78				Sugg	ested	UCL to Us	<u></u>													
79							95% H-UC												\neg	
80																				
81		Note: Sugge	estions	regard	ding th	ne selec	ction of a 95	% UCL	are pr	ovided to h	elp t	the user	to sel	ect the	most a	appropri	iate	95% U	JCL.	
82							ations are ba									••••				
83		These reco	mmen				upon the res	-								chle, an	d Le	e (200	06).	
84	————	wever, simu					•											•		n.
85															, -					
86				Pro	UCL (comput	tes and outp	outs H-s	tatisti	c based U	CLs	for histo	rical	easons	s onlv.					
87		H-statistic	c often				both high										nical	Guide	 €.	
88							recommen		•											
89	U:	se of nonpar	rametr	ic met	hods a	are pre	ferred to co	mpute l	JCL95	for skewe	ed da	ata sets v	which	do not	follow	a gam	ıma	distrib	utior	 1.
90		•																		
91																				
_	Chromium			-																
93																				
94								Ge	neral	Statistics										
95				Tota	l Num	ber of C	Observation	s 26						Numb	er of D	istinct (Obse	ervatio	ns	16
96														Numbe	er of M	lissing (Obse	ervatio	ns	21
97							Minimun	n 21										Ме		29.65
98							Maximun											Medi		28
99							SI	D 6.	19							Std. E	Error	r of Me	an	1.214
100					Cor	efficien	t of Variation	n 0.2	209								S	kewne	ess	0.74
101										<u> </u>										
101								No	rmal (GOF Test										
102				5	Shapir	o Wilk	Test Statisti		929				Sh	apiro V	Vilk G	OF Test	t			
103					•		Critical Value					Data app						e Leve	<u> </u>	
105							Test Statisti		196			- 171	•	_illiefor		-				
							Critical Value					Data N				ignifica	nce	Level		
106							appear Ap	-		rmal at 5%	Sia					J				
107							· · · · · ·						•							
108											_						_		_	

109	A	В	С	D	E As	F ssuming Norr	G mal Distribution	Н	I	J	K	L
110			95% No	ormal UCL				95% U	JCLs (Adju	sted for S	kewness)	
111				95% Stu	ident's-t UCL	31.73		95	5% Adjuste	ed-CLT UC	L (Chen-1995)	31.84
112								9	5% Modifi	ed-t UCL (Johnson-1978)	31.76
113												
114						Gamma	GOF Test					
115				A-D	Test Statistic	0.503		Anderso	on-Darling	Gamma G	OF Test	
116				5% A-D (Critical Value	0.744	Detected da	ata appear	Gamma D	istributed a	at 5% Significan	ce Level
117				K-S	Test Statistic	0.172		Kolmogor	rov-Smirno	ov Gamma	GOF Test	
118					Critical Value	-					Significance Lev	rel .
119				Detected da	ata follow Ap	pr. Gamma I	Distribution at 5	5% Significa	ance Leve	I		
120												
121							Statistics					
122					k hat (MLE)					•	corrected MLE)	22.41
123					eta hat (MLE)				Theta	•	corrected MLE)	1.323
124					nu hat (MLE)					,	bias corrected)	
125			M	LE Mean (bia	as corrected)	29.65					bias corrected)	
126								Αţ	· ·	· .	re Value (0.05)	1087
127			Adjus	sted Level of	Significance	0.0398			A	djusted Ch	i Square Value	1082
128												
129							ma Distribution					
130	9	5% Approxir	nate Gamma	a UCL (use w	vhen n>=50))	31.79		95% Adju	sted Gamı	ma UCL (u	se when n<50)	31.93
131												
132						-	I GOF Test					
133				•	Test Statistic		_	-	ro Wilk Log			
134			5% S		Critical Value		Da				nificance Level	
135					Test Statistic				efors Logn			
136			5		Critical Value			• • •	Lognormal	at 5% Sigi	nificance Level	
137					Data appea	r Lognormai	at 5% Significar	nce Level				
138						Lognorma	I Statistics					
139				Minimum of	Logged Data	•	1 Otatiotics			Mean	of logged Data	3.37
140					Logged Data						of logged Data	0.201
141			•	viaximam or	Loggod Data	0.701					or logged Data	U.201
142					Ass	umina Loana	ormal Distributio	on .				
143					95% H-UCL				90%	Chebyshe	v (MVUE) UCL	33.17
144			95%		(MVUE) UCL					•	v (MVUE) UCL	36.99
145				•	(MVUE) UCL					22,00	,,,	
146 147				-,	, , , , , , , ,							
147					Nonparam	etric Distribu	tion Free UCL S	Statistics				
149				Data appea			Distribution at 5		ance Leve	I		
150				••								
151					Nonpa	rametric Dis	tribution Free U	ICLs				
152				95	5% CLT UCL					95%	Jackknife UCL	31.73
153			95%	Standard Bo	ootstrap UCL	31.59				95% B	ootstrap-t UCL	31.87
154			9	5% Hall's Bo	ootstrap UCL	31.86			95%	Percentile	Bootstrap UCL	31.73
155				95% BCA Bo	ootstrap UCL	31.77						
156			90% Ch	nebyshev(Me	ean, Sd) UCL	33.3			95% Cł	nebyshev(N	Mean, Sd) UCL	34.95
157			97.5% Ch	nebyshev(Me	an, Sd) UCL	37.23			99% Cł	nebyshev(N	Mean, Sd) UCL	41.73
158						I	<u> </u>					
159						Suggested	UCL to Use					
160				95% Stu	ident's-t UCL	31.73						
161							<u> </u>					
162			When a d	data set follo	ws an approx	kimate (e.g., r	normal) distributi	tion passing	one of the	e GOF test		
102												

	A B C D E	F	G H I J K distribution (e.g., gamma) passing both GOF tests in ProUCL	L
163	When applicable, it is suggested to use a OCL ba	iseu upon a	uistribution (e.g., gamma) passing both GOT tests in F100CL	
164	Note: Suggestions regarding the collection of a 0.5%	LICL are pr	ovided to help the user to select the most appropriate 95% UCL.	
165			a size, data distribution, and skewness.	
166			ulation studies summarized in Singh, Maichle, and Lee (2006).	
167	•		s; for additional insight the user may want to consult a statisticia	n
168	However, simulations results will not cover all recar will		3, for additional margine the date may want to consult a statisticia	
169				
170	Copper			
171 172				
173		General	Statistics	
174	Total Number of Observations	49	Number of Distinct Observations	27
175			Number of Missing Observations	0
176	Minimum	12	Mean	26.51
177	Maximum	77	Median	23
178	SD	13.29	Std. Error of Mean	1.899
179	Coefficient of Variation	0.501	Skewness	2.17
180			I.	
181		Normal C	GOF Test	
182	Shapiro Wilk Test Statistic	0.775	Shapiro Wilk GOF Test	
183	5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level	
184	Lilliefors Test Statistic	0.187	Lilliefors GOF Test	
185	5% Lilliefors Critical Value	0.126	Data Not Normal at 5% Significance Level	
186	Data Not	Normal at 5	% Significance Level	
187				
188	Ass	suming Norr	nal Distribution	
189	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
190	95% Student's-t UCL	29.69	95% Adjusted-CLT UCL (Chen-1995)	30.26
191			95% Modified-t UCL (Johnson-1978)	29.79
192				
193		Gamma (GOF Test	
194	A-D Test Statistic	1.372	Anderson-Darling Gamma GOF Test	
195	5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Leve	el
196	K-S Test Statistic	0.149	Kolmogorov-Smirnov Gamma GOF Test	
197	5% K-S Critical Value	0.127	Data Not Gamma Distributed at 5% Significance Leve	el
198	Data Not Gamn	na Distribute	ed at 5% Significance Level	
199				
200		Gamma	Statistics	
201	k hat (MLE)	5.691	k star (bias corrected MLE)	5.356
202	Theta hat (MLE)	4.658	Theta star (bias corrected MLE)	4.949
203	nu hat (MLE)	557.7	nu star (bias corrected)	524.9
204	MLE Mean (bias corrected)	26.51	MLE Sd (bias corrected)	11.45
205			Approximate Chi Square Value (0.05)	472.8
206	Adjusted Level of Significance	0.0451	Adjusted Chi Square Value	471.3
207				
208			ma Distribution	
209	95% Approximate Gamma UCL (use when n>=50))	29.43	95% Adjusted Gamma UCL (use when n<50)	29.53
210			2057	
211	0	Lognormal		
212	Shapiro Wilk Test Statistic	0.941	Shapiro Wilk Lognormal GOF Test	
213	5% Shapiro Wilk Critical Value	0.947	Data Not Lognormal at 5% Significance Level	
214	Lilliefors Test Statistic	0.121	Lilliefors Lognormal GOF Test	
215	5% Lilliefors Critical Value	0.126	Data appear Lognormal at 5% Significance Level	
216	Data appear Approx	kimate Logn	ormal at 5% Significance Level	

047	Α	В	(С	D)	E		F	G	Н		<u> </u>		J		K	L
217									Lognorma	l Statistics								
218				N	Minimu	ım of L	ogged	Data	2.485					N	/lean of	logge	d Data	3.187
219 220							.ogged		4.344								d Data	0.405
221																		
222	 							Assu	ming Logno	rmal Distrib	ution							
223							95% H-	-UCL	29.26				90%	Cheb	yshev (MVUE	E) UCL	30.95
224				95% C	Chebys	shev (I	MVUE)	UCL	33.08			ç	97.5%	Cheb	yshev (MVUE	E) UCL	36.04
225				99% C	Chebys	shev (ľ	MVUE)	UCL	41.86									
226																		
227										tion Free UC								
228					Data a	appea	to follo	ow a C)iscernible	Distribution a	at 5% Sign	ificance	Leve					
229									5.		1101							
230	 					0.5				tribution Free	UCLS				050/ 1-	-1-1	f- 1101	20.00
231	 			OE9/ (Ctonds		% CLT		29.63						95% Ja			29.69 31.19
232							otstrap otstrap		30.4				Q5%		5% Boo			29.67
233							otstrap		30.4				JJ /0	, 0100	יייייי דו	JUGUIC	.p 00L	
234			9(0% Che			•		32.21			9	5% CI	hebvs	hev(Me	an. So	d) UCI	34.79
235				5% Che		`	. ,		38.37						hev(Me		•	45.4
236 237						,,								, -	(., 5.	,	
238									Suggested	UCL to Use								
239					959	% Stud	dent's-t	UCL	29.69					or 9	95% Mc	dified	l-t UCL	29.79
240						or	95% H-	-UCL	29.26									-
241																		
242		Note: Sugo	gestions	regardi	ing the	selec	tion of a	э 95%	UCL are pr	ovided to hel	p the user	to selec	t the n	nost a	ppropri	ate 95	5% UCL	
243										a size, data d		-						
244							•			ulation studi			•				` '	
245		However, sin	nulations	results	s will no	ot cov	er all R	eal W	orld data se	ts; for additio	nal insight	the use	r may	want	to cons	ult a s	statisticia	an.
246	<u> </u>																	
247		11 -4-4-								c based UCL					Taska	inal O	\! al a	
248		n-statis	LIC OILEN				•		•	es of UCL95					e recnn	icai G	iuiue.	
249		Use of nonpa	arametri												a dam	ma dis	stributio	on .
250						o pror				- TOT OKOWOU		Willion G			u guiii	ina an	ourband	
251 252																		
	Lead																	
254																		
255									General	Statistics								
256				Total I	Numbe	er of O	bserva	tions	49			Ν	lumbe	er of D	istinct (Observ	vations	43
257												N	lumbe	r of M	issing (Observ	vations	0
258								mum	12								Mean	81.45
259							Maxii		480								Median	56
260								SD	83.76						Std. E		f Mean	11.97
261	<u> </u>				Coef	ficient	of Varia	ation	1.028							Ske	ewness	2.824
262	<u> </u>								N 2 :	OC T								
263	 				honi	\ \ /:!!. T	oot Ct-	ticti-		GOF Test		Ch-	niro ۱۸/	iik OO)E T+	,		
264					•		est Sta ritical V		0.701		Data N	Snap Not Norn			OF Test		امریدا	
265				J /0 OII			est Sta		0.947		Data N		liefors			ICC LC	. 4 € I	
266				50			ritical V		0.237		Data N	Not Norn				nce I e	evel	
267										 i% Significar		.0111011	.iui at	J /0 OI	3lcal	.50 LC		
268										J.g.iiilodi								
269								Ass	suming Nor	nal Distribut	ion							
270																		

271	Α	В	C 95% N	ormal UCL	Е	F	G	H 95°	│ │ │ % UCLs (Ad	J djusted for s	K Skewness)	L
272				95% Stu	ident's-t UCL	101.5			95% Adjus	sted-CLT U	CL (Chen-1995)	106.3
273									95% Mod	ified-t UCL	(Johnson-1978)	102.3
274												
275							GOF Test					
276					Test Statistic	1.325			erson-Darlii			
277					Critical Value	0.767	Da				Significance Lev	'el
278					Test Statistic	0.143	<u> </u>		<u> </u>		a GOF Test	
279					Critical Value	0.129				outed at 5%	Significance Lev	'el
280				Da	ata Not Gamn	na Distribute	at 5% Sigr	lificance L	_evel			
281						Gamma	Statistics					
282					k hat (MLE)	1.577	Statistics			k star (hias	corrected MLE)	1.494
283				The	eta hat (MLE)	51.64				,	corrected MLE)	54.51
284					nu hat (MLE)	154.6				•	(bias corrected)	146.4
285			M	LE Mean (bia	` ,	81.45					(bias corrected)	66.63
286					55/100100/	51.70			Approxima		are Value (0.05)	119.5
287			Adiu	sted Level of	Significance	0.0451					hi Square Value	118.7
288 289			,		32300					.,	- 4	
289					Ass	suming Gam	ma Distributi	ion				
291	95% A	\pproxim	ate Gamma	a UCL (use w		99.83			Adjusted Ga	mma UCL (use when n<50)	100.5
292											•	
293						Lognormal	GOF Test					
294			5	Shapiro Wilk 7	Test Statistic	0.963		Sh	apiro Wilk L	ognormal (GOF Test	
295			5% S	Shapiro Wilk C	Critical Value	0.947		Data appe	ear Lognorm	al at 5% Si	gnificance Level	
296				Lilliefors	Test Statistic	0.0902		L	illiefors Log	normal GC	F Test	
297			5	5% Lilliefors C	Critical Value	0.126		Data appe	ear Lognorm	al at 5% Si	gnificance Level	
298					Data appear	Lognormal	at 5% Signific	cance Lev	rel .			
299												
300						Lognorma	l Statistics					
301				Minimum of I	00	2.485					n of logged Data	4.051
302				Maximum of I	Logged Data	6.174	<u> </u>			SI	O of logged Data	0.808
303												
304							rmal Distribu	ition	000		(14) (15) 1101	100.0
305			050/		95% H-UCL	102.3	<u> </u>			•	ev (MVUE) UCL	109.6
306				Chebyshev (Chebyshev (,	123.5 180.7			97.5	∞ cnebysh	ev (MVUE) UCL	142.8
307				Chebysnev (IVIVUE) UCL	100.7						
308					Nonnaramo	tric Dietribu	tion Free UC	I Statietic	•			
309				Data annes	r to follow a [/el		
310				uu uppea	IOIIOW a L							
311 312					Nonpar	ametric Dist	tribution Free	UCLs				
				95	5% CLT UCL	101.1				95%	6 Jackknife UCL	101.5
313 314			95%	Standard Bo		101					Bootstrap-t UCL	110
315				95% Hall's Bo	-	115.3			95%		e Bootstrap UCL	103.7
316				95% BCA Bo	•	107.3					<u> </u>	
317				nebyshev(Me	-	117.3			95%	Chebyshev	(Mean, Sd) UCL	133.6
318			97.5% Cł	nebyshev(Me	an, Sd) UCL	156.2			99% (Chebyshev	(Mean, Sd) UCL	200.5
319												
320						Suggested	UCL to Use					
321					95% H-UCL	102.3						
322												
323	Note:	Suggest	•	•							opriate 95% UCL	
324			F	Recommenda	ations are bas	ed upon dat	a size, data d	istribution	, and skewn	ess.		
JZ-T												

	Α	B Those recor	C	D	E dupon the re-	F	G	Н	riand in Cinak	J K n, Maichle, and Lee (2006	L
325	ш				-					want to consult a statisti	•
326	110	JWEVEI, SIIIIU	iations resul	15 WIII HOL CO		- VVOIIU Uata Se	tis, for addition	iai irisigiit	tile user may	y want to consult a statisti	Ciaii.
327			Pro	LICL comp	utes and out	nute H-etatiet	ic based UCLs	s for histo	rical reasons	s only	
328		H-statistic		•		-				s in the Technical Guide.	
329		11 00000				•	the use of H-st		-		
330 331	U	se of nonpara								: follow a gamma distribu	tion.
332 333											
	Mercury										
335											
336						General	Statistics				
337			Tota	Number of	f Observation	ns 44			Numb	er of Distinct Observation	s 14
338									Numbe	er of Missing Observation	s 5
339					Minimu	m 3				Mea	n 6.341
340					Maximui	m 31				Media	n 4.5
341					S	D 5.203				Std. Error of Mea	n 0.784
342				Coefficie	ent of Variation	on 0.82				Skewnes	s 2.936
343							-				'
344						Normal	GOF Test				
345				•	k Test Statist					Vilk GOF Test	
346			5% S		Critical Valu			Data N		5% Significance Level	
347					s Test Statist					s GOF Test	
348				5% Lilliefors	Critical Valu				Not Normal at	5% Significance Level	
349					Data N	ot Normal at	5% Significand	ce Level			
350											
351			050/ N			Assuming Nor	mal Distributio		0/ 1101 - /4-1	lasta difan Olassana	
352			95% N	lormal UCL	tudent's-t UC	CL 7.659		95		justed for Skewness)	0.000
353				95% 5	tudent s-t OC	L 7.009				ted-CLT UCL (Chen-1995 fied-t UCL (Johnson-1978	*
354									95% 101001	ileu-t OCL (Johnson-1976	7.717
355						Gamma	GOF Test				
356				Δ-Γ	D Test Statist		Tor rest	And	erson-Darlin	g Gamma GOF Test	
357					Critical Valu		Da			uted at 5% Significance Lo	evel
358					S Test Statist					nov Gamma GOF Test	
359					Critical Valu		Da			uted at 5% Significance Lo	evel
360 361							⊥ ed at 5% Sign				
362											
363						Gamma	Statistics				
364					k hat (MLE	2.658			k	star (bias corrected MLE	2.492
365				Tł	heta hat (MLE	51			Theta	a star (bias corrected MLE	2.545
366					nu hat (MLE	E) 233.9				nu star (bias corrected) 219.3
367			M	ILE Mean (t	oias corrected	d) 6.341				MLE Sd (bias corrected) 4.017
368									Approximat	te Chi Square Value (0.05	186
369			Adju	sted Level o	of Significand	ce 0.0445			A	Adjusted Chi Square Valu	e 185
370							<u>•</u>				
371							nma Distributio				
372	(95% Approxin	nate Gamma	a UCL (use	when n>=50)) 7.475		95% <i>F</i>	Adjusted Gan	nma UCL (use when n<50	7.517
373											
374							I GOF Test				
375					k Test Statist				-	ognormal GOF Test	
376			5% S	·	Critical Valu					at 5% Significance Level	
377			=		s Test Statist					normal GOF Test	
378				5% Lilliefors	Critical Valu	ie 0.132		Data No	t Lognormal	at 5% Significance Level	

379	A B C D E Data Not	F Lognormal at	G H I J K 5% Significance Level	L
380				
381		Lognorma	l Statistics	
382	Minimum of Logged Data	1.099	Mean of logged Data	1.647
383	Maximum of Logged Data	3.434	SD of logged Data	0.58
384				
385			ormal Distribution	
386	95% H-UCI		90% Chebyshev (MVUE) UCL	7.827
387	95% Chebyshev (MVUE) UCL		97.5% Chebyshev (MVUE) UCL	9.676
388	99% Chebyshev (MVUE) UCL	. 11.79		
389	Nounouou	etnie Dietniku	tion Fron LICI Statistics	
390	·		tion Free UCL Statistics ernible Distribution (0.05)	
391	Data do not	ioliow a Disc	ernible Distribution (0.03)	
392	Nonna	rametric Dis	tribution Free UCLs	
393	95% CLT UCL		95% Jackknife UCL	7.659
394	95% Standard Bootstrap UCL		95% Bootstrap-t UCL	8.261
395	95% Hall's Bootstrap UCL		95% Percentile Bootstrap UCL	7.75
396 397	95% BCA Bootstrap UCL		22.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2	
397	90% Chebyshev(Mean, Sd) UCL		95% Chebyshev(Mean, Sd) UCL	9.76
399	97.5% Chebyshev(Mean, Sd) UCL		99% Chebyshev(Mean, Sd) UCL	14.14
400				
401		Suggested	UCL to Use	
402	95% Chebyshev (Mean, Sd) UCL	9.76		
403				
404	Note: Suggestions regarding the selection of a 95°	% UCL are pr	ovided to help the user to select the most appropriate 95% UCL.	
405	Recommendations are ba	sed upon dat	a size, data distribution, and skewness.	
406	•		ulation studies summarized in Singh, Maichle, and Lee (2006).	
407	However, simulations results will not cover all Real \	Vorld data se	ts; for additional insight the user may want to consult a statisticiar	١.
408				
409				
410	Maladada			
	Molybdenum			
411	Molybdenum	General	Statistics	
411 412	•		Statistics Number of Distinct Observations	10
411 412 413	Molybdenum Total Number of Observations		Number of Distinct Observations	10
411 412 413 414	•	35		10 14 5.714
411 412 413 414 415	Total Number of Observations	35	Number of Distinct Observations Number of Missing Observations	14
411 412 413 414 415 416	Total Number of Observations Minimum	35	Number of Distinct Observations Number of Missing Observations Mean	14 5.714
411 412 413 414 415 416 417	Total Number of Observations Minimum Maximum	35 3 12 2.504	Number of Distinct Observations Number of Missing Observations Mean Median	14 5.714 5
411 412 413 414 415 416 417 418	Total Number of Observations Minimum Maximum SE	35 3 12 2.504	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419	Total Number of Observations Minimum Maximum SE	35 3 12 2.504 0.438	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420	Total Number of Observations Minimum Maximum SE	35 3 12 2.504 0.438	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421	Total Number of Observations Minimum Maximum SE Coefficient of Variation	35 3 12 2.504 0.438 Normal C	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421 422	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic	35 3 12 2.504 0.438 Normal C 0.876 0.934	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	35 3 12 2.504 0.438 Normal C 0.876 0.934 0.197	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421 422 423 424	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	35 3 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421 422 423 424 425	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data No	35 31 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148 t Normal at 5	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data Not Normal at 5% Significance Level Significance Level	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421 422 423 424 425	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data No	35 31 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148 t Normal at 5	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data Not Normal at 5% Significance Level Significance Level W Significance Level	14 5.714 5 0.423
411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data No Page Normal UCL	35 3 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148 t Normal at 5	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data Not Normal at 5% Significance Level % Significance Level % Significance Level mal Distribution 95% UCLs (Adjusted for Skewness)	14 5.714 5 0.423 1.001
411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data No	35 3 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148 t Normal at 5	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data Not Normal at 5% Significance Level Significance Level W Significance Level Mal Distribution 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995)	14 5.714 5 0.423 1.001
411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data No Page Normal UCL	35 3 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148 t Normal at 5	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data Not Normal at 5% Significance Level % Significance Level % Significance Level mal Distribution 95% UCLs (Adjusted for Skewness)	14 5.714 5 0.423 1.001
411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429	Total Number of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data No Page Normal UCL	35 3 12 2.504 0.438 Normal C 0.876 0.934 0.197 0.148 t Normal at 5	Number of Distinct Observations Number of Missing Observations Mean Median Std. Error of Mean Skewness GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data Not Normal at 5% Significance Level Significance Level W Significance Level Mal Distribution 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995)	14 5.714 5 0.423 1.001

433	Α	В	(С	D A-D	E Test Statistic	F 0.852	G	H And	l erson-Darlin	J g Gamma GO	K F Test	L
434					5% A-D	Critical Value	0.749	Da	ata Not Ga	mma Distribu	ited at 5% Sig	nificance Lev	el
435					K-S	Test Statistic	0.142		Kolmo	gorov-Smirn	ov Gamma G	iOF Test	
436					5% K-S	Critical Value	0.149	Detected	l data appe	ear Gamma D	Distributed at 5	5% Significan	ce Level
437					Detected of	data follow Ap	pr. Gamma I	Distribution a	t 5% Sign	ificance Leve	el		
438								O					
439								Statistics					
440						k hat (MLE)					star (bias cor	,	5.447
441						eta hat (MLE)				Ineta	star (bias cor	,	1.049
442				N / I		nu hat (MLE) ias corrected)					•	as corrected)	381.3 2.448
443				IVIL	E Mean (bi	as correcteu)	5.714			Approximat	e Chi Square	<i>*</i>	337
444				Adius	tod Lovol o	f Significance	0.0425			• •	djusted Chi S	` '	335.1
445				Aujus	Led Level 0	- Significance	0.0423				iujusieu Cili S	quale value	333.1
446						Δο	euming Gam	ıma Distribut	ion				
447		95% Approx	vimate (Samma	IICI (use	when n>=50)				diusted Gam	ıma UCL (use	when n<50)	6.503
448			- Indic C	201111110		WIICH IIP -30)	0.400		33707	ajusteu dan	iiila OOL (usc	Wilchinson	
449							Lognorma	GOF Test					
450				SI	naniro Wilk	Test Statistic	-	1 401 1031	Sh	aniro Wilk I o	gnormal GOF	- Test	
451					•	Critical Value				-	at 5% Signific		
452				0 70 01	•	Test Statistic					normal GOF T		
453				59		Critical Value					ıl at 5% Signif		
454						appear Appro							
455									- · · · · · · · · · · · · · · · · · · ·				
456							Lognorma	l Statistics					
457 458				ľ	 ∕linimum of	Logged Data					Mean of	logged Data	1.656
459						Logged Data						logged Data	0.418
460													
461						Ass	uming Logno	rmal Distribu	ition				
462						95% H-UCL	6.545			90%	Chebyshev (MVUE) UCL	6.953
463				95% (Chebyshev	(MVUE) UCL	7.519			97.5%	Chebyshev (MVUE) UCL	8.305
464				99% (Chebyshev	(MVUE) UCL	9.847						
465													
466						Nonparamo	etric Distribu	tion Free UC	L Statistic	S			
467					Data appe	ar to follow a	Discernible I	Distribution a	t 5% Sign	ificance Leve	el		
468													
469						Nonpa	rametric Dist	tribution Free	UCLs				
470					9	95% CLT UCL	6.41				95% Ja	ckknife UCL	6.43
471				95%	Standard B	Bootstrap UCL	6.396				95% Boo	tstrap-t UCL	6.529
472						Bootstrap UCL	6.494			95%	Percentile Bo	otstrap UCL	6.429
473						Bootstrap UCL							
474					• '	ean, Sd) UCL					hebyshev(Me	-	7.559
475			97.5	5% Ch	∍byshev(M	ean, Sd) UCL	8.357			99 [%] C	hebyshev(Me	an, Sd) UCL	9.925
476													
477							Suggested	UCL to Use					
478				959	6 Adjusted	Gamma UCL	6.503						
479													
480						ows an approx	, -	,		•		· B !/=:	
481		When ap	plicable,	, it is s	uggested to	o use a UCL b	ased upon a	distribution (e.g., gamm	na) passing b	oth GOF tests	s in ProUCL	
482		No. 2				-41- 1 27-	/ 1101	au in the first	- 41-			-1- OFC/ 110:	
483		Note: Sugge	estions r			ection of a 95%	•	·				ate 95% UCL	
484						dations are bas	· ·					11 (0000)	
485						upon the resu				•		, ,	
486	Н	iowever, simi	ulations	results	will not co	over all Real W	voria data set	ıs; tor additio	nai insight	tne user may	want to cons	uit a statistici	an.

	Α	В	С		D	Е	E	F	G	Н	ļ	J		K	L
487	<u> </u>														
488	Niekal														
409	Nickel														
490	<u> </u>							General	Statistics						
491	<u> </u>		Tota	al Numb	er of O	hean	ations	49	Statistics		Numb	er of Dist	inct Obse	nyatione	18
492			1012	ai ivuiiib		DSCIVE	3110113						sing Obse		0
493						Min	nimum	12			- Trumb	01 01 111100		Mean	20.82
494							imum	35						Median	21
495 496							SD	4.241					Std. Error	of Mean	0.606
490 497				Coet	fficient	of Var	riation	0.204						kewness	0.796
498															
499								Normal (GOF Test						
500			;	Shapiro	Wilk T	est St	atistic	0.967			Shapiro V	Vilk GOF	Test		
501			5% 5	Shapiro	Wilk C	ritical	Value	0.947		Data app	ear Normal	at 5% Si	gnificance	e Level	
502				Lillie	efors T	est St	atistic	0.104			Lilliefor	s GOF T	est		
503			!	5% Lillie	efors C	ritical	Value	0.126		Data app	ear Normal	at 5% Si	gnificance	e Level	
504						Data	appea	ar Normal at	5% Significa	nce Level					
505															
506							Ass	suming Norr	mal Distributio						
507			95% N	Normal (95%	UCLs (Ad				
508				95	5% Stud	dent's-	t UCL	21.83			95% Adjus		•	-	21.89
509	<u> </u>										95% Modi	fied-t UC	L (Johnso	on-1978)	21.84
510	<u> </u>														
511	<u> </u>				4 D.T	est St	-4:-4:-	0.258	GOF Test	Amala	Davis	- 0	- 00F T		
512	<u> </u>			5%	A-D C			0.238	Detected		rson-Darlin ar Gamma I				ce I evel
513				370		est St		0.0783	Detected		gorov-Smiri				
514				5%	K-S C			0.126	Detected		ar Gamma				ce Level
515 516									stributed at 5%						
517															
518								Gamma	Statistics						
519						k hat ((MLE)	25.55			I	k star (bia	s correct	ed MLE)	24
520					Thet	ta hat ((MLE)	0.815			Theta	a star (bia	as correct	ed MLE)	0.867
521					n	u hat ((MLE)	2504				nu sta	ar (bias co	orrected)	2352
522			M	/ILE Mea	an (bia	s corre	ected)	20.82				MLE S	d (bias co	orrected)	4.249
523							'				Approxima	te Chi Sc	juare Valu	ue (0.05)	2240
524			Adju	usted Le	evel of S	Signific	cance	0.0451			,	Adjusted	Chi Squa	re Value	2237
525															
526	<u> </u>								ma Distributio						
527	9	95% Approxi	mate Gamm	na UCL ((use wh	hen n>	·=50))	21.85		95% Ad	djusted Gar	nma UCL	. (use whe	en n<50)	21.89
528	 							laces ···	00F T:						
529				Shapiro	\\/;ii/ T	OC+ C+	atiotic	0.992	GOF Test	Ch-	niro Mille I :	anor	GOE To	et	
530				Shapiro Shapiro				0.992	r		piro Wilk Lo ar Lognorma	-			
531			5% 3		efors T			0.947	L		lliefors Log		•	CE LEVE!	
532			ı	5% Lillie				0.0713	г		ar Lognorm			ce l evel	
533			•	373 EIIIIC					at 5% Signific				gcari		
534 535															
536								Lognorma	I Statistics						
537				Minimu	um of L	ogged	l Data	2.485				Me	an of logg	ged Data	3.016
538				Maximu	um of L	ogged	d Data	3.555					SD of logg		0.2
539									l						
540							Assu	ming Logno	rmal Distribut	tion					
•															

541	A	В	С	D	95% H-UCL	F 21.94	G	Н	9(J 0% Chebyshev (K MVUE) UCL	L 22.62
542			95%	Chebyshev	(MVUE) UCL	23.43			97.5	5% Chebyshev (MVUE) UCL	24.56
543			99%	Chebyshev	(MVUE) UCL	26.79						
544							<u> </u>					
545					Nonparame	tric Distribut	tion Free UCL	Statistic	:s			
546				Data appe	ar to follow a	Discernible [Distribution at	5% Sign	ificance Le	evel		
547												
548					Nonpar	rametric Dist	tribution Free	UCLs				
549				9	95% CLT UCL	21.81				95% Ja	ckknife UCL	21.83
550			95%	6 Standard B	Bootstrap UCL	21.81				95% Boo	tstrap-t UCL	21.93
551			-	95% Hall's B	Bootstrap UCL	21.97			95	5% Percentile Bo	otstrap UCL	21.84
552				95% BCA B	Bootstrap UCL	21.84						
553				• ,	lean, Sd) UCL	22.63				Chebyshev(Me		23.46
554			97.5% C	hebyshev(M	lean, Sd) UCL	24.6			99%	Chebyshev(Me	an, Sd) UCL	26.84
555												
556	1					Suggested	UCL to Use					
557				95% St	udent's-t UCL	21.83						
558												
559	Note: S	Sugges					<u>'</u>			ne most appropria	ate 95% UCL.	
560					dations are bas	•						
561					•					ngh, Maichle, and	, ,	
562	However	r, simula	ations resu	Its will not co	ver all Real W	orld data set	ts; for addition	al insight	the user m	nay want to cons	ult a statisticia	n.
563												
564												
565	Vanadium											
566						0	Ototiotico					
567			T-1-	-1 Ni is a of	Ob		Statistics		NI	ah an af Diatio at C	Nh	- 20
568	<u> </u>		1018	il Number of	Observations	49				nber of Distinct Conber of Missing C		39 0
569					Minimum	118			INUII		Mean	216.5
570	1				Maximum	272					Median	223
571	1				SD	34.73				Std F	rror of Mean	4.961
572	<u> </u>			Coefficie	nt of Variation	0.16					Skewness	-0.728
573	<u> </u>				The Or Variation	0.10					OKCWIIC33	-0.720
574	1					Normal (GOF Test					
575	1			Shaniro Wilk	Test Statistic				Shapiro	Wilk GOF Test	,	
576				<u> </u>	Critical Value			Data ap	•	al at 5% Significa		
577					Test Statistic	0.0843			•	ors GOF Test		
578 579					Critical Value			Data ap		al at 5% Significa	ance Level	
580							│ t 5% Significar					
581												
582					As	suming Norr	mal Distributio	n				
583			95% N	lormal UCL					% UCLs (A	Adjusted for Ske	wness)	
584				95% St	udent's-t UCL	224.8			95% Adjı	usted-CLT UCL ((Chen-1995)	224.1
585									95% Mo	dified-t UCL (Jol	hnson-1978)	224.7
586						<u> </u>	L					
587						Gamma (GOF Test					
588				A-D	Test Statistic	0.809		And	erson-Darl	ling Gamma GO	F Test	
589	-			5% A-D	Critical Value	0.748	Dat	ta Not Ga	mma Distri	ibuted at 5% Sig	nificance Leve	el
590				K-S	Test Statistic	0.102		Kolmo	gorov-Sm	irnov Gamma G	OF Test	
591				5% K-S	Critical Value	0.126	Detected	data appe	ear Gamma	a Distributed at 5	5% Significand	e Level
592				Detected of	data follow Ap	pr. Gamma I	Distribution at	5% Sign	ificance Le	evel		
593												
594						Gamma	Statistics					

	Α		В		С		D	E k hat (MLE)	F 35.02	G	Н	l	J	K rrected MLE)	L 32.89
595							The	eta hat (MLE)					•	rrected MLE)	6.583
596								nu hat (MLE)				Tricta	`	as corrected)	3223
597					N	11 F Me		as corrected)					•	as corrected)	37.75
598	1					ILL WIC	an (bi		210.0			Annroximate	,	Value (0.05)	3092
599					Adiu	sted I e	evel of	Significance	0.0451					Square Value	3088
600					Auju	ISICU EC	2001 01	Olgrinicarico	0.0401				ujustou Om C	oquaic value	
601								As	suming Gam	nma Distribu	ıtion				
602		95%	Approx	imate	Gamm	a UCL	(use v	vhen n>=50))	_			diusted Gami	ma UCL (use	when n<50)	226
603 604									-					,	
605									Lognorma	I GOF Test					
606						Shapiro	Wilk	Test Statistic			Sha	piro Wilk Log	gnormal GOI	F Test	
607					5% 5	Shapiro	Wilk	Critical Value	0.947		Data Not	Lognormal a	t 5% Signific	ance Level	
608						Lilli	iefors	Test Statistic	0.108		Li	lliefors Logn	ormal GOF	Test	
609					ļ	5% Lilli	efors (Critical Value	0.126		Data appea	ar Lognormal	at 5% Signif	ficance Level	
610							Data a	appear Appro	ximate Logr	normal at 5%	6 Significand	e Level			
611															
612									Lognorma	I Statistics					
613						Minim	um of	Logged Data					Mean of	logged Data	5.363
614						Maxim	um of	Logged Data	5.606				SD of	logged Data	0.178
615															
616								Ass	uming Logno	ormal Distrib	oution				
617								95% H-UCL	227			90%	Chebyshev ((MVUE) UCL	233.4
618					95%	Cheby	shev	(MVUE) UCL	240.9			97.5%	Chebyshev ((MVUE) UCL	251.3
619					99%	Cheby	shev	(MVUE) UCL	271.9						
620									I						
621								Nonparam	etric Distribu	tion Free U	CL Statistics				
622						Data	appea	ar to follow a	Discernible	Distribution	at 5% Signif	icance Leve	I		
623															
624								•	rametric Dis	tribution Fre	e UCLs				
625							9	5% CLT UCL	224.7				95% Ja	ackknife UCL	224.8
626								ootstrap UCL						otstrap-t UCL	224.1
627								ootstrap UCL				95%	Percentile Bo	ootstrap UCL	224.3
628								ootstrap UCL							
629						-	•	ean, Sd) UCL					• •	ean, Sd) UCL	238.1
630				9	7.5% C	hebysh	ev(Me	ean, Sd) UCL	247.5			99% Ch	nebyshev(Me	ean, Sd) UCL	265.9
631															
632						_	-0/ -			UCL to Use	•				
633						95	% Stu	ıdent's-t UCL	224.8						
634		B.1 -	. 0			att		-#: f 050	/ 1101		l., al.		•	-1- 050/ 110:	
635		Note	: Sugge	estion					· · · · · · · · · · · · · · · · · · ·		<u> </u>		• • • •	iate 95% UCL	
636		T1-		om===				ations are ba	•					41 oc (2000)	
637								<u> </u>						d Lee (2006).	
638	4	nowev	er, sım	uiatio	ns resu	its Will I	OO JOIL	ver all Real V	voria data se	is; for additi	onai insight t	ne user may	want to cons	sult a statistici	ail.
639		k i	oto: F-	r bi	du ====	dival.	oko	d dota	donce limit-	(o.a. Oba	lohmas '	oanema-l	nd Com	mov met he	
640	1	N	ole: FO					ed data, confi		• •		-		шау пот ве	
				re	nable.	Chen.	DIID	Johnson's m	eulous provi	ue aujustme	ans for posit	very skewed	ı uala sels.		
641															
641 642															
641 642 643															
641 642 643 644	Zinc														J
641 642 643 644 645	Zinc								Conord	Statistics					
641 642 643 644 645 646	Zinc				Tata	l Niver	or of t	Obcorustions		Statistics		Nimber	r of Diotinot (Obsorvations	40
641 642 643 644 645	Zinc				Tota	l Numb	per of (Observations		Statistics				Observations Observations	40

649	Α	В	С	D	E Minimum	F 64	G	Н	l	J	K Mean	L 132.5
650					Maximum	376					Median	127
651					SD	49.22				Std. E	rror of Mean	7.032
652				Coefficient	t of Variation	0.371					Skewness	2.647
653												
654						Normal C	OF Test					
655			5	Shapiro Wilk	Test Statistic	0.807			Shapiro W	ilk GOF Test	1	
656			5% S	Shapiro Wilk C	Critical Value	0.947		Data No	t Normal at	5% Significa	nce Level	
657				Lilliefors	Test Statistic	0.132			Lilliefors	GOF Test		
658			5	5% Lilliefors C	Critical Value	0.126		Data No	t Normal at	5% Significa	nce Level	
659					Data Not	Normal at 5	% Significan	ce Level				
660												
661					As	suming Norr	nal Distribution	on				
662			95% N	ormal UCL				95%	UCLs (Adju	usted for Ske	wness)	
663				95% Stu	dent's-t UCL	144.3			95% Adjuste	ed-CLT UCL	(Chen-1995)	146.9
664									95% Modifi	ed-t UCL (Jo	hnson-1978)	144.7
665												
666						Gamma (GOF Test					
667					Γest Statistic	0.526				Gamma GC		
668				5% A-D C	Critical Value	0.75	Detected				5% Significand	ce Level
669					Test Statistic	0.0892				ov Gamma G		
670					Critical Value	0.127				istributed at	5% Significan	ce Level
671				Detected	l data appear	Gamma Dis	stributed at 5°	% Significa	nce Level			
672												
673						Gamma	Statistics					
674					k hat (MLE)	9.751				`	rrected MLE)	9.167
675					ta hat (MLE)	13.59			Theta	•	rrected MLE)	14.45
676					nu hat (MLE)	955.6				•	as corrected)	898.4
677			M	LE Mean (bia	is corrected)	132.5				`	as corrected)	43.76
678					0: :6	0.0454			• •	e Chi Square	` '	829.8
679			Adju	sted Level of	Significance	0.0451			A	djusted Chi S	Square Value	827.9
680					A		Disaultical					
681		DEO/ Approx	imata Camm	na UCL (use v		143.5	ma Distributi		liveted Com	ma LICI /uaa	when n<50)	143.8
682		95% Approx	imate Gamin	ia UCL (use v	vnen n>-50)	143.5		95% Au	ijusteu Gami	ma oct (use	when h<50)	143.0
683						Lognormal	COE Toet					
684				Shapiro Wilk	Fact Statistic	0.97	GOF Test	Shar	airo Wilk I o	gnormal GOI	- Toet	
685				Shapiro Wilk C		0.947					icance Level	
686				•	Test Statistic	0.0809			_	ormal GOF		
687			· ·	5% Lilliefors C		0.126					icance Level	
688							at 5% Signific				2230 20101	
689 690												
691						Lognorma	I Statistics					
692				Minimum of I	ogged Data	4.159				Mean of	logged Data	4.835
693				Maximum of I		5.93					logged Data	0.314
694											= =	
695					Assu	ıming Logno	rmal Distribu	tion				
696					95% H-UCL	143.3			90%	Chebyshev ((MVUE) UCL	150.1
697			95%	Chebyshev (MVUE) UCL	158.3			97.5%	Chebyshev ((MVUE) UCL	169.7
698			99%	Chebyshev (MVUE) UCL	192						
699												
700					Nonparame	tric Distribu	tion Free UCI	Statistics				
701				Data appea	r to follow a l	Discernible I	Distribution a	t 5% Signifi	icance Leve	I		
702												
, 02												

	Α	В	С	D	E	F	G	Н	I	J	K	L
703					Nonpa	rametric Dist	tribution Free	∍ UCLs				
704				95	% CLT UCL	144.1				95% Ja	ckknife UCL	144.3
705			95%	Standard Bo	otstrap UCL	144.1				95% Boo	tstrap-t UCL	148
706			9	5% Hall's Bo	otstrap UCL	157.9			95% F	Percentile Bo	otstrap UCL	144.5
707			!	95% BCA Bo	otstrap UCL	147.1						
708			90% Ch	ebyshev(Me	an, Sd) UCL	153.6			95% Ch	ebyshev(Me	an, Sd) UCL	163.2
709			97.5% Ch	ebyshev(Me	an, Sd) UCL	176.4			99% Ch	ebyshev(Me	an, Sd) UCL	202.5
710												
711						Suggested	UCL to Use					
712			95	% Adjusted C	amma UCL	143.8						
713												
714	١	Note: Sugges	stions regard	ing the selec	tion of a 95%	6 UCL are pro	ovided to help	p the user to	o select the m	ost appropri	ate 95% UCL	
715			F	Recommenda	itions are bas	sed upon dat	a size, data d	distribution,	and skewnes	S.		
716		These recor	mmendations	are based u	pon the resu	ılts of the sim	ulation studie	es summari	zed in Singh,	Maichle, and	J Lee (2006).	
717	Ho	wever, simul	lations result	s will not cov	er all Real W	/orld data set	ts; for additio	nal insight t	he user may	want to cons	ult a statistici	an.
718												

	A B C	D E	F	G H	I	J	K	L
1		UCL Statis	Stics for Unc	ensored Full Data Sets				
2	Llean Calastad Onti							
3	User Selected Option		. 40.0E AM					
4	Date/Time of Computation From File			luo hylo				
5			USFS BIG E	biue_b.xis				
6	Full Precision Confidence Coefficie							
7								
8	Number of Bootstrap Operation	IS 2000						
9								
10	Arsenic							
11	Alsenic							
12			General	Statistics				
13	T	otal Number of Observations	72	Otationos	Numbe	r of Distinct C)hservations	17
14	''	Otal Namber of Observations	72			r of Missing C		0
15		Minimum	5		Number	or wissing c	Mean	11.54
16		Maximum	37				Median	10
17	 	SD	5.392			Std F	rror of Mean	0.635
18		Coefficient of Variation	0.467			Olu. L	Skewness	2.208
19		- Commont of Variation	0.407				CICWIIC33	
20			Normal (GOF Test				
21		Shapiro Wilk Test Statistic			Shaniro Wi	ik GOF Test		
22		5% Shapiro Wilk P Value		Data N	ot Normal at 5			
23		Lilliefors Test Statistic		- Data IV		GOF Test		
24		5% Lilliefors Critical Value	0.104	Data N	ot Normal at 5		nce Level	
25				% Significance Level		o 70 Olgilillodi		
26				70 O.IgOLIOO 2010.				
27		As	sumina Norr	nal Distribution				
28	95%	Normal UCL			6 UCLs (Adju	sted for Ske	wness)	
29		95% Student's-t UCL	12.6		` •	ed-CLT UCL (12.76
30					-	ed-t UCL (Jol	` '	12.63
31 32								
33			Gamma (GOF Test				
34		A-D Test Statistic			rson-Darling	Gamma GO	F Test	
35		5% A-D Critical Value	0.753	Data Not Gar				el
36		K-S Test Statistic			gorov-Smirno	_		
37		5% K-S Critical Value	0.105	Data Not Gar				el
38			na Distribute	ed at 5% Significance L				
39								
40			Gamma	Statistics				
41		k hat (MLE)	6.303		k :	star (bias cor	rected MLE)	6.05
42		Theta hat (MLE)	1.831		Theta	star (bias cor	rected MLE)	1.908
43		nu hat (MLE)				•	s corrected)	871.2
44		MLE Mean (bias corrected)				MLE Sd (bia	s corrected)	4.692
45		<u> </u>	l		Approximate	Chi Square	Value (0.05)	803.7
46	A	djusted Level of Significance	0.0467		Ad	djusted Chi S	quare Value	802.4
47			<u> </u>	<u> </u>				
48		Ass	suming Gam	ma Distribution				
49	95% Approximate Gan	nma UCL (use when n>=50))	12.51	95% A	djusted Gamr	ma UCL (use	when n<50)	12.53
50			I	<u> </u>				
51			Lognormal	GOF Test				
52		Shapiro Wilk Test Statistic	0.952	Sha	piro Wilk Log	normal GOF	Test	
53		5% Shapiro Wilk P Value	0.0219	Data Not	Lognormal a	t 5% Significa	ance Level	
54		Lilliefors Test Statistic	0.133	Li	lliefors Logno	ormal GOF T	est	
J 1			I.					

55	A B C D E 5% Lilliefors Critical Value	F 0.104	G	H Data Not	l Lognormal a	J t 5% Significa	K nce Level	L
56	Data Not	Lognormal at	5% Significa	nce Level				
57								
58		Lognorma	l Statistics					
59	Minimum of Logged Data	1.609					ogged Data	2.365
60	Maximum of Logged Data	3.611				SD of lo	ogged Data	0.387
61			•				<u> </u>	
62	Ass		rmal Distribut	ion				
63	95% H-UCI	12.45				Chebyshev (M	· ·	13.07
64	95% Chebyshev (MVUE) UCI				97.5%	Chebyshev (M	IVUE) UCL	14.82
65	99% Chebyshev (MVUE) UCI	16.82						
66								
67	•		tion Free UCL					
68	Data do not	follow a Disc	ernible Distrib	ution (0.0	5)			
69								
70	Nonpa	arametric Dist	tribution Free	UCLs				
71	95% CLT UCI					95% Jac	kknife UCL	12.6
72	95% Standard Bootstrap UCI						strap-t UCL	12.88
73	95% Hall's Bootstrap UCI				95% I	Percentile Boo	tstrap UCL	12.6
74	95% BCA Bootstrap UCI							
75	90% Chebyshev(Mean, Sd) UCI					nebyshev(Mea	,	14.31
76	97.5% Chebyshev(Mean, Sd) UCI	15.51			99% Ch	nebyshev(Mea	n, Sd) UCL	17.86
77								
78			UCL to Use					
79	95% Student's-t UCI	12.6				or 95% Mod	lified-t UCL	12.63
80								
81	Note: Suggestions regarding the selection of a 95						te 95% UCL.	
82	Recommendations are ba							
83	These recommendations are based upon the res						` ,	
84	However, simulations results will not cover all Real	Vorld data se	ts; for addition	al insight t	the user may	want to consu	lt a statisticia	ın.
85								
86								
	Chromium							
	Chromium							
87			Statistics					
87 88	Chromium Total Number of Observations		Statistics			r of Distinct Ob		14
87 88 89	Total Number of Observations	20	Statistics			r of Distinct Ob	oservations	51
87 88 89 90	Total Number of Observations Minimun	20 23	Statistics				oservations Mean	51 32.15
87 88 89 90 91	Total Number of Observations Minimun Maximun	20 1 23 1 51	Statistics			of Missing Ol	Mean Median	51 32.15 32.5
87 88 89 90 91 92 93 94	Total Number of Observations Minimun Maximun SE	20 23 51 6.675	Statistics			of Missing Ol	Mean Median ror of Mean	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95	Total Number of Observations Minimun Maximun	20 23 51 6.675	Statistics			of Missing Ol	Mean Median	51 32.15 32.5
87 88 89 90 91 92 93 94 95 96	Total Number of Observations Minimun Maximun SE	23 5 51 6 6.675 6 0.208				of Missing Ol	Mean Median ror of Mean	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96	Total Number of Observations Minimun Maximun SE Coefficient of Variation	23 51 51 6.675 0 0.208	Statistics GOF Test		Number	of Missing Ob	Mean Median ror of Mean	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96 98	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic	23 51 51 6.675 0.208 Normal C			Number	Std. En	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96 97 99 99	Total Number of Observations Minimun Maximun St Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	23 51 6.675 0.208 Normal C		Data app	Number Shapiro Wi	Std. Eri	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96 97 98 99 100	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic	23 51 6.675 6.675 7 0.208 Normal C 2 0.914 9 0.905 2 0.149			Shapiro Wi ear Normal a	Std. En	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96 97 98 100 101	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	23 51 6.675 0.208 Normal C 0.914 0.905 0.149 0.192	GOF Test	Data app	Shapiro Wi ear Normal a	Std. Eri	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96 99 100 101 101 2	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	23 51 6.675 0.208 Normal C 0.914 0.905 0.149 0.192		Data app	Shapiro Wi ear Normal a	Std. En	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 95 96 97 98 100 101 102 103	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appr	23 51 6.675 0.208 Normal C 0.914 0.905 0.149 0.192 ear Normal at	GOF Test	Data app	Shapiro Wi ear Normal a	Std. En	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 96 99 100 101 102 103 104	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appe	23 51 6.675 0.208 Normal C 0.914 0.905 0.149 0.192 ear Normal at	GOF Test	Data app	Shapiro Wi ear Normal a Lilliefors ear Normal a	Std. Err Std. Err Ik GOF Test t 5% Significa GOF Test t 5% Significa	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493
87 88 89 90 91 92 93 94 95 97 100 101 102 103 104 105	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data app	23 51 6.675 0.208 Normal C 0.914 0.905 0.149 0.192 ear Normal at	GOF Test	Data app	Shapiro Wi ear Normal a Lilliefors ear Normal a	Std. En	Mean Median ror of Mean Skewness	51 32.15 32.5 1.493 0.963
87 88 89 90 91 92 93 95 96 97 98 100 101 102 103 104 105 106	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data app	23 51 6.675 6.675 7 0.208 Normal C 2 0.914 9 0.905 9 0.149 9 0.192 Par Normal at	GOF Test	Data app	Shapiro Wi ear Normal a Lilliefors ear Normal a 6 UCLs (Adju	Std. Eri K GOF Test t 5% Significat GOF Test t 5% Significat sted for Skew	Mean Median For of Mean Skewness Mean Median For of Mean Skewness Median For of Mean Skewness Median For of Mean Skewness Median For of Mean For of Mean Median For of Mean For of Mean Median For of Mean 51 32.15 32.5 1.493 0.963	
87 88 89 90 91 92 93 94 95 97 100 101 102 103 104 105	Total Number of Observations Minimun Maximun SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data app	23 51 6.675 0.208 Normal C 0.914 0.905 0.149 0.192 ear Normal at	GOF Test	Data app	Shapiro Wi ear Normal a Lilliefors ear Normal a 6 UCLs (Adju	Std. En	Mean Median For of Mean Skewness Mean Median For of Mean Skewness Median For of Mean Skewness Median For of Mean Skewness Median For of Mean For of Mean Median For of Mean For of Mean Median For of Mean 51 32.15 32.5 1.493 0.963	

	Α	В		С		[D	E		F Gamma	G GOF Test		Н		ı		J		K	丄	L	-
109							A-D 1	Test St	atistic	0.476	101 1031		Ande	ereon.	-Darlin	na Ga	mma G	OF T	-est			-
110						5%		Critical		0.74	Detecte	d dat								anc	e l evel	-
111						070		Test St		0.167	Botooto						amma					
112						5%		Critical		0.193	Detected			_						anc	e Level	-
113											stributed at 8											-
114 115																						1
116										Gamma	Statistics											-
117								k hat ((MLE)	25.89						k star	(bias c	orrec	ted ML	E)	22.04	
118							The	ta hat ((MLE)	1.242					Theta	a star	(bias c	orrec	ted ML	E)	1.459	1
119							r	nu hat ((MLE)	1036						n	u star (b	oias c	orrecte	d)	881.7	
120					MLI	E Mea	an (bia	as corre	ected)	32.15						ML	E Sd (b	oias c	orrecte	d)	6.848	1
121														App	roxima	te Ch	i Squar	e Val	ue (0.0	15)	813.8	1
122				Α	Adjust	ed Le	evel of	Signific	cance	0.038					,	Adjus	ted Chi	Squa	are Val	ue	808.6	1
123									,													1
124										suming Gan	nma Distribu											
125		95% Appro	oxima	ite Gar	mma l	UCL ((use w	hen n>	·=50))	34.83			95% A	djuste	ed Gar	mma I	UCL (us	se wh	en n<5	0)	35.05	
126																						
127											I GOF Test											
128						•		Test St		0.945				-			mal GC					
129				59	% Sha			Critical		0.905		Data			-		5% Sigr			/el]
130					=0.			Test St		0.179							al GOF					1
131					5%	6 Lillie		Critical		0.192	. 50/ 0: :				gnorm	al at t	5% Sigr	niticar	ice Lev	/el		
132								Data a	ppear	Lognormai	at 5% Signif	ricano	ce Lev	eı								_
133										1	l Otatiatica											4
134					N/	linimi	um of I	Logged	l Data	3.135	I Statistics						Moon	of log	ged Da	nto.	3.451	4
135								Logged		3.932									ged Da		0.201	4
136					IVI	ахин	uiii oi i	Logged	Dala	3.932							30 (Ji log	yeu Da	ııa	<u> </u>	_
137									Assı	ımina Loane	ormal Distrib	ution	1									-
138								95% F		34.93		Julion			90%	% Che	ebyshev	/ (MV	UF) U(CI I	36.49	
139				9.	5% C	heby		MVUE		38.47							ebyshev	•	•		41.2	1
140 141								MVUE		46.58										+		-
142																						1
143								Nonp	arame	tric Distribu	tion Free UC	CL St	atistics	S								1
144					ı	Data	appea	r to fol	low a l	Discernible	Distribution a	at 5%	6 Signi	ifican	ce Lev	rel						1
145																						1
146								N	lonpar	rametric Dis	tribution Fre	e UC	Ls									1
147							95	% CL1	UCL	34.61							95% 、	Jackk	nife U0	CL	34.73	1
148				9	95% S	Stand	ard Bo	otstrap	UCL	34.49							95% Bo	ootstr	ap-t U0	CL	35.18	1
149								otstrap		35.84					95%	6 Per	centile E	3oots	trap U0	CL	34.5	
150								otstrap		34.7]
151						-	•	an, Sd	·	36.63						-	/shev(N		-		38.66	
152				97.5%	6 Che	bysh	ev(Me	an, Sd) UCL	41.47					99% (Cheby	/shev(N	1ean,	Sd) U(CL	47]
153																						
154											UCL to Use)]
155						95	% Stu	dent's-	t UCL	34.73										\perp		
156																			050/			1
157		Note: Sug	gesti	ons re							ovided to hel	•					approp	riate	95% U	CL.		1
158		There	00	ma:-:-!						•	ta size, data						ioble		/200	(C)		-
159											nulation studi											-
160	ŀ	nowever, sii	rnulat	uons re	esults	will r	IOT COV	er all F	keai W	oria data se	ts; for addition	onal ii	risight	ine us	ser ma	y war	it to cor	isult a	3 statis	ucia	n. ———	-
161																						-
162																						l

162	A B C D E Copper	F	G	Н	I	J	K	L
164								
165		General	Statistics					
166	Total Number of Observations	72			Numbe	r of Distinct O	bservations	26
167					Number	r of Missing O	bservations	0
168	Minimum	8					Mean	20.33
169	Maximum	36					Median	20
170	SD	7.037				Std. Er	ror of Mean	0.829
171	Coefficient of Variation	0.346					Skewness	0.292
172								
173		Normal (GOF Test					
174	Shapiro Wilk Test Statistic	0.962			Shapiro Wi	lk GOF Test		
175	5% Shapiro Wilk P Value	0.0892		Data app	ear Normal a	t 5% Significa	nce Level	
176	Lilliefors Test Statistic	0.0882			Lilliefors	GOF Test		
177	5% Lilliefors Critical Value	0.104		Data app	ear Normal a	t 5% Significa	nce Level	
178	Data appe	ar Normal at	⊥ t 5% Signific	ance Level				
179	·							
180	As	suming Nor	mal Distribut	ion				
181	95% Normal UCL				UCLs (Adju	sted for Skev	/ness)	
182	95% Student's-t UCL	21.72			95% Adjuste	ed-CLT UCL (0	Chen-1995)	21.73
183					95% Modifi	ed-t UCL (Joh	nson-1978)	21.72
184								
185		Gamma	GOF Test					
186	A-D Test Statistic	0.332		Ande	rson-Darling	Gamma GOF	Test	
187	5% A-D Critical Value	0.752	Detecte	d data appea	ar Gamma D	istributed at 5°	% Significan	ce Level
188	K-S Test Statistic	0.0671				ov Gamma GO		
189	5% K-S Critical Value	0.105	Detecte	d data appea	ar Gamma D	istributed at 5°	% Significan	ce Level
190	Detected data appear	r Gamma Di	stributed at	5% Significa	nce Level			
191								
192		Gamma	Statistics					
193	k hat (MLE)	7.929			k	star (bias corr	ected MLE)	7.608
194	Theta hat (MLE)	2.565			Theta	star (bias corr	ected MLE)	2.673
195	nu hat (MLE)	1142				nu star (bias	corrected)	1095
196	MLE Mean (bias corrected)	20.33				MLE Sd (bias	corrected)	7.372
197					Approximate	Chi Square \	/alue (0.05)	1020
198	Adjusted Level of Significance	0.0467			A	djusted Chi So	uare Value	1018
199		Į.						
200	As	suming Gam	nma Distribu	tion				
201	95% Approximate Gamma UCL (use when n>=50))	21.85		95% Ac	djusted Gamı	ma UCL (use v	when n<50)	21.88
202	_	1	1					
203		Lognorma	I GOF Test					
204	Shapiro Wilk Test Statistic	0.952		Sha	piro Wilk Log	normal GOF	Test	
205	5% Shapiro Wilk P Value	0.0207		Data Not	Lognormal a	t 5% Significa	nce Level	
206	Lilliefors Test Statistic	0.0916		Lil	lliefors Logn	ormal GOF Te	est	
207	5% Lilliefors Critical Value	0.104		Data appea	ar Lognormal	at 5% Signific	ance Level	
208	Data appear Appro	ximate Logr	normal at 5%	Significand	e Level			
209								
210		Lognorma	I Statistics					
211	Minimum of Logged Data	2.079				Mean of I	ogged Data	2.948
212	Maximum of Logged Data	3.584				SD of I	ogged Data	0.373
213		1	1					
214	Ass	uming Logno	ormal Distrib	ution				
215	95% H-UCL	22.12			90%	Chebyshev (N	IVUE) UCL	23.2
	95% Chebyshev (MVUE) UCL	24.45	 		07.50/	Chahuahau /N	IVUE) UCL	26.2
216	95% Chebyshev (MVOE) OCL	24.40			97.5%	Chebysnev (N	IVUL) UCL	20.2

	Α		В	\top	С	Т		Е	Т	F		G		Н			1			J	T		K	—			
217			В			Chel	D byshe	v (MV	/UE) UCI		29.63		<u> </u>					'						IX	+		\dashv
218							-					1															
219						-		- N	onparam	netric	c Distribu	utior	n Free l	JCL	Statis	tics											
220						Dat	а арр	ear to	follow a	Dis	cernible	Dis	tributio	n at	5% Si	gnifi	can	ce Le	vel								_
221																											
222		-		-					Nonpa	aram	netric Dis	strib	ution F	ree l	JCLs				-				-	-	-		\dashv
223								95%	CLT UCL		21.7	T									95% J	Jacl	kkni	fe U	CL	21.72	\dashv
224					95%	6 Star			strap UCL		21.69									9.	5% Bo	ots	trar	o-t U	CL	21.7	
									trap UCL		21.7							959	% Pr		ntile B					21.67	-
225 226									strap UCL		21.72														+		_
227					90% C				•		22.82							95%	Che	ebvs	hev(M	lear	n. S	d) U	CL	23.95	_
228				6			•		<u> </u>		25.51										hev(M					28.59	-
							•																				-
229										Su	uggested	I UC	CL to Us	se								_					-
230				nt's-t UCI		21.72	Т													\Box		\dashv					
231																						_					
232		No	ote: Sugge	n of a 95		CL are pr	rovi	ded to h	nelp t	the use	er to	sele	ect the	e mc	ost a	pprop	riat	e 95	5% L	JCL.		_					
233		Note: Suggestions regarding the selection of Recommendations These recommendations are based upon the However, simulations results will not cover all a Total Number of Observations Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations results will not cover all a Mineral Recommendations are based upon the However, simulations are based upon the However and the However and the However and the However and the However and the However and the However and the However and the However are the However and the However and the However and the However and the However and the However and the However and the However and the However and the However are the However and the H									•			•													-
234		However, simulations results will not cover all I																			hle a	nd !	Lee	(200)6)		\dashv
235		These recommendations are based upon the However, simulations results will not cover all F																							-		\dashv
236							111010				<u> </u>	J.O, 1	ioi addi		ar morg	,,,,,	10 00			, and						·	=
237																											_
238	Lead																										_
239	Leau																										_
240	 										General	S+c	tictics														_
241	 	Total Number of Obser							onvations		72	- Ju	าแอแบอ					Numl	hor	of D	istinct	Or	cor	vatio	nc	17	
242	<u> </u>				ervations	_	72										issing					0	_				
243	 								Minimum		0							INUITIL	Jei (OI IVI	SSILIG	—	-561	Me		9.514	
244	<u> </u>								Maximum		21													Medi		9.514	_
245	 																									0.437	_
246	 				SE		3.711										Std.										
247	 						епісіє	ent or	variation	1	0.39												SKE	ewne	SS	1.07	4
248	<u> </u>										Name at 4	00															
249	<u> </u>					Ol:	\^/:1	U. T	. 0 1: - 1:		Normal (GOI	riest				Ob		14711	- 00	·						
250	 								t Statistic		0.898										F Tes						_
251	<u> </u>								k P Value						Data	a No					gnifica	anc	e Le	evel			_
252	ļ								t Statistic		0.184							illiefo									_
253	ļ					5% LII	lliefors		cal Value		0.104	<u></u>	<u> </u>				ot No	rmaı a	at 5%	% SI	gnifica	anc —	e Le	evel			
254	ļ								Data No	ot No	ormal at 5	5%	Signific	ance	e Leve	el .											
255	<u> </u>																										
256	<u> </u>								A	ssun	ming Nor	rmal	Distrib	utior													
257	<u> </u>				95% N						10 = 1										for Sk						_
258	<u> </u>						95% S	studen	nt's-t UCL	1	10.24							-			T UCL	•			1	10.29	_
259																	95%	6 Moc	dified	d-t U	ICL (J	ohr	ison	1-197	′8) 	10.25	
260											a Statisti																
261									Log	norm	nal Statis	stics	Not A	vaila	ble												
262																											
263								No	onparam	etric	c Distribu	utior	Free l	JCL	Statis	tics											
264								Dat	a do not	follo	ow a Disc	cern	ible Di	stribu	ution (0.05	5)										
265																											
266									Nonpa	aram	netric Dis	strib	ution F	ree l	JCLs							_					
267								95%	CLT UCL		10.23										95% J	Jacl	kkni	fe U	CL	10.24	
268					95%	6 Star	ndard	Boots	strap UCL		10.22									9	5% Bo	ots	trap	o-t U	CL	10.33	\dashv
269						95% I	Hall's	Boots	strap UCL	+	10.32							959	% P	erce	ntile B	300	tstra	ap U	CL	10.26	\dashv
270						95%	ВСА	Boots	trap UCL	+	10.31														+		\dashv
4 /U				_		_				_									_			_	_	_	<u> </u>		

271 272 273 274 275			97.5% Ch	obychoy/Mos								11.42
273 274 275				enysile (ivie	an, Sd) UCL	12.25			99% (Chebyshev(Mea	n, Sd) UCL	13.87
274 275						'						
						Suggested	UCL to Use					
			95% Che	ebyshev (Mea	an, Sd) UCL	11.42						
276												
277		Note: Sugge:				-				most appropria	ite 95% UCL	
278		T.				•	a size, data di				(0000)	
279	11.									h, Maichle, and	. ,	
280	Н	wever, simu	lations results	s will not cove	er all Real W	orid data set	ts; for addition	iai insignt ti	ne user ma	y want to consu	iit a statisticia	an.
281												
282 Mai	ercury											
203	-icui y											
284						General	Statistics					
285			Total	Number of O	bservations	36			Numb	er of Distinct O	bservations	3
286					20011440110					er of Missing O		36
287 288					Minimum	3					Mean	3.722
289					Maximum	5					Median	4
290					SD	0.615				Std. Er	ror of Mean	0.102
291				Coefficient	of Variation	0.165					Skewness	0.233
292												
293						Normal C	GOF Test					
294			SI	hapiro Wilk T	est Statistic	0.757			Shapiro V	Wilk GOF Test		
295			5% Sh	napiro Wilk C	ritical Value	0.935		Data No	ot Normal a	t 5% Significan	ce Level	
296				Lilliefors T	est Statistic	0.313			Lilliefor	s GOF Test		
297			59	% Lilliefors C	ritical Value	0.145		Data No	ot Normal a	t 5% Significan	ce Level	
298					Data Not	Normal at 5	% Significand	ce Level				
299												
300					Ass	suming Norr	mal Distribution					
301			95% No	ormal UCL	- 1			95%	-	ljusted for Skev	-	
302				95% Stuc	dent's-t UCL	3.895				sted-CLT UCL (′	3.895
303									95% Mod	ified-t UCL (Joh	nson-1978)	3.896
304						Camma	GOF Test					
305				A D T	est Statistic	4.32	JOF TEST	Ando	roon Dorlin	ng Gamma GOI	= Toot	
306					ritical Value	0.746	Da			uted at 5% Sign		ام
307					est Statistic	0.740	Da			nov Gamma G		
308					ritical Value	0.146	Da	_		uted at 5% Sign		<u></u>
309							ed at 5% Sign			atou at 0 70 Oigi	IIIIcarico Ecv	
310 311									· - 			
312						Gamma	Statistics					
312					k hat (MLE)	37.71				k star (bias corr	ected MLE)	34.59
314					a hat (MLE)	0.0987				a star (bias corr	,	0.108
315				n	u hat (MLE)	2715				nu star (bia	s corrected)	2490
316			ML	E Mean (bia:	s corrected)	3.722				MLE Sd (bia	s corrected)	0.633
317									Approxima	te Chi Square \	/alue (0.05)	2375
318			Adjus	ted Level of S	Significance	0.0428				Adjusted Chi So	quare Value	2370
319							L					
320					Ass	suming Gam	ma Distributi	on				
321	9	5% Approxir	nate Gamma	UCL (use wh	nen n>=50))	3.902		95% Ad	ljusted Gar	mma UCL (use	when n<50)	3.911
322												
323							GOF Test					
324			SI	hapiro Wilk T	est Statistic	0.75		Sha	piro Wilk L	ognormal GOF	Test	

325	Α		В		(Shapi	D ro Wil	lk Cr	E itical Va	alue	F 0.935		G		H Data No	ot Lo	l anormal	at 5°	J % Sia	nifica	nce	K Level		L
326										est Stati		0.335						fors Log							
327						5				itical Va		0.145				Data No							Level		
328												.ognormal	at 5	5% Signif	fica										
329																									
330												Lognorm	nal	Statistics	3										
331							Mini	mum	of Lo	gged D	ata	1.099								Mea	n of I	ogge	ed Dat	a	1.301
332						ı	Maxi	mum	of Lo	gged D)ata	1.609								SI	D of I	ogge	ed Dat	a	0.166
333																									
334										-	Assı	ıming Logi	nor	rmal Distr	ribut	tion									
335									9	5% H-L	JCL	3.908						909	% Ch	ebysh	ev (N	ΛVU	E) UC	L	4.033
336						95%	Che	byshe	ev (M	IVUE) L	JCL	4.174						97.59	% Ch	ebysh	ev (N	ΛVU	E) UC	L	4.369
337						99%	Che	byshe	ev (M	IVUE) L	JCL	4.752													
338																									
339												etric Distrib													
340									Di	ata do r	not f	ollow a Dis	sce	rnible Dis	strib	oution (0.0	05)								
341																									
342											-	rametric D	istr	ribution Fi	ree	UCLs									
343										6 CLT L		3.891											fe UC		3.895
344										tstrap L		N/A											o-t UC		N/A
345										tstrap U		N/A						95%	6 Per	centil	e Boo	otstra	ap UC	L	N/A
346										tstrap L		N/A													
347							•	•		n, Sd) L		4.03						95% (-	•		•		4.169
348					97.5	5% Cr	neby	shev(I	Mea	n, Sd) L	JCL	4.362						99% (Cheb	yshev	(Mea	ın, S	d) UC	L	4.741
349																									
350								050/ 0	. اما الما	ent's-t L	ICI	Suggeste	a u	JCL to Us	se					OE0	/ 1/1-	J:£:	4 4 1 10		2.000
351								95% 3	Stude	ents-t c	JCL	3.895								or 95%	o IVIO	Jille	d-t UC	·L	3.896
352		Note	. Sua	aesti	one i	onaro	dina	ho so	lecti	on of a	95%	UCL are	aray	vided to h	neln	the user t	to s	alact tha	mos	t annr	onria	to QI	5% 110	וי	
353		NOR	. oug	gesu	0113 1							sed upon d								т аррі	Орпа	10 3	7/0 00	<i>J</i> L.	
354		The	ese re	comr	nenc							Its of the si								aichle	and	l ee	(2006	3)	
355	Н											orld data s											`		1.
356 357														<u> </u>											
358																									
350	Molybdeni	um																							
360	-																								
361												Genera	al S	Statistics											
362						Total	l Nur	nber c	of Ob	servati	ons	60						Numb	er of	Distir	nct O	bser	vation	ıs	12
363																		Numb	er of	Missi	ng O	bser	vation	ıs	12
364										Minim	num	3											Mea	ın	6.883
365										Maxim	num	18	\dagger										Media	ın	7
366											SD	3.043	\dagger							St	td. Er	ror c	of Mea	n	0.393
367							С	oeffici	ient d	of Varia	tion	0.442	\dagger									Ske	ewnes	s	1.134
368																									
369													I G	OF Test											
270										est Stati		0.911						hapiro V							
370												1.7251E-4	1			Data N	Not I	lormal a				ce L	evel		
370 371										est Stati		0.149						Lilliefor							
371						5	5% L	lliefor	s Cr	itical Va		0.114					Not N	lormal a	t 5%	Signi	fican	ce Le	evel		
371 372										Data	Not	Normal at	59	% Signific	cand	ce Level									
371 372 373																									
371 372 373 374																									
371 372 373											As	suming No	orm	nal Distrib	outic										
371 372 373 374 375					9!	5% No		il UCL		ent's-t U		suming No	orm	nal Distrib	outic			CLs (A d						-, 1	7.591

	Α	В	С		D	E	F	G	Н		J	K (272)	L
379										95% Modif	ied-t UCL (Joh	ınson-1978)	7.549
380													
381							Gamma (JOF Test	A . 1		0 00		
382						Test Statistic		Datastad			g Gamma GO		
383						Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level					ce Level
384						Test Statistic	0.134 0.115	Kolmogorov-Smirnov Gamma GOF Test Data Not Gamma Distributed at 5% Significance Level					
385						Critical Value							eı
386				L	Detected da	ita follow Ap	pr. Gamma ı	Distribution a	t 5% Signi	ncance Leve)		
387							Gamma	Ctatiatias					
388						k hat (MLE)	5.624	Statistics			otor (biog oor	rooted MLEV	5.354
389					Tho		1.224				star (bias cor		1.286
390	Theta hat (MLE) nu hat (MLE)							Theta star (bias corrected MLE)					642.5
391							6.883	nu star (bias corrected) MLE Sd (bias corrected)					2.975
392	MLE Mean (bias corrected						0.883	Approximate Chi Square Value (0.05)				584.7	
393			Λ.	liuete	nd Loval of	Significance	0.046				djusted Chi S	` ,	583.3
394			Au	ıjusie	ed Level of	Significance	0.046				lujusteu Chi S	quare value	
395							ouming Com	ma Distributi	ion				
396		Q5% Approx	vimato Gan	ama	LICL (uso v	vhen n>=50)	7.564	ווום טופוווטענו		diusted Cam	ıma UCL (use	whon n<50)	7.581
397		95 % Approx		IIIIIa	OCL (use v	///e// ///-50)	7.504		95 % A	ujusteu Gam	illia UCL (use	wileii ii<50)	7.301
398							Lognormal	COE Toot					
399				Sh	aniro Wilk T	Test Statistic		GOF Test	Sho	niro Wilk Lo	gnormal GOF	Toet	
400						Wilk P Value	0.933			-	at 5% Significa		
401				J,		Test Statistic				-	normal GOF T		
402				5%		Critical Value	0.117				at 5% Significa		
403				J /0	Lillelois			5% Significa		Logiloillai	at 5 % Significa	IIICE LEVEI	
404							.ognornar at	3 /0 Olgrinica	IIICE LEVEI				
405							Lognorma	l Statistics					
406				М	inimum of I	_ogged Data	1.099	- Claudiou			Mean of	logged Data	1.838
407						ogged Data	2.89					logged Data	0.434
408						- Joggod Data	2.00					loggod Data	
409						Assı	umina Loanc	rmal Distribu	ıtion				
410						95% H-UCL	7.661			90%	Chebyshev (I	MVUE) UCL	8.091
411			95	% CI		MVUE) UCL	8.635				Chebyshev (I	,	9.391
412					•	MVUE) UCL	10.88				, ,		
413 414					, ,								
415						Nonparame	etric Distribu	tion Free UC	L Statistics				
416				D) Oata appea	r to follow a	Discernible I	Distribution a	t 5% Signi	ficance Leve	el		
417													
418						Nonpa	rametric Dist	ribution Free	UCLs				
419					95	% CLT UCL	7.529				95% Ja	ckknife UCL	7.54
420			95	5% S	tandard Bo	otstrap UCL	7.508				95% Boo	tstrap-t UCL	7.624
421				95	% Hall's Bo	otstrap UCL	7.669	*		95%	Percentile Bo	otstrap UCL	7.55
422				95	5% BCA Bo	otstrap UCL	7.6						
423			90%	Chel	byshev(Me	an, Sd) UCL	8.062			95% C	hebyshev(Mea	an, Sd) UCL	8.595
424			97.5%	Chel	byshev(Me	an, Sd) UCL	9.336			99% C	hebyshev(Mea	an, Sd) UCL	10.79
425								1					
426							Suggested	UCL to Use					
427			95%	6 App	oroximate (Gamma UCL	7.564						
428													
429			When	a da	ta set follov	vs an approx	imate (e.g., r	normal) distrib	oution pass	ing one of th	e GOF test		
430		When app	plicable, it i	is su	ggested to	use a UCL b	ased upon a	distribution (e	e.g., gamm	a) passing b	oth GOF tests	in ProUCL	
431													
432		Note: Sugge	estions rega	ardin	g the selec	tion of a 95%	UCL are pro	ovided to help	the user t	o select the r	most appropria	ate 95% UCL	
-TUZ								<u>.</u>					

433	A B C D E Recommendations are bas	F sed upon data	G H I J K a size, data distribution, and skewness.	L
434	These recommendations are based upon the resu	Its of the sim	ulation studies summarized in Singh, Maichle, and Lee (2006).	
435	However, simulations results will not cover all Real W	orld data set	s; for additional insight the user may want to consult a statisticia	n.
436				
437				
438	Nickel			
439				
440		General	Statistics	
441	Total Number of Observations	72	Number of Distinct Observations	18
442			Number of Missing Observations	0
443	Minimum	7	Mean	21.13
444	Maximum	31	Median	21.5
445	SD	5.574	Std. Error of Mean	0.657
446	Coefficient of Variation	0.264	Skewness	-0.305
447				
448	Observe Mills Took Observe	Normal C		
449	Shapiro Wilk Test Statistic	0.957	Shapiro Wilk GOF Test	
450	5% Shapiro Wilk P Value Lilliefors Test Statistic	0.0403 0.0869	Data Not Normal at 5% Significance Level Lilliefors GOF Test	
451	5% Lilliefors Critical Value	0.0009	Data appear Normal at 5% Significance Level	
452			rmal at 5% Significance Level	
453		TOXIIIIGIO TYO	marato // Organicano Estar	
454 455	As	sumina Norr	nal Distribution	
455 456	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
457	95% Student's-t UCL	22.22	95% Adjusted-CLT UCL (Chen-1995)	22.18
457 458			95% Modified-t UCL (Johnson-1978)	22.22
459			· · · · · · · · · · · · · · · · · · ·	
460		Gamma (GOF Test	
461	A-D Test Statistic	1.022	Anderson-Darling Gamma GOF Test	
462	5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Leve	el
463	K-S Test Statistic	0.0996	Kolmogorov-Smirnov Gamma GOF Test	
464	5% K-S Critical Value	0.105	Detected data appear Gamma Distributed at 5% Significance	e Level
465	Detected data follow Ap	pr. Gamma I	Distribution at 5% Significance Level	
466				
467		Gamma		
468	k hat (MLE)	12.58	k star (bias corrected MLE)	12.07
469	Theta hat (MLE)	1.679	Theta star (bias corrected MLE)	1.751
470	nu hat (MLE)	1812	nu star (bias corrected)	1738
471	MLE Mean (bias corrected)	21.13	MLE Sd (bias corrected)	6.081
472	Adinated Lavral of Cimitary	0.0467	Approximate Chi Square Value	1642
473	Adjusted Level of Significance	0.0467	Adjusted Chi Square Value	1640
474	Ani	eumina Cam	ma Distribution	
475	95% Approximate Gamma UCL (use when n>=50))	22.36	95% Adjusted Gamma UCL (use when n<50)	22.38
476	30 % Approximate damina GOL (use when 117-30))	22.00	30707 Mjustou Guillina GOL (use when 11500)	22.00
477		Lognormal	GOF Test	
478 470	Shapiro Wilk Test Statistic	0.917	Shapiro Wilk Lognormal GOF Test	
479 480	5% Shapiro Wilk P Value		Data Not Lognormal at 5% Significance Level	
480 481	Lilliefors Test Statistic	0.115	Lilliefors Lognormal GOF Test	
482	5% Lilliefors Critical Value	0.104	Data Not Lognormal at 5% Significance Level	
483	Data Not L	ognormal at	5% Significance Level	
484				
485		Lognorma	Statistics	
486	Minimum of Logged Data	1.946	Mean of logged Data	3.01
. 55		i .		

487	Α	В	С	D E	F	G	Н	I	J K	L
+0/				Maximum of Logged Data	3.434				SD of logged Data	0.3
488				A		amaal Diatribu	Al			
489				95% H-UCI		ormal Distribu	uon	00%	Chahyahay (MV/UE) LICI	23.51
490			05%	Chebyshev (MVUE) UCI						
491				Chebyshev (MVUE) UCI		97.5% Chebysnev (MVUE) UCL 2				25.99
492			33 70	Chebyshev (WVOL) OCI	20.03					
493				Nonparam	etric Distribu	ıtion Free UC	L Statistics	<u> </u>		
494				Data appear to follow a					1	
495 496				- ши аррош 10 1011011 1						
490 497				Nonpa	rametric Dis	tribution Free	UCLs			
498				95% CLT UCI					95% Jackknife UCL	22.22
499			95%	Standard Bootstrap UCL	. 22.2		22.22			
500	050/ H III D HOL 00 00 050/ D HOL							22.19		
501				95% BCA Bootstrap UCI	. 22.18					
502			90% CI	nebyshev(Mean, Sd) UCl	. 23.1		95% Chebyshev(Mean, Sd) UCL			
503			97.5% Cl	nebyshev(Mean, Sd) UCI	25.23	99% Chebyshev(Mean, Sd) UCL				27.66
504										
505						UCL to Use				
506				95% Student's-t UCI	. 22.22					
507										
508				data set follows an appro	· -					
509		When app	olicable, it is s	suggested to use a UCL I	pased upon a	distribution (e	e.g., gamm	a) passing bo	th GOF tests in ProUCL	
510										
511		Note: Sugge		<u> </u>	•	·			nost appropriate 95% UCL.	
512		Th		Recommendations are ba	•				Maichle, and Lee (2006).	
513	LI.			·					want to consult a statisticia	n
514	110	wever, simu	iialions resul	is will not cover all near	voriu uata se	tis, ioi additioi	iai irisigiit t	ne user may	want to consult a statisticia	111.
515										
-40		Note: For	highly nega	tively-skewed data, conf	idence limits	(e.a., Chen.,	Johnson, L	ognormal, ai	nd Gamma) may not be	
		Note: For		tively-skewed data, conf				-		
517		Note: For		tively-skewed data, conf Chen's and Johnson's m				-		
517 518		Note: For						-		
517 518 519	Vanadium	Note: For						-		
517 518 519 520	Vanadium	Note: For						-		
517 518 519 520 521	Vanadium	Note: For			ethods provi			-		
517 518 519 520 521 522	Vanadium	Note: For	reliable.		ethods provi	ide adjustmer		vely skewed		58
517 518 519 520 521 522 523	Vanadium	Note: For	reliable.	Chen's and Johnson's m	ethods provi	ide adjustmer		Numbe	data sets.	58
517 518 519 520 521 522 523 524	Vanadium	Note: For	reliable.	Chen's and Johnson's m	General 72 86	ide adjustmer		Numbe	r of Distinct Observations	
517 518 519 520 521 522 523 524 525	Vanadium	Note: For	reliable.	Chen's and Johnson's management of Observations Minimum Maximum	General 5 72 1 86 1 315	ide adjustmer		Numbe	r of Distinct Observations r of Missing Observations Mean Median	0 232.6 239.5
517 518 519 520 521 522 523 524 525	Vanadium	Note: For	reliable.	Chen's and Johnson's management of Observations Minimum Maximum SE	General 86 315 48.59	ide adjustmer		Numbe	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 525 526 527	Vanadium	Note: For	reliable.	Chen's and Johnson's management of Observations Minimum Maximum	General 86 315 48.59	ide adjustmer		Numbe	r of Distinct Observations r of Missing Observations Mean Median	0 232.6 239.5
517 518 519 520 521 522 523 524 525 526 527	Vanadium	Note: For	reliable.	Chen's and Johnson's management of Observations Minimum Maximum SE	General 86 315 48.59 0.209	Statistics		Numbe	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean	0 232.6 239.5 5.726
521 522 523 524 525 526 527 528	Vanadium	Note: For	Tota	Number of Observations Minimum Maximum Sc Coefficient of Variation	General 72 86 315 48.59 0.209	ide adjustmer		Number	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean Skewness	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 525 526 527 528 529 530 531	Vanadium	Note: For	Tota	I Number of Observations Minimum Maximum Sci Coefficient of Variation	General 6 72 86 315 0 48.59 0 0.209 Normal 6 0.945	Statistics	ts for posi	Number Number Shapiro Wi	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean Skewness	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 531	Vanadium	Note: For	Tota	Chen's and Johnson's many controls of the control o	General 72 86 315 48.59 0.209 Normal 0 0.945 0.00668	Statistics	ts for posi	Number Number Shapiro Witto Normal at a	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean Skewness	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 526 527 528 529 530 531 532	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum Sci Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk P Value Lilliefors Test Statistic	General 72 86 315 48.59 0.209 Normal (0.945 0.00668 0.103	Statistics	Data N	Number Number Shapiro Without Normal at 3	r of Distinct Observations of Missing Observations Mean Median Std. Error of Mean Skewness Ilk GOF Test 5% Significance Level GOF Test	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum Sci Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk P Value Lilliefors Test Statistic Killiefors Critical Value	General 6 72 86 315 48.59 0.209 Normal 6 0.945 0.00668 0.103 0.104	Statistics GOF Test	Data No	Number Number Shapiro Without Normal at 1	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean Skewness	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 525 526 527 528 529 531 532 533 534 534	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum Sci Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk P Value Lilliefors Test Statistic	General 6 72 86 315 48.59 0.209 Normal 6 0.945 0.00668 0.103 0.104	Statistics GOF Test	Data No	Number Number Shapiro Without Normal at 1	r of Distinct Observations of Missing Observations Mean Median Std. Error of Mean Skewness Ilk GOF Test 5% Significance Level GOF Test	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 525 526 527 528 530 531 532 533 534 535 536	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum SE Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk P Value Lilliefors Test Statistic Kanagement of Variation Shapiro Wilk P Value Lilliefors Critical Value Data appear App	General	Statistics GOF Test ormal at 5% S	Data No	Number Number Shapiro Without Normal at 1	r of Distinct Observations of Missing Observations Mean Median Std. Error of Mean Skewness Ilk GOF Test 5% Significance Level GOF Test	0 232.6 239.5 5.726
517 518 519 520 521 523 524 525 526 527 528 530 531 532 533 534 535 536 537	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum Statistic Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk P Value Lilliefors Test Statistic Management of Coefficient Value Lilliefors Critical Value Data appear App	General	Statistics GOF Test	Data No Data app	Number Nu	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean Skewness Ilk GOF Test 5% Significance Level GOF Test t 5% Significance Level	0 232.6 239.5 5.726
517 518 519 520 521 522 523 524 526 527 528 530 531 532 533 534 535 536 537 538	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum SE Coefficient of Variation Chapiro Wilk Test Statistic S% Shapiro Wilk P Value Lilliefors Test Statistic S% Lilliefors Critical Value Data appear App A cormal UCL	General	Statistics GOF Test ormal at 5% S	Data No Data app	Number Nu	r of Distinct Observations of Missing Observations Mean Median Std. Error of Mean Skewness Ilk GOF Test 5% Significance Level GOF Test t 5% Significance Level	0 232.6 239.5 5.726 -0.854
517 518 519 521 522 523 524 526 527 528 529 531 531 532 533 534 535 536 537	Vanadium	Note: For	Tota	Chen's and Johnson's management of Observations Minimum Maximum Statistic Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk P Value Lilliefors Test Statistic Management of Coefficient Value Lilliefors Critical Value Data appear App	General	Statistics GOF Test ormal at 5% S	Data No Data app	Number Nu	r of Distinct Observations r of Missing Observations Mean Median Std. Error of Mean Skewness Ilk GOF Test 5% Significance Level GOF Test t 5% Significance Level	0 232.6 239.5 5.726

	A B C D E	F	G	Н	I	J	K	L
541		Gamma (GOF Test					
542	A-D Test Statistic	1.785	1001	Anders	on-Darlin	g Gamma	GOF Test	
543 544	5% A-D Critical Value	0.75	Dat			_	Significance Lev	/el
545	K-S Test Statistic	0.132					a GOF Test	
546	5% K-S Critical Value	0.105	Dat				Significance Lev	'el
547	Data Not Gamn	na Distribute	⊔ ed at 5% Signi	ficance Lev	el			
548								
549		Gamma	Statistics					
550	k hat (MLE)	18.68			k	star (bias	corrected MLE)	17.91
551	Theta hat (MLE)	12.45			Theta	star (bias	corrected MLE)	12.99
552	nu hat (MLE)	2689				nu star	(bias corrected)	2579
553	MLE Mean (bias corrected)	232.6				MLE Sd	(bias corrected)	54.96
554				Α	pproximat	e Chi Squa	are Value (0.05)	2462
555	Adjusted Level of Significance	0.0467			A	Adjusted Cl	ni Square Value	2459
556								
557		suming Gam	ma Distributio					
558	95% Approximate Gamma UCL (use when n>=50))	243.6		95% Adjı	usted Gam	ıma UCL (ı	use when n<50)	243.9
559								
560			GOF Test					
561	Shapiro Wilk Test Statistic	0.851		·=		gnormal G		
562	5% Shapiro Wilk P Value						ificance Level	
563	Lilliefors Test Statistic	0.143				normal GO		
564	5% Lilliefors Critical Value	0.104	E0/ OlIf		ognormal	at 5% Sign	ificance Level	
565	Data Not Li	ognormai at	5% Significar	ice Level				
566		Lognorma	I Statistics					
567	Minimum of Logged Data	4.454	i Statistics			Moon	of logged Data	5.422
568	Maximum of Logged Data	5.753					of logged Data	0.251
569	Waximum of Logged Data	3.733					or logged Data	0.231
570		ımina Loano	rmal Distribut	ion				
571	95% H-UCL	245.9			90%	Chebyshe	ev (MVUE) UCL	254.5
572	95% Chebyshev (MVUE) UCL	264					ev (MVUE) UCL	277.1
573 574	99% Chebyshev (MVUE) UCL	303					(- ,	
575								
576	Nonparame	tric Distribut	tion Free UCL	Statistics				
577	Data appear to follow a D	Discernible I	Distribution at	5% Signific	ance Leve	əl		
578								
579	Nonpar	rametric Dist	tribution Free	UCLs				
580	95% CLT UCL	242				95%	Jackknife UCL	242.1
581	95% Standard Bootstrap UCL	242				95% E	Bootstrap-t UCL	241.9
582	95% Hall's Bootstrap UCL	241.7			95%	Percentile	Bootstrap UCL	241.7
583	95% BCA Bootstrap UCL	241.5						
584	90% Chebyshev(Mean, Sd) UCL	249.8			95% C	hebyshev(Mean, Sd) UCL	257.5
585	97.5% Chebyshev(Mean, Sd) UCL	268.3			99% C	hebyshev(Mean, Sd) UCL	289.6
586			-					
587		Suggested	UCL to Use					
588	95% Student's-t UCL	242.1						
589								
590	When a data set follows an approxi		•	•	_			
591	When applicable, it is suggested to use a UCL ba	ased upon a	distribution (e.	g., gamma)	passing b	oth GOF te	ests in ProUCL	
592	New Owner 15 But 1 I I I I I I I I I I I I I I I I I I	HOL			1		OE0/ LIG:	
593	Note: Suggestions regarding the selection of a 95% Recommendations are bas	•	•				priate 95% UCL	
594	Recommendations are bas	eu upon dat	a sı∠e, data dis	surbution, ar	iu skewne	:55.		

	A B C D E	F Ita of the sim	G H I J K ulation studies summarized in Singh, Maichle, and Lee (2006).	L
595	·		s; for additional insight the user may want to consult a statisticia	n
596	However, Simulations results will not cover all real w	ond data set	s, for additional insignt the user may want to consult a statisticia	11.
597	Note: For highly negatively-skewed data, confid	dence limits	(e.g., Chen, Johnson, Lognormal, and Gamma) may not be	
598			de adjustments for positively skewed data sets.	
599 600	, , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , ,		
600				
602	Zinc			
603				
604		General	Statistics	
605	Total Number of Observations	72	Number of Distinct Observations	51
606			Number of Missing Observations	0
607	Minimum	37	Mean	89.53
608	Maximum	182	Median	85.5
609	SD	29.88	Std. Error of Mean	3.521
610	Coefficient of Variation	0.334	Skewness	0.494
611		•		
612		Normal C		
613	Shapiro Wilk Test Statistic	0.967	Shapiro Wilk GOF Test	
614	5% Shapiro Wilk P Value	0.177	Data appear Normal at 5% Significance Level	
615	Lilliefors Test Statistic	0.0894	Lilliefors GOF Test	
616	5% Lilliefors Critical Value	0.104	Data appear Normal at 5% Significance Level	
617	Data appea	ar Normal at	5% Significance Level	
618				
619		suming Norn	nal Distribution	
620	95% Normal UCL 95% Student's-t UCL	95.4	95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995)	0E E4
621	95% Student s-t OCL	95.4	95% Adjusted-CLT OCL (Crien-1995) 95% Modified-t UCL (Johnson-1978)	95.54
622			95% Modified-t OCL (Johnson-1978)	95.43
623		Gamma (20E Toet	
624	A-D Test Statistic	0.379	Anderson-Darling Gamma GOF Test	
625	5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance	e l evel
626	K-S Test Statistic	0.0625	Kolmogorov-Smirnov Gamma GOF Test	
627 628	5% K-S Critical Value	0.105	Detected data appear Gamma Distributed at 5% Significance	e Level
629			stributed at 5% Significance Level	
630	-TF		-	
631		Gamma	Statistics	
632	k hat (MLE)	8.89	k star (bias corrected MLE)	8.528
633	Theta hat (MLE)	10.07	Theta star (bias corrected MLE)	10.5
634	nu hat (MLE)	1280	nu star (bias corrected)	1228
635	MLE Mean (bias corrected)	89.53	MLE Sd (bias corrected)	30.66
636			Approximate Chi Square Value (0.05)	1148
637	Adjusted Level of Significance	0.0467	Adjusted Chi Square Value	1146
638			<u> </u>	
639			ma Distribution	
640	95% Approximate Gamma UCL (use when n>=50))	95.8	95% Adjusted Gamma UCL (use when n<50)	95.93
641				
642		Lognormal		
643	Shapiro Wilk Test Statistic	0.969	Shapiro Wilk Lognormal GOF Test	
644	5% Shapiro Wilk P Value	0.214	Data appear Lognormal at 5% Significance Level	
645	Lilliefors Test Statistic	0.074	Lilliefors Lognormal GOF Test	
646	5% Lilliefors Critical Value	0.104	Data appear Lognormal at 5% Significance Level	
647	Data appear	Lognormal	at 5% Significance Level	
648				

	Α	В	С	D	Е	F	G	Н	J	K	L	
649						Lognorma	l Statistics					
650				Minimum of I	• •	3.611					logged Data	4.437
651			N	/laximum of l	₋ogged Data	5.204				SD of	logged Data	0.348
652												
653							rmal Distrib	ution				
654					95% H-UCL	96.64				Chebyshev (I	•	101.1
655				Chebyshev (,	106.2			97.5%	Chebyshev (I	MVUE) UCL	113.4
656			99%	Chebyshev (MVUE) UCL	127.4						
657												
658					•		tion Free UC					
659				Data appea	r to follow a	Discernible I	Distribution a	at 5% Signifi	cance Level			
660												
661					•		tribution Free	e UCLs				
662				95	% CLT UCL	95.32				95% Ja	ckknife UCL	95.4
663				Standard Bo	•	95.35					tstrap-t UCL	95.55
664				5% Hall's Bo	•	95.68			95% I	Percentile Bo	otstrap UCL	95.11
665				95% BCA Bo	•	95.21						
666				ebyshev(Me	. ,	100.1				ebyshev(Me	. ,	104.9
667			97.5% Ch	ebyshev(Me	an, Sd) UCL	111.5			99% Ch	ebyshev(Me	an, Sd) UCL	124.6
668												
669							UCL to Use					
670				95% Stu	dent's-t UCL	95.4						
671												
672	١	Note: Sugges				•		•		ost appropria	ate 95% UCL	
673					itions are bas							
674					•					Maichle, and	, ,	
675	Ho	wever, simul	lations result	s will not cov	er all Real W	orld data se	ts; for additio	nal insight th	ne user may	want to consi	ult a statistici	an.
676												

	A B C	D E	F	G	Н	l	J	K	L
1		UCL Statis	stics for Unc	ensored Full Data	Sets				
2	Linear College of Continue								
3	User Selected Options		1.40.57 AM						
4	Date/Time of Computation	ProUCL 5.12/11/2021 11		No. a sala					
5	From File	UCL UTL concentrations	USFS BIG E	JIUE_C.XIS					
6	Full Precision	OFF							
7	Confidence Coefficient	95%							
8	Number of Bootstrap Operations	2000							
9									
10									
11	Arsenic								
12									
13				Statistics					
14	Tota	l Number of Observations	25					nct Observations	
15						Numbe	er of Missi	ing Observations	
16		Minimum						Mean	
17		Maximum						Median	
18		SD	-				S	td. Error of Mean	
19		Coefficient of Variation	1.144					Skewness	2.228
20									
21				GOF Test					
22		Shapiro Wilk Test Statistic				Shapiro W			
23	5% S	Shapiro Wilk Critical Value		С	Data Not			ficance Level	
24		Lilliefors Test Statistic	0.225				GOF Te		
25	Ę	5% Lilliefors Critical Value				Normal at	5% Signi	ficance Level	
26		Data Not	Normal at 5	5% Significance Lo	evel				
27									
28		As	suming Norr	mal Distribution					
29	95% N	ormal UCL			95%	UCLs (Adj	usted for	Skewness)	
30		95% Student's-t UCL	605.3		6	95% Adjust	ed-CLT U	JCL (Chen-1995)	646.1
31						95% Modif	ied-t UCL	(Johnson-1978)	612.7
32									
33			Gamma (GOF Test					
34		A-D Test Statistic	0.443		Anders	son-Darling	g Gamma	GOF Test	
35		5% A-D Critical Value	0.772	Detected data	a appear	r Gamma D	Distributed	d at 5% Significar	nce Level
36		K-S Test Statistic	0.139	P	Kolmogo	orov-Smirn	ov Gamn	na GOF Test	
37		5% K-S Critical Value	0.179	Detected data	a appear	r Gamma D	Distributed	d at 5% Significar	nce Level
38	1	Detected data appear	r Gamma Di	stributed at 5% Si	ignifican	ce Level			
39	1								
40			Gamma	Statistics					
41		k hat (MLE)	1.061			k	star (bias	s corrected MLE)	0.96
42		Theta hat (MLE)	410			Theta	star (bias	s corrected MLE)	452.9
43		nu hat (MLE)					nu star	r (bias corrected)	48.02
44		ILE Mean (bias corrected)					MLE So	d (bias corrected)	443.9
45			1			Approximat		uare Value (0.05)	33.12
46		sted Level of Significance	0.0395					Chi Square Value	
47	·		1	<u> </u>			-	·	
48	 	As	suming Gar	nma Distribution					
48	050/ 4 0	na UCL (use when n>=50)			95% Adi	usted Gam	ıma UCL	(use when n<50)	647.3
	* * *	,							
50	 		Lognorma	I GOF Test					
51		Shapiro Wilk Test Statistic			Shan	iro Wilk Lo	gnormal	GOF Test	
52	F0/ 0	Shapiro Wilk Critical Value		Data			-	ignificance Level	
53		Lilliefors Test Statistic		Date		iefors Logr		<u> </u>	
54	<u> </u>		0.0021			. S. S. G. Eogi	.sar G(

55	А	В	С	D 5% Lilliefors C	E Critical Value	F 0.173	G	H Data appea	l ar Lognormal	J at 5% Signific	K cance Level	L
56					Data appear	Lognormal	at 5% Signific	cance Leve)I			
57												
58						Lognorma	l Statistics					
59				Minimum of I	ogged Data	2.565				Mean of I	ogged Data	5.535
60				Maximum of L	ogged Data	7.688				SD of I	logged Data	1.12
61												
62					Assı	ıming Logno	rmal Distribu	tion				
63					95% H-UCL	869.1			90% (Chebyshev (N	MVUE) UCL	812.5
64			95%	Chebyshev (MVUE) UCL	973.8			97.5%	Chebyshev (N	MVUE) UCL	1198
65			99%	Chebyshev (MVUE) UCL	1637						
66												
67					Nonparame	tric Distribut	tion Free UCI	L Statistics				
68				Data appea	r to follow a	Discernible [Distribution a	t 5% Signifi	icance Level			
69												
70					Nonpa	rametric Dist	ribution Free	UCLs				
71				95	% CLT UCL	598.7				95% Jac	ckknife UCL	605.3
72			95%	6 Standard Bo	otstrap UCL	593.4				95% Boot	tstrap-t UCL	718
73				95% Hall's Bo	•	726.9			95% F	Percentile Boo	•	612.7
74				95% BCA Bo		661.5						
75			90% C	hebyshev(Me	•	733.6			95% Ch	ebyshev(Mea	an. Sd) UCL	868.9
76				hebyshev(Me		1057				ebyshev(Mea	,	1425
											, ,	
77						Suggested	UCL to Use					
78			9!	5% Adjusted 0	Gamma UCI	647.3						
79						• • • • • • • • • • • • • • • • • • • •						
80		Note: Suage	stions regar	ding the selec	tion of a 95%	UCL are pro	ovided to help	the user to	select the m	nost appropria	ate 95% UCL	
81				Recommenda		-						
82		These reco		ns are based u							Lee (2006)	
83	Но			Its will not cov	·				•	•	` ,	an
84	110		1011011011000	110 WIII 1101 00V	- Ci dii i (Cdi Vi	Toria data sol	o, for addition	iai irioigiit ti	ic asci may	want to consc		
85												
86	Chromium											
67	Onnonnam											
88						General	Statietice					
89			Tota	al Number of C	heervations	13	Otationos		Number	r of Distinct O	heervations	12
90			1010	in real ribor or c	7D3CI Valion3	10				of Missing O		11
91					Minimum	22			Number	or wissing o	Mean	32.54
92					Maximum	49					Median	29
93					SD	8.695				C+4 F-	ror of Mean	2.412
94				Coofficient	SD t of Variation	0.267				Siú. Eľ	Skewness	0.819
95				Coemicien	t of variation	0.207					Skewiless	0.019
96						Name - 1 C	OF Tast					
97				Chanina Marii 3	Foot Otatiati	Normal C	JUT LEST		Obenius 147	IL COL T		
				Shapiro Wilk 7	esi Statistic	0.896 0.866		Det		Ik GOF Test t 5% Significa		
98				Dh: 16777 C	Salat a c 1 N / 1	11 066		Ligta anno	ar Normal a	t 5% Significa	ince Level	
98 99				Shapiro Wilk C				Бата арре		•		
98 99 100			5% 5	Lilliefors 7	Test Statistic	0.196			Lilliefors	GOF Test		
98 99			5% 5	•	Γest Statistic Critical Value	0.196 0.234	F0/ C1 ::-	Data appe	Lilliefors	•		
98 99 100			5% 5	Lilliefors 7	Γest Statistic Critical Value	0.196 0.234	5% Significa	Data appe	Lilliefors	GOF Test		
98 99 100 101 102			5% 5	Lilliefors 7	Test Statistic Critical Value Data appe	0.196 0.234 ar Normal at	-	Data appe	Lilliefors	GOF Test		
98 99 100 101			5% \$	Lilliefors 7 5% Lilliefors C	Test Statistic Critical Value Data appe	0.196 0.234 ar Normal at	5% Significa	Data appe	Lilliefors ear Normal a	GOF Test t 5% Significa	ance Level	
98 99 100 101 102 103			5% \$	Lilliefors 7 5% Lilliefors C	Fest Statistic Critical Value Data appe	0.196 0.234 ar Normal at suming Norr	-	Data appeince Level	Lilliefors ear Normal a	GOF Test t 5% Significa	wness)	
98 99 100 101 102 103 104			5% \$	Lilliefors 7 5% Lilliefors C	Test Statistic Critical Value Data appe	0.196 0.234 ar Normal at	-	Data appeince Level	Lilliefors ear Normal a	GOF Test t 5% Signification sted for Skevel-CLT UCL (wness) Chen-1995)	37.09
98 99 100 101 102 103 104 105			5% \$	Lilliefors 7 5% Lilliefors C	Fest Statistic Critical Value Data appe	0.196 0.234 ar Normal at suming Norr	-	Data appeince Level	Lilliefors ear Normal a	GOF Test t 5% Significa	wness) Chen-1995)	37.09 36.93

100	Α	В		С		D	Е		F Gamma	G GOF Test	Н		ı		J		K	L
109						A-D	Test Sta	tistic	0.5		A	nderso	n-Darlir	na Gar	nma GC)F Tes	st .	
110					5'		Critical V		0.733	Detected								ce l evel
111							Test Sta		0.184	20100101		•			amma C			70 20101
112					5		Critical V		0.236	Detected		_						ce Level
113										stributed at 5							5	
114 115																		
116									Gamma	Statistics								
117							k hat (N	ЛLE)	16.38					k star	(bias co	rrected	d MLE)	12.65
118						The	eta hat (N	ЛLE)	1.987				Thet	a star	(bias co	rrected	d MLE)	2.572
119						ı	nu hat (N	ЛLE)	425.8					nu	star (bi	as cor	rected)	328.9
120				N	MLE M	lean (bia	as corre	cted)	32.54					ML	E Sd (bi	as cor	rected)	9.149
121												Ap	proxima	ate Chi	Square	Value	(0.05)	287.9
122				Adju	usted l	_evel of	Significa	ance	0.0301				į	Adjust	ed Chi S	Square	e Value	282.4
123																		
124									uming Gan	ıma Distribut								
125		95% Appro	ximate	e Gamm	na UCI	_ (use w	/hen n>=	=50))	37.18		95%	% Adjus	sted Gar	mma L	JCL (use	e when	n<50)	37.89
126																		
127										GOF Test								
128							Test Sta		0.933			-			mal GO			
129				5% 5			Critical V		0.866		Data ap		•		% Signi		e Level	
130							Test Sta		0.168						I GOF			
131					5% Lil	lliefors (Critical V		0.234	. 50/ 0: :0			.ognorm	al at 5	% Signi	ficance	e Level	
132							Data ap	pear	Lognormai	at 5% Signifi	icance L	_evei						
133									Lagrania	l Ctatiatian								
134					Minir	num of	Logged	Data	3.091	I Statistics					Mean of	floggo	d Data	3.452
135							Logged		3.892								ed Data	0.254
136					IVIAXII	ilulii oi	Loggeu	Dala	3.092						30 0	llogge	u Dala	0.254
137								Assu	ımina Loana	ormal Distribi	ution							
138							95% H-		37.39				909	% Che	byshev	(MVUF	=) UCI	39.44
139 140				95%	6 Cheb	yshev ((MVUE)		42.58						byshev	•	,	46.94
141							(MVUE)		55.5								,	
142							<u>, , , , , , , , , , , , , , , , , , , </u>											
143							Nonpa	rame	tric Distribu	tion Free UC	L Statis	tics						
144					Data	a appea	ar to follo	w a [Discernible	Distribution a	at 5% Si	gnifica	nce Lev	/el				
145																		
146							No	onpar	ametric Dis	tribution Free	e UCLs							
147						95	5% CLT	UCL	36.51						95% Ja	ackknit	fe UCL	36.84
148				95%	% Stan	ndard Bo	ootstrap	UCL	36.23					(95% Boo	otstrap	-t UCL	37.7
149							ootstrap		36.86				95%	6 Perc	entile B	ootstra	ap UCL	36.46
150							ootstrap		36.92									
151						•	ean, Sd)		39.77					-	shev(Me			43.05
152			ί	97.5% C	hebys	shev(Me	an, Sd)	UCL	47.6				99% (Cheby	shev(Me	ean, So	d) UCL	56.53
153																		
154										UCL to Use								
155					9	95% Stu	ident's-t	UCL	36.84									
156		Ni. C				h - '	-41. *	0501	1101			•	1				-0/ 110:	
157		Note: Sug	gestio							ovided to hel	·				appropr	iate 95	% UCL	
158		Th "							•	a size, data o					abla -	- تالم	(2000)	
159										nulation studie								
160		nowever, sir	nulatio	ons resu	IITS WII	not cov	ver all R	eai W	oria data se	ts; for additio	mai insig	ınt tne	user ma	ıy wan	to cons	suit a s	statisticia	∄∏.
161																		
162																		

163	A B C D E Copper	F	G	Н	1	J	К	L
164	_ · ·							
165		General	Statistics					
166	Total Number of Observations	25			Numbe	r of Distinct C	bservations	19
167					Number	r of Missing C)bservations	0
168	Minimum	11					Mean	30.16
169	Maximum	88					Median	23
170	SD	19.18				Std. E	rror of Mean	3.836
171	Coefficient of Variation	0.636					Skewness	1.847
172								
173		Normal (GOF Test					
174	Shapiro Wilk Test Statistic	0.79			Shapiro Wi	ilk GOF Test		
175	5% Shapiro Wilk Critical Value	0.918		Data No	ot Normal at	5% Significar	nce Level	
176	Lilliefors Test Statistic	0.206			Lilliefors	GOF Test		
177	5% Lilliefors Critical Value	0.173		Data No	ot Normal at	5% Significar	nce Level	
178	Data No	t Normal at 5	⊥ 5% Significa	nce Level				
179								
180	As	ssuming Norr	mal Distribu	ion				
181	95% Normal UCL				UCLs (Adju	sted for Ske	wness)	
182	95% Student's-t UCL	. 36.72			95% Adjuste	ed-CLT UCL ((Chen-1995)	37.98
183					95% Modifi	ed-t UCL (Jol	nnson-1978)	36.96
184						•		
185		Gamma	GOF Test					
186	A-D Test Statistic			Ande	rson-Darling	Gamma GO	F Test	
187	5% A-D Critical Value	0.75	D				nificance Lev	el
188	K-S Test Statistic	0.163				ov Gamma G		
189	5% K-S Critical Value	0.176	Detecte				5% Significand	ce Level
190	Detected data follow Ap	pr. Gamma						
191	·	-						
192		Gamma	Statistics					
193	k hat (MLE)	3.503			k	star (bias cor	rected MLE)	3.109
194	Theta hat (MLE)				Theta	star (bias cor	rected MLE)	9.7
195	nu hat (MLE)					nu star (bia	as corrected)	155.5
196	MLE Mean (bias corrected)					MLE Sd (bia	as corrected)	17.1
197					Approximate	Chi Square	Value (0.05)	127.6
	Adjusted Level of Significance	0.0395				djusted Chi S	` ′	125.9
198 199	, , , , , , , , , , , , , , , , , , , ,						- '	
200	As	suming Gam	nma Distribu	tion				
200	95% Approximate Gamma UCL (use when n>=50)	_			djusted Gamı	ma UCL (use	when n<50)	37.24
					-	, -		
202 203		Lognorma	I GOF Test					
203	Shapiro Wilk Test Statistic		<u> </u>	Sha	piro Wilk Loc	normal GOF	Test	
	5% Shapiro Wilk Critical Value			·		at 5% Signifi		
205	Lilliefors Test Statistic				•	ormal GOF T		
206	5% Lilliefors Critical Value					at 5% Signifi		
207		r Lognormal	at 5% Signif		•			
208								
209		Loanorma	I Statistics					
210	Minimum of Logged Data					Mean of	logged Data	3.257
211	Maximum of Logged Data						logged Data	0.533
212		T.T//				3D 01	. Jygou Dala	
213	Λοο	uming Logno	rmal Dietrih	ution				
214	95% H-UCL				QN%	Chebyshev (MVUE) LICI	39.69
215	050/ 01 1 1 (48)/(15) 1101					Chebyshev (,	50.44
216		7.10			37.370	Chooyonev (, 501	JJ. 77

	Α		В		С		D			Е		F		G			Н		- 1			J			K	Т	L	Т
217					99	% Ch	ebysł	hev (MVUI	E) UCL	- 62	2.73														T		1
218											,																	
219										param																		
220						Da	ata ap	ppea	r to fo	ollow a	Disce	ernible	Dis	stribu	tion a	it 5%	Sign	ifica	nce L	.eve	<u> </u>							
221																												
222										Nonpa			strib	oution	ree	UC	Ls											_
223										T UCL		5.47													ife UCI		36.72	
224					95					p UCL		5.29								\F0/					p-t UCI		39.27	_
225										p UCL		1.51 7.8							9	5%	Perc	entile)tstr	ap UCI	4	36.36	4
226					00%					p UCL d) UCL		7.8 1.67							050)/ Ck	hoby	chov/I	Moo	.n C	Sd) UCI	+	46.88	4
227				0				•		d) UCL		4.11										•			Sd) UCI		68.32	_
228					7.570	CITED.	ysilev	V(IVIC	an, o	u) UCL		Ŧ. I I							- 337	70 CI	СОУ		vica					-
229											Sua	gested	d UC	CL to	Use								—	—		—		-
230 231						95% A	Adius	ted C	Gamm	na UCL		7.24														\top		-
232							,																					-
233				٧	Vhen	a data	a set f	follov	ws an	approx	ximate	e (e.g.,	, nor	mal)	distrib	butio	n pas	sing	one c	of the	e GC	OF test	t					1
234			When app									. •		•			•	-						in P	roUCL			1
235															-													1
236		Nc	ote: Sugge	estion	s rega	arding	the s	selec	ction o	of a 959	% UCI	are p	rovi	ided 1	o help	p the	user	to se	elect t	he n	nost	appro	pria	te 9	5% UC	L.		1
237						Rec	omm	enda	ations	are ba	sed u	pon da	ata s	size,	data d	listrik	outior	i, and	skev	wnes	SS.							
238		Т	hese reco	mme	ndatio	ons ar	e bas	sed u	ıpon t	he resi	ults of	the sir	mula	ation	studie	es su	ımma	rized	in Si	ngh,	, Mai	ichle, a	and	Lee	(2006)).		1
239	I	How	ever, simu	ulatio	ns res	ults w	vill no	t cov	er all	Real V	World (data se	ets;	for a	dditior	nal ir	nsigh	the i	user r	may	wan	t to co	nsu	lt a	statistic	cian		1
240																												
241																												1
242	Lead																											
243																												
244												eneral	l Sta	atisti	cs													
245					То	tal Nu	ımbeı	r of C	Obser	vations	2!	5													rvations		23	
246																			Nur	mbei	r of N	vissin	g Ol	bsei	rvations		0	
247										nimum															Mear		107.7	
248									Ма	ximum													_		Mediar		70	4
249) tt:		+ -£\/-	SD												Sta	. Eri		of Mear		20.99	4
250							Joenn	cieni	t Of Va	ariation	1 0	.974												-SK	ewnes	5	1.699	4
251											N	ormal	GO	E To	ct													4
252						Shai	niro V	N/ilk 7	Tast S	Statistic		.803	<u> </u>	,, ,,	3i			9	hanir	o Wi	ilk G	OF Te	et .					-
253					5%					l Value		.918				Г)ata l		•			Signific			evel			_
254					0 70					tatistic		.216					Julu					F Test				—		-
255										l Value		.173					Data I					Signific		ce L	evel			-
256 257										ata No			5%	Sign	ifican													\dashv
257 258																												+
259										A:	ssumi	ng Noi	rma	l Dis	tributi	on												1
260					95%	Norm	nal UC	CL									95	% U	CLs (Adjι	ustec	d for S	kew	vne	ss)			1
261							95%	Stu	dent's	-t UCL	_ 14:	3.6						95	% Ad	juste	ed-C	LT UC)L (0	Che	n-1995)	149.9	1
262																		95	5% M	odifi	ed-t	UCL (Joh	nso	n-1978)	144.8	1
263											1																	1
264											G	amma	GC	OF T€	est													
265							F	4-D 7	Test S	Statistic	0	.417					And	lerso	n-Dai	rling	Gar	mma G	ЭOF	- Te	st			
266							5% A	A-D C	Critica	l Value	9 0	.766		De	tected										ignifica	ince	Level	7
267							ł	K-S 7	Test S	Statistic	0	.104										amma						
268										l Value		.178									istrib	outed a	at 5°	% S	ignifica	nce	Level	
269							Dete	ected	data	appea	ar Gan	nma D	istri	ibute	d at 5	% Si	ignifi	cance	e Lev	el								
270]
																												_

	A B C D E	F Gamma	G Statistics	Н	I	J	K		L
271	k hat (MLE)				k	star (bias	corrected Mi	LE)	1.171
272	Theta hat (MLE)					•	corrected MI		91.98
273	nu hat (MLE)					•	(bias correct	1	58.55
274	MLE Mean (bias corrected)	107.7					(bias correct		99.54
275	(,				Approximate		are Value (0.	1	41.96
276	Adjusted Level of Significance	0.0395			• • • • • • • • • • • • • • • • • • • •	· ·	ni Square Va		41
277 278	, ,						<u>'</u>		
279	As	suming Gam	nma Distribu	tion					
280	95% Approximate Gamma UCL (use when n>=50)				justed Gamı	ma UCL (ι	use when n<	50)	153.8
281						-			
282		Lognorma	I GOF Test						
283	Shapiro Wilk Test Statistic	0.97		Shap	oiro Wilk Log	gnormal G	OF Test		
284	5% Shapiro Wilk Critical Value	0.918		Data appea	r Lognormal	l at 5% Sig	nificance Le	evel	
285	Lilliefors Test Statistic	0.104		Lil	liefors Logn	ormal GO	F Test		
286	5% Lilliefors Critical Value	0.173		Data appea	r Lognormal	l at 5% Sig	nificance Le	evel	
287	Data appear	Lognormal	at 5% Signi	ficance Leve	l				
288									
289		Lognorma	l Statistics						
290	Minimum of Logged Data	2.485				Mean	of logged D	ata	4.248
291	Maximum of Logged Data	6.075				SD	of logged D	ata	0.976
292									
293	Assu	ıming Logno	ormal Distrib	ution					
294	95% H-UCL	184			90%	Chebyshe	ev (MVUE) U	ICL	182.3
295	95% Chebyshev (MVUE) UCL	215.2			97.5%	Chebyshe	ev (MVUE) U	ICL	260.9
296	99% Chebyshev (MVUE) UCL	350.6							
			1						
297	Nonparame	etric Distribu	tion Free U	CL Statistics					
297 298	Nonparame Data appear to follow a				cance Leve	ı			
297 298 299	•				cance Leve	I			
297 298 299 300	Data appear to follow a	Discernible		at 5% Signifi	cance Leve	I			
297 298 299 300 301	Data appear to follow a	Discernible	Distribution	at 5% Signifi	cance Leve		Jackknife U	ICL	143.6
297 298 299 300 301 302	Data appear to follow a	Discernible rametric Dis	Distribution	at 5% Signifi	cance Leve	95%	Jackknife U Bootstrap-t U		143.6 155.2
297 298 299 300 301 302 303	Data appear to follow a Nonpai 95% CLT UCL	Discernible rametric Dis	Distribution	at 5% Signifi		95% 95% E		ICL	
297 298 299 300 301 302 303 304	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL	rametric Dis 142.2 141.8 155.5 150.6	Distribution	at 5% Signifi	95%	95% 95% E Percentile	Bootstrap-t U Bootstrap U	ICL ICL	155.2 142.2
297 298 299 300 301 302	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL	rametric Dis 142.2 141.8 155.5 150.6 170.7	Distribution	at 5% Signifi	95% 95% Ct	95% 95% E Percentile nebyshev(l	Bootstrap-t U Bootstrap U Mean, Sd) U	ICL ICL	155.2 142.2 199.2
297 298 299 300 301 302 303 304 305	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL	rametric Dis 142.2 141.8 155.5 150.6	Distribution	at 5% Signifi	95% 95% Ct	95% 95% E Percentile nebyshev(l	Bootstrap-t U Bootstrap U	ICL ICL	155.2 142.2
297 298 300 301 302 303 304 305 306 307	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8	Distribution	at 5% Signifi	95% 95% Ct	95% 95% E Percentile nebyshev(l	Bootstrap-t U Bootstrap U Mean, Sd) U	ICL ICL	155.2 142.2 199.2
297 298 300 301 302 303 304 305 306 307 308	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8	Distribution	at 5% Signifi	95% 95% Ct	95% 95% E Percentile nebyshev(l	Bootstrap-t U Bootstrap U Mean, Sd) U	ICL ICL	155.2 142.2 199.2
297 298 299 300 301 302 303 304 305 306 307 308 309	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8	Distribution	at 5% Signifi	95% 95% Ct	95% 95% E Percentile nebyshev(l	Bootstrap-t U Bootstrap U Mean, Sd) U	ICL ICL	155.2 142.2 199.2
297 298 299 300 301 302 303 304 305 306 307 308 309	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8	Distribution tribution Fre	at 5% Signifi	95% 95% Ct 99% Ct	95% E 95% E Percentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U	ICL ICL ICL	155.2 142.2 199.2
297 298 299 300 301 302 303 304 305 306 307 308 309 310 311	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested	UCL to Use	e UCLs Ip the user to	95% 95% Ch 99% Ch	95% 95% E Percentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U	ICL ICL ICL	155.2 142.2 199.2
297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are based	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are prosed upon dates	UCL to Use ovided to he ta size, data	e UCLs Ip the user to distribution, a	95% Cr 95% Cr 99% Cr	95% E Percentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U	JCL JCL	155.2 142.2 199.2
297 298 299 300 301 302 303 304 305 306 307 308 309 310 311	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Possible Suggestions regarding the selection of a 95% Recommendations are based upon the resu	142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datastic of the sim	UCL to Use ovided to he ta size, data nulation stud	lp the user to distribution, a ies summarize	95% Ch 95% Ch 99% Ch select the n and skewnes	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U	ICL ICL ICL ICL ICL ICL ICL ICL ICL ICL	155.2 142.2 199.2 316.5
297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are based	142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datastic of the sim	UCL to Use ovided to he ta size, data nulation stud	lp the user to distribution, a ies summarize	95% Ch 95% Ch 99% Ch select the n and skewnes	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U	ICL ICL ICL ICL ICL ICL ICL ICL ICL ICL	155.2 142.2 199.2 316.5
297 298 300 301 302 303 304 305 306 307 308 310 311 312 313 314 315 316	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Possible Suggestions regarding the selection of a 95% Recommendations are based upon the resu	142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datastic of the sim	UCL to Use ovided to he ta size, data nulation stud	lp the user to distribution, a ies summarize	95% Ch 95% Ch 99% Ch select the n and skewnes	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U	ICL ICL ICL ICL ICL ICL ICL ICL ICL ICL	155.2 142.2 199.2 316.5
297 298 300 301 302 303 304 305 306 307 308 310 311 312 313 314 315 316 317	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are base These recommendations are based upon the resu However, simulations results will not cover all Real W	142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datastic of the sim	UCL to Use ovided to he ta size, data nulation stud	lp the user to distribution, a ies summarize	95% Ch 95% Ch 99% Ch select the n and skewnes	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U	ICL ICL ICL ICL ICL ICL ICL ICL ICL ICL	155.2 142.2 199.2 316.5
297 298 300 301 302 303 304 305 306 307 310 311 312 313 314 315 316 317 318	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Possible Suggestions regarding the selection of a 95% Recommendations are based upon the resu	142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datastic of the sim	UCL to Use ovided to he ta size, data nulation stud	lp the user to distribution, a ies summarize	95% 95% Ch 99% Ch select the n and skewnes	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U	ICL ICL ICL ICL ICL ICL ICL ICL ICL ICL	155.2 142.2 199.2 316.5
297 298 299 300 301 302 303 304 305 306 307 310 311 312 313 314 315 316 317 318 319	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are base These recommendations are based upon the resu However, simulations results will not cover all Real W	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datalts of the simulation of the	UCL to Use ovided to he ta size, data nulation studits; for addition	lp the user to distribution, a ies summarize	95% 95% Ch 99% Ch select the n and skewnes	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U	ICL ICL ICL ICL ICL ICL ICL ICL ICL ICL	155.2 142.2 199.2 316.5
297 298 300 301 302 303 304 305 306 307 308 310 311 312 313 314 315 316 317 318 319 320	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 95% Adjusted Gamma UCL Note: Suggestions regarding the selection of a 95% Recommendations are base These recommendations are based upon the resu However, simulations results will not cover all Real W	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 GUCL are prised upon data lits of the similar for its order and its of the similar for its order and its of the similar for its of the similar for its order and its of the similar for its of the similar for its order and its of the similar for its order and its of the similar for its order and its	UCL to Use ovided to he ta size, data nulation stud	lp the user to distribution, a ies summarize	95% Ch 95% Ch 99% Ch select the n and skewnes ared in Singh, ne user may	95% 95% E Percentile nebyshev(l nebyshev(l nost appro	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U and Lee (200 pnsult a statis	JCL JCL JCL JCL JCL JCL	155.2 142.2 199.2 316.5
297 298 299 300 301 302 303 304 305 306 307 310 311 312 313 314 315 316 317 318 319	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are base These recommendations are based upon the resu However, simulations results will not cover all Real W	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are presed upon datalts of the simulation of the	UCL to Use ovided to he ta size, data nulation studits; for addition	lp the user to distribution, a ies summarize	95% Cf 95% Cf 99% Cf select the n and skewnes red in Singh, ne user may	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U and Lee (200 ponsult a statis	JCL JCL JCL JCL JCL JCL JCL JCL JCL JCL	155.2 142.2 199.2 316.5
297 298 300 301 302 303 304 305 306 307 310 311 312 313 314 315 316 317 318 319 320	Nonpar 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 95% Adjusted Gamma UCL Note: Suggestions regarding the selection of a 95% Recommendations are base These recommendations are based upon the resu However, simulations results will not cover all Real W. Mercury Total Number of Observations	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 UCL are prised upon datalts of the similar for the similar	UCL to Use ovided to he ta size, data nulation studits; for addition	lp the user to distribution, a ies summarize	95% Cf 95% Cf 99% Cf select the n and skewnes red in Singh, ne user may	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U and Lee (200 onsult a statis	JCL JCL JCL JCL JCL JCL JCL JCL JCL JCL	155.2 142.2 199.2 316.5
297 298 300 301 302 303 304 305 306 307 310 311 312 313 314 315 316 317 318 319 320 321	Nonpal 95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 95% Adjusted Gamma UCL Note: Suggestions regarding the selection of a 95% Recommendations are base These recommendations are based upon the resu However, simulations results will not cover all Real W	rametric Dis 142.2 141.8 155.5 150.6 170.7 238.8 Suggested 153.8 GUCL are prised upon data lits of the similar for its order and its of the similar for its order and its of the similar for its of the similar for its order and its of the similar for its of the similar for its order and its of the similar for its order and its of the similar for its order and its	UCL to Use ovided to he ta size, data nulation studits; for addition	lp the user to distribution, a ies summarize	95% Cf 95% Cf 99% Cf select the n and skewnes red in Singh, ne user may	95% EPercentile nebyshev(i	Bootstrap-t U Bootstrap U Mean, Sd) U Mean, Sd) U priate 95% U and Lee (200 onsult a statis	JCL JCL JCL JCL JCL JCL JCL JCL JCL JCL	155.2 142.2 199.2 316.5

325	Α		В		С		D	Е	SD	F 19.27	G		Н		I		J Std.	Error c	K of Mean	L 4.675
326						Со	efficien	t of Vari	ation	1.483								Ske	ewness	2.8
327																				
328										Normal (GOF Test									
329								Test Sta		0.531					-		OF Tes			
330					5%			Critical V		0.892			Data N				Significa	ance Le	evel	
331								Test Sta		0.385					Lilliefors					
332						5% Lil	liefors (Critical V		0.207				lot No	ormal at	t 5% \$	Significa	ance Le	evel	
333								Dat	a Not	Normal at 5	5% Signific	ance	e Level							
334																				
335					050/ 1	NI			Ass	suming Nor	mal Distrib	utio		V 110	1 - /A -1!		-1 6 Ol-			
336					95% [Normal		ıdent's-t	LICI	21.16			957				d for Sk		n-1995)	24.08
337							95% Stu	ident S-t	UCL	21.10					•			•	n-1995) n-1978)	21.69
338														95	/o IVIOUII	iieu-i	OCL (3		11-1970)	21.09
339										Gamma	GOF Test									
340							A-D	Test Sta	tistic	2.194	101 1031		Ande	erson	-Darlin	n Ga	mma G	OF Te	et	
341						5°		Critical V		0.764		Data	a Not Gar							el
342								Test Sta		0.319							amma			-
343 344						5'		Critical V		0.215		Data	a Not Gar	-						el
345						·	Da	ata Not	Gamn	na Distribut										
346																				
347										Gamma	Statistics									
348								k hat (I	MLE)	1.09					k	star	(bias co	orrecte	ed MLE)	0.937
349							The	eta hat (N	MLE)	11.92					Theta	star	(bias co	orrecte	ed MLE)	13.87
350							ı	nu hat (l	MLE)	37.07						nι	ı star (b	ias cor	rrected)	31.86
351					N	MLE M	ean (bia	as corre	cted)	13						ML	E Sd (b	ias cor	rrected)	13.43
352														App	roximat	te Ch	i Square	e Value	e (0.05)	19.96
353					Adjı	usted L	_evel of	Signific	ance	0.0346					P	Adjus	ted Chi	Square	e Value	18.98
354									,											
355										uming Gan	ma Distrib	outio								
356		95% <i>F</i>	Approx	imat	te Gamn	na UCL	_ (use w	vhen n>=	=50))	20.75			95% A	djust	ed Gan	nma l	JCL (us	e wher	n n<50)	21.83
357																				
358										Lognorma	GOF Tes	t								
359								Test Sta		0.804				•		•	mal GC			
360					5%	<u> </u>		Critical V		0.892			Data Not						Level	
361								Test Sta		0.247			Data Not				al GOF		Lavial	
362						3% LII	ileiois (ognormal a	5% Signif				norman	at 5%	Signin	cance	Levei	
363								Data	NOL E	ognomiai a	. 5 % Sigilii	ICall	ice revei							
364										Loanorma	l Statistics	·								
365						Minir	num of	Logged	Data	1.099		-					Mean	of loans	ed Data	2.041
366								Logged		4.331									ed Data	0.887
367 368								- 33-4												
369									Assu	ming Logno	ormal Distri	ibuti	ion							
370								95% H-		19.83					90%	6 Che	byshev	(MVU	IE) UCL	18.82
371					95%	% Chet	yshev ((MVUE)	UCL	22.34								•	E) UCL	27.22
372							•	(MVUE)		36.8										
373								<u> </u>			1									
374								Nonpa	arame	tric Distribu	tion Free L	JCL	Statistics	S						
375								Data do	not fo	ollow a Disc	ernible Dis	strib	ution (0.0)5)						
376																				
377								N	onpar	ametric Dis	tribution Fr	ree l	UCLs							
378							95	5% CLT	UCL	20.69							95% J	ackkni	ife UCL	21.16
		_																		

270	Α	В		C 9	95% St	D tandard	Boots	E trap UCL	F 20.53	3	G	ì	ŀ	1		I		J 95% Boo		t UCL	L 50.79
379								trap UCL	51.56							95%		entile Bo			21.18
380								trap UCL	24.71	l		-									
381				90%				Sd) UCL	27.02							95% C	hebv	shev(Me	ean. Sd) UCL	33.38
382 383							-	Sd) UCL	42.19								-	shev(Me		´	59.51
384						•		,										`		,	
385									Sugges	ted	UCL to	Use									
386				95%	Cheb	yshev (ľ	Mean,	Sd) UCL	33.38	3											
387																					
388		Note: Su	igges	tions req		_		n of a 95%										appropri	iate 959	% UCL.	
389	<u> </u>	There						ns are bas										-1-1	<u> </u>	2006)	
390		However, s						n the resu													n.
391	'		Simula	2110115 16		WIII HOL C		ali ixeai vv	Ullu uata	3 50	15, 101 6	uuition	ai ii is	igni u	ile us	ei illay	y wan	t to cons		ausucia	11.
392																					
393 394	Molybden	um																			
395																					
396									Gene	eral	Statisti	cs									
397				Т	otal N	umber c	of Obs	ervations	16							Numbe	er of I	Distinct (Observ:	ations	7
398									1							Numbe	er of N	Missing (Observ	ations	9
399								Minimum	4											Mean	7.313
400							N	Maximum	13										M	ledian	5.5
401								SD	3.34	1								Std. E	Error of	Mean	0.835
402						Coeffici	ient of	Variation	0.45	7									Skev	wness	0.706
403																					
404	<u> </u>										GOF Te	est									
405	<u> </u>					•		t Statistic								-		OF Test			
406	<u> </u>			59	% Sha	•		cal Value	0.88				Da	ata No				Significa	nce Lev	/el	
407	<u> </u>							t Statistic						- 4 - NI -		illiefors				1	
408	 				5%	Lilliefor		cal Value Data Not	0.213		50/ Sign	nificano			ot No	rmai at	5% 8	Significa	nce Lev	/ei	
409								Data Not	Nominal	al J	o o oigi	IIICanc	e re	VEI							
410								Δe	suming N	Vorr	mal Dis	tributic	n								
411				95%	% Norr	nal UCL	L	710		1011		- and a a	/ 11	95%	uc	Ls (Adi	iusted	l for Ske	wness)	
412								nt's-t UCL	8.77	7								LT UCL		•	8.844
413 414																-		UCL (Jo	•	· /	8.801
415																		,			
416						-			Gamr	ma (GOF T	est									
417						A-	-D Test	t Statistic	1.042	2				Ande	rson-	-Darling	g Gaı	mma GC	F Test	t	
418								cal Value	0.74			Dat						ıt 5% Siç	-		el .
419								t Statistic										amma G			
420								cal Value								Distribu	uted a	ıt 5% Siç	ınifican	ce Leve	;
421							Data I	Not Gamr	na Distri	bute	ed at 5°	% Sign	ificar	ice Le	evel						
422											O4-4'										
423	<u> </u>						1. 1.	nat (MLE)			Statisti	CS				1.	cto-	(bias co	rroots	MI E/	4.545
424						т		nat (MLE)			-							(bias co			1.609
425								nat (MLE)		J						ineta		star (bia		,	145.4
426					MIF	Mean (orrected)		3	-							E Sd (bi		<i>'</i>	3.43
427								Jolou)	7.010	-					App	roximat		i Square		•	118.6
428 420				A	djuste	d Level	l of Sia	nificance	0.033	35								ed Chi S		` '	115.8
429 430							9			•							,				
430								Ass	suming G	Gam	nma Dis	stributio	on								
432		95% Appı	roxim	ate Gan	nma U	ICL (use	e wher		_					5% Ac	djuste	ed Gam	ıma l	JCL (use	when	n<50)	9.183
1 02					_	<u> </u>		,,							-						

	Α	В		(С		D		E	F	G		Н		ı		J			K	工	L
433										Lognorms	I GOF Test											
434					S	hanir	o Wilk	Test S	tatistic	-	1 401 1001		Sha	niro \	Nilk L	oan	orma	GOF	- Ter			
435						-	Wilk (0.887		Dat		-		-				e Level		
436 437							liefors			0.244					rs Log							
438					5°	% Lill	iefors (Critical	Value	0.213		Dat								e Level		
439								Dat	a Not L	⊥ .ognormal a	t 5% Signific	cance	Level									
440																						
441										Lognorma	al Statistics											
442					1	Minim	num of	Logge	d Data	1.386							Me	an of	logg	ged Dat	ta	1.897
443					N	N axim	num of	Logge	d Data	2.565							- (SD of	logg	ged Dat	ta	0.439
444																						
445									Assı	uming Logn	ormal Distril	bution							-			
446								95% H	H-UCL	9.192					90%	% CI	nebys	hev (MVL	JE) UC	L)	9.748
447					95% (Cheb	yshev (MVUE) UCL	10.86					97.5%	% CI	nebys	hev (MVL	JE) UC)L	12.41
448					99% (Cheb	yshev (MVUE) UCL	15.44												
449																						
450								•		etric Distribu												
451								Data d	o not f	follow a Disc	cernible Dist	tributio	n (0.0)5)								
452																						
453										rametric Dis	tribution Fre	ee UCL	.s									
454									TUCL	8.686										nife UC		8.777
455							dard Bo		•	8.641										ap-t UC		8.955
456							all's Bo		•	8.61					95%	% Pe	rcent	ile Bo	otsti	rap UC	;L	8.75
457							BCA Bo		•	8.813					050/ 6	Ol I		/\1-	(0-1) 116	+	10.05
458							nev(Me nev(Me			9.818 12.53							•	•		Sd) UC Sd) UC		10.95 15.62
459				97.0		ebysi	iev(ivie	an, sc	1) UCL	12.55					99 /0 (CHE	уѕпе		an, c		<u></u>	15.02
460										Suggested	UCL to Use	<u> </u>										
461							5% Stu	ıdent's	-+ LICI	8.777	TOOL to ose						or 95	% Mc	odifie	ed-t UC	<u> </u>	8.801
462							5 70 Otu	uent s	-1001	0.777							01 33	70 1010				
463		Note: Su	Jaaes'	tions	regard	lina th	e selec	ction o	f a 95%	6 UCL are pr	rovided to he	elp the	user to	o sele	ect the	mo	st apr	oropria	ate 9	95% U	CL.	
464			-33							sed upon da		•										
465 466		These	recom	nmenc						Ilts of the sin							laichl	e, and	d Le	e (2006	3).	
467								-		/orld data se										,		
468																						
469																						-
470	Nickel																					
471																						
472										General	Statistics											
473					Total	Numl	ber of C	Observ	ations	24					Numb	oer c	f Dist	inct C	Dbse	ervation	าร	12
474															Numb	er o	f Miss	sing C	Obse	ervation	าร	1
475									nimum	15										Mea		20.25
476								Max	ximum	32										Media		19.5
477									SD	4.255								Std. E		of Mea		0.869
478						Coe	efficien	t of Va	riation	0.21									Sk	kewnes	SS	1.569
479																						
480							10.000	_			GOF Test				•							
481							o Wilk								apiro V							
482					5% Sh		Wilk (0.916		D	ata N		rmal a				nce L	_evel		
483							liefors								illiefor							
484					5	% Lilli	iefors (0.177						ı at 5	% Si	gnifica	ance	e Level		
485							Data	appe	ar App	roximate No	ormal at 5%	Signific	cance	Leve	91							
486																						

487	Α	В	С	D	E As	F suming Norr	G mal Distribution	Н	I	J	K	L
488			95% No	rmal UCL				95% U	JCLs (Adju	sted for Sk	(ewness)	
489				95% Stu	dent's-t UCL	21.74		95	5% Adjuste	ed-CLT UCI	_ (Chen-1995)	21.98
490								9	5% Modifi	ed-t UCL (J	ohnson-1978)	21.79
491												
492						Gamma (GOF Test					
493				A-D T	Test Statistic	0.83		Anderso	on-Darling	Gamma G	OF Test	
494				5% A-D C	Critical Value	0.742	Data	Not Gamm	a Distribut	ed at 5% S	ignificance Lev	el
495				K-S T	Test Statistic	0.163		Kolmogor	rov-Smirno	ov Gamma	GOF Test	
496				5% K-S C	Critical Value	0.177	Detected da	ata appear	Gamma Di	istributed a	t 5% Significan	ce Level
497				Detected da	ata follow Ap	pr. Gamma I	Distribution at 5	5% Significa	ance Leve			
498												
499						Gamma	Statistics					
500					k hat (MLE)	27.25			k	star (bias c	orrected MLE)	23.87
501				The	ta hat (MLE)	0.743			Theta	star (bias c	orrected MLE)	0.848
502				r	nu hat (MLE)	1308				nu star (b	oias corrected)	1146
503			ML	E Mean (bia	as corrected)	20.25				MLE Sd (b	oias corrected)	4.145
504								Aı	pproximate	Chi Squar	e Value (0.05)	1068
505			Adjus	ted Level of	Significance	0.0392			A	djusted Chi	Square Value	1063
506						1						
507					Ass	suming Gam	ma Distribution	1				
508	9:	5% Approxir	nate Gamma	UCL (use w	hen n>=50))	21.72		95% Adju	sted Gamı	na UCL (us	se when n<50)	21.83
509												
510						Lognormal	GOF Test					
511			S	hapiro Wilk 7	Test Statistic	0.912		Shapir	o Wilk Log	normal GC	OF Test	
512			5% SI	napiro Wilk C	Critical Value	0.916	[Data Not Lo	gnormal a	t 5% Signif	icance Level	
513				Lilliefors	Test Statistic	0.157		Lillie	fors Logn	ormal GOF	Test	
514			5'	% Lilliefors C	Critical Value	0.177	Da	ata appear	Lognormal	at 5% Sign	ificance Level	
515				Data a	ppear Appro	ximate Logn	ormal at 5% Si	gnificance	Level			
516												
517						Lognorma	l Statistics					
518			I	Minimum of I	Logged Data	2.708				Mean	of logged Data	2.99
519			N	laximum of l	Logged Data	3.466	 			SD	of logged Data	0.19
520						<u> </u>						
521					Assı	ıming Logno	rmal Distributio	on .				
522					95% H-UCL	21.71			90%	Chebyshev	(MVUE) UCL	22.6
523			95% (Chebyshev (MVUE) UCL	23.67			97.5%	Chebyshev	(MVUE) UCL	25.17
524			99% (Chebyshev (MVUE) UCL	28.09						
525												
526					Nonparame	etric Distribut	tion Free UCL S	Statistics				
527				Data appea	r to follow a	Discernible [Distribution at 5	5% Significa	ance Leve			
528												
529					Nonpa	rametric Dist	tribution Free U	ICLs				
530				95	5% CLT UCL	21.68				95% 、	Jackknife UCL	21.74
531			95%	Standard Bo	otstrap UCL	21.66				95% Bo	ootstrap-t UCL	22.26
532			9	5% Hall's Bo	otstrap UCL	23.06			95%	Percentile E	Bootstrap UCL	21.63
533			(95% BCA Bo	otstrap UCL	22.04						
534			90% Ch	ebyshev(Me	an, Sd) UCL	22.86			95% Cł	nebyshev(N	lean, Sd) UCL	24.04
535			97.5% Ch	ebyshev(Me	an, Sd) UCL	25.67			99% Ct	nebyshev(N	lean, Sd) UCL	28.89
536												
537						Suggested	UCL to Use					
538				95% Stu	dent's-t UCL	21.74						
539												
540			When a d	ata set follow	ws an approx	imate (e.g., r	normal) distribut	tion passing	one of the	GOF test		
U T U												

	A B C D E When applicable, it is suggested to use a UCL ba	F ased upon a	G H I J K distribution (e.g., gamma) passing both GOF tests in ProUCL	L
541		au apon a	222(o.g., gamma) passing sour dor tools in 1000L	
542	Note: Suggestions regarding the selection of a 95%	UCL are pro	ovided to help the user to select the most appropriate 95% UCL.	
543		•	a size, data distribution, and skewness.	
544 545		·	ulation studies summarized in Singh, Maichle, and Lee (2006).	
545 546			ts; for additional insight the user may want to consult a statisticia	ın.
546				
547 548				
549	Vanadium			
550				
551		General	Statistics	
552	Total Number of Observations	25	Number of Distinct Observations	25
553			Number of Missing Observations	0
554	Minimum	142	Mean	218
555	Maximum	316	Median	217
556	SD	50.71	Std. Error of Mean	10.14
557	Coefficient of Variation	0.233	Skewness	0.213
558				
559		Normal C	GOF Test	
560	Shapiro Wilk Test Statistic	0.96	Shapiro Wilk GOF Test	
561	5% Shapiro Wilk Critical Value	0.918	Data appear Normal at 5% Significance Level	
562	Lilliefors Test Statistic	0.0989	Lilliefors GOF Test	
563	5% Lilliefors Critical Value	0.173	Data appear Normal at 5% Significance Level	
564	Data appea	ar Normal at	5% Significance Level	
565				
566	Ass	suming Norr	nal Distribution	
567	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
568	95% Student's-t UCL	235.3	95% Adjusted-CLT UCL (Chen-1995)	235.1
569			95% Modified-t UCL (Johnson-1978)	235.4
570				
571		Gamma (
572	A-D Test Statistic	0.289	Anderson-Darling Gamma GOF Test	
573	5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance	e Level
574	K-S Test Statistic	0.0943	Kolmogorov-Smirnov Gamma GOF Test	
575	5% K-S Critical Value	0.174	Detected data appear Gamma Distributed at 5% Significance	e Level
576	Detected data appear	Gamma Dis	stributed at 5% Significance Level	
577		Gamma	Statistics	
578	k hat (MLE)	18.99	k star (bias corrected MLE)	16.74
579	Theta hat (MLE)	11.48	Theta star (bias corrected MLE)	13.02
580	nu hat (MLE)	949.5	nu star (bias corrected)	836.9
581	MLE Mean (bias corrected)	218	MLE Sd (bias corrected)	53.27
582	WILL WEAT (DIAS COTTECTED)	210	Approximate Chi Square Value (0.05)	770.8
583	Adjusted Level of Significance	0.0395	Adjusted Chi Square Value Adjusted Chi Square Value	766.5
584	, agasta zovor or organicalita	3.0000	, injustica offi oquato value	
585	Ass	sumina Gam	ma Distribution	
586	95% Approximate Gamma UCL (use when n>=50))	236.7	95% Adjusted Gamma UCL (use when n<50)	238
587			obs	
588 580		Lognormal	GOF Test	
589 590	Shapiro Wilk Test Statistic	0.958	Shapiro Wilk Lognormal GOF Test	
590 591	5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
591	Lilliefors Test Statistic	0.0987	Lilliefors Lognormal GOF Test	
592 593	5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
593 594			at 5% Significance Level	
594	appoin			

595	A B C D E	F	G H I J K	L
FOC		Lognorma	al Statistics	
596	Minimum of Logged Da		Mean of logged Dat	5.358
597	Maximum of Logged Da		SD of logged Dat	
598 599				
600	A	suming Logno	ormal Distribution	
601	95% H-U0	L 237.9	90% Chebyshev (MVUE) UC	249.4
602	95% Chebyshev (MVUE) UC	L 263.5	97.5% Chebyshev (MVUE) UC	283.2
603	99% Chebyshev (MVUE) UC	L 321.9		
604				
605	Nonpara	netric Distribu	tion Free UCL Statistics	
606	Data appear to follow	a Discernible	Distribution at 5% Significance Level	
607				
608	Non	parametric Dis	tribution Free UCLs	
609	95% CLT UC	CL 234.6	95% Jackknife UC	235.3
610	95% Standard Bootstrap UC	L 234	95% Bootstrap-t UC	235.8
611	95% Hall's Bootstrap UC		95% Percentile Bootstrap UC	234.7
612	95% BCA Bootstrap UC			
613	90% Chebyshev(Mean, Sd) UC		95% Chebyshev(Mean, Sd) UC	
614	97.5% Chebyshev(Mean, Sd) UG	CL 281.3	99% Chebyshev(Mean, Sd) UC	318.9
615				
616			UCL to Use	
617	95% Student's-t UC	CL 235.3		
618	Netes Occase tions are need to a the collection of a O	-0/ HOL	0.00/ 110	
619			ovided to help the user to select the most appropriate 95% UC ta size, data distribution, and skewness.	·L.
620			ta size, data distribution, and skewness. nulation studies summarized in Singh, Maichle, and Lee (2006	
621			ts; for additional insight the user may want to consult a statisti	
622	However, simulations results will not cover all recu	World data 30	is, for additional margine the deer may want to consult a statistic	Jan.
623				
624				
COE	Zinc			
	Zinc			
626	Zinc	General	Statistics	
626 627	Zinc Total Number of Observatio	4	Statistics Number of Distinct Observation	s 25
626 627 628				
626 627 628 629		ns 25	Number of Distinct Observation	s 0
626 627 628 629 630	Total Number of Observatio	ns 25 m 63	Number of Distinct Observation Number of Missing Observation	s 0 n 139.4
626 627 628 629 630 631	Total Number of Observatio Minimu Maximu	ns 25 m 63	Number of Distinct Observation Number of Missing Observation Mea	0 139.4 135
626 627 628 629 630 631	Total Number of Observatio Minimu Maximu	m 63 m 273 D 52.87	Number of Distinct Observation Number of Missing Observation Mea Media	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633	Total Number of Observation Minimu Maximu	m 63 m 273 D 52.87	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633	Total Number of Observation Minimu Maximu	m 63 m 273 D 52.87 on 0.379	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea	0 139.4 1 135 1 10.57
625 626 627 628 629 630 631 632 633 634 635 636	Total Number of Observation Minimu Maximu	m 63 m 273 D 52.87 on 0.379	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635 636	Total Number of Observatio Minimu Maximu S Coefficient of Variation	m 63 m 273 D 52.87 on 0.379 Normal 0	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635 636	Total Number of Observation Minimu Maximu Coefficient of Variation Shapiro Wilk Test Statis	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 ue 0.918	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635 636 637	Total Number of Observation Minimu Maximu S Coefficient of Variation Shapiro Wilk Test Statis 5% Shapiro Wilk Critical Value Lilliefors Test Statis 5% Lilliefors Critical Value	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 ue 0.918 ic 0.138 ue 0.173	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635 636 637 638	Total Number of Observation Minimu Maximu S Coefficient of Variation Shapiro Wilk Test Statis 5% Shapiro Wilk Critical Value Lilliefors Test Statis 5% Lilliefors Critical Value	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 ue 0.918 ic 0.138 ue 0.173	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635	Total Number of Observation Minimum Maximum Standard Coefficient of Variation Shapiro Wilk Test Statis 5% Shapiro Wilk Critical Value Lilliefors Test Statis 5% Lilliefors Critical Value Data appear A	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 de 0.918 ic 0.138 de 0.173	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635 636 637 638 639 640	Total Number of Observation Minimu Maximu S Coefficient of Variation Shapiro Wilk Test Statis 5% Shapiro Wilk Critical Value Lilliefors Test Statis 5% Lilliefors Critical Value Data appear A	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 de 0.918 ic 0.138 de 0.173	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level	0 139.4 1 135 1 10.57
626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641	Total Number of Observation Minimum Maximum Section of Variation Schapiro Wilk Test Statis Shapiro Wilk Critical Value Lilliefors Test Statis 5% Shapiro Wilk Critical Value Lilliefors Critical Value Data appear Aection Data appear Aection Section Sect	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 ie 0.918 iic 0.138 iie 0.173 Oproximate No	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level mal Distribution 95% UCLs (Adjusted for Skewness)	s 0 n 139.4 n 135 n 10.57 s 1.003
626 627 628 639 631 632 633 634 635 636 637 638 639 640 641 642	Total Number of Observation Minimu Maximu S Coefficient of Variation Shapiro Wilk Test Statis 5% Shapiro Wilk Critical Value Lilliefors Test Statis 5% Lilliefors Critical Value Data appear A	m 63 m 273 D 52.87 on 0.379 Normal 6 ic 0.914 de 0.918 ic 0.138 de 0.173 Deproximate Normal Normal 6 Assuming Normal Normal 6	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level mal Distribution 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995)	0 139.4 135 10.57 s 1.003
626 627 628 629 630 631 632 633 634 635 636 637 638 639	Total Number of Observation Minimum Maximum Section of Variation Schapiro Wilk Test Statis Shapiro Wilk Critical Value Lilliefors Test Statis 5% Shapiro Wilk Critical Value Lilliefors Critical Value Data appear Aection Data appear Aection Section Sect	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 ie 0.918 iic 0.138 iie 0.173 Oproximate No	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level mal Distribution 95% UCLs (Adjusted for Skewness)	0 139.4 135 10.57 s 1.003
626 627 628 630 631 632 633 634 635 636 637 638 640 641 642 643	Total Number of Observation Minimum Maximum Section of Variation Schapiro Wilk Test Statis Shapiro Wilk Critical Value Lilliefors Test Statis 5% Shapiro Wilk Critical Value Lilliefors Critical Value Data appear Aection Data appear Aection Section Sect	m 63 m 273 D 52.87 on 0.379 Normal 0 ic 0.914 de 0.918 ic 0.138 de 0.173 oproximate Normal 0 Assuming Normal 0	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level mal Distribution 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978)	0 139.4 135 10.57 s 1.003
626 627 628 630 631 632 633 634 635 636 637 638 639 640 641 642 643	Total Number of Observation Minimum Maximum Section of Variation Schapiro Wilk Test Statis Shapiro Wilk Critical Value Lilliefors Test Statis 5% Shapiro Wilk Critical Value Lilliefors Critical Value Data appear Aection Data appear Aection Section Sect	S 25	Number of Distinct Observation Number of Missing Observation Mea Media Std. Error of Mea Skewnes GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level rmal at 5% Significance Level mal Distribution 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995)	0 139.4 135 10.57 s 1.003

649	Α	В		С		D 5% A-D	Critical		F 0.746	G Detected	H d data a _l	ppear	I Gamm	na Dist		J ed at 5		K gnificand	L ce Level
650						K-S	Test St	atistic	0.119		Kol	mogo	rov-Sm	nirnov	Gam	nma G	OF To	est	
651					Ę	5% K-S	Critical	Value	0.175	Detected	d data a	ppear	Gamm	na Dist	tribute	ed at 5	% Sig	gnificand	e Level
652					l	Detecte	ed data a	appea	r Gamma Di	stributed at 5	% Sign	ifican	ce Leve	el					
653																			
654									Gamma	Statistics									
655							k hat ((MLE)	7.764					k st	ar (bi	as cor	rected	d MLE)	6.859
656						Th	neta hat ((MLE)					Th		,			MLE)	20.32
657							nu hat ((MLE)	388.2							•		rected)	342.9
658				N	MLE N	/lean (b	ias corre	ected)	139.4							•		rected)	53.21
659												Α	pproxir			<u> </u>		` '	301
660				Adjı	usted	Level o	of Signific	cance	0.0395					Adjı	usted	Chi S	quare	Value	298.4
661																			
662										ma Distribut									
663		95% App	roxima	te Gamm	na UC	L (use	when n>	-=50))	158.8		95%	% Adju	ısted G	amma	a UCI	L (use	when	n<50)	160.2
664																			
665					01	. \^(!!	T . 0.			GOF Test		OI'	\APII-			1005	.		
666							Critical						ro Wilk	_					
667				5% 3			Critical Test St				Data ap		efors Lo					Level	
668							Critical		-		Data ap							a Lovol	
669					3 % L	illeiois				at 5% Signifi			Logiloi	IIIai a	11 3 //0	Signin	Carice	e Level	
670							Data c	ippeai	Logiloillai	at 5 % Signin	icarice L	-6461							
671									Lognorma	I Statistics									
672					Mini	mum of	f Logged	l Data							Me	ean of	logge	d Data	4.871
673							f Logged											d Data	0.37
674 675																	- 55-		
675 676								Assı	uming Logno	ormal Distribu	ution								
677							95% F		160.8				9	0% C	heby	shev (I	MVUE	E) UCL	171
678				95%	% Che	byshev	(MVUE) UCL	185.3				97.	.5% C	heby	shev (I	MVUE) UCL	205.3
679				99%	% Che	byshev	(MVUE	UCL	244.4							<u> </u>		,	
680																			
681							Nonp	arame	etric Distribu	tion Free UC	L Statis	stics							
682					Da	ta appe	ear to fol	low a	Discernible	Distribution a	at 5% Si	ignific	ance L	evel					
683																			
684							١	lonpa	rametric Dis	tribution Free	e UCLs								
685						ç	95% CL1	UCL	156.8						9	5% Ja	ckknif	fe UCL	157.5
686							Bootstrap		156.5									-t UCL	161.5
687							Bootstrap						9!	5% Pe	ercen	tile Bo	otstra	p UCL	156.2
688							Bootstrap		159.1										
689						`	lean, Sd											d) UCL	185.4
690				97.5% C	Cheby	shev(M	lean, Sd) UCL	205.4				99%	% Che	bysh	ev(Mea	an, So	d) UCL	244.6
691									0										
692						050/ 0				UCL to Use									
693						95% St	tudent's-	t UCL	157.5										
694				\\//b = :-	. d=+-	00+ f - II	OUIC 5 :-		imate (s =	o o rm = 1\ -!: - + '!	hustin -	000:-	~ ~ ~ ~	£ 414 - 4	005	tost			
695		\ \ /ba	applic							normal) distril	-		-				in Dr	al ICI	
696		vviieli	applica	avi c , il iS	s sugg	esieu (o use a l	JOL D	aseu upon a	นเอนามนนเปน ((e.y., yar	ıııııd)	hassiii	y nor	i GOI	เฮรเร	11111	UUUL	
697		Note: Si	ınnesti	nns regar	rding	the sale	ection of	a 05%	ALICI are no	ovided to help	n the us	er to c	elect th	he mo	nst an	nronric	ate Q5	% IICI	
698		11016. 01	299 c 2110	•	•				•	a size, data d						hi ohi id	ALG 90	, 70 UCL.	
699		These	recomn							nulation studie						le, and	Lee	(2006)	
700	ŀ									ts; for addition								-	an.
701	<u>'</u>									-,		,		, ••					-
702																			

	A B	С	D E	F	G H	I J K	L
1			UCL Stat	ISUCS FOR UN	censored Full Data Sets		
2	User Select	ed Ontions	T				
3	Date/Time of Con	•	ProUCL 5.12/11/2021 1	1:51:10 AM			
4		From File	UCL UTL concentration		Blue d.xls		
5 6		Precision	OFF				
7	Confidence C		95%				
8	Number of Bootstrap O	perations	2000				
9		·	1				
10							
	Antimony						
12							
13				Genera	l Statistics		
14		Total	Number of Observations	s 7		Number of Distinct Observations	7
15						Number of Missing Observations	8
16			Minimun	n 23		Mear	n 1538
17			Maximun	n 8764		Mediar	1 224
18			SI	3211		Std. Error of Mear	1214
19			Coefficient of Variation	n 2.087		Skewness	2.565
20					•		
21		Note: Sam	ple size is small (e.g., <	10), if data a	are collected using ISM app	proach, you should use	
22	g	uidance pr	ovided in ITRC Tech Re	g Guide on	ISM (ITRC, 2012) to comp	ute statistics of interest.	
23		For e	example, you may want	to use Chel	syshev UCL to estimate EP	PC (ITRC, 2012).	
24	1	Chebyshev	UCL can be computed	using the N	onparametric and All UCL	Options of ProUCL 5.1	
25							
26				Normal	GOF Test		
27			hapiro Wilk Test Statistic			Shapiro Wilk GOF Test	
28		5% SI	hapiro Wilk Critical Value	e 0.803	Data Not	Normal at 5% Significance Level	
29			Lilliefors Test Statistic	0.403		Lilliefors GOF Test	
30		5	% Lilliefors Critical Value			Normal at 5% Significance Level	
31			Data No	ot Normal at	5% Significance Level		
32							
33				ssuming No	rmal Distribution		
34		95% No	ormal UCL			UCLs (Adjusted for Skewness)	
35			95% Student's-t UCI	3897		5% Adjusted-CLT UCL (Chen-1995)	·
36					!	95% Modified-t UCL (Johnson-1978)	4093
37							
38					GOF Test	D. II. O	
39			A-D Test Statistic			son-Darling Gamma GOF Test	
40			5% A-D Critical Value			Gamma Distributed at 5% Significa	nce Level
41			K-S Test Statistic			prov-Smirnov Gamma GOF Test	
42			5% K-S Critical Value		1.1	Gamma Distributed at 5% Significa	nce Level
43			Detected data appea	ar Gamma D	Distributed at 5% Significan	ce Level	
44					Chatlatias		
45			I, b - + /M/I F		a Statistics	k otor /biog gamested BALE	0.211
46			k hat (MLE			k star (bias corrected MLE Theta star (bias corrected MLE	
47			Theta hat (MLE nu hat (MLE	-		nu star (bias corrected MLE)	·
48		I VI	nu nat (MLE LE Mean (bias corrected	-		MLE Sd (bias corrected	
49		IVII	ivican (bias corrected	/ 1336	Λ	Approximate Chi Square Value (0.05	
50		Δdius	sted Level of Significance	e 0.0158	A	Adjusted Chi Square Value (0.05	
51		Aujus		0.0136		Aujusteu Oni Square Value	, 0.433
52			Α	seumina Ca	mma Distribution		
53	95% Annrovim	nate Gamm	a UCL (use when n>=50	_		usted Gamma UCL (use when n<50	13537
54	JO // Approxim	ato Garrille	2 00E (430 WINGIT II? =30	/	35 /0 Auju	actor damina OOL (ase when ii-30)	, 10007

	Α	В		С	D)	E	F		G	Н	I		J		K	L
55 56								Lognor	rmal G	GOF Test							
57				S	hapiro '	Wilk T	est Statisti				Sha	piro Wilk	Logno	ormal GC	OF Te	st	
58							ritical Valu		3		Data appea		-				
59					Lillie	fors T	est Statisti	0.139	9		Li	lliefors Lo	gnorr	nal GOF	Test		
60				5	% Lillie	fors C	ritical Valu	e 0.304	4		Data appea	ar Lognorr	mal at	5% Sigr	nifican	ce Level	
61						ı	Data appe	ar Lognorn	mal at	5% Signif	icance Leve	əl					
62																	
63	-							Logno	rmal S	Statistics							
64				ı	Minimu	m of L	ogged Dat	a 3.13	5					Mean	of logg	ged Data	5.582
65				Λ	√laximu	m of L	ogged Dat	a 9.078	8					SD	of logg	ged Data	2.073
66																	
67								_	gnorn	mal Distrib	ution						
68							95% H-UC								`	JE) UCL	3931
69					•	•	MVUE) UC					97.5	5% Cł	ebyshev	/ (MVL	JE) UCL	6830
70				99% (Chebys	shev (N	MVUE) UC	10140									
71							Nonners	otrio Dist	elbust -	n Eros IIC	1 Ctatiatis						
72					Data a		•				CL Statistics at 5% Signif		avol				
73					Dala a	ippeai	to ioliow a	Discernii	DIE DI	Suibudon a	at 5 /6 Sigilii	icance Le	5VGI				
74							Nonn	arametric	Distril	bution Fre	e UCI s						
75 76						959	% CLT UC				0 0020			95% 、	Jackkr	nife UCL	3897
				95%	Standa		otstrap UC									ap-t UCL	32057
77 78							otstrap UC					95	5% Pe			rap UCL	3859
79							otstrap UC									•	
80				90% Ch	ebyshe	ev(Mea	an, Sd) UC	5179				95%	Chel	yshev(N	lean, S	Sd) UCL	6828
81			9	7.5% Ch	ebyshe	ev(Mea	an, Sd) UC	9117				99%	Chel	yshev(N	/lean, \$	Sd) UCL	13613
82																	
83								Sugges	ted U	CL to Use							
84				959	% Adjus	sted G	amma UC	13537									
85								-1	'								
86						Rec	ommende	d UCL exc	ceeds	the maxim	num observa	ation					
87																	
88		Note: Sug	gestion								p the user to			st approp	oriate 9	95% UCL	
89								•		•	distribution,					(2222)	
90							•				es summari						
91		owever, si	mulatio	ns result	.s wiii no	ot cove	er all Real	vvoria data	a sets;	; for additio	nal insight t	ne user m	nay wa	int to cor	isuit a	statistici	an.
92																	
93	Arsenic																
94																	
95 96								Gene	eral St	tatistics							
96				Total	Numbe	er of O	bservation					Num	nber o	f Distinct	t Obse	ervations	15
98																ervations	
99							Minimur	n 35	\vdash							Mean	
100							Maximur	n 10929								Median	364
101							SI	3371	+					Std.	Error	of Mean	870.4
102					Coeff	ficient	of Variatio	1.683	3						Sł	kewness	1.969
103								-1									
104								Norm	nal GC	OF Test							
105							est Statisti		4			Shapiro	Wilk	GOF Te	st		
106				5% SI			ritical Valu				Data No	ot Normal				Level	
107							est Statisti							OF Test			
108				5	% Lillie	fors C	ritical Valu	e 0.22			Data No	ot Normal	at 5%	Signific	ance l	Level	
								•									

109	Α	В	С	D	E Data Not	F : Normal at 5	G 5% Significa	H ance Level	I	J	K	L
110												
111					Ass	suming Norr	nal Distribu	ıtion				
112			95% N	ormal UCL				95%		usted for Skew	-	
113				95% Stud	dent's-t UCL	3536			-	ed-CLT UCL (C	,	3908
114									95% Modifi	ed-t UCL (Johr	nson-1978)	3610
115												
116							GOF Test					
117					Test Statistic	1.206				Gamma GOF		
118					Critical Value	0.795				ted at 5% Sign		el
119					Test Statistic	0.305				ov Gamma GC		
120					Critical Value	0.234				ted at 5% Sign	ificance Lev	el
121				Da	ita Not Gamn	na Distribute	ed at 5% Si	gnificance Lo	evel			
122												
123						Gamma	Statistics					
124					k hat (MLE)	0.489			k	star (bias corre	ected MLE)	0.436
125				The	ta hat (MLE)	4094			Theta	star (bias corre	ected MLE)	4596
126				r	nu hat (MLE)	14.68				nu star (bias	1	13.08
127			М	LE Mean (bia	s corrected)	2003				MLE Sd (bias	corrected)	3034
128					I				Approximate	e Chi Square V	'alue (0.05)	5.943
129			Adjus	sted Level of	Significance	0.0324			A	djusted Chi Sq	uare Value	5.362
130					11.						!	
131					Ass	suming Gam	ma Distrib	ution				
132		95% Approxir	nate Gamma	UCL (use w	hen n>=50))	4407		95% A	djusted Gam	ma UCL (use v	vhen n<50)	4885
133												
134						Lognormal	GOF Test					
135			S	Shapiro Wilk T	Test Statistic	0.924		Sha	piro Wilk Lo	gnormal GOF	Test	
136			5% S	hapiro Wilk C	Critical Value	0.881		Data appe	ar Lognorma	l at 5% Signific	ance Level	
137				Lilliefors T	Test Statistic	0.201		Li	illiefors Logn	ormal GOF Te	st	
138			5	5% Lilliefors C	Critical Value	0.22		Data appe	ar Lognorma	l at 5% Signific	ance Level	
139					Data appear	Lognormal	at 5% Sign	ificance Leve	el			
140												
141						Lognorma	I Statistics					
142				Minimum of L	ogged Data	3.555				Mean of lo	ogged Data	6.3
143			ı	Maximum of L	ogged Data	9.299				SD of lo	ogged Data	1.671
144												
145					Assu	ıming Logno	rmal Distri	bution				
146					95% H-UCL	12731			90%	Chebyshev (M	IVUE) UCL	4558
147			95%	Chebyshev (I	MVUE) UCL	5792			97.5%	Chebyshev (M	IVUE) UCL	7505
148			99%	Chebyshev (I	MVUE) UCL	10871						
149				- `	-		1					
150					Nonparame	tric Distribu	tion Free U	ICL Statistics	3			
151				Data appea	<u>-</u>				ficance Leve	ı		
152												
153					Nonpar	rametric Dist	tribution Fr	ee UCLs				
154				95	% CLT UCL	3435				95% Jac	kknife UCL	3536
155			95%	Standard Bo		3342					strap-t UCL	5258
156				95% Hall's Bo	-	4139			95%	Percentile Boo	•	3492
157				95% BCA Bo	•	3982					•	
158				nebyshev(Mea	-	4614			95% CI	nebyshev(Mea	n, Sd) UCL	5797
				nebyshev(Mea		7439				nebyshev(Mea	,	10663
159					, -,						,	
160						Suggested	UCL to Us					
161			99% Ch	ebyshev (Mea	an, Sd) UCI		12.55					
162				., (,,							

	A B C D E	F	G H I J K	L
163	Note: Suggestions regarding the selection of a 95%	UCL are pro	ovided to help the user to select the most appropriate 95% UCL.	
164			a size, data distribution, and skewness.	
165		•	ulation studies summarized in Singh, Maichle, and Lee (2006).	
166 167			ts; for additional insight the user may want to consult a statisticia	n.
168			-,	
169				
_	Chromium			
171				
172		General	Statistics	
173	Total Number of Observations	7	Number of Distinct Observations	6
174			Number of Missing Observations	7
175	Minimum	25	Mean	31.57
176	Maximum	50	Median	27
177	SD	9.217	Std. Error of Mean	3.484
178	Coefficient of Variation	0.292	Skewness	1.738
179				
180		••	e collected using ISM approach, you should use	
181			SM (ITRC, 2012) to compute statistics of interest.	
182			shev UCL to estimate EPC (ITRC, 2012).	
183	Chebyshev UCL can be computed us	sing the No	nparametric and All UCL Options of ProUCL 5.1	
184		Normal C	NOT Test	
185	Shapiro Wilk Test Statistic	0.735	Shapiro Wilk GOF Test	
186	5% Shapiro Wilk Critical Value	0.733	Data Not Normal at 5% Significance Level	
187	Lilliefors Test Statistic	0.365	Lilliefors GOF Test	
188	5% Lilliefors Critical Value	0.304	Data Not Normal at 5% Significance Level	
189			% Significance Level	
190 191				
192	Ass	suming Norr	nal Distribution	
193	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
194	95% Student's-t UCL	38.34	95% Adjusted-CLT UCL (Chen-1995)	39.75
195			95% Modified-t UCL (Johnson-1978)	38.72
196				
197		Gamma (GOF Test	
198	A-D Test Statistic	0.899	Anderson-Darling Gamma GOF Test	
199	5% A-D Critical Value	0.707	Data Not Gamma Distributed at 5% Significance Leve	ıl .
200	K-S Test Statistic	0.367	Kolmogorov-Smirnov Gamma GOF Test	
201	5% K-S Critical Value	0.312	Data Not Gamma Distributed at 5% Significance Leve	1
202	Data Not Gamm	na Distribute	ed at 5% Significance Level	
203			0	
204		Gamma		0.470
205	k hat (MLE)	16.42	k star (bias corrected MLE)	9.478
206	Theta hat (MLE)	1.923	Theta star (bias corrected MLE)	3.331
207	nu hat (MLE) MLE Mean (bias corrected)	229.9 31.57	nu star (bias corrected) MLE Sd (bias corrected)	132.7 10.25
208	wi∟⊏ Mean (bias corrected)	31.3/	Approximate Chi Square Value (0.05)	10.25
209	Adjusted Level of Significance	0.0158	Approximate Cni Square Value Adjusted Chi Square Value	107.1
210	Adjusted Level of Significance	0.0100	Aujusteu Otti Square Value	100.1
211	Δοο	umina Gam	ma Distribution	
212	95% Approximate Gamma UCL (use when n>=50))	39.12	95% Adjusted Gamma UCL (use when n<50)	41.84
213	25 (25 A P. P. S. MINIS COL (400 MINISTED - 00)))	33.12	observation administration (and minimized)	
214		Lognormal	GOF Test	
215 216	Shapiro Wilk Test Statistic	0.773	Shapiro Wilk Lognormal GOF Test	
∠10	,	•		

217	Α	В		C 5% S	D napiro Wilk	E Critical Valu	F e 0.803	G	H Data Not	l Lognormal a	J t 5% Signific	K ance Level	L
217 218						Test Statisti				lliefors Logno			
				5		Critical Valu				Lognormal a			
219 220							Lognormal a	⊥ t 5% Signific					
221													
222							Lognorma	al Statistics					
223					Minimum o	f Logged Dat	a 3.219				Mean of	logged Data	3.421
224				N	/laximum o	f Logged Dat	a 3.912				SD of	logged Data	0.256
225													
226						As	suming Logn	ormal Distrib	ution				
227						95% H-UC	L 39.43			90%	Chebyshev (MVUE) UCL	40.66
228				95%	Chebyshev	(MVUE) UC	L 44.81			97.5%	Chebyshev (MVUE) UCL	50.58
229				99%	Chebyshev	(MVUE) UC	L 61.9						
230												I.	
231						Nonparan	netric Distribu	tion Free UC	L Statistics				
232						Data do not	follow a Disc	cernible Distr	ibution (0.0	5)			
233													
234						Nonp	arametric Dis	tribution Fre	UCLs				
235					9	95% CLT UC	L 37.3				95% Ja	ckknife UCL	38.34
236				95%	Standard E	Bootstrap UC	L 36.93				95% Boo	otstrap-t UCL	75.36
237				9	5% Hall's E	Bootstrap UC	L 81.88			95% I	Percentile Bo	ootstrap UCL	38
238				!	95% BCA E	Bootstrap UC	L 38.29						
239				90% Ch	ebyshev(N	lean, Sd) UC	L 42.02			95% Ch	nebyshev(Me	an, Sd) UCL	46.76
240			,	97.5% Ch	ebyshev(N	lean, Sd) UC	L 53.33			99% Ch	nebyshev(Me	an, Sd) UCL	66.23
241								<u>'</u>				'	
242							Suggested	UCL to Use					
243					95% St	tudent's-t UC	L 38.34				or 95% Mo	odified-t UCL	38.72
244												<u>.</u>	
245		Note: Sugg	gestio	ns regard	ing the sele	ection of a 95	% UCL are p	rovided to hel	p the user to	select the m	nost appropri	ate 95% UCL.	
246				F	Recommen	dations are b	ased upon da	ta size, data (distribution,	and skewnes	SS.		
247						<u> </u>	sults of the sin					, ,	
248	H	owever, sim	nulatio	ons result	s will not co	over all Real	World data se	ets; for additio	nal insight tl	he user may	want to cons	ult a statisticia	ın.
249													
250													
251	Copper												
252													
253								Statistics					
254				Total	Number of	Observation	s 15					Observations	13
255										Number	of Missing C	Observations	0
256						Minimur						Mean	16.07
257						Maximur					<u> </u>	Median	15
258					0 67 7	SI					Std. E	rror of Mean	1.832
259					Coefficie	nt of Variatio	n 0.442					Skewness	1.044
260							NI	005.5					
261					L	. T C		GOF Test		Ob	II. 00==		
262						Test Statisti			D. :		lk GOF Test		
263				5% S		Critical Valu			Data app	ear Normal a		ance Level	
264						Critical Value			Doto		GOF Test	ongo I aval	
265				5	/o LIIIIETOI'S	Critical Valu		+ E0/ Cic-id-		ear Normal a	10% Signific	ance Level	
266						Data app	ear Normal a	1 0% SIGNITIC	ance Level				
267							couming N	mal Distriber	ion				
268				OFO/ NI	rmel LIO	<i>P</i>	ssuming Nor	ınaı Distribut			otod for Cla-	wmoca)	
269				90% NO	ormal UCL	tudent's-t UC	L 19.29		95%	UCLs (Adju 95% Adjuste			10.61
270					35% 5	iuu c iii 5-l UC	19.29			33 /o Aujuste	u-CLI UCL	(011011-1995)	19.61

	Α	В	С	D	E	F	G	Н	I	L
271		•	•						95% Modified-t UCL (Johnson-1978)	19.38
272										
273						Gamma	GOF Test			
274				A-D	Test Statistic			And	lerson-Darling Gamma GOF Test	
275				5% A-D	Critical Value		Detected		ear Gamma Distributed at 5% Significand	e Level
276				K-S	Test Statistic	0.112			ogorov-Smirnov Gamma GOF Test	
277					Critical Value				ear Gamma Distributed at 5% Significand	e Level
278				Detecte	ed data appea	ır Gamma Di	stributed at 5	% Signific	cance Level	
279										
280							Statistics		_	
281					k hat (MLE				k star (bias corrected MLE)	4.818
282				Th	eta hat (MLE				Theta star (bias corrected MLE)	3.335
283					nu hat (MLE				nu star (bias corrected)	144.5
284			N	/ILE Mean (b	ias corrected	16.07			MLE Sd (bias corrected)	7.32
285						T			Approximate Chi Square Value (0.05)	117.8
286			Adju	usted Level o	of Significance	0.0324			Adjusted Chi Square Value	114.8
287										
288							ma Distributi			
289		5% Approxir	mate Gamm	a UCL (use	when n>=50)	19.72		95% A	Adjusted Gamma UCL (use when n<50)	20.23
290							LOOFT			
291				Ol i M/III	T4 04-4:-4:		GOF Test	01-	anima Milla I ann ann a I OOF Taat	
292					Test Statistic				apiro Wilk Lognormal GOF Test	
293			5% 8		Critical Value				ear Lognormal at 5% Significance Level	
294									Lilliefors Lognormal GOF Test	
295				5% Lilletors	Critical Value				ear Lognormal at 5% Significance Level	
296					Data appea	r Lognorniai	at 5% Signific	cance Lev	vei	
297						Lognorma	l Statistics			
298				Minimum o	f Logged Data		ii Otatistics		Mean of logged Data	2.691
299					f Logged Data				SD of logged Data	0.429
300				- Waxiii aiii o	- Logged Dak	0.400			OD of logged Data	0.423
301					Ass	umina Loana	ormal Distribu	ition		
302					95% H-UCL				90% Chebyshev (MVUE) UCL	21.51
303 304			95%	Chebyshev	(MVUE) UCL				97.5% Chebyshev (MVUE) UCL	27.41
				•	(MVUE) UCL				, , ,	
305 306					. , -	1	1			
307					Nonparam	etric Distribu	tion Free UC	L Statistic	es es	
308				Data appe	<u>-</u>				nificance Level	
309								-		
310					Nonpa	rametric Dis	tribution Free	UCLs		
311				!	95% CLT UCL	. 19.08			95% Jackknife UCL	19.29
312			95%	6 Standard E	Bootstrap UCL	. 18.92			95% Bootstrap-t UCL	20.47
313				95% Hall's E	Bootstrap UCL	. 21.75			95% Percentile Bootstrap UCL	19.2
314				95% BCA E	Bootstrap UCL	. 19.6				
315			90% C	hebyshev(M	lean, Sd) UCL	. 21.56			95% Chebyshev(Mean, Sd) UCL	24.05
316			97.5% C	hebyshev(N	lean, Sd) UCL	. 27.51			99% Chebyshev(Mean, Sd) UCL	34.3
317						•			-	
318						Suggested	UCL to Use			
319				95% S	tudent's-t UCL	. 19.29				
320										
321		Note: Sugge							to select the most appropriate 95% UCL.	
322						•			n, and skewness.	
323					•				rized in Singh, Maichle, and Lee (2006).	
324	Но	wever, simu	lations resu	lts will not c	over all Real \	Vorld data se	ts; for additior	nal insight	the user may want to consult a statisticia	ın.

	Α	В	С	D		E	F	G	Н	I	J		K	L
325														
326	Lead													
327	Leau													
328							General	Statistics						
329			Tota	l Number	r of Obs	servations				Numb	er of Dis	tinct Obs	ervations	14
330			1014		. 0. 050								ervations	0
331						Minimum	10					g	Mean	225.1
332 333						Maximum							Median	98
334						SD	274.4				;	Std. Erro	r of Mean	70.84
335				Coeffic	cient of	f Variation	1.219					S	kewness	1.409
336														
337							Normal	GOF Test						
338			5	Shapiro W	Vilk Tes	st Statistic	0.766			Shapiro W	Vilk GOF	Test		
339			5% S	Shapiro W	Vilk Crit	ical Value	0.881		Data No	t Normal at	5% Sigi	nificance	Level	
340				Lillief	fors Tes	st Statistic	0.321			Lilliefor	s GOF T	est		
341			5	5% Lilliefo	ors Crit	ical Value	0.22		Data No	t Normal at	t 5% Sigi	nificance	Level	
342						Data No	t Normal at !	% Significand	e Level					
343														
344						As	suming Nor	mal Distributio						
345			95% N	ormal UC						UCLs (Adj			-	
346				95%	Stude	nt's-t UCL	349.9			95% Adjus				369.2
347										95% Modi	fied-t UC	L (Johns	on-1978)	354.2
348														
349								GOF Test						
350						st Statistic		Datastad	data appea	son-Darlin	_			
351						st Statistic		Detected		orov-Smirr			•	e resei
352						ical Value		Datastad	data appea					an Lovel
353								stributed at 59			Jistribute	at 3 /0		'e revei
354				Dete	otou ut	na appea	- Gamina Di	Stributou at 07	- Olgrinical	IICC ECVCI				
355							Gamma	Statistics						
356					k	hat (MLE)				k	star (bia	as correc	ted MLE)	0.635
357 358						hat (MLE)					`		ted MLE)	354.6
359						hat (MLE)					nu st	ar (bias c	orrected)	19.05
360			M	ILE Mean		corrected)							orrected)	282.6
361					•					Approximat	te Chi So	quare Val	ue (0.05)	10.15
362			Adju	sted Leve	el of Si	gnificance	0.0324			, ,	Adjusted	Chi Squa	are Value	9.359
363							1	İ						
364						As	suming Gan	nma Distributio	on					
365	9	95% Approxi	mate Gamm	na UCL (u	use whe	en n>=50)	422.4		95% Ad	justed Gam	nma UCI	(use wh	en n<50)	458.1
366							4	1						
367							Lognorma	I GOF Test						
368				•		st Statistic				oiro Wilk Lo	-			
369			5% S			ical Value			Data appea	•		•		
370						st Statistic				liefors Logi				
371			5	5% Lilliefo		ical Value			Data appea		al at 5%	Significar	ice Level	
372					Da	ata appea	r Lognormal	at 5% Signific	ance Level	I				
373														
374								al Statistics						
375						gged Data							ged Data	4.604
376				Maximum	n ot Log	gged Data	6.792					SD of log	ged Data	1.428
377						A	lesellesellese	numed District						
378						Ass	uming Logno	ormal Distribut	nou					

379	Α	В	С	D	95% H-UCL	F 1043	G	Н	90%	J Chebyshev (I	K MVUE) UCL	L 554.9
380			95%	Chebyshev	(MVUE) UCL	694.9				Chebyshev (I	*	889.2
381					(MVUE) UCL	1271				, ,	,	
382				,	,							
383					Nonparame	tric Distribu	tion Free U	CL Statistic	:s			
384				Data appe	ar to follow a [Discernible I	Distribution	at 5% Sign	ificance Level			
385												
386					Nonpar	ametric Dist	tribution Fre	e UCLs				
387				9	5% CLT UCL	341.7				95% Jac	ckknife UCL	349.9
388			95%	Standard B	ootstrap UCL	335.5				95% Boot	tstrap-t UCL	402.9
389			(95% Hall's B	ootstrap UCL	348.2			95% F	Percentile Bo	otstrap UCL	344.1
390				95% BCA B	ootstrap UCL	372.6						
391			90% CI	nebyshev(Mo	ean, Sd) UCL	437.7			95% Ch	ebyshev(Mea	an, Sd) UCL	533.9
392			97.5% Cl	nebyshev(M	ean, Sd) UCL	667.5			99% Ch	ebyshev(Mea	an, Sd) UCL	930
393					Į.		1				l	
394						Suggested	UCL to Use)				
395			95	% Adjusted	Gamma UCL	458.1						
396							1					
397	N	ote: Sugge:	stions regard	ding the sele	ction of a 95%	UCL are pro	ovided to he	lp the user	to select the m	ost appropria	ate 95% UCL.	
398			ı	Recommend	lations are bas	ed upon dat	a size, data	distribution	, and skewnes	S.		
399	7	These recor	mmendation	s are based	upon the resul	ts of the sim	nulation stud	ies summa	rized in Singh,	Maichle, and	Lee (2006).	
400	How	ever, simu	lations resul	ts will not co	ver all Real W	orld data se	ts; for addition	onal insight	the user may	want to consu	ult a statisticia	an.
401												
402												
403	Mercury											
404												
405						General	Statistics					
406			Tota	Number of	Observations	11				of Distinct O		8
407									Number	of Missing O	bservations	4
408					Minimum	0					Mean	5.818
409					Maximum	16					Median	4
410					SD	4.191				Std. E	rror of Mean	1.264
411				Coefficier	nt of Variation	0.72					Skewness	1.421
412												
445												
413							GOF Test					
				<u> </u>	Test Statistic	0.869	GOF Test		<u> </u>	lk GOF Test		
414				hapiro Wilk	Critical Value	0.869 0.85	GOF Test	Data ap	pear Normal a	t 5% Significa	ance Level	
414 415			5% S	hapiro Wilk Lilliefors	Critical Value Test Statistic	0.869 0.85 0.214	GOF Test	·	pear Normal a	t 5% Significa		
414 415 416			5% S	hapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value	0.869 0.85 0.214 0.251		Data ap	pear Normal a Lilliefors pear Normal a	t 5% Significa		
414 415 416 417 418			5% S	hapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value	0.869 0.85 0.214 0.251	GOF Test	Data ap	pear Normal a Lilliefors pear Normal a	t 5% Significa		
414 415 416 417 418			5% S	hapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value Data appea	0.869 0.85 0.214 0.251 ar Normal at	t 5% Signific	Data ap	pear Normal a Lilliefors pear Normal a	t 5% Significa		
414 415 416 417 418 419			5% S	chapiro Wilk Lilliefors 5% Lilliefors	Critical Value Test Statistic Critical Value Data appea	0.869 0.85 0.214 0.251 ar Normal at		Data apcance Leve	pear Normal a Lilliefors pear Normal a I	t 5% Significa GOF Test t 5% Significa	ance Level	
414 415 416 417 418 419 420 421			5% S	hapiro Wilk Lilliefors % Lilliefors cormal UCL	Critical Value Test Statistic Critical Value Data appea	0.869 0.85 0.214 0.251 ar Normal at	t 5% Signific	Data apcance Leve	pear Normal a Lilliefors pear Normal a	t 5% Significa GOF Test t 5% Significa sted for Skev	nnce Level	0.475
414 415 416 417 418 419 420 421 422			5% S	hapiro Wilk Lilliefors % Lilliefors cormal UCL	Critical Value Test Statistic Critical Value Data appea	0.869 0.85 0.214 0.251 ar Normal at	t 5% Signific	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (wness) Chen-1995)	8.475
414 415 416 417 418 419 420 421 422 423			5% S	hapiro Wilk Lilliefors % Lilliefors cormal UCL	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL	0.869 0.85 0.214 0.251 ar Normal at suming Normal 8.108	t 5% Signific	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju	t 5% Significa GOF Test t 5% Significa sted for Skev	wness) Chen-1995)	8.475 8.199
414 415 416 417 418 419 420 421 422 423 424			5% S	hapiro Wilk Lilliefors % Lilliefors cormal UCL	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan	0.869 0.85 0.214 0.251 ar Normal at suming Normal 8.108	t 5% Signific mal Distribu	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (wness) Chen-1995)	
414 415 416 417 418 419 420 421 422 423 424 425			5% S	hapiro Wilk Lilliefors % Lilliefors cormal UCL	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan	0.869 0.85 0.214 0.251 ar Normal at suming Normal 8.108	t 5% Signific	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (wness) Chen-1995)	
414 415 416 417 418 419 420 421 422 423 424 425 426			5% S	hapiro Wilk Lilliefors % Lilliefors cormal UCL	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan Logno	0.869 0.85 0.214 0.251 ar Normal at suming Normal 8.108 mma Statistic	mal Distribu	Data apcance Leve	pear Normal a Lilliefors pear Normal a V W UCLs (Adju 95% Adjuste 95% Modifie	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (wness) Chen-1995)	
414 415 416 417 418 419 420 421 422 423 424 425 426 427			5% S	chapiro Wilk Lilliefors 5% Lilliefors cormal UCL 95% Stu	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan Logno	0.869 0.85 0.214 0.251 ar Normal at suming Norm 8.108 and Statistic	t 5% Signific mal Distribu cs Not Avai tics Not Ava	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju 95% Adjuste 95% Modifie	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (ed-t UCL (Joh	wness) Chen-1995)	
414 415 416 417 418 419 420 421 422 423 424 425 426 427 428			5% S	chapiro Wilk Lilliefors 5% Lilliefors cormal UCL 95% Stu	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan Logno	0.869 0.85 0.214 0.251 ar Normal at suming Norm 8.108 and Statistic	t 5% Signific mal Distribu cs Not Avai tics Not Ava	Data apcance Leve	pear Normal a Lilliefors pear Normal a V W UCLs (Adju 95% Adjuste 95% Modifie	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (ed-t UCL (Joh	wness) Chen-1995)	
414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429			5% S	chapiro Wilk Lilliefors 5% Lilliefors cormal UCL 95% Stu	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan Logno Nonparame ar to follow a [0.869 0.85 0.214 0.251 ar Normal at suming Norm 8.108 anna Statisticormal Statist	cs Not Avaitics Not Avaition Free Uc	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju 95% Adjuste 95% Modifie	t 5% Significa GOF Test t 5% Significa sted for Skew d-CLT UCL (ed-t UCL (Joh	wness) Chen-1995)	
415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430			5% S	chapiro Wilk Lilliefors 5% Lilliefors cormal UCL 95% Stu	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan Logno Nonparame ar to follow a [0.869 0.85 0.214 0.251 ar Normal at suming Norm 8.108 ama Statistic primal Statistic Distribution Discernible in the sum of the sum	t 5% Signific mal Distribu cs Not Avai tics Not Ava	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju 95% Adjuste 95% Modifie	t 5% Significa GOF Test t 5% Significa sted for Skev d-CLT UCL (ed-t UCL (Joh	wness) Chen-1995) nnson-1978)	8.199
414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429			5% S	chapiro Wilk Lilliefors 5% Lilliefors cormal UCL 95% Stu	Critical Value Test Statistic Critical Value Data appea Ass udent's-t UCL Gan Logno Nonparame ar to follow a [0.869 0.85 0.214 0.251 ar Normal at suming Norm 8.108 anna Statisticormal Statist	cs Not Avaitics Not Avaition Free Uc	Data apcance Leve	pear Normal a Lilliefors pear Normal a I W UCLs (Adju 95% Adjuste 95% Modifie	sted for Skeved-CLT UCL (John 95% Jacobs)	wness) Chen-1995)	

433	A B C D E 95% Hall's Bootstrap UCL	F 18.46	G	Н	I J K 95% Percentile Bootstrap UCL	L 7.818
434	95% BCA Bootstrap UCL	8.182				
435	90% Chebyshev(Mean, Sd) UCL	9.609			95% Chebyshev(Mean, Sd) UCL	11.33
436	97.5% Chebyshev(Mean, Sd) UCL	13.71			99% Chebyshev(Mean, Sd) UCL	18.39
437						
438		Suggested	UCL to Use			
439	95% Student's-t UCL	8.108				
440						
441	Note: Suggestions regarding the selection of a 95%	UCL are pro	ovided to help	the user to	select the most appropriate 95% UCL.	
442	Recommendations are bas	ed upon dat	a size, data d	istribution,	and skewness.	
443	These recommendations are based upon the resul	Its of the sim	nulation studie	s summari:	zed in Singh, Maichle, and Lee (2006).	
444	However, simulations results will not cover all Real W	orld data set	ts; for addition	nal insight t	he user may want to consult a statisticiar	n.
445						
446						
	Molybdenum					
448						
449		General	Statistics			
450	Total Number of Observations	13			Number of Distinct Observations	7
451					Number of Missing Observations	1
452	Minimum	3			Mean	5.923
453	Maximum	10			Median	5
454	SD	2.216			Std. Error of Mean	0.615
455	Coefficient of Variation	0.374			Skewness	0.711
456			!			
457		Normal C	GOF Test			
458	Shapiro Wilk Test Statistic	0.903			Shapiro Wilk GOF Test	
459	5% Shapiro Wilk Critical Value	0.866		Data app	ear Normal at 5% Significance Level	
460	Lilliefors Test Statistic	0.2			Lilliefors GOF Test	
461	5% Lilliefors Critical Value	0.234		Data app	ear Normal at 5% Significance Level	
462	Data appea	ar Normal at	t 5% Significa	nce Level		
463						
464		suming Norr	mal Distribution			
465	95% Normal UCL				UCLs (Adjusted for Skewness)	
466	95% Student's-t UCL	7.018			95% Adjusted-CLT UCL (Chen-1995)	7.064
467					95% Modified-t UCL (Johnson-1978)	7.039
468						
469			GOF Test			
470	A-D Test Statistic	0.42			rson-Darling Gamma GOF Test	
471	5% A-D Critical Value	0.735	Detected		ar Gamma Distributed at 5% Significance	e Level
472	K-S Test Statistic	0.176			gorov-Smirnov Gamma GOF Test	
473	5% K-S Critical Value	0.237			ar Gamma Distributed at 5% Significance	e Level
474	Detected data appear	Gamma Dis	stributed at 5°	% Significa	ince Level	
475			O			
476			Statistics			0.000
477	k hat (MLE)	8.16			k star (bias corrected MLE)	6.328
478	Theta hat (MLE)	0.726			Theta star (bias corrected MLE)	0.936
479	nu hat (MLE)	212.1			nu star (bias corrected)	164.5
480	MLE Mean (bias corrected)	5.923			MLE Sd (bias corrected)	2.355
481	Adinated Level of Classification	0.0204			Approximate Chi Square Value (0.05)	
482	Adjusted Level of Significance	0.0301			Adjusted Chi Square Value	132.2
483	A	numina Ca	ma Distribust			
484			nma Distributi		divisted Commo LICL (vos vikes = 550)	7 274
485	95% Approximate Gamma UCL (use when n>=50))	7.172		95% A0	djusted Gamma UCL (use when n<50)	7.374
486						

487	Α		В		С	;		D		E		F norma	G I GOF Te	est	Н		I			J		K		L	
488						SI	hapir	o Wilk	Test	Statistic	0.	947			S	hapir	Wilk I	Logr	norma	al GOI	F T	est			1
489					ļ	5% Sh	hapir	o Wilk	Critic	al Value	0	866			Data ap	pear L	.ognorr	mal a	at 5%	Signif	fica	nce L	_evel		-
490							Lil	liefors	Test	Statistic	0.	153				Lillie	fors Lo	gnoi	rmal	GOF T	Tes	t			
491						59	% Lill	iefors	Critic	al Value	0.	234			Data ap	pear L	.ognorr	mal a	at 5%	Signif	fica	nce L	_evel		
492									Dat	a appea	r Logn	ormal	at 5% Sig	gnifi	cance Le	evel									1
493																									
494											Log	norma	l Statistic	S											
495						N	Minin	num of	Logo	jed Data	1.	099							М	ean of	flog	ged	Data	1.716	
496						N	<i>l</i> axin	num of	Logo	jed Data	2.	303								SD of	flog	ged	Data	0.367	
497													•												
498													rmal Dist	tribu	ıtion										
499										6 H-UCL		33								shev	•	•		7.75	
500								-	-	JE) UCL		58					97.5	5% C	Cheby	shev	(MV	/UE)	UCL	9.732	
501						99% (Cheb	yshev	(MVl	JE) UCL	. 11	.99													
502																_									
503							D .						tion Free												
504							Data	appe	ar to	tollow a	Disce	rnible	Distributio	on a	nt 5% Sig	Initica	nce Le	evel							4
505										Nama		de Die	tudhi atlam F												_
506									E0/ C	Nonpa LT UCL		934	tribution F	ree	UCLS					95% Ja	اداد	rnifo.	LICI	7.018	
507						05%	Cton			rap UCL		934 867								% Bo				7.018	
508										rap UCL		967					05	0/ D		ntile Bo				6.923	_
509										rap UCL							90)% P	ercer	illie Di	oois	ыар	UCL	0.923	_
510					90					Sd) UCL		767					05%	Cho	hych	iev(Me	aan	64/	LICI	8.602	_
511							•	•		Sd) UCL		761							-	iev(Me				12.04	_
512					07.0	70 011	СБУС	110 (1111	ouri,	<i>54) 00L</i>		701					3370		JD y Oi i	iov(ivio	ouri,	, ou,	OOL		-
513											Suga	ested	UCL to U	Jse											-
514 515							9	5% Stı	udent	's-t UCL		018													-
516																									_
517		Not	e: Sug	gestic	ons r	egardi	ling th	ne sele	ction	of a 95%	% UCL	are pr	ovided to	help	the use	er to se	elect the	e mo	ost ap	propri	iate	95%	UCL		-
518						R	Recor	nmend	lation	s are ba	sed up	on dat	a size, da	ata d	listributio	on, and	d skewi	ness	5.						-
519		Th	ese re	comn	nend	ations	are	based	upon	the resu	ults of	the sim	nulation st	tudie	es summ	arized	in Sin	gh, I	Maich	ıle, an	id Le	ee (2	006).		1
520		Howe	ver, si	mulat	ions	results	s will	not co	ver a	II Real V	Vorld o	lata se	ts; for add	ditio	nal insigl	ht the	user m	ay w	vant t	o cons	sult	a sta	tisticia	an.	
521																									
522																									
523	Nickel																								
524																									
525											G	eneral	Statistics	3											
526						Total	Num	ber of	Obse	ervations	15	i								stinct (11	
527																	Num	nber (of Mis	ssing (Obs	erva	tions	0	
528										/linimum													Mean	16.8	
529									N	laximum													edian	15	
530										SD		193								Std. E				1.857	
531							Со	etticier	nt of \	/ariation	0.	428										skew	ness	1.608	_
532											A.			•											4
533						01	be~!	- \A/:II	T/	Otetica:			GOF Test	[ho=!	\A/:!!	k 00	C Tare					_
534										Statistic		867			D-4-		hapiro					Lavo	al.		4
535						J /0 Sr				al Value Statistic		881 211			Data	I JONI I	lormal Lilliefo				iice	Leve	J I		4
536						E(al Value		211 22			Data a	nnea					nan/	ملم	wel		4
537						5	/o ∟III						rmal at 5°	<u>% c</u>		• •		aı dl	J /0 C	ngi iiii C	Jai I	e re	vei		4
538								Dali	u app	oai App	, OAIIII	al e INU	iniai at 3	<i>7</i> 0 3	-igiiiiiCali	io o Le	401								4
539										Δα	ssumir	na Nor	mal Distri	huti	on										-
540											Journal	9 11011	513111	-uu	J II										

541	A B	95% No	D ormal UCL	Е	F	G	H 95	UCLs (Ad	J justed for Ske	K ewness)	L
542			95% Stud	dent's-t UCL	20.07			95% Adjus	ted-CLT UCL	(Chen-1995)	20.68
543								95% Modi	fied-t UCL (Jo	hnson-1978)	20.2
544											
545					Gamma (GOF Test					
546				Test Statistic	0.365				g Gamma GC		
547				Critical Value	0.738	Detected				5% Significand	e Level
548				Test Statistic	0.166			<u> </u>	nov Gamma G		
549				Critical Value	0.222				Distributed at 8	5% Significand	e Level
550 551			Detected	data appear	Gamma Dis	stributed at 59	% Signific	cance Level			
552					Gamma	Statistics					
553				k hat (MLE)	6.861	·		ŀ	k star (bias co	rrected MLE)	5.533
554			The	ta hat (MLE)	2.449	<u> </u>	-	Theta	a star (bias co	rrected MLE)	3.036
555			r	nu hat (MLE)	205.8				nu star (bia	as corrected)	166
556		M	LE Mean (bia	is corrected)	16.8	·			MLE Sd (bia	as corrected)	7.142
557								Approxima	te Chi Square	Value (0.05)	137.2
558		Adjus	sted Level of	Significance	0.0324			,	Adjusted Chi S	Square Value	134
559											
560				Ass	suming Gam	ma Distribution	on				
561	95% Approx	imate Gamma	UCL (use w	hen n>=50))	20.33	·	95% /	Adjusted Gan	nma UCL (use	when n<50)	20.81
562											
563					Lognormal	GOF Test					
564		S	Shapiro Wilk T	Fest Statistic	0.969		Sh	apiro Wilk Lo	ognormal GOF	F Test	
565		5% SI	hapiro Wilk C	Critical Value	0.881				al at 5% Signif		
566			Lilliefors T	Test Statistic	0.141		I	illiefors Log	normal GOF 1	Test	
567		5	% Lilliefors C		0.22				al at 5% Signif	ficance Level	
568				Data appear	Lognormal	at 5% Signific	ance Lev	/el			
569											
570					Lognorma	Statistics					
571			Minimum of L	00	1.946					f logged Data	2.747
572			Maximum of L	_ogged Data	3.611				SD of	f logged Data	0.394
573						15: . "					
574						rmal Distribu	tion	000	/ Ob - b b	(M) (LIE) LIOI	01.07
575		050/		95% H-UCL	20.72				6 Chebyshev (` ,	21.97
576			Chebyshev (I Chebyshev (I	•	34.06			97.5%	6 Chebyshev ((MIVUE) UCL	27.02
577		9970	Chebyshev (i	MIVUE) UCL	34.00						
578				Nonnarama	tric Dietribu	tion Free UCL	Statistic	·e			
579			Data annes	-		Distribution at					
580			Data appear	. WIGHOW d I	-1909HIIDIG L	-iou ibuuUii al	. 5 70 Olyli	carice Lev			
581				Nonnar	ametric Diet	tribution Free	UCI s				
582			95	% CLT UCL	19.85				95% .l.	ackknife UCL	20.07
583 584		95%	Standard Bo		19.73					otstrap-t UCL	21.6
584 585			95% Hall's Bo	·	26.77			95%	6 Percentile Bo	-	20
585 586			95% BCA Bo		20.6						
587			nebyshev(Mea	·	22.37			95% C	Chebyshev(Me	ean, Sd) UCL	24.9
588			nebyshev(Mea	•	28.4				Chebyshev(Me		35.28
589			- `	,					- '	•	
590					Suggested	UCL to Use					
591			95% Stu	dent's-t UCL	20.07						
592											
593		When a c	data set follov	ws an approxi	mate (e.g., r	normal) distrib	ution pas	sing one of th	ne GOF test		
594	When ap	plicable, it is s	suggested to	use a UCL ba	ased upon a	distribution (e	g., gamn	na) passing b	ooth GOF tests	s in ProUCL	
∪ ∪-†											

	A B C D E	F	G H I J K	L
595	Note: Suggestions regarding the selection of a 95%	LICL are nr	ovided to help the user to select the most appropriate 95% UCL.	
596		•	a size, data distribution, and skewness.	
597			ulation studies summarized in Singh, Maichle, and Lee (2006).	
598 599			ts; for additional insight the user may want to consult a statisticia	n.
600			,	
601				
	Vanadium			
603				
604		General	Statistics	
605	Total Number of Observations	15	Number of Distinct Observations	14
606			Number of Missing Observations	0
607	Minimum	138	Mean	217.9
608	Maximum	288	Median	224
609	SD	40.53	Std. Error of Mean	10.47
610	Coefficient of Variation	0.186	Skewness	-0.249
611				
612		Normal C		
613	Shapiro Wilk Test Statistic	0.973	Shapiro Wilk GOF Test	
614	5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level	
615	Lilliefors Test Statistic	0.148	Lilliefors GOF Test	
616	5% Lilliefors Critical Value	0.22	Data appear Normal at 5% Significance Level	
617	Data appea	ar Normal at	5% Significance Level	
618	And		nal Distribution	
619	95% Normal UCL	surring North	95% UCLs (Adjusted for Skewness)	
620	95% Student's-t UCL	236.4	95% Adjusted CLT UCL (Chen-1995)	234.4
621	33 % Student 3-t OCL	250.4	95% Modified-t UCL (Johnson-1978)	236.3
622			30% Modified (302 (Soffiscial 1979)	200.0
623		Gamma (GOF Test	
624 625	A-D Test Statistic	0.309	Anderson-Darling Gamma GOF Test	
626	5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance	e Level
627	K-S Test Statistic	0.165	Kolmogorov-Smirnov Gamma GOF Test	
628	5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance	e Level
629	Detected data appear	Gamma Dis	stributed at 5% Significance Level	
630				
631		Gamma	Statistics	
632	k hat (MLE)	29.1	k star (bias corrected MLE)	23.33
633	Theta hat (MLE)	7.488	Theta star (bias corrected MLE)	9.343
634	nu hat (MLE)	873.1	nu star (bias corrected)	699.8
635	MLE Mean (bias corrected)	217.9	MLE Sd (bias corrected)	45.12
636			Approximate Chi Square Value (0.05)	639.4
637	Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	632.3
638				
639			ma Distribution	044.0
640	95% Approximate Gamma UCL (use when n>=50))	238.5	95% Adjusted Gamma UCL (use when n<50)	241.2
641			COST Took	
642	Observed Wells Total Co. v. v.	Lognormal		
643	Shapiro Wilk Critical Value	0.953	Shapiro Wilk Lognormal GOF Test	
644	5% Shapiro Wilk Critical Value Lilliefors Test Statistic	0.881 0.164	Data appear Lognormal at 5% Significance Level Lilliefors Lognormal GOF Test	
645	5% Lilliefors Critical Value	0.164	Data appear Lognormal at 5% Significance Level	
646			at 5% Significance Level	
647			at 0.70 digninicance core	
648				

649	Α	В	С	D	Е	F Lognorma	G H I J K Statistics	L
650				Minimum of	Logged Data	4.927	Mean of logged D	ta 5.367
651				Maximum of		5.663	SD of logged D	
652								
653					Assı	ıming Logno	rmal Distribution	
654					95% H-UCL	240.1	90% Chebyshev (MVUE) U	CL 251.4
655			95%	Chebyshev ((MVUE) UCL	266.5	97.5% Chebyshev (MVUE) U	CL 287.4
656			99%	Chebyshev ((MVUE) UCL	328.6		
657								
658					Nonparame	tric Distribu	ion Free UCL Statistics	
659				Data appea	ar to follow a l	Discernible I	Distribution at 5% Significance Level	
660								
661					Nonpar	ametric Dist	ribution Free UCLs	
662				95	5% CLT UCL	235.1	95% Jackknife U	CL 236.4
663			95%	Standard Bo	ootstrap UCL	234.6	95% Bootstrap-t U	CL 236.3
664			9	95% Hall's Bo	ootstrap UCL	233.9	95% Percentile Bootstrap U	CL 234.2
665				95% BCA Bo	ootstrap UCL	233.8		
666			90% C	hebyshev(Me	an, Sd) UCL	249.3	95% Chebyshev(Mean, Sd) U	CL 263.6
667			97.5% CI	hebyshev(Me	an, Sd) UCL	283.3	99% Chebyshev(Mean, Sd) U	CL 322.1
668								1
669						Suggested	JCL to Use	
670				95% Stu	ident's-t UCL	236.4		
671								
	١	Note: Sugge	stions regard	ding the selec	ction of a 95%	UCL are pro	ovided to help the user to select the most appropriate 95% l	CL.
6/2					- 4 ¹ 1		a size, data distribution, and skewness.	
672 673				Recommenda	ations are bas	ea upon dat	d Size, data distribution, and skewness.	
673		These reco				-	ulation studies summarized in Singh, Maichle, and Lee (20	6).
673 674			mmendation	ıs are based ι	upon the resu	Its of the sim		*
673 674 675			mmendation	ıs are based ι	upon the resu	Its of the sim	ulation studies summarized in Singh, Maichle, and Lee (20	*
673 674		wever, simu	mmendation llations resul	is are based u	upon the resu ver all Real W	Its of the sim	ulation studies summarized in Singh, Maichle, and Lee (20	ician.
673 674 675 676		wever, simu	mmendation lations resul	ns are based under the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street the same street the same street that the same street the same street the same street the same street the same street the same street the same street the same street the same street th	upon the resuver all Real W	Its of the sime for Id data set the se	ulation studies summarized in Singh, Maichle, and Lee (200s; for additional insight the user may want to consult a statis	ician.
673 674 675 676 677		wever, simu	mmendation lations resul	ns are based under the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street the same street the same street that the same street the same street the same street the same street the same street the same street the same street the same street the same street th	upon the resuver all Real W	Its of the sime for Id data set the se	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statistic (e.g., Chen, Johnson, Lognormal, and Gamma) may not be	ician.
673 674 675 676 677 678 679		wever, simu	mmendation lations resul	ns are based under the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street the same street the same street that the same street the same street the same street the same street the same street the same street the same street the same street the same street th	upon the resuver all Real W	Its of the sime for Id data set the se	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statistic (e.g., Chen, Johnson, Lognormal, and Gamma) may not be	ician.
673 674 675 676 677 678 679		wever, simu	mmendation lations resul	ns are based under the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street the same street the same street that the same street the same street the same street the same street the same street the same street the same street the same street the same street th	upon the resuver all Real W	Its of the sime for Id data set the se	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statistic (e.g., Chen, Johnson, Lognormal, and Gamma) may not be	ician.
673 674 675 676 677 678 679 680 681	Но	wever, simu	mmendation lations resul	ns are based under the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street the same street the same street that the same street the same street that the same street the same street the same street the same street the same street that the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same s	upon the resuver all Real W	Its of the sim forld data set dence limits ethods provide	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statistic (e.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets.	ician.
673 674 675 676 677 678 679 680 681	Но	wever, simu	mmendation lations resul highly nega reliable.	is are based units will not constitutely-skewe	upon the resu ver all Real W d data, confid Johnson's me	Its of the sim orld data set dence limits ethods provid	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statistic. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets.	ician.
673 674 675 676 677 678 679 680 681 682 683	Но	wever, simu	mmendation lations resul highly nega reliable.	ns are based under the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street that the same street the same street that the same street that the same street the same street the same street that the same street the same street that the same street the same street the same street the same street the same street that the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same street the same s	upon the resu ver all Real W d data, confid Johnson's me	Its of the sim forld data set dence limits ethods provide	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statistic. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets. Statistics Number of Distinct Observation	ns 14
673 674 675 676 677 678 679 680 681 682 683 684	Но	wever, simu	mmendation lations resul highly nega reliable.	is are based units will not constitutely-skewe	upon the resulver all Real Word data, confidence of Johnson's me	dence limits ethods provid	ulation studies summarized in Singh, Maichle, and Lee (20) s; for additional insight the user may want to consult a statis (e.g., Chen, Johnson, Lognormal, and Gamma) may not be de adjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation	ns 14
673 674 675 676 677 678 680 681 682 683 684 685	Но	wever, simu	mmendation lations resul highly nega reliable.	is are based units will not constitutely-skewe	upon the resulver all Real Word data, confiduous Johnson's me	Its of the sim orld data set dence limits ethods provid General 15	ulation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Statistics	ns 14 ns 0 an 159.5
673 674 675 676 677 678 680 681 682 683 684 685 686	Но	wever, simu	mmendation lations resul highly nega reliable.	is are based units will not constitutely-skewe	upon the resulver all Real Word data, confiduonson's me	dence limits ethods providence limits General 15	ce.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets. Statistics Number of Distinct Observation Med	ns 14 ns 0 an 159.5 an 124
673 674 675 676 677 678 680 681 682 683 684 685 686 687	Но	wever, simu	mmendation lations resul highly nega reliable.	Its will not cover the stirred of th	upon the resulver all Real Word data, confidence of the confidence	Its of the sime of	culation studies summarized in Singh, Maichle, and Lee (2005); for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Error of Medical Error of Medical Error of	ns 14 ns 0 an 159.5 an 24.62
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688	Но	wever, simu	mmendation lations resul highly nega reliable.	Its will not cover the stirred of th	upon the resulver all Real Word data, confiduonson's me	dence limits ethods providence limits General 15	ce.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets. Statistics Number of Distinct Observation Med	ns 14 ns 0 an 159.5 an 24.62
673 674 675 676 677 678 680 681 682 683 684 685	Но	wever, simu	mmendation lations resul highly nega reliable.	Its will not cover the stirred of th	upon the resulver all Real Word data, confidence of the confidence	General 15 75 444 95.34 0.598	culation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Skewnorm Skewnorm	ns 14 ns 0 an 159.5 an 24.62
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 689	Но	wever, simu	highly negareliable. Tota	Its will not cover the stively-skewer Chen's and self-skewer Chen's	upon the resulver all Real Word data, confidence of Johnson's media of	General 15 75 444 95.34 0.598	culation studies summarized in Singh, Maichle, and Lee (2005); for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Skewnoods	ns 14 ns 0 an 159.5 an 24.62
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 689	Но	wever, simu	highly negareliable.	Its will not cover the stively-skewer Chen's and stively-skewer Chen's	Deservations Minimum Maximum SD t of Variation	General 15 75 444 95.34 0.598	cludation studies summarized in Singh, Maichle, and Lee (2005); for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be the adjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Skewnoods	ns 14 ns 0 an 159.5 an 24.62
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 689 690 690	Но	wever, simu	highly negareliable.	Its will not covaries will not	Dbservations Minimum Maximum SD t of Variation Test Statistic Critical Value	General 15 75 444 95.34 0.598 Normal C 0.788 0.881	culation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Error of Me	ns 14 ns 0 an 159.5 an 24.62
673 674 675 676 678 679 680 681 682 683 684 685 686 687 688 689 690 691	Но	wever, simu	highly negareliable. Tota	Its will not cover the stively-skewer Chen's and stively-skewer Chen's	Deservations Minimum Maximum SD t of Variation Test Statistic Critical Value Test Statistic	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188	Authorition studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Skewnows GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test	ns 14 ns 0 an 159.5 an 124 an 24.62 as 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 689 690 691 692 693	Но	wever, simu	highly negareliable. Tota	Its will not cover the stively-skewe Chen's and of the stively-sk	Deservations Minimum Maximum SD t of Variation Test Statistic Critical Value Critical Value Critical Value	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22	Authorition studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be the adjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Error Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level	ns 14 ns 0 an 159.5 an 124 an 24.62 as 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 690 691 692 693 694 695	Но	wever, simu	highly negareliable. Tota	Its will not cover the stively-skewe Chen's and of the stively-sk	Deservations Minimum Maximum SD t of Variation Test Statistic Critical Value Critical Value Critical Value	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22	Authorition studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Skewnows GOF Test Shapiro Wilk GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test	ns 14 ns 0 an 159.5 an 124 an 24.62 as 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 695	Но	wever, simu	highly negareliable. Tota	Its will not cover the stively-skewe Chen's and of the stively-sk	Deservations Minimum Maximum SD t of Variation Test Statistic Critical Value Test Statistic Critical Value Test Apple	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22 roximate No	cludation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistic segments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Nu	ns 14 ns 0 an 159.5 an 124 an 24.62 as 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 690 691 692 693 694 695	Но	wever, simu	mmendation llations resul highly nega reliable. Tota	Its will not covaries will not	Deservations Minimum Maximum SD t of Variation Test Statistic Critical Value Test Statistic Critical Value Test Apple	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22 roximate No	ulation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be lee adjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Number of Missing Observation Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical	ns 14 ns 0 an 159.5 an 124 an 24.62 as 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 690 691 691 692 693 694 695 696 697	Но	wever, simu	mmendation llations resul highly nega reliable. Tota	Its will not cover the stively-skewer Chen's and selection of the stively-skewer Chen's and selection of the stip	Dbservations Minimum Maximum SD t of Variation Test Statistic Critical Value Test Statistic Critical Value Test Statistic Critical Value Asservation	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22 coximate No	ulation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Number of Missing Observation Number of Missing Observation Number of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Er	ns 14 ns 0 an 159.5 an 124 an 24.62 ss 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 690 691 692 693 694 695 696 697 698	Но	wever, simu	mmendation llations resul highly nega reliable. Tota	Its will not cover the stively-skewer Chen's and selection of the stively-skewer Chen's and selection of the stip	Deservations Minimum Maximum SD t of Variation Test Statistic Critical Value Test Statistic Critical Value Test Apple	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22 roximate No	ulation studies summarized in Singh, Maichle, and Lee (200 s); for additional insight the user may want to consult a statistics. (e.g., Chen, Johnson, Lognormal, and Gamma) may not be adjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Med Std. Error of Med Std. Error of Med Skewnormal GOF Test Data Not Normal at 5% Significance Level Lilliefors GOF Test Data appear Normal at 5% Significance Level mal at 5% Significance Level mal Distribution 95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-19	ns 14 ns 0 an 159.5 an 24.62 as 2.032
673 674 675 676 677 678 680 681 682 683 684 685 686 687 688 690 691 692 693 694 695 696 697 698	Но	wever, simu	mmendation llations resul highly nega reliable. Tota	Its will not cover the stively-skewer Chen's and selection of the stively-skewer Chen's and selection of the stip	Dbservations Minimum Maximum SD t of Variation Test Statistic Critical Value Test Statistic Critical Value Test Statistic Critical Value Asservation	General 15 75 444 95.34 0.598 Normal C 0.788 0.881 0.188 0.22 coximate No	ulation studies summarized in Singh, Maichle, and Lee (200 s; for additional insight the user may want to consult a statistics (e.g., Chen, Johnson, Lognormal, and Gamma) may not be deadjustments for positively skewed data sets. Statistics Number of Distinct Observation Number of Missing Observation Number of Missing Observation Number of Missing Observation Number of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Std. Error of Medical Er	ns 14 ns 0 an 159.5 an 24.62 as 2.032

703	A	В		С		D	Е		F Gamma	G GOF Test	Н		I		J	Щ	K	L
704						A-D	Test St	atistic	0.497		And	erson-[Darling	g Gam	ma GO	F Tes	st	
705					5%	6 A-D C	Critical '	Value	0.74	Detected	l data appe	ear Gar	nma D	Distribu	ited at 5	5% Si	gnifican	ce Level
706						K-S	Test St	atistic	0.157		Kolmo	gorov-	Smirn	ov Ga	mma G	iOF T	est	
707					5%	6 K-S C	Critical '	Value	0.223	Detected	data appe	ear Gar	nma D	Distribu	ited at 5	5% Sig	gnifican	ce Level
708					De	etected	data a	appear	Gamma Di	stributed at 5	% Signific	ance L	.evel					
709																		
710									Gamma	Statistics								
711							k hat ((MLE)	4.024				k	star (l	oias cor	recte	d MLE)	3.264
712						The	eta hat ((MLE)	39.64				Theta	star (l	oias cor	recte	d MLE)	48.88
713							nu hat (,	120.7						•		rected)	97.91
714				ML	LE Me	ean (bia	as corre	ected)	159.5								rected)	88.31
715												Appro					e (0.05)	76.09
716				Adjus	sted Le	evel of	Signific	cance	0.0324				Α	djuste	d Chi S	Square	e Value	73.72
717																		
718									_	ma Distribut								
719		95% Approx	ximate (Gamma	UCL	(use w	/hen n>	-=50))	205.3		95% A	Adjusted	d Gam	ma U(CL (use	wher	า n<50)	211.9
720																		
721										GOF Test								
722					•		Test St		0.929			apiro W		-				
723				5% Sr			Critical '		0.881		Data appe						e Level	
724							Test St		0.129			illiefors.						
725				5	% Lilli		Critical '		0.22		Data appe	•	norma	l at 5%	6 Signit	icance	e Level	
726							Data a	appear	Lognormal	at 5% Signifi	cance Lev	/el						
727										1000								
728					N 41 1	6 1	1	I D - 4 -		I Statistics					4	1	- I D-1-	4.040
729							Logged		4.317					IV			ed Data	4.943
730				IV	viaxim	um or i	Logged	Data	6.096						20 01	logge	ed Data	0.504
731								Accu	ımina Loane	ormal Distribu	ıtion.							
732							95% H		210.3		luon		90%	Cheh	yshev (M\/LII	E) LICI	221
733				95% (Cheh		MVUE		249.8						yshev (•	<i>'</i>	289.6
734						•	MVUE	,	367.9			•	07.070	Ones	y 5110 V (_, 00L	200.0
735					01100)	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	, 002										
736							Nonn	arame	tric Distribu	tion Free UC	L Statistic	s						
737					Data	appea	-			Distribution a			e Leve	əl				
738 739																		
740							N	Nonpar	ametric Dis	tribution Free	UCLs							
741						95	5% CLT	-	200						95% Ja	ckkni	fe UCL	202.9
742				95%	Stanc	dard Bo	otstrap	UCL	199.1					9	5% Boo	tstrap	o-t UCL	231.8
743							ootstrap		381.3				95%		ntile Bo			200.3
744				ç	95% E	BCA Bo	ootstrap	UCL	212.7									
745			9	90% Ch	nebysh	nev(Me	an, Sd) UCL	233.4			g	95% C	hebys	hev(Me	an, S	d) UCL	266.8
746			97	7.5% Ch	ebysh	nev(Me	an, Sd) UCL	313.3			g	99% C	hebys	hev(Me	an, S	d) UCL	404.5
747										I								
748									Suggested	UCL to Use								
749					95	5% Stu	dent's-	t UCL	202.9									
750										1								
751			W	/hen a d	data se	et follov	ws an a	approxi	mate (e.g., ı	normal) distril	oution pass	sing on	e of th	e GOF	test			
752		When ap	pplicabl	le, it is s	sugges	sted to	use a l	JCL ba	sed upon a	distribution (e	e.g., gamm	na) pas	sing bo	oth GC)F tests	in Pr	oUCL	
753																		
754		Note: Sugg	gestions	s regard	ling th	e selec	ction of	a 95%	UCL are pr	ovided to help	the user t	to selec	ct the r	nost a	ppropri	ate 95	5% UCL	
755									•	a size, data d								
756		These rec	commer	ndations	s are b	oased ι	upon th	e resul	ts of the sim	ulation studie	es summar	rized in	Singh	, Maic	hle, and	d Lee	(2006).	

	Α	В	С	D	E	F	G	Н	I	J	K	L
757	Но	wever, simul	ations result	s will not cov	er all Real W	orld data se	ts; for additio	nal insight th	e user may v	want to cons	ult a statistici	an.
758												
												·-

	A B	С	D	E	F	_	Н	I	J	K		L
1				UCL Statis	tics for Unce	ensored Full Data	Sets					
2	Lloor Colo	ected Options	,									
3	Date/Time of C	-	ProUCL 5.12/	/11/2021 11	·52·35 ΔM							
4	Date/Time of C	From File	UCL UTL con			Rlue fyls						
5	Fu	III Precision	OFF									
6	Confidence		95%									
7	Number of Bootstrap		2000									
9												
10												
11	Antimony											
12												
13					General	Statistics						
14		Total	Number of Ob	servations	8		N	Number	of Distinct	Observatio	ns	8
15							N'	lumber (of Missing	Observatio	ns	0
16				Minimum	0.83					Me	an	16.3
17				Maximum	74					Medi	an	3.9
18				SD	24.95				Std.	Error of Me	an	8.822
19			Coefficient of	of Variation	1.531					Skewne	ss	2.194
20												
21			<u> </u>		-	e collected using	= =					
22		_		_		SM (ITRC, 2012) t				it.		
23				<u> </u>		shev UCL to estir						
24		Chebyshev	v UCL can be	computed u	ising the No	nparametric and A	All UCL Option	ons of P	roUCL 5.1	1		
25												
26				-	Normal C	3OF Test						
27			Shapiro Wilk Te		0.679				k GOF Tes			
28		5% S	Shapiro Wilk Cri		0.818	D	Data Not Norn			ance Level		
29			Lilliefors Te		0.307				GOF Test			
30		5	5% Lilliefors Cri		0.283		Data Not Norn	mal at 5°	% Significa	ance Level		
31				Data Not	Normal at 5	5% Significance Le	evel					
32					arreste a Nore	nol Distribution						
33		05% N	ormal UCL	AS:	suming Non	mal Distribution	95% UCLs	e (Adius	stad for Sk	ownose)		
34				ent's-t UCL	33.02					Chen-199	25)	38.13
35				JIII 3-I UUL	33.02			-		ohnson-197		34.16
36											-	
37					Gamma (GOF Test						
38			A-D Te	est Statistic	0.507		Anderson-D	Darling (Gamma G	OF Test		
39			5% A-D Cri		0.755	Detected data					cance	Level
40 41				est Statistic	0.271		Kolmogorov-			_		
42			5% K-S Cri		0.307	Detected data					cance	Level
42						stributed at 5% Signature						
44												
45					Gamma	Statistics						
46			k	k hat (MLE)	0.61			k st	tar (bias co	orrected ML	.E)	0.465
47			Theta	hat (MLE)	26.71			Theta st	tar (bias co	orrected ML	.E)	35.07
48			nu	ı hat (MLE)	9.767				nu star (b	ias correcte	ed)	7.438
49		M	ILE Mean (bias	corrected)	16.3			ı	MLE Sd (b	ias correcte	ed)	23.91
50							Appro	ximate	Chi Square	e Value (0.0)5)	2.414
51		Adjus	sted Level of S	ignificance	0.0195			Adj	justed Chi	Square Val	ue	1.755
52												
				Ass	suming Gam	ma Distribution		_				
53			na UCL (use wh		50.24		95% Adjusted					

	Α		В		С		D		Е	F	G	Н		I		J	K		L
55										Lognorma	al GOF Test								
56						Shani	ro Wilk	Test 9	Statistic	-	T GOF TEST	Sha	apiro W	ilk I o	norms	I GOE	Toet		
57						-			al Value			Data appe	-					evel	
58					070 (Statistic				illiefors					-0001	
59									al Value	0.283		Data appe						evel	
60 61											at 5% Signif					9			
62																			
63										Lognorma	al Statistics								
64						Mini	mum of	Logg	ed Data	-0.186					Me	ean of I	ogged	Data	1.782
65						Maxi	mum of	Logg	ed Data	4.304						SD of I	ogged	Data	1.549
66																			
67									Ass	uming Logn	ormal Distrib	ution							
68								95%	H-UCL	342				90%	Cheby	shev (N	/IVUE)	UCL	40.71
69							•	`	E) UCL	52.19			ç	97.5%	Cheby	shev (N	/IVUE)	UCL	68.12
70					99%	6 Che	byshev	(MVU	E) UCL	99.41									
71																			
72									-		ution Free UC								
73						Dat	a appe	ar to f	ollow a	Discernible	Distribution a	at 5% Signi	ficance	Leve	l				
74																			
75							0	E0/ C	Nonpa LT UCL		stribution Fre	e UCLS				E0/ 1-	ckknife	LICI	33.02
76					050	/ Star			ap UCL	29.78							strap-t		59.02
77									ap UCL					95%			otstrap		30.58
78									ap UCL	38.16				33 70	i ercen	itile Dot	Jistiap	UCL	
79					90% C				d) UCL	42.77			9	5% CI	nebvsh	ev(Mea	an, Sd)	UCI	54.76
80 81					97.5% C		•		•	71.4						•	an, Sd)		104.1
82									,										
83										Suggested	UCL to Use								
84					9.	5% A	djusted	Gamr	na UCL	69.11									
85																			
86		No	te: Sug	gestio	ns regar	rding t	he sele	ection	of a 95%	6 UCL are p	rovided to hel	p the user t	o selec	t the n	nost ap	propria	ite 95%	UCL.	
87						Reco	mmend	lations	are ba	sed upon da	ta size, data	distribution,	and sk	ewne	SS.				
88								-			nulation studi								
89		Howe	ever, si	mulatio	ons resu	ılts wi	I not co	ver al	l Real V	orld data se	ets; for addition	nal insight	the use	r may	want to	o consu	ılt a sta	tisticia	an.
90																			
91																			
92	Arsenic																		
93										Conord	Statistics								
94					Tota	al Nur	nher of	Ohsai	vations		Juansucs		N	Jumbo	r of Die	tinct ∩	bserva	tions	8
95					1 010	ai i NUI	IIDGI UI	UDSE	vali0115	3							bserva		0
96								M	linimum	1100			- 14		. OI IVIIC	.5ig O			21150
97 98										88000									14000
98										28851						Std. Er	ror of N		10200
100		Coefficient of ¹								1.364							Skew	ness	2.185
101										<u> </u>	1								
102				N	ote: San	nple s	ize is s	mall (e.g., <1	0), if data a	re collected ι	ısing ISM a	pproac	h, you	shoul	d use			
103				gui	dance p	provid	ed in IT	RC T	ech Re	g Guide on I	SM (ITRC, 2	012) to con	npute s	tatistic	s of in	terest.			
104					For	r exar	nple, yo	ou ma	y want t	o use Cheb	yshev UCL to	estimate l	EPC (IT	ΓRC, 2	2012).				
105				С	hebyshe	ev UC	L can b	oe con	nputed	using the No	onparametric	and All UC	L Optio	ons of	ProUC	L 5.1			
106																			
107											GOF Test								
108						Shapi	ro Wilk	Test	Statistic	0.721			Shap	oiro W	ilk GOI	F Test			

	АВ	C D E 5% Shapiro Wilk Critical Value	F 0.818	G	H Data Nat	 	J 5% Significan	K	L
109		Lilliefors Test Statistic			Data Not		GOF Test		
110		5% Lilliefors Critical Value			Data anne		5% Significa	ance Level	
111 112		Data appear App		rmal at 5% Sid			. c /c c.gc.		
113				•	-				
114		As	suming Non	mal Distributio	n				
115		95% Normal UCL			95%	UCLs (Adju	sted for Ske	wness)	
116		95% Student's-t UCL	40475		9	95% Adjuste	d-CLT UCL ((Chen-1995)	46349
117						95% Modifie	ed-t UCL (Joh	hnson-1978)	41789
118			-	-					
119			Gamma (GOF Test					
120		A-D Test Statistic					Gamma GO		
121		5% A-D Critical Value		Detected				5% Significan	ce Level
122		K-S Test Statistic					v Gamma G		
123		5% K-S Critical Value					stributed at 5	5% Significan	ce Level
124		Detected data appea	r Gamma Dis	stributed at 5%	6 Significan	nce Level			
125				01-11-11					
126		,		Statistics		I	etar/higa ===	rected MLE)	0.495
127		k hat (MLE) Theta hat (MLE)					`	rected MLE)	
128		nu hat (MLE)				THELAS	•	s corrected)	7.925
129		MLE Mean (bias corrected)					•	s corrected)	
130			21100					Value (0.05)	2.691
131		Adjusted Level of Significance	0.0195				·	quare Value	1.984
132 133							,	1	
134		As	suming Gar	nma Distributio	on .				
135	95% Approximat	te Gamma UCL (use when n>=50))	62274		95% Adj	usted Gamn	na UCL (use	when n<50)	84491
136									
137			Lognorma	I GOF Test					
138		Shapiro Wilk Test Statistic	0.902		Shap	iro Wilk Log	normal GOF	Test	
139		5% Shapiro Wilk Critical Value	0.818	Г	Data appear	Lognormal	at 5% Signifi	icance Level	
140		Lilliefors Test Statistic			Lilli	iefors Logno	rmal GOF T	est	
141		5% Lilliefors Critical Value					at 5% Signifi	icance Level	
142		Data appear	r Lognormal	at 5% Signific	ance Level				
143									
144				I Statistics					
145		Minimum of Logged Data						logged Data	9.035
146		Maximum of Logged Data	11.39				SD of	logged Data	1.624
147		A	umina Laar-	rmal Distribut	ion				
148		95% H-UCL		ormal Distribut	IUII	00% (hehyehov (MVUE) UCL	64314
149		95% H-UCL 95% Chebyshev (MVUE) UCL					• •	MVUE) UCL	
150		99% Chebyshev (MVUE) UCL				37.370	onenyanev (I	WIVOL) UCL	100230
151									
152		Nonparamo	etric Distribu	tion Free UCL	Statistics				
153 154		Data appear to follow a				cance Level			
154		11			J	·-· - ·			
156		Nonpa	rametric Dis	tribution Free	UCLs				
157		95% CLT UCL	37928				95% Ja	ckknife UCL	40475
158		95% Standard Bootstrap UCL	37287				95% Boo	tstrap-t UCL	70894
159		95% Hall's Bootstrap UCL	112109			95% F	Percentile Bo	otstrap UCL	38900
160		95% BCA Bootstrap UCL	43263						
161		90% Chebyshev(Mean, Sd) UCL				95% Ch	ebyshev(Me	an, Sd) UCL	65612
162		97.5% Chebyshev(Mean, Sd) UCL	84851			99% Ch	ebyshev(Me	an, Sd) UCL	122643

	Α	В	С	D)	Е	F	G	Н	I	J	K	L
163													
164								UCL to Use				T	
165				95%	% Stude	ent's-t UC	40475						
166			14/1		6.11			I) P :			005		
167		\A/I					ximate (e.g.,	•	•	•		- : D1101	
168		vvnen ap	olicable, it is s	suggest	ea to u	se a UCL	based upon a	distribution	e.g., gamm	a) passing bo	oth GOF tests	s in ProuCL	
169		Noto: Cuas	ationa rogar	dina tha	colooti	on of a OF	0/ LICL are no	ravidad ta ba	n the year t	a aalaat tha m	acet appropri	iate 95% UCL	
170		Note: Sugge	•	•			% OCL are praints					late 95% UCL	
171		These reco					<u> </u>	<u> </u>				d Lee (2006).	
172	<u> </u>				•							sult a statisticia	n
173	•					an riour	Trona data oc	no, for addition	Tidi inoigne	uooi may			
174													
175 176	Barium												
177													
178							General	Statistics					
179			Tota	l Numbe	er of Ob	servation	s 8			Numbe	r of Distinct (Observations	7
180										Numbe	r of Missing (Observations	0
181						Minimun	n 18					Mean	47.75
182						Maximun	n 79					Median	46
183						SI	17.26				Std. E	rror of Mean	6.103
184				Coeff	ficient o	of Variatio	n 0.361					Skewness	0.17
185								•					
186							10), if data a			· ·			
187							eg Guide on I	•	•	-			
188							to use Cheb						
189			Chebyshe	v UCL d	an be	computed	using the No	onparametric	and All UC	L Options of	ProUCL 5.1		
190													
191				Si	A.C.I. T	. 0		GOF Test		Ob 1 14/			
192						est Statisti itical Valu			Data and	·	ilk GOF Test		
193			5% 5	•		est Statisti			рата арр	ear Normal a	GOF Test	ance Level	
194			E			itical Valu			Data ann	ear Normal a		ance I evel	
195				70 LIIIIC			ear Normal a	t 5% Signific		- Torriar a	it 5 % Olgriille	ance Level	
196						Data app	- Tronnara	CO70 Olgillille	ando Edvoi				
197						A	ssuming Nor	mal Distribut	ion				
198			95% N	ormal U	ICL					6 UCLs (Adju	sted for Ske	ewness)	
199						ent's-t UC	L 59.31					(Chen-1995)	58.18
200	1											hnson-1978)	59.37
202	1							1				<u> </u>	
203	1						Gamma	GOF Test					
204					A-D Te	est Statisti	0.44		Ande	rson-Darling	Gamma GC	F Test	
205					Λ D Cr		e 0.717	Dotooto		ar Camma D	istributed at	E0/ Cignifican	
				5%	A-D CI	itical Valu	9 0.717	Detecte	d data appe	ai Gaillilla D		3 % Significant	e Level
206						itical Value est Statisti		Detecte		gorov-Smirno			ce Level
206				5%	K-S Te K-S Cr	est Statisti itical Valu	0.265 e 0.295	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D	ov Gamma G		
				5%	K-S Te K-S Cr	est Statisti itical Valu	0.265	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D	ov Gamma G	GOF Test	
207				5%	K-S Te K-S Cr	est Statisti itical Valu	0.265 e 0.295 ar Gamma D	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D	ov Gamma G	GOF Test	
207 208				5%	K-S Te K-S Cr ected (est Statisti itical Valud data appe	c 0.265 e 0.295 ar Gamma D	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D ance Level	ov Gamma Gistributed at	GOF Test 5% Significand	ce Level
207 208 209				5%	K-S Te K-S Cr ected o	est Statisti itical Valud data appea	0.265 e 0.295 ar Gamma Di Gamma) 7.409	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D ance Level k	ov Gamma C istributed at star (bias co	GOF Test 5% Significand	te Level
207 208 209 210				5%	K-S Te K-S Cr ected (est Statisti itical Valud data appea c hat (MLE	Gamma) 7.409) 6.445	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D ance Level k	star (bias co	GOF Test 5% Significand rrected MLE)	4.714 10.13
207 208 209 210 211				5% Det	K-S Te K-S Cr ected c	est Statisti itical Valud data appea k hat (MLE a hat (MLE u hat (MLE	Gamma 7.409 0.265 Gamma 0.295 Gamma 0.295 Gamma 0.295 Gamma 0.295 Gamma 0.295 Gamma 0.295	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D ance Level k	star (bias co	GOF Test 5% Significance rrected MLE) rrected MLE) as corrected)	4.714 10.13 75.42
207 208 209 210 211 212 213 214			M	5% Det	K-S Te K-S Cr ected c	est Statisti itical Valud data appea c hat (MLE	Gamma 7.409 0.265 Gamma 0.295 Gamma 0.295 Gamma 0.295 Gamma 0.295 Gamma 0.295 Gamma 0.295	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D ance Level k Theta	star (bias co nu star (bias	Frected MLE) as corrected) as corrected)	4.714 10.13 75.42 21.99
207 208 209 210 211 212 213				5% Det	K-S Te K-S Cr ected c	est Statisti itical Valud data appea k hat (MLE a hat (MLE u hat (MLE	Gamma 7.409 6.445 118.5 47.75	Detecte	Kolmo d data appe	gorov-Smirno ar Gamma D ance Level k Theta	star (bias co nu star (bias MLE Sd (bias e Chi Square	GOF Test 5% Significance rrected MLE) rrected MLE) as corrected)	4.714 10.13 75.42

	A B C D E	F	G	Н	ı	J	K	L
217	As	suming Gam	nma Distribut	ion				
218	95% Approximate Gamma UCL (use when n>=50))	63.83			sted Gam	ma UCL (use	when n<50)	68.88
219	oo // pproximate damma oo 2 (doo mion ii oo))	00.00			otou dam		, wildin ii '00')	
220		Lognorma	I GOF Test					
221	Shapiro Wilk Test Statistic	0.872		Shapir	o Wilk Lo	gnormal GOF	- Test	
222	5% Shapiro Wilk Critical Value	0.818		Data appear l				
223 224	Lilliefors Test Statistic	0.297			_	ormal GOF 1		
225	5% Lilliefors Critical Value	0.283			•	at 5% Signific		
226	Data appear Appro	⊥ ximate Logr	ormal at 5%					
227								
228		Lognorma	I Statistics					
229	Minimum of Logged Data	2.89				Mean of	logged Data	3.797
230	Maximum of Logged Data	4.369				SD of	logged Data	0.425
231								
232	Asso	uming Logno	ormal Distribu	ıtion				
233	95% H-UCL	69.81			90%	Chebyshev ((MVUE) UCL	70.08
234	95% Chebyshev (MVUE) UCL	80			97.5%	Chebyshev ((MVUE) UCL	93.76
235	99% Chebyshev (MVUE) UCL	120.8						
236			1					
237	Nonparame	etric Distribu	tion Free UC	L Statistics				
238	Data appear to follow a	Discernible	Distribution a	t 5% Significa	nce Leve	el		
239								
240	Nonpa	rametric Dis	tribution Free	UCLs				
241	95% CLT UCL	57.79				95% Ja	ackknife UCL	59.31
242	95% Standard Bootstrap UCL	57.08					otstrap-t UCL	59.01
243	95% Hall's Bootstrap UCL	62.74			95%	Percentile Bo	ootstrap UCL	57.25
244	95% BCA Bootstrap UCL	57.5						
245	90% Chebyshev(Mean, Sd) UCL	66.06				hebyshev(Me	-	74.35
246	97.5% Chebyshev(Mean, Sd) UCL	85.86			99% C	hebyshev(Me	ean, Sd) UCL	108.5
247								
248			UCL to Use					
249	95% Student's-t UCL	59.31						
250	Notes Commenting and additional additional and additional addition	/ LIOL			-14-1		-+- 050/ 1101	
251	Note: Suggestions regarding the selection of a 95%	<u> </u>	<u>'</u>				ate 95% UCL	
252	Recommendations are based upon the resu	•					d I ee (2006)	
253	However, simulations results will not cover all Real W							20
254	However, simulations results will not cover all freal vi	Toriu uata se	to, for addition	nai insigni tile	user may	want to cons		211.
255								
256	Cadmium							
237								
258 259		General	Statistics					
260	Total Number of Observations	8			Numbe	er of Distinct (Observations	8
261					Numbe	er of Missing (Observations	0
262	Minimum	8.5					Mean	151.6
263	Maximum	630					Median	100.5
264	SD	206.2				Std. E	rror of Mean	72.89
265	Coefficient of Variation	1.36					Skewness	2.195
266		ı	1					
267	Note: Sample size is small (e.g., <1	0), if data ar	e collected u	sing ISM appi	oach, you	u should use		
268	guidance provided in ITRC Tech Reg	Guide on I	SM (ITRC, 20	12) to compu	te statisti	cs of interest		
269	For example, you may want t	o use Cheby	shev UCL to	estimate EPO	C (ITRC, 2	2012).		
270	Chebyshev UCL can be computed of	using the No	nparametric	and All UCL C	ptions of	ProUCL 5.1		

	Α	В		С		D		E	F	G	Н	ł		l		J	K	I	L
271									Normal (GOF Test									
272				SI	hapirc	Wilk ⁻	Test S	Statistic	0.72	1001		—	Sha	piro W	ilk GO	F Test		—	
273 274								l Value	0.818		Da	ita N		-		gnificano	e Level		
275								Statistic	0.272					lliefors					
276				5°	% Lilli	efors (Critical	l Value	0.283		Data	app	ear N	ormal	at 5% S	Significa	nce Level		
277						Data	appe	ar App	roximate No	rmal at 5% S	Significa	ance	Leve	ı					
278																			
279								As	suming Norr	nal Distribut	tion								
280				95% No	rmal (UCL						95%	% UCL	s (Adj	usted 1	or Skew	ness)		
281					95	% Stu	udent's	-t UCL	289.7				95%	Adjust	ed-CL	T UCL (0	Chen-199	5)	331.9
282				-									95%	Modif	ied-t U	CL (Joh	nson-1978	8)	299.1
283										I									
284									Gamma (GOF Test									
285						A-D	Test S	Statistic	0.372		P	Ande	erson-	Darling	g Gam	ma GOF	Test		
286					5%	A-D (Critical	l Value	0.751	Detected	d data a	эрре	ar Ga	mma [istribu	ted at 59	% Significa	ance	e Level
287						K-S	Test S	Statistic	0.208		Ko	omlc	gorov	-Smirn	ov Ga	mma GC	OF Test		
288								l Value	0.306						istribu	ted at 59	% Significa	ance	e Level
289					De	etectec	data t	appear	r Gamma Dis	stributed at 5	5% Sigr	nifica	ance l	_evel					
290																			
291									Gamma	Statistics									
292								(MLE)	0.672						•		ected MLE		0.503
293								(MLE)	225.5					Theta	•		ected MLE	- 1	301.1
294								(MLE)	10.75							•	corrected:	1	8.054
295				ML	_E Me	an (bia	as corr	rected)	151.6				•				corrected		213.6
296				۸ طاند م			C::4		0.0105				Appr				/alue (0.0		2.766
297				Adjus	tea Le	evel of	Signii	ficance	0.0195						ajuste	d Chi Sq	uare Valu	ie	2.046
298									suming Gam	ma Dietribut	tion								
299	OF	5% Approx	imata (LICI	(uso v	whon n		441.3			- Ο/. Λ.	diusto	d Com	ma LIC	l (uson	when n<50	0)	596.7
300		% Applox	.iiiate C	Jaiiiiia	UCL	(use w	/HeH H	<u> </u>	441.3		90	/0 A	ujusie	u Gan	illa UC	L (use v	viieii ii>30	رر	390.7
301									Lognorma	GOF Test									
302				SI	hapiro	Wilk ⁻	Test S	Statistic	0.901	1001		Sha	niro V	Vilk Lo	anorm	al GOF	Test		
303								l Value	0.818				•		-		ance Lev	el	
305								Statistic	0.222				_	•		GOF Te			
306				5°	% Lilli	efors (Critical	l Value	0.283		Data a			_			ance Lev	el	
307							Data	appear	Lognormal :	at 5% Signif	icance	Leve	el						
308												-						-	
309									Lognorma	l Statistics									
310					Minim	um of	Logge	d Data	2.14						N	lean of lo	ogged Dat	ta	4.117
311				N	/laxim	um of	Logge	d Data	6.446							SD of lo	ogged Dat	ta	1.597
312										L									
313								Assı	uming Logno	rmal Distrib	ution								
314							95% I	H-UCL	4505					90%	Cheby	yshev (N	IVUE) UC	;L	451.6
315		95% Chebyshev (MVUE)						•	580.2					97.5%	Cheb	yshev (N	IVUE) UC	;L	758.7
316	99% Chebyshev (MVUE)						E) UCL	1109											
317																			
318							-	-	etric Distribu										
319					Data	appea	ar to fo	llow a	Discernible I	Distribution a	at 5% S	}ignii	ficanc	e Leve	el				
320																			
321									rametric Dist	tribution Fre	e UCLs	<u> </u>							
322								T UCL	271.5								kknife UC		289.7
323							ootstra	•	265.6					0=0:			strap-t UC		481
324				95	5% Ha	all's Bo	ootstra	p UCL	801					95%	Perce	ntile Boo	otstrap UC	;L	284

205	A B C D E 95% BCA Bootstrap UCL	F 321.1	G H I I J K	L
325	90% Chebyshev(Mean, Sd) UCL	370.2	95% Chebyshev(Mean, Sd) UCL	469.3
326	97.5% Chebyshev(Mean, Sd) UCL	606.8		876.8
327	0.10.70 0.102 (.11021.1, 0.21) 0.02		00% 0.102/0.104(.110211, 02/) 002	
328		Suggested	UCL to Use	
329	95% Student's-t UCL	289.7		
330				
331 332	When a data set follows an approx	imate (e.g., r	normal) distribution passing one of the GOF test	
333	• •	, ,	distribution (e.g., gamma) passing both GOF tests in ProUCL	
334		<u> </u>		
335	Note: Suggestions regarding the selection of a 95%	UCL are pr	ovided to help the user to select the most appropriate 95% UCL.	
336	Recommendations are base	sed upon dat	a size, data distribution, and skewness.	
337	These recommendations are based upon the resu	Its of the sim	ulation studies summarized in Singh, Maichle, and Lee (2006).	
338	However, simulations results will not cover all Real V	orld data se	ts; for additional insight the user may want to consult a statistician	
339				
340				
	Chromium			
342				
343		General	Statistics	
344	Total Number of Observations	7	Number of Distinct Observations	6
345			Number of Missing Observations	1
346	Minimum	3.7	Mean	6.257
347	Maximum	10	Median	5.9
348	SD	2.358	Std. Error of Mean	0.891
349	Coefficient of Variation	0.377	Skewness	0.639
350				
351			e collected using ISM approach, you should use	
352			SM (ITRC, 2012) to compute statistics of interest.	
353		•	shev UCL to estimate EPC (ITRC, 2012).	
354	Chebyshev UCL can be computed to	ising the No	nparametric and All UCL Options of ProUCL 5.1	
355		N 1 C	2057	
356	Chanina Will. Took Chatiatia		GOF Test Shapiro Wilk GOF Test	
357	Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	0.919	Data appear Normal at 5% Significance Level	
358	Lilliefors Test Statistic	0.803	Lilliefors GOF Test	
359	5% Lilliefors Critical Value	0.304	Data appear Normal at 5% Significance Level	
360			: 5% Significance Level	
361	Эша црро			
362	As	sumina Norr	nal Distribution	
363				
A	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
364	95% Normal UCL 95% Student's-t UCL	7.989	95% UCLs (Adjusted for Skewness) 95% Adjusted-CLT UCL (Chen-1995)	7.953
365		7.989	95% Adjusted-CLT UCL (Chen-1995)	7.953 8.025
365 366		7.989	, , ,	
365 366 367			95% Adjusted-CLT UCL (Chen-1995)	
365 366 367 368			95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978)	
365 366 367 368 369	95% Student's-t UCL	Gamma (95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978)	8.025
365 366 367 368	95% Student's-t UCL A-D Test Statistic	Gamma 0.302	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test	8.025
365 366 367 368 369 370	95% Student's-t UCL A-D Test Statistic 5% A-D Critical Value	Gamma (0.302 0.709	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance	8.025
365 366 367 368 369 370 371	95% Student's-t UCL A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value	Gamma (0.302 0.709 0.232 0.312	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance Kolmogorov-Smirnov Gamma GOF Test	8.025
365 366 367 368 369 370 371 372	95% Student's-t UCL A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value	Gamma (0.302 0.709 0.232 0.312	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance Kolmogorov-Smirnov Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance	8.025
365 366 367 368 369 370 371 372 373	95% Student's-t UCL A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value	Gamma (0.302 0.709 0.232 0.312 Camma Dis	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance Kolmogorov-Smirnov Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance	8.025
365 366 367 368 369 370 371 372 373	A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear	Gamma (0.302 0.709 0.232 0.312 Gamma Dis	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance Kolmogorov-Smirnov Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level Statistics k star (bias corrected MLE)	Level Level 4.97
365 366 367 368 369 370 371 372 373 374 375	A-D Test Statistic 5% A-D Critical Value K-S Test Statistic 5% K-S Critical Value Detected data appear	Gamma (0.302 0.709 0.232 0.312 r Gamma Dis	95% Adjusted-CLT UCL (Chen-1995) 95% Modified-t UCL (Johnson-1978) GOF Test Anderson-Darling Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance Kolmogorov-Smirnov Gamma GOF Test Detected data appear Gamma Distributed at 5% Significance stributed at 5% Significance Level Statistics	Level

	Α		В			С		D		Е		F		G		Н		I			J			K		L	
379							MLE	Mean	(bias o	corrected)	6.257										•		orrect	1	2.807	
380																	/	Approxi						•		51.38	
381						Ad	justed	d Level	of Si	gnificance	9 (0.0158							А	Adjus	ted C	thi S	quai	re Va	ılue	46.69	
382																											_
383			.0/ 4					OL (ing Gam	nma	a Distrib	butio		, A II								50)	0.005	4
384		95	% App	oroxir	mate	Gamı	ma U	CL (us	e whe	n n>=50))	8.474				95%	% Adj	justed (Gam	nma	UCL	(use	whe	∍n n<	50)	9.325	4
385											1.5	gnorma	10	OF T	_												4
386							Sha	niro Wi	ilk Too	t Statistic		0.941		OF 168	51		Shan	iro Will	k l o	ano	rmal	COF	: To	et			
387						5%				cal Value		0.803						r Logno									-
388						J /0				t Statistic		0.803				ata ap	•	iefors L				-		Ce Le	;vei		-
389										ical Value		0.304			D	ata ar		r Logno						ce Le			4
390										ita appea			at 5	5% Sia			•										-
391 392										па аррос		,															-
393											Lo	gnorma	al St	tatistics	S												-
394							Mir	nimum	of Log	ged Data	а	1.308									Mea	n of	logg	ged D	ata	1.774	-
395										ged Data		2.303												ged D		0.372	-
396										-	1																1
397										Ass	sumin	g Logno	orm	al Distr	ributi	on											1
398									95	% H-UCL	_	8.929	Π						90%	Che	ebysh	nev (ľ	MVL	JE) U	JCL	8.897	1
399						95	% Ch	ebyshe	ev (M\	/UE) UCL	_ 1	10.1						97	7.5%	Che	ebysh	nev (ľ	MVL	JE) U	JCL	11.76	
400						99	% Ch	ebyshe	ev (M\	(UE) UCL	_ 1	15.03															1
401																											
402									N	onparam	etric	Distribu	ıtior	n Free I	UCL	Statis	tics										
403							Da	ata app	ear to	follow a	Disc	ernible	Dis	tributio	n at	5% Si	gnifi	cance l	Leve	əl							
404																											
405												etric Dis	strib	ution F	ree l	JCLs											
406										CLT UCL		7.723												nife U		7.989	
407						95				strap UCL		7.586												ap-t U		8.766	
408										strap UCL		8.399							95%	Per	centil	e Bo	otstı	rap U	ICL	7.743	
409						000/				strap UCL		7.757						0.5	0/ 0	N I		-/\ 1 -	(O-1/ T	101	10.14	4
410										Sd) UCL		8.931 11.82												Sd) U Sd) U		15.12	-
411					9	7.5 /6	CHED	ysnev(ivieari	, 3u) UCI	- '	11.02						99	∕₀ C	neby	SHEV	(IVIE	an, c	3u) U	,CL	13.12	-
412											Suc	gested	LUC	CL to Us	se												-
413								95% :	Stude	nt's-t UCL		7.989	T														-
414 415											1	- *															1
416		N	lote: Si	ugge	stion	s rega	arding	the se	electio	n of a 95°	% UC	L are pr	rovi	ded to h	nelp t	he us	er to	select	the r	most	аррі	ropria	ate 9	<u></u>	JCL.		1
417							Rec	omme	ndatio	ns are ba	ased (upon dat	ta s	ize, dat	ta dis	tributi	on, a	nd ske	wne	ess.							1
418		•	These	reco	mme	ndatio	ns ar	e base	ed upo	n the res	ults o	f the sim	nula	ation stu	ıdies	sumn	nariz	ed in S	ingh	ı, Ma	ichle	, and	l Le	e (20	06).		1
419		Hov	vever,	simu	llatio	ns res	ults v	ill not	cover	all Real \	Norld	data se	ets; f	for addi	itiona	ıl insig	ht th	e user	may	/ war	nt to c	consi	ult a	statis	sticiar	١.	
420																											1
421]
422	Cobalt																										
423																											
424												General	Sta	atistics													
425						То	tal Nu	ımber	of Obs	ervations	5	7												ervatio		7	
426											1	4 4						Nu	ımbe	er of	Missi	ng O)bse	ervatio		1	1
427										Minimum		1.4													ean	3.743	4
428										Maximum		6.9	-									<u></u>		Med		3.5	4
429								ooti -	iont -	SE		1.955	1								5	ıa. El		of Me		0.739	4
430							(JUEITIC	ent 01	Variation	'	0.522												kewne	588	0.487	-
431					No	te: Sa	mole	eize is	eme	l (e.g., <	10\ #	f data ar	re ^	ollecto	d nei	na IQI	M an	nroach	. VO	ıı eh	Orijq	IISE					-
432					140	. .	iiihie	312 0 18	o onlid	ı (o .y., `	10 <i>)</i> , II	uald di	ים ני	JII GULGI	u usi	iy iSl	vi aþ	Pivacil	, yO	u SII	ouiù	use 					

433	A B C D E guidance provided in ITRC Tech Reg	F Guide on IS	G H I J K SM (ITRC, 2012) to compute statistics of interest.	L
434	For example, you may want to	o use Cheby	shev UCL to estimate EPC (ITRC, 2012).	
435	Chebyshev UCL can be computed u	sing the No	nparametric and All UCL Options of ProUCL 5.1	
436				
437		Normal (GOF Test	
438	Shapiro Wilk Test Statistic	0.946	Shapiro Wilk GOF Test	
439	5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level	
440	Lilliefors Test Statistic	0.198	Lilliefors GOF Test	
441	5% Lilliefors Critical Value	0.304	Data appear Normal at 5% Significance Level	
442	Data appea	ar Normal at	5% Significance Level	
443				
444	Ass	suming Nor	nal Distribution	
445	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
446	95% Student's-t UCL	5.179	95% Adjusted-CLT UCL (Chen-1995)	5.104
447			95% Modified-t UCL (Johnson-1978)	5.202
448				
449		Gamma	GOF Test	
450	A-D Test Statistic	0.245	Anderson-Darling Gamma GOF Test	
451	5% A-D Critical Value	0.71	Detected data appear Gamma Distributed at 5% Significance I	Level
452	K-S Test Statistic	0.197	Kolmogorov-Smirnov Gamma GOF Test	
453	5% K-S Critical Value	0.313	Detected data appear Gamma Distributed at 5% Significance I	Level
454	Detected data appear	Gamma Di	stributed at 5% Significance Level	
455			-	
456		Gamma	Statistics	
457	k hat (MLE)	4.053	k star (bias corrected MLE)	2.411
458	Theta hat (MLE)	0.924	· · ·	1.552
459	nu hat (MLE)	56.74	` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` ` `	33.75
	MLE Mean (bias corrected)	3.743	,	2.41
460 461			· · ·	21.47
	Adjusted Level of Significance	0.0158	11	18.57
462 463	.,		7,	
464	Ass	sumina Gam	ma Distribution	
	95% Approximate Gamma UCL (use when n>=50))	5.885		6.804
465	,		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
466		Lognorma	GOF Test	
467	Shapiro Wilk Test Statistic	0.959	Shapiro Wilk Lognormal GOF Test	
468	5% Shapiro Wilk Critical Value	0.803	Data appear Lognormal at 5% Significance Level	
469	Lilliefors Test Statistic	0.177	Lilliefors Lognormal GOF Test	
470	5% Lilliefors Critical Value	0.304	Data appear Lognormal at 5% Significance Level	
471			at 5% Significance Level	
472	2 da appour			
473		Lognorma	I Statistics	
474	Minimum of Logged Data	0.336		1.191
475	Maximum of Logged Data	1.932		0.564
476			32 3. 13ggsa 2ata	
477	Δεει	ımina Loana	rmal Distribution	
478	95% H-UCL	7.012	90% Chebyshev (MVUE) UCL	6.184
479	95% Chebyshev (MVUE) UCL	7.28	, , ,	8.801
480	99% Chebyshev (MVUE) UCL	11.79	2	
481	22.12.2.102,6.102 (6.2.) 6.02			
482	Nonnarama	tric Distribu	tion Free UCL Statistics	
483	-		Distribution at 5% Significance Level	
484	Data appear to follow a r		Joan Dation at 0 /0 Organication Lotter	
485	Nonnar	rametric Die	ribution Free UCLs	
486	Nonpai	amount Dis		

	A B C D E	F	G	Н		J OF 0/ Josef	K knife UCL	L 5 170
487	95% CLT UCL 95% Standard Bootstrap UCL	4.958 4.871				95% Jack 95% Boots		5.179 5.521
488	95% Hall's Bootstrap UCL	4.953			95%	Percentile Boot	-	4.929
489	95% BCA Bootstrap UCL	4.957			95 70	r ercentile boot	istrap OCL	4.323
490	90% Chebyshev(Mean, Sd) UCL	5.96			95% CI	nebyshev(Mear	n. Sd) UCL	6.964
491	97.5% Chebyshev(Mean, Sd) UCL	8.358				nebyshev(Mear	·	11.1
492 493						,	,,	
494		Suggested	UCL to Use					
495	95% Student's-t UCL	5.179						
496								
497	Note: Suggestions regarding the selection of a 95%	6 UCL are pro	ovided to help	the user to	select the r	nost appropriate	e 95% UCL.	
498	Recommendations are bas	sed upon dat	a size, data di	stribution, a	and skewne	SS.		
499	These recommendations are based upon the resu	lts of the sim	ulation studies	s summariz	zed in Singh	, Maichle, and L	_ee (2006).	
500	However, simulations results will not cover all Real W	orld data set	ts; for addition	al insight th	ne user may	want to consult	t a statisticia	n.
501								
502								
503	Copper							
504								
505		General	Statistics					
506	Total Number of Observations	8				er of Distinct Ob		8
507					Numbe	r of Missing Ob		0
508	Minimum	3					Mean	24.63
509	Maximum	87				Ot - F	Median	13.7
510	SD Coefficient of Variation	28.37 1.152					or of Mean Skewness	10.03
511	Coefficient of Variation	1.152					Skewness	1.814
512	Note: Sample size is small (e.g., <1	Ω\ if data an	e collected us	ing ISM an	nroach voi	ı ehould uee		
513	guidance provided in ITRC Tech Reg							
514 515	For example, you may want t	_	-	-	-			
516	Chebyshev UCL can be computed u	-			•	•		
517	<u> </u>							
518		Normal C	GOF Test					
519	Shapiro Wilk Test Statistic	0.782			Shapiro W	ilk GOF Test		
520	5% Shapiro Wilk Critical Value	0.818		Data No	t Normal at	5% Significance	e Level	
521	Lilliefors Test Statistic	0.228			Lilliefors	GOF Test		
522	5% Lilliefors Critical Value	0.283		Data appe	ear Normal a	at 5% Significar	nce Level	
523	Data appear App	roximate No	rmal at 5% Sig	gnificance	Level			
524								
525		suming Norr	mal Distributio					
526	95% Normal UCL					usted for Skew	•	
527	95% Student's-t UCL	43.63				ed-CLT UCL (C	<i>'</i>	48
528					95% Modifi	ed-t UCL (John	ison-1978)	44.7
529		0	20E T					
530	A.D.T1.07 ** **		GOF Test	A	mon Derlie	Gomma COT	Tost	
531	A-D Test Statistic 5% A-D Critical Value	0.329 0.735	Dotostod			Gamma GOF istributed at 5%		no Lovol
532	K-S Test Statistic	0.735	Detected			ov Gamma GO		C LEVEI
533	5% K-S Critical Value	0.242	Detected			istributed at 5%		e l evel
534	Detected data appear					เอเกมนเซน สโ 3%	Joiginnealle	- LGVGI
535	Detected data appear	. Gaillilla DR	Samuleu al 07		1100 F04 <u>0</u> 1			
536 537		Gamma	Statistics					
h / /		1.008			k	star (bias corre	cted MI F)	0.714
	k hat (MLF)							
538	k hat (MLE) Theta hat (MLE)	24.42					,	34.51
	k hat (MLE) Theta hat (MLE) nu hat (MLE)	24.42 16.13				star (bias corre	cted MLE)	34.51 11.42

541	Α		В		C N	ILE Mea		E corrected)	24.0		(G		Н		1	М	J LE S	•	ias (K correct	ted)	L 29.15
542															Аррі	oxima	te C	hi Sc	, uare	• Va	lue (0.	.05)	4.845
543					Adju	sted Lev	vel of S	ignificance	0.0	195						-	Adju	sted	Chi S	Squ	are Va	alue	3.82
544																							
545								As	suming	Gan	nma Di	istribut	tion										
546		95%	6 Approx	imate	e Gamm	a UCL (ı	use wh	en n>=50))	58.0)2			9	5% Ac	djuste	ed Gan	nma	UCL	(use	e wi	hen n<	50)	73.58
547																							
548									Logn	orma	I GOF	Test									-		
549					,	Shapiro '	Wilk Te	est Statistic	0.9	55				Sha	piro \	Vilk Lo	ogno	rma	I GOI	FΤ	est		
550					5% 5	Shapiro \	Wilk Cr	itical Value	0.8	18			Data	appea	ar Lo	gnorma	al at	5% \$	Signif	fica	nce Le	evel	
551						Lillie	efors Te	est Statistic	0.2	05				Lil	lliefo	rs Log	norn	nal G	iOF	Tes	t		
552					ļ	5% Lillie	fors Cr	itical Value	0.2	83			Data	appea	ar Lo	gnorma	al at	5% \$	Signif	fica	nce Le	evel	
553							D	ata appea	r Logno	rmal	at 5%	Signif	icance	e Leve	el				-				
554																							
555									Logn	orma	al Stati	stics											
556						Minimu	m of Lo	ogged Data	1.0	99								Ме	an of	f loç	gged D	ata	2.632
557						Maximu	m of Lo	ogged Data	4.4	66									SD of	f loç	gged D	ata	1.168
558									1		1												
559								Ass	uming l	_ogno	ormal I	Distrib	ution										
560							9	5% H-UCL	150.4	4						90%	% Ch	ebys	hev	(M\	/UE) L	JCL	55.17
561					95%	Chebys	shev (M	IVUE) UCL	69.	12						97.5%	% Ch	ebys	shev	(M\	/UE) L	JCL	88.48
562					99%	Chebys	shev (M	IVUE) UCL	126.	5													
563								-															
564								Nonparam	etric Dis	stribu	ıtion Fı	ree UC	L Sta	tistics									
565						Data a	appear	to follow a	Discerr	nible	Distrib	ution a	at 5%	Signif	ican	e Lev	el		-				
566							• •																
567								Nonpa	rametri	c Dis	stributio	on Free	e UCL	.s									
							95%	6 CLT UCL										95		ack	knife L	JCL	43.63
568 569					95%	6 Standa	ard Boo	tstrap UCL	40.2	21								95%	% Boo	otst	rap-t L	JCL	63.45
570						95% Hal	II's Boo	tstrap UCL	. 107.0	3						95%	6 Pei	rcent	tile Bo	oot	strap U	JCL	40.25
571								tstrap UCL															
572					90% C			n, Sd) UCL								95% C	Cheb	vshe	ev(Me	ean	, Sd) L	JCL	68.35
573				(n, Sd) UCL		27								-	-		, Sd) L		124.4
574							•	. ,			ļ												
575									Sugge	sted	UCL t	o Use											
576						959	% Stude	ent's-t UCL															
577									1		1												
578					When a	data set	follows	s an approx	kimate (e.g., ı	normal	l) distri	bution	ı passi	ing o	ne of th	he G	OF t	est				
579		,	When ap					se a UCL b	•	-		•			-					s in	ProU	CL	
580			· ·		-																		
581		No	te: Suga	estio	ns regar	ding the	selecti	on of a 95%	% UCL a	re pr	rovided	to hel	p the i	user to	sele	ct the	mos	t apr	propr	riate	95%	UCL.	
582								ons are ba															
583		TI	hese rec	omm				on the resu										aichl	e, an	nd L	ee (20	06).	
584								r all Real V													•		n.
585			•								•					-	- '						
585																							
587	Lead																						
588	· · · · · · · · · · · · · · · · · · ·																						
589									Gei	neral	Statist	tics											
		Total Number of Observat						servations			1					Numb	er of	f Dist	tinct (Obs	servati	ons	8
590					. 0.0																servati		0
591								Minimum	66														3532
592								Maximum)											Med		1750
593								SD											Std F	 Frr	or of Me		1549
594									1001										J.G. L		. 51 191	JU11	

	Α	В	С	D	E	F	G	Н	I	J	K	L
595				Coefficient	of Variation	1.24					Skewness	1.832
596												
597			-			•	e collected us					
598			-		_		SM (ITRC, 20		-		rest.	
599					-	-	shev UCL to		•	•	E 1	
600			Chebyshev	OCL Can be	computed t	ising the No	прагашение	and All OC	L Options (DI PIOUCL	5.1	
601						Normal (GOF Test					
602			S	hapiro Wilk T	est Statistic	0.748	101 1030		Shapiro \	Wilk GOF T	Test	
603				napiro Wilk C		0.818		Data N			ficance Level	
604 605					est Statistic	0.352				rs GOF Tes		
606			5	% Lilliefors C	ritical Value	0.283		Data N	ot Normal a	at 5% Signif	ficance Level	
607					Data Not	: Normal at 5	 % Significan	ce Level				
608												
609					As	suming Nor	mal Distribution	on				
610			95% No	rmal UCL				95%	6 UCLs (Ac	ljusted for	Skewness)	
611				95% Stud	lent's-t UCL	6466			95% Adjus	sted-CLT U	CL (Chen-1995)	7151
612									95% Mod	ified-t UCL	(Johnson-1978)	6633
613												
614							GOF Test					
615					est Statistic	0.345				ng Gamma		
616					ritical Value	0.744	Detected				at 5% Significan	ce Level
617					est Statistic	0.22					a GOF Test	
618					ritical Value	0.304				Distributed	at 5% Significan	ce Level
619				Detected	data appeai	r Gamma Di	stributed at 5	% Significa	ince Level			
620						Commo	Statistics					
621					k hat (MLE)	0.771				k star (bias	corrected MLE)	0.565
622					a hat (MLE)	4582					corrected MLE)	6250
623					u hat (MLE)	12.33			11101	•	(bias corrected)	9.042
624			ML	E Mean (bias	<u> </u>	3532					(bias corrected)	4698
625 626									Approxima		are Value (0.05)	3.352
627			Adjus	ted Level of S	Significance	0.0195					hi Square Value	2.538
628												
629					Ass	suming Gam	ıma Distributi	on				
630	,	95% Approx	imate Gamma	a UCL (use w	hen n>=50)	9526		95% A	djusted Gar	mma UCL (use when n<50)	12584
631												
632						Lognorma	GOF Test					
633				hapiro Wilk T		0.907			•	ognormal (
634			5% Sh	napiro Wilk C		0.818			-		gnificance Level	
635					est Statistic	0.251				normal GC		
636			5'	% Lilliefors C		0.283				al at 5% Si	gnificance Level	
637					Jata appear	Lognormal	at 5% Signific	cance Leve	9 1			
638							I Ctotictics					
639				Minimum of L	ogged Data	Lognorma 4.19	l Statistics			Maa	n of logged Data	7.396
640				Vilnimum of L		9.473					n of logged Data D of logged Data	1.576
641			N.	naximum 01 L	ogged Data	3.473				SL	o logged Data	1.570
642					Assı	ımina Loana	ormal Distribu	ıtion				
643				9	95% H-UCL		5134154		909	% Chebvsh	ev (MVUE) UCL	11632
644 645			95% (Chebyshev (N						•	ev (MVUE) UCL	19508
646				Chebyshev (N							/ - 3-	
647				, - (,							
648					Nonparame	etric Distribu	tion Free UC	L Statistics	.			
U 4 0					•							

	Α	В	С	D	E	F	G	Н	ı.	J	K		L
649				Data appea	ar to follow a	Discernible	Distribution at	5% Signition	cance Level				
650					Nonna	rametric Dis	tribution Free (IICI s					
651				- Ot	5% CLT UCL					95%.	Jackknife U	ICI	6466
652			95%	Standard Bo							otstrap-t U		16285
653 654				5% Hall's Bo					95% F	Percentile E	•		6175
655				95% BCA Bo							<u>'</u>		
656				ebyshev(Me					95% Ch	ebyshev(M	lean, Sd) U	JCL	10283
657			97.5% Ch	ebyshev(Me	ean, Sd) UCL	13204			99% Ch	ebyshev(M	lean, Sd) U	JCL	18942
658													
659						Suggested	UCL to Use						
660			95°	% Adjusted (Gamma UCL	12584							
661													
662		Note: Sugges	stions regard	ing the selec	ction of a 95°	% UCL are pr	ovided to help	the user to	select the m	nost approp	riate 95% l	JCL.	
663			P	Recommenda	ations are ba	sed upon dat	a size, data dis	stribution, a	and skewnes	SS.			
664		These recor	mmendations	are based (upon the resi	ults of the sim	nulation studies	summariz	ed in Singh,	Maichle, a	nd Lee (200	06).	
665	Нс	wever, simul	lations result	s will not cov	ver all Real V	Vorld data se	ts; for additiona	al insight th	e user may	want to con	sult a statis	sticia	n.
666													
667													
668	Mercury												
669							O						
670					<u></u>		Statistics			(5)	<u> </u>		
671			I otal	Number of C	Observations	8				r of Distinct			8
672									Number	of Missing			0
673					Minimum	-						ean	92.69
674					Maximum SD					C+d	Med Error of Me		14.4 48.64
675				Coefficien	st of Variation					510.	Skewne		1.444
676				Coemicien	it of variation	1.404					Skewile	288	1.444
677			Note: Sami	nle size is sı	mall (e a <'	10) if data ar	e collected usi	ing ISM an	nroach vou	should use			
678			-	-	, -	•	SM (ITRC, 201	•	•				
679			<u> </u>			<u> </u>	shev UCL to e	<u> </u>					
680						-	nparametric a				1		
681 682						_							
683						Normal (GOF Test						
684			S	hapiro Wilk	Test Statistic	0.695			Shapiro Wi	lk GOF Tes	st		
685			5% SI	hapiro Wilk C	Critical Value	0.818		Data No	t Normal at 5	5% Significa	ance Level		
686				Lilliefors	Test Statistic	0.326			Lilliefors	GOF Test			
687			5′	% Lilliefors C	Critical Value	0.283		Data No	t Normal at 5	5% Significa	ance Level		
688					Data No	t Normal at 5	5% Significanc	e Level					
689													
690					As	ssuming Nor	mal Distribution	n					
691			95% No	ormal UCL					UCLs (Adju				
692				95% Stu	ıdent's-t UCL	. 184.8			95% Adjuste		-		199.2
693									95% Modifie	ed-t UCL (J	ohnson-19	78)	189
694													
695							GOF Test						
696					Test Statistic				son-Darling				
697					Critical Value		Data		ma Distribut				:
698					Test Statistic		D		orov-Smirno				
699					Critical Value				r Gamma Di		5% Signifi	canc	e Level
700				Detected da	ata tollow Ap	opr. Gamma	Distribution at	5% Signific	cance Level	l 			
701							Statistics						
702													

700	A B C D E k hat (MLE)	F 0.527	G	Н	I J K k star (bias corrected MLE)	0.413
703 704	Theta hat (MLE)	175.9			Theta star (bias corrected MLE)	224.6
705	nu hat (MLE)	8.433			nu star (bias corrected)	6.604
706	MLE Mean (bias corrected)	92.69			MLE Sd (bias corrected)	144.3
707					Approximate Chi Square Value (0.05)	1.956
708	Adjusted Level of Significance	0.0195			Adjusted Chi Square Value	1.382
709						
710	Ass	suming Gam	nma Distributi	on		
711	95% Approximate Gamma UCL (use when n>=50)	313		95% Adj	justed Gamma UCL (use when n<50)	442.8
712			•			
713			I GOF Test			
714	Shapiro Wilk Test Statistic	0.835			oiro Wilk Lognormal GOF Test	
715	5% Shapiro Wilk Critical Value	0.818			r Lognormal at 5% Significance Level	
716	Lilliefors Test Statistic	0.254			iefors Lognormal GOF Test	
717	5% Lilliefors Critical Value	0.283			r Lognormal at 5% Significance Level	
718	Data appear	Lognornal	at 5% Signific	Janue Level	· · · · · · · · · · · · · · · · · · ·	
719		Loanorma	I Statistics			
720	Minimum of Logged Data	1.74			Mean of logged Data	3.334
721	Maximum of Logged Data	5.858			SD of logged Data	1.685
722 723						
724	Assı	uming Logno	ormal Distribu	tion		
725	95% H-UCL	3288			90% Chebyshev (MVUE) UCL	235.8
726	95% Chebyshev (MVUE) UCL	304.1			97.5% Chebyshev (MVUE) UCL	398.9
727	99% Chebyshev (MVUE) UCL	585.1				
728			I			
729	Nonparame	etric Distribu	tion Free UC	L Statistics		
730	Data appear to follow a l	Discernible I	Distribution a	t 5% Signifi	cance Level	
731						
732	•		tribution Free	UCLs		
733	95% CLT UCL	172.7			95% Jackknife UCL	184.8
734	95% Standard Bootstrap UCL	165.9 801.4			95% Bootstrap-t UCL	550.1 174.6
735	95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL	193.5			95% Percentile Bootstrap UCL	174.0
736	90% Chebyshev(Mean, Sd) UCL	238.6			95% Chebyshev(Mean, Sd) UCL	304.7
737	97.5% Chebyshev(Mean, Sd) UCL	396.4			99% Chebyshev(Mean, Sd) UCL	576.6
738	57.15% Shibbyshiot (Modif, Su) 66E				22.12 2.132 join 37 (modify 0.0) 0.01	
739 740		Suggested	UCL to Use			
741	95% Adjusted Gamma UCL	442.8				
741	<u> </u>	<u> </u>	1			
743	Recommended	UCL exceed	ds the maxim	um observa	tion	
744						
745	When a data set follows an approx	, •	•	•	<u> </u>	
746	When applicable, it is suggested to use a UCL ba	ased upon a	distribution (e	e.g., gamma) passing both GOF tests in ProUCL	
747						
748	Note: Suggestions regarding the selection of a 95%				· · · ·	
749	Recommendations are bas	•				
750	These recommendations are based upon the resu				• , ,	
751	However, simulations results will not cover all Real W	orid data se	ts; for addition	nai insight th	e user may want to consult a statisticia	in.
752						
753	Nickel					
734	INICKGI					
755		Ganaral	Statistics			
756		General	Ciausiics			

757	Α	В	C Tota	D Dal Number of O	E bservations	F 6	G	Н	I J Number of Distinct Obs	K servations	6
758									Number of Missing Obs	servations	2
759					Minimum	1.5				Mean	4.317
760					Maximum	7.1				Median	4.6
761					SD	2.286			Std. Erro	or of Mean	0.933
762				Coefficient	of Variation	0.53			;	Skewness	-0.222
763											
764			Note: San	nple size is sm	nall (e.g., <1	0), if data ar	e collected u	sing ISM a _l	pproach, you should use		
765			guidance p	rovided in ITF	RC Tech Reg	Guide on IS	SM (ITRC, 20	012) to com	pute statistics of interest.		
766			For	example, you	may want to	o use Cheby	shev UCL to	estimate E	PC (ITRC, 2012).		
767			Chebyshe	v UCL can be	computed u	sing the No	nparametric	and All UC	L Options of ProUCL 5.1		
768											
769						Normal C	GOF Test				
770				Shapiro Wilk T	est Statistic	0.912			Shapiro Wilk GOF Test		
771			5% 9	Shapiro Wilk C	ritical Value	0.788		Data app	ear Normal at 5% Significan	ice Level	
772				Lilliefors T	est Statistic	0.199			Lilliefors GOF Test		
773				5% Lilliefors C	ritical Value	0.325		Data app	ear Normal at 5% Significan	ce Level	
774					Data appe	ar Normal at	5% Significa	ance Level			
775											
776					As	suming Norr	nal Distributi	on			
777			95% N	Iormal UCL				95%	UCLs (Adjusted for Skewr	ness)	
778				95% Stud	dent's-t UCL	6.197			95% Adjusted-CLT UCL (CI	hen-1995)	5.761
779									95% Modified-t UCL (John:	son-1978)	6.183
780							Į.			!	
781						Gamma (GOF Test				
782				A-D T	est Statistic	0.457		Ande	rson-Darling Gamma GOF	Test	
783				5% A-D C	ritical Value	0.701	Detected	l data appea	ar Gamma Distributed at 5%	Significand	e Level
784				K-S T	est Statistic	0.269		Kolmoç	jorov-Smirnov Gamma GOI	F Test	
785				5% K-S C	ritical Value	0.334	Detected	data appea	ar Gamma Distributed at 5%	Significand	e Level
786				Detected	data appear	Gamma Dis	stributed at 5	% Significa	ince Level		
787											
788						Gamma	Statistics				
789					k hat (MLE)	3.386			k star (bias correc	1	1.804
790				Thet	a hat (MLE)	1.275			Theta star (bias correc	cted MLE)	2.393
791					u hat (MLE)	40.63			nu star (bias	1	21.65
792			N	ILE Mean (bia	s corrected)	4.317			MLE Sd (bias	'	3.214
793									Approximate Chi Square Va	` '	12.07
794			Adju	sted Level of	Significance	0.0122			Adjusted Chi Squ	uare Value	9.598
795											
796							ma Distribut			,	
797	95	5% Approx	imate Gamm	a UCL (use wh	nen n>=50))	7.739		95% A	djusted Gamma UCL (use w	hen n<50)	9.735
798											
799						_	GOF Test				
800				Shapiro Wilk T		0.859			piro Wilk Lognormal GOF T		
801			5% \$	Shapiro Wilk C		0.788			ar Lognormal at 5% Significa		
802					est Statistic	0.285			lliefors Lognormal GOF Tes		
803				5% Lilliefors C		0.325			ar Lognormal at 5% Significa	ance Level	
804					uata appear	Lognormal	at 5% Signifi	cance Leve) 		
805							LOVE III				
806						Lognorma	I Statistics				1000
807				Minimum of L	••	0.405			Mean of log		1.308
808				Maximum of L	ogged Data	1.96			SD of log	gged Data	0.654
809											
810					Assı	ıming Logno	rmal Distribu	ution			

	Α	В	С	D	95% H-UCL	F	G	Н	1	J Chebyshev (K	L 7.909
811			05%	Chohychov	(MVUE) UCL	11.14 9.499				Chebyshev (,	11.71
812	1				(MVUE) UCL	16.04			97.576	Chebyshev (WIVUE) UCL	11.71
813			3370	Chebyshev	(IVIVOL) OCL	10.04						
814	1				Nonparame	etric Distribut	tion Free UC	L Statistics				
815				Data appe	ar to follow a					əl		
816 817												
818					Nonpa	rametric Dist	tribution Free	UCLs				
819				9	95% CLT UCL	5.852				95% Ja	ckknife UCL	6.197
820			95%	Standard B	Bootstrap UCL	5.698				95% Boo	tstrap-t UCL	6.062
821			(95% Hall's B	Bootstrap UCL	5.632			95%	Percentile Bo	otstrap UCL	5.767
822				95% BCA B	Bootstrap UCL	5.633						
823			90% CI	hebyshev(M	ean, Sd) UCL	7.116			95% C	hebyshev(Me	an, Sd) UCL	8.385
824			97.5% CI	hebyshev(M	ean, Sd) UCL	10.14			99% C	hebyshev(Me	an, Sd) UCL	13.6
825							1				•	
826						Suggested	UCL to Use					
827				95% St	udent's-t UCL	6.197						
828												
829	1	Note: Sugge			ection of a 95%						ate 95% UCL.	
830	<u> </u>				dations are bas	•					(22.2.2.	
831					upon the resu						, ,	
832	Ho	wever, sim	ulations resul	its will not co	over all Real W	oria data set	ts; for addition	nai insignt ti	ne user may	want to cons	ult a statisticia	in.
833		Noto: Eo	r highly nogo	tivoly skow	ed data, confi	donoo limite	(o.g. Chon	lohneon L	ognormal a	and Gamma) r	may not bo	
834		Note. Fo			Johnson's m						nay not be	
835			Tellable.	Onen s and	3011130113111	eulous provid	ue aujustinei	its for posit	very skewe	u uata sets.		
836 837												
838	Silver											
839												
840						General	Statistics					
841			Tota	I Number of	Observations	8			Numbe	er of Distinct C	Observations	8
842									Numbe	er of Missing C	Observations	0
843					Minimum	0.85					Mean	15.29
844					Maximum	45					Median	7.85
845					SD	16.03				Std. E	rror of Mean	5.669
846				Coefficie	nt of Variation	1.048					Skewness	1.031
847						0) 10 :		,				
848	1			-	small (e.g., <1	-			-			
849	1				TRC Tech Reg				-		•	
850	-				ou may want to be computed to	_			<u>-</u>	-		
851	-		Cilebysile	V OOL CAIL	oe compated t	asing the NO	ııparametric i	anu Ali UCI	L Ophions of	1 F1000L 3.1		
852	-					Normal C	OF Test					
853	1		ç	Shapiro Wilk	Test Statistic	0.856			Shapiro W	/ilk GOF Test		
854	-			-	Critical Value	0.818		Data appe		at 5% Signific		
855 856	1				Test Statistic	0.246		- 1- 15		GOF Test		
857	†		Ę	5% Lilliefors	Critical Value	0.283		Data appe		at 5% Signific	ance Level	
	1				Data appe	ar Normal at	∣ : 5% Significa					
XXX												
858 859	1				As	suming Norr	mal Distributi	on				
859	1		95% N	ormal UCL				95%	UCLs (Adj	usted for Ske	wness)	
	 											
859 860				95% St	udent's-t UCL	26.03			95% Adjust	ted-CLT UCL	(Chen-1995)	26.83
859 860 861				95% St	udent's-t UCL	26.03				ied-CLT UCL (ied-t UCL (Jol		26.83
859 860 861				95% St	udent's-t UCL	26.03			95% Adjust	ted-CLT UCL	(Chen-1995)	26.83

005	A B C D E	F Gamma	G H I J K L GOF Test
865 866	A-D Test Statistic	0.268	Anderson-Darling Gamma GOF Test
867	5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level
868	K-S Test Statistic	0.207	Kolmogorov-Smirnov Gamma GOF Test
869	5% K-S Critical Value	0.303	Detected data appear Gamma Distributed at 5% Significance Level
870	Detected data appear	r Gamma Di	stributed at 5% Significance Level
871			
872		Gamma	Statistics
873	k hat (MLE)	0.879	k star (bias corrected MLE) 0.633
874	Theta hat (MLE)	17.4	Theta star (bias corrected MLE) 24.17
875	nu hat (MLE)	14.06	nu star (bias corrected) 10.12
876	MLE Mean (bias corrected)	15.29	MLE Sd (bias corrected) 19.23
877			Approximate Chi Square Value (0.05) 4.019
878	Adjusted Level of Significance	0.0195	Adjusted Chi Square Value 3.106
879			
880		-	nma Distribution
881	95% Approximate Gamma UCL (use when n>=50))	38.52	95% Adjusted Gamma UCL (use when n<50) 49.84
882			10057
883	Observe Will. Total Obstation		I GOF Test
884	Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	0.954 0.818	Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level
885	Sinapiro Wilk Chucai Value Lilliefors Test Statistic	0.818	Lilliefors Lognormal GOF Test
886	5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level
887			at 5% Significance Level
888		Lognomiai	at 070 digitilibation E0701
889		Lognorma	Il Statistics
890 891	Minimum of Logged Data		Mean of logged Data 2.06
892	Maximum of Logged Data	3.807	SD of logged Data 1.379
893			
894	Assı	uming Logno	ormal Distribution
895	95% H-UCL	202.8	90% Chebyshev (MVUE) UCL 41.99
896	95% Chebyshev (MVUE) UCL	53.34	97.5% Chebyshev (MVUE) UCL 69.1
897	99% Chebyshev (MVUE) UCL	100.1	
898			
899	•		tion Free UCL Statistics
900	Data appear to follow a	Discernible	Distribution at 5% Significance Level
901			
902			tribution Free UCLs
903	95% CLT UCL	24.62	95% Jackknife UCL 26.03
904	95% Standard Bootstrap UCL	24.27	95% Bootstrap-t UCL 29.97
905	95% Hall's Bootstrap UCL	25.25	95% Percentile Bootstrap UCL 25.13
906	95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL	25.55 32.3	95% Chebyshev(Mean, Sd) UCL 40
907	90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL	50.7	95% Chebyshev(Mean, Sd) UCL 40 99% Chebyshev(Mean, Sd) UCL 71.7
908	97.3% Chebyshev(Iviedh, 5u) UCL	30.7	99 /0 Chebyshev(Medil, Su) UCL / 1.7
909		Sunnested	UCL to Use
910	95% Student's-t UCL	26.03	332.0.300
911			
912	Note: Suggestions regarding the selection of a 95%	UCL are pr	ovided to help the user to select the most appropriate 95% UCL.
913			a size, data distribution, and skewness.
914 915			nulation studies summarized in Singh, Maichle, and Lee (2006).
916	· · · · · · · · · · · · · · · · · · ·		ts; for additional insight the user may want to consult a statistician.
917			·
918			
J 10			

	A B C D E Vanadium		F	G	Н	I	J	K	L
919	vanadium								
920 921			General S	Statistics					
922	Total Number of Observati	tions	8			Numbe	er of Distinct	Observations	7
923						Numbe	er of Missing	Observations	0
924	Minin	num	3.3					Mean	19.26
925	Maxin	num	28					Median	22
926		SD	9.087				Std.	Error of Mean	3.213
927	Coefficient of Varia	ation	0.472					Skewness	-0.913
928		·	Į.					Į.	
929	Note: Sample size is small (e.g.	ı., < 10)), if data are	collected us	ing ISM a _l	pproach, yo	u should use)	
930	guidance provided in ITRC Tech	_		-	-			t.	
931	For example, you may wa		•			•	•		
932	Chebyshev UCL can be comput	ited us	ing the Nor	parametric a	nd All UC	L Options of	ProUCL 5.1		
933									
934			Normal G	OF Test					
935	Shapiro Wilk Test Stati		0.887			-	ilk GOF Tes		
936	5% Shapiro Wilk Critical Va		0.818		Data app		at 5% Signific	cance Level	
937	Lilliefors Test Stati		0.199		D-/		GOF Test		
938	5% Lilliefors Critical Va		0.283	E0/ 0::-		ear Normal a	at 5% Signific	cance Level	
939	Data a	appear	Normal at	5% Significar	ice Levei				
940		Λοοι	umina Norm	nal Distributio	<u> </u>				
941	95% Normal UCL	ASSU				LICLe (Adi	usted for Sk	ownoce)	
942	95% Student's-t U	IICI	25.35		95 /	• •		(Chen-1995)	23.44
943	35 / Student S-LC	OCL	20.00			•		ohnson-1978)	25.18
944						OO70 WIOGII	100 1 002 (00	71113011 1370)	20.10
945			Gamma G	OF Test					
946 947	A-D Test Stati	tistic	0.69		Ande	rson-Darling	g Gamma Go	OF Test	
948	5% A-D Critical Va	alue	0.721	Detected of				5% Significand	ce Level
949	K-S Test Stati	tistic	0.243				ov Gamma (
950	5% K-S Critical Va	alue	0.296	Detected of	data appea	ar Gamma D	istributed at	5% Significand	ce Level
951	Detected data ap	pear C	Gamma Dis	tributed at 5%	6 Significa	ance Level			
952									
953			Gamma S	Statistics					
954	k hat (M	ΛLE)	3.001			k	star (bias co	rrected MLE)	1.959
955	Theta hat (M	ΛLE)	6.42			Theta	star (bias co	rrected MLE)	9.834
956	nu hat (M	ΛLE)	48.01				,	as corrected)	31.34
957	MLE Mean (bias correc	cted)	19.26				,	as corrected)	13.76
958							•	Value (0.05)	19.55
959	Adjusted Level of Significa	ance	0.0195			A	djusted Chi	Square Value	17.23
960									
961	0.504			ma Distributio					
962	95% Approximate Gamma UCL (use when n>=	50))	30.88		95% Ad	djusted Gam	ma UCL (us	e when n<50)	35.03
963				0055					
964	OL LANGET CO.		Lognormal	GOF Test	OI.	mine \A#!!- !		Γ Tes⁴	
965	Shapiro Wilk Test Stati		0.776			-	gnormal GO		
966	5% Shapiro Wilk Critical Va		0.818 0.277			•	at 5% Signific		
967	Lilliefors Test Stati 5% Lilliefors Critical Va		0.277	-			ormal GOF		
968	5% Lillietors Critical Va						ı aı ၁% Signi	ficance Level	
969	Data appear A	φρισχι	mate roali	onnai at 370 S	ngi ililoano	JU LUVOI			
970			Lognormal	Statistics					
971	Minimum of Logged D		1.194				Mean o	f logged Data	2.782
972	Millimitani oi zoggod z						11.5411 0		, 02

072	A	В	С	D Maximum of	E Logged Data	F 3.332	G	Н	I	J K SD of logged Data	L 0.746
973 974						0.002				02 0. 10ggou 2 ata	
975					Assı	ıming Logno	rmal Distribut	tion			
976					95% H-UCL	47.4			90%	Chebyshev (MVUE) UCL	36.96
977			95	5% Chebyshev	(MVUE) UCL	44.42			97.5%	Chebyshev (MVUE) UCL	54.78
978			99	9% Chebyshev	(MVUE) UCL	75.13					
979											
980					Nonparame	etric Distribu	tion Free UCL	. Statistic	3		
981				Data appe	ar to follow a	Discernible I	Distribution at	5% Signi	ficance Leve	el	
982											
983							ribution Free	UCLs			
984					5% CLT UCL	24.55				95% Jackknife UCL	25.35
985			9	5% Standard B	•	24.31				95% Bootstrap-t UCL	24.38
986					ootstrap UCL	23.46			95%	Percentile Bootstrap UCL	23.88
987					ootstrap UCL	23.63					
988				Chebyshev(M	. ,	28.9				hebyshev(Mean, Sd) UCL	33.27
989			97.5%	Chebyshev(M	ean, Sa) UCL	39.33			99% C	hebyshev(Mean, Sd) UCL	51.23
990						Cuggostod	UCL to Use				
991				0E9/ C+	udent's-t UCL	25.35	UCL to Use				
992				95 /0 31	udeni s-i occ	25.55					
993		Note: Suga	estions rec	arding the sele	ection of a 95%	LICL are pro	ovided to help	the user t	n select the	most appropriate 95% UCL	
994	'	voic. Ougg		_	lations are bas		-				
995		These reco	ommendati							n, Maichle, and Lee (2006).	
996					•					want to consult a statisticia	an.
997 998	1.0						,	ao.g			
999		Note: Fo	r highly ne	gatively-skew	ed data, confi	dence limits	(e.g., Chen, J	ohnson, l	_ognormal, a	and Gamma) may not be	
1000			reliabl	e. Chen's and	Johnson's me	ethods provi	de adjustment	ts for posi	tvely skewe	d data sets.	
1001											
1002											
1003	Zinc										
1004											
1005						General	Statistics				
1006			To	otal Number of	Observations	8			Numbe	er of Distinct Observations	7
1007									Numbe	er of Missing Observations	0
1008					Minimum	19				Mean	98.63
1009					Maximum	190				Median	110
1010					SD	56.36				Std. Error of Mean	19.93
1011				Coefficier	nt of Variation	0.571				Skewness	0.058
1012			Nists C	ommis sies i	mall /s =	U/ it	a aallasta 1	ing IOI1	mmu	u abauld	
1013				ample size is s		·					
1014				e provided in IT			•	<u> </u>	·		
				or example, yo hev UCL can b							
1015			Chebys	OUGA OOF CAUL	oe compated t	asing the NO	прагаппеціс а	ina Ali UC	- opuons o	FIUUGE 8.1	
1016											
1016 1017						Normal (OF Teet				
1016 1017 1018				Shaniro Wilk	Test Statistic	Normal C	GOF Test		Shaniro W	/ilk GOF Test	
1016 1017 1018 1019			59	•	Test Statistic	0.961	GOF Test	Data and		/ilk GOF Test at 5% Significance Level	
1016 1017 1018 1019 1020			5%	% Shapiro Wilk		0.961 0.818	GOF Test	Data app	pear Normal	at 5% Significance Level	
1016 1017 1018 1019 1020 1021			5%	% Shapiro Wilk Lilliefors	Critical Value Test Statistic	0.961 0.818 0.205	GOF Test		bear Normal	at 5% Significance Level	
1016 1017 1018 1019 1020 1021 1022			59	% Shapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value	0.961 0.818 0.205 0.283		Data app	pear Normal Lilliefors Dear Normal	at 5% Significance Level	
1016 1017 1018 1019 1020 1021 1022 1023			5%	% Shapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value	0.961 0.818 0.205 0.283	GOF Test 5% Significal	Data app	pear Normal Lilliefors Dear Normal	at 5% Significance Level	
1016 1017 1018 1019 1020 1021 1022 1023 1024			59	% Shapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value Data appe	0.961 0.818 0.205 0.283 ar Normal at	5% Significat	Data app	pear Normal Lilliefors Dear Normal	at 5% Significance Level	
1016 1017 1018 1019 1020 1021 1022 1023				% Shapiro Wilk Lilliefors	Critical Value Test Statistic Critical Value Data appe	0.961 0.818 0.205 0.283 ar Normal at		Data app nce Level	pear Normal Lilliefors Dear Normal	at 5% Significance Level	

1027	Α	В		С	D 95% Stu	E dent's-t UCL	F 136.4	G	Н	I 95% Adjusted	J d-CLT UCL	K (Chen-1995)	L 131.8
1028										95% Modifie	d-t UCL (Jo	hnson-1978)	136.4
1029													
1030							Gamma	GOF Test					
1031						Test Statistic	0.381			erson-Darling			
1032						Critical Value	0.723	Detected		ear Gamma Dis		•	ce Level
1033						Test Statistic	0.275			ogorov-Smirno			
1034						Critical Value	0.297			ear Gamma Dis	stributed at	5% Significan	ce Level
1035					Detected	I data appea	r Gamma Di	stributed at 5	% Signific	ance Level			
1036							Gamma	Statistics					
1037						k hat (MLE)	2.554	Statistics		ks	tar (hias co	rrected MLE)	1.68
1038					The	ta hat (MLE)	38.61				`	rrected MLE)	58.71
1039						nu hat (MLE)	40.87			111010	•	as corrected)	26.88
1040 1041				ML		as corrected)	98.63				,	as corrected)	76.09
1041										Approximate	•	•	16.06
1042				Adjust	ted Level of	Significance	0.0195			Ad	justed Chi S	Square Value	13.98
1044													
1044						As	suming Gam	ma Distribut	ion				
1046	9	5% Approx	ximate	e Gamma	UCL (use w	hen n>=50))	165.1		95% A	Adjusted Gamm	a UCL (use	when n<50)	189.6
1047							l						
1048							Lognorma	I GOF Test					
1049					•	Test Statistic	0.893			apiro Wilk Logi			
1050				5% Sh		Critical Value	0.818			ear Lognormal a			
1051						Test Statistic	0.284			illiefors Logno			
1052				5%		Critical Value	0.283	=0/		t Lognormal at	5% Signific	ance Level	
1053					Data a	ippear Appro	ximate Logr	normal at 5%	Significan	ice Level			
1054							Lognormo	I Statistics					
1055					dinimum of I	Logged Data	2.944	ii Statistics			Moon of	logged Data	4.383
1056						Logged Data	5.247					logged Data	0.773
1057				141		Logged Data	0.247				00 01	logged Data	
1058						Assı	umina Loand	rmal Distribu	ution				
1059 1060						95% H-UCL	251.3			90% (Chebyshev ((MVUE) UCL	189.5
1061				95% C	hebyshev (MVUE) UCL	228.5				•	(MVUE) UCL	282.7
1062				99% (hebyshev (MVUE) UCL	389.1				<u> </u>		
1063							l	I .					
1064						Nonparame	etric Distribu	tion Free UC	L Statistic	s			
1065					Data appea	r to follow a	Discernible	Distribution a	nt 5% Sign	ificance Level			
1066													
1067		-		<u>-</u>				tribution Free	UCLs				
1068						5% CLT UCL	131.4					ackknife UCL	136.4
1069						ootstrap UCL	128.4					otstrap-t UCL	136.7
1070						ootstrap UCL	132.3			95% P	ercentile Bo	ootstrap UCL	128.8
1071						ootstrap UCL	129.9			050/ 01	alas en la acción de	on 04/1101	105.5
1072						an, Sd) UCL	158.4				, ,	ean, Sd) UCL	185.5
1073				77.5% CN6	bysnev(ivie	an, Sd) UCL	223.1			99% Cne	enysnev(IVI6	ean, Sd) UCL	296.9
1074							Suggested	UCL to Use					
1075					95% Stu	dent's-t UCL	136.4	201 10 036					
1076						45111.5-1.UOL	100.7						
1077	1	Note: Suga	estion	ns regardi	na the selec	ction of a 95%	6 UCL are nr	ovided to heli	p the user	to select the me	ost appropri	iate 95% UCI	
1078			,							, and skewness		00 /0 OOL	
1079 1080		These rec	comme				•			rized in Singh, I		d Lee (2006).	
IUOU										J ., .	,	,/-	

	Α	В	С	D	E	F	G	Н		J	K	L
1081	Но	wever, simul	ations result	s will not cov	er all Real W	orld data se	ts; for additio	nal insight th	ie user may v	want to cons	ult a statistici	an.
1082												

	A B C	D E	F	G H I J K Pensored Full Data Sets	L
1		OCL Statis	ucs for Office	erisoreu Fuli Data Sets	
2	User Selected Option	ne			
3	Date/Time of Computation		·51·48 AM		
4	From File			lue e.xls	
5 6	Full Precision				
7	Confidence Coefficient				
8	Number of Bootstrap Operations	s 2000			
9					
10			-		
	Antimony				
12					
13			General	Statistics	
14	Tot	tal Number of Observations	6	Number of Distinct Observations	6
15				Number of Missing Observations	9
16		Minimum	27	Mean	58.67
17		Maximum	95	Median	55.5
18		SD	32.96	Std. Error of Mean	13.46
19		Coefficient of Variation	0.562	Skewness	0.0889
20					
21				e collected using ISM approach, you should use	
22	-			SM (ITRC, 2012) to compute statistics of interest.	
23			-	shev UCL to estimate EPC (ITRC, 2012).	
24	Chebysh	ev UCL can be computed u	sing the No	nparametric and All UCL Options of ProUCL 5.1	
25			Name of C	205 T	
26		Shapiro Wilk Test Statistic	Normal C 0.79	Shapiro Wilk GOF Test	
27	50/-	Shapiro Wilk Critical Value	0.79	Data appear Normal at 5% Significance Level	
28	5 /6	Lilliefors Test Statistic	0.788	Lilliefors GOF Test	
29		5% Lilliefors Critical Value	0.325	Data appear Normal at 5% Significance Level	
30				5% Significance Level	
31					
32 33		Ass	suming Norr	nal Distribution	
34	95%	Normal UCL		95% UCLs (Adjusted for Skewness)	
35		95% Student's-t UCL	85.78	95% Adjusted-CLT UCL (Chen-1995)	81.32
36				95% Modified-t UCL (Johnson-1978)	85.87
37				·	
38			Gamma (GOF Test	
39		A-D Test Statistic	0.729	Anderson-Darling Gamma GOF Test	
40		5% A-D Critical Value	0.701	Data Not Gamma Distributed at 5% Significance Leve	:I
41		K-S Test Statistic	0.299	Kolmogorov-Smirnov Gamma GOF Test	
42		5% K-S Critical Value	0.334	Detected data appear Gamma Distributed at 5% Significance	e Level
43		Detected data follow App	or. Gamma I	Distribution at 5% Significance Level	
44					
45			Gamma		
46		k hat (MLE)	3.479	k star (bias corrected MLE)	1.851
47		Theta hat (MLE)	16.86	Theta star (bias corrected MLE)	31.7
48		nu hat (MLE)	41.75	nu star (bias corrected)	22.21
49		MLE Mean (bias corrected)	58.67	MLE Sd (bias corrected)	43.12
50			0.0400	Approximate Chi Square Value (0.05)	12.49
51	Adj	justed Level of Significance	0.0122	Adjusted Chi Square Value	9.968
52				Distribution	
53	000/ 4			ma Distribution	120.7
54	95% Approximate Gamr	ma UCL (use when n>=50))	104.3	95% Adjusted Gamma UCL (use when n<50)	130.7

	Α	В	С	D	E	F	G	Н	I	J	K	L
55						Lognorm	al GOF Test					
56 57				Shapiro Wil	lk Test Statisti		100.	Sha	piro Wilk Lo	ognormal GOF	Test	
58				•	k Critical Valu				-	at 5% Significa		
59				Lilliefor	s Test Statisti	c 0.27				normal GOF Te		
60			Ę	5% Lilliefor:	s Critical Valu	e 0.325		Data appea	ar Lognorm	al at 5% Signific	ance Level	
61				Data	a appear App	roximate Lo	gnormal at 5%	Significand	ce Level			
62												
63						Lognorm	nal Statistics					
64				Minimum o	of Logged Dat	a 3.296				Mean of lo	ogged Data	3.921
65				Maximum o	of Logged Dat	a 4.554				SD of lo	ogged Data	0.616
66											1	
67					As	suming Log	normal Distrib	ution				
68					95% H-UC	L 136.8			90%	6 Chebyshev (M	IVUE) UCL	103.2
69				•	v (MVUE) UC				97.5%	6 Chebyshev (M	IVUE) UCL	151
70			99%	Chebyshe	v (MVUE) UC	L 205.7						
71												
72					· •		oution Free UC					
73				Data app	ear to follow	a Discernible	Distribution a	at 5% Signif	ficance Lev	el		
74												
75					_		istribution Free	e UCLs				
76					95% CLT UC						kknife UCL	85.78
77					Bootstrap UC				0.50		strap-t UCL	92.1
78					Bootstrap UC				95%	Percentile Boo	otstrap UCL	79.17
79					Bootstrap UC				050/ (N. I. /A.A.	0 1) 1101	447.0
80					Mean, Sd) UC					Chebyshev(Mea	,	117.3
81			97.5% CI	nebysnev(i	Mean, Sd) UC	L 142.7			99% (Chebyshev(Mea	in, Sa) UCL	192.6
82						Suggeste	d UCL to Use					
83				Q5% S	Student's-t UC							
84				95% 5		05.76						
85		Note: Sugge	etione regar	ding the se	lection of a 9F	% IICL are	provided to hel	n the user to	n select the	most appropria	to 95% LICI	
86							ata size, data d					
87		These reco				•				h, Maichle, and	Lee (2006).	
88 89	Н				-					y want to consu	. ,	an.
90										,		
91												
-	Arsenic											
93												
94						Genera	al Statistics					
95			Tota	l Number o	of Observation	s 15			Numb	er of Distinct Ob	bservations	15
96									Numb	er of Missing Ol	bservations	0
97					Minimur	n 65					Mean	13789
98					Maximur	n 90189					Median	1833
99					S	23482				Std. En	ror of Mean	6063
100				Coefficie	ent of Variatio	n 1.703					Skewness	2.778
101											I	
102							GOF Test					
103			5	Shapiro Wil	lk Test Statisti	c 0.625			Shapiro V	Vilk GOF Test		
104			5% S	Shapiro Will	k Critical Valu			Data No	ot Normal a	t 5% Significand	ce Level	
105				Lilliefor	rs Test Statisti	c 0.279			Lilliefor	s GOF Test		
106				5% Lilliefors	s Critical Valu				ot Normal a	t 5% Significand	ce Level	
107					Data N	ot Normal at	5% Significar	nce Level				
108												
	_	_							_			

109	Α	В	С	D	E As	F suming Norr	G mal Distribution	Н	I	J	K	L
110			95% No	rmal UCL				95% U	CLs (Adju	sted for S	kewness)	
111				95% Stu	dent's-t UCL	24468		95	% Adjuste	d-CLT UC	CL (Chen-1995)	28408
112								9:	5% Modific	ed-t UCL ((Johnson-1978)	25193
113							<u> </u>					
114						Gamma	GOF Test					
115				A-D T	Test Statistic	0.402		Anderso	on-Darling	Gamma (GOF Test	
116				5% A-D C	Critical Value	0.809	Detected da	ata appear (Gamma Di	stributed a	at 5% Significa	nce Level
117				K-S	Test Statistic	0.205		Kolmogor	ov-Smirno	v Gamma	GOF Test	
118				5% K-S C	Critical Value	0.236	Detected da	ata appear (Gamma Di	stributed a	at 5% Significa	nce Level
119				Detected	data appea	r Gamma Di	stributed at 5% \$	Significanc	e Level			
120												
121						Gamma	Statistics					
122					k hat (MLE)	0.423			k:	star (bias	corrected MLE)	0.383
123				The	ta hat (MLE)	32577			Theta	star (bias	corrected MLE)	35997
124				r	nu hat (MLE)	12.7				nu star ((bias corrected)	11.49
125			ML	E Mean (bia	s corrected)	13789				MLE Sd ((bias corrected)	22280
126						1		Ap	proximate	Chi Squa	are Value (0.05)	4.895
127			Adjus	ted Level of	Significance	0.0324			Ad	djusted Ch	ni Square Value	4.376
128												
129					As	suming Gam	ma Distribution	i				
130		35% Approxim	mate Gamma	UCL (use v	vhen n>=50)	32378		95% Adjus	sted Gamr	na UCL (ι	use when n<50)	36217
131						I						
132						Lognorma	I GOF Test					
133			Sh	napiro Wilk 1	Test Statistic	0.949		Shapiro	o Wilk Log	normal G	OF Test	
134			5% Sh	apiro Wilk C	Critical Value	0.881	Da	ata appear L	ognormal	at 5% Sig	nificance Leve	
135				Lilliefors	Test Statistic	0.168		Lillie	fors Logno	ormal GO	F Test	
136			59	% Lilliefors C	Critical Value	0.22	Da	ata appear L	ognormal	at 5% Sig	nificance Leve	
137					Data appear	Lognormal	at 5% Significan	nce Level				
138												
139							l Statistics					
140					_ogged Data	4.174					of logged Data	
141			N	laximum of l	_ogged Data	11.41				SD	of logged Data	2.169
142												
143							ormal Distribution	n				
144					95% H-UCL					•	ev (MVUE) UCL	
145				• •	MVUE) UCL				97.5%	Chebyshe	ev (MVUE) UCL	105310
146			99% (Chebyshev (MVUE) UCL	155290						
147												
148					<u>-</u>		tion Free UCL S					
149				Data appea	r to follow a	Discernible	Distribution at 5°	% Significa	nce Level			
150												
151					-		tribution Free U	CLS		2=2:	1 1) 1/2 116:	04400
152					5% CLT UCL						Jackknife UCL	
153					otstrap UCL						Bootstrap-t UCL	
154					otstrap UCL				95%	-ercentile	Bootstrap UCL	24951
155					ootstrap UCL				050/ 61	// -ا	Maan 0-1/1101	40017
156				•	an, Sd) UCL					• •	Mean, Sd) UCL	
157			97.5% Che	ebysnev(Me	an, Sd) UCL	51652			99% Ch	ebysnev(Mean, Sd) UCL	. /4115
158						0	HOL 4- 11:					
159				/ A alt 1.5	Damer - 1101		UCL to Use					
160			95%	% Adjusted (Gamma UCL	36217						
161 162	1	Note: Sugges	stions regardi	ng the selec	tion of a 95%	UCL are pr	ovided to help th	ne user to se	elect the m	nost appro	priate 95% UC	L.
- 1												

	A B C D E	F	G H I J K L
163			a size, data distribution, and skewness. ulation studies summarized in Singh, Maichle, and Lee (2006).
164			s; for additional insight the user may want to consult a statistician.
165	However, Simulations results will not cover all freal W	ond data set	s, for additional insignt the user may want to consult a statistician.
166			
167	Chromium		
100	Onionium		
169		General	Statistics
170	Total Number of Observations	7	Number of Distinct Observations 6
171	Total Number of Observations	•	Number of Missing Observations 8
172	Minimum	23	Mean 34
173	Maximum	46	Median 33
174	SD	7.895	Std. Error of Mean 2.984
175	Coefficient of Variation	0.232	Skewness 0.24
176			
177	Note: Sample size is small (e.g., <1	0), if data are	e collected using ISM approach, you should use
178		•	SM (ITRC, 2012) to compute statistics of interest.
179			shev UCL to estimate EPC (ITRC, 2012).
180 181		-	parametric and All UCL Options of ProUCL 5.1
182	,		
183		Normal C	OF Test
184	Shapiro Wilk Test Statistic	0.975	Shapiro Wilk GOF Test
185	5% Shapiro Wilk Critical Value	0.803	Data appear Normal at 5% Significance Level
186	Lilliefors Test Statistic	0.165	Lilliefors GOF Test
187	5% Lilliefors Critical Value	0.304	Data appear Normal at 5% Significance Level
188	Data appe	ar Normal at	5% Significance Level
189			·
190	As	suming Norr	nal Distribution
191	95% Normal UCL		95% UCLs (Adjusted for Skewness)
192	95% Student's-t UCL	39.8	95% Adjusted-CLT UCL (Chen-1995) 39.2
193			95% Modified-t UCL (Johnson-1978) 39.84
194			,
195		Gamma (GOF Test
196	A-D Test Statistic	0.19	Anderson-Darling Gamma GOF Test
197	5% A-D Critical Value	0.707	Detected data appear Gamma Distributed at 5% Significance Level
198	K-S Test Statistic	0.169	Kolmogorov-Smirnov Gamma GOF Test
199	5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level
200	Detected data appear	Gamma Dis	tributed at 5% Significance Level
201			
202		Gamma	
203	k hat (MLE)	21.4	k star (bias corrected MLE) 12.33
204	Theta hat (MLE)	1.589	Theta star (bias corrected MLE) 2.758
205	nu hat (MLE)	299.6	nu star (bias corrected) 172.6
206	MLE Mean (bias corrected)	34	MLE Sd (bias corrected) 9.684
200	,		Approximate Chi Square Value (0.05) 143.2
	Adjusted Level of Significance	0.0158	Adjusted Chi Square Value 135.1
207 208	Adjusted Level of Significance		
207 208 209 210	Adjusted Level of Significance	suming Gam	ma Distribution
207 208 209 210	Adjusted Level of Significance		
207 208 209 210 211	Adjusted Level of Significance	suming Gam 40.98	ma Distribution 95% Adjusted Gamma UCL (use when n<50) 43.43
207	Adjusted Level of Significance Ass 95% Approximate Gamma UCL (use when n>=50))	suming Gam 40.98 Lognormal	ma Distribution 95% Adjusted Gamma UCL (use when n<50) 43.43 GOF Test
207 208 209 210 211 212 213 214	Adjusted Level of Significance Ass 95% Approximate Gamma UCL (use when n>=50)) Shapiro Wilk Test Statistic	suming Gam 40.98 Lognormal 0.977	ma Distribution 95% Adjusted Gamma UCL (use when n<50) 43.43 GOF Test Shapiro Wilk Lognormal GOF Test
207 208 209 210 211 212 213	Adjusted Level of Significance Ass 95% Approximate Gamma UCL (use when n>=50))	suming Gam 40.98 Lognormal	ma Distribution 95% Adjusted Gamma UCL (use when n<50) 43.43 GOF Test

217	Α	В		C	D 5% Lilliefors C	E Critical Value	F 0.304	G	H Data appea	l r Lognormal	J at 5% Signifi	K cance Level	L
218						Data appear	Lognormal	at 5% Signific	cance Leve	l			
219													
220							Lognorma	I Statistics					
221					Minimum of I	Logged Data	3.135				Mean of	logged Data	3.503
222					Maximum of I	Logged Data	3.829				SD of	logged Data	0.236
223							1	1				ļ	
224						Assı	ıming Logno	ormal Distribu	ition				
225						95% H-UCL	41.63			90%	Chebyshev (MVUE) UCL	43.12
226				95%	Chebyshev (MVUE) UCL	47.25			97.5%	Chebyshev (MVUE) UCL	52.97
227				99%	Chebyshev (MVUE) UCL	64.22						
228							1					ļ.	
229						Nonparame	tric Distribu	tion Free UC	L Statistics				
230					Data appea	r to follow a	Discernible I	Distribution a	t 5% Signifi	cance Leve	1		
231													
232						Nonpa	rametric Dis	tribution Free	UCLs				
233					95	5% CLT UCL	38.91				95% Ja	ckknife UCL	39.8
234				95%	Standard Bo	ootstrap UCL	38.51				95% Boo	tstrap-t UCL	40.37
235				(95% Hall's Bo	ootstrap UCL	39.99			95%	Percentile Bo	otstrap UCL	38.71
236					95% BCA Bo	ootstrap UCL	38.29						
237				90% C	hebyshev(Me	an, Sd) UCL	42.95			95% Cł	nebyshev(Me	an, Sd) UCL	47.01
238			!	97.5% CI	hebyshev(Me	an, Sd) UCL	52.64			99% Cł	nebyshev(Me	an, Sd) UCL	63.69
239													
240							Suggested	UCL to Use					
241					95% Stu	dent's-t UCL	39.8						
242													
243		Note: Sugg	jestio	ns regar	ding the selec	ction of a 95%	UCL are pr	ovided to help	the user to	select the n	nost appropri	ate 95% UCL	
244					Recommenda	ations are bas	sed upon dat	a size, data d	listribution, a	and skewnes	SS.		
245		These rec	omm	endation	s are based u	upon the resu	Its of the sim	nulation studie	es summariz	zed in Singh,	Maichle, and	d Lee (2006).	
246	I	However, sim	nulatio	ons resul	Its will not cov	er all Real W	orld data se	ts; for addition	nal insight th	ne user may	want to cons	ult a statisticia	an.
247													
248													
	Copper						-	-	-				
250													
251							General	Statistics					
252				Tota	I Number of C	Observations	10			Numbe	r of Distinct C	bservations	9
253										Number	r of Missing C	bservations	3
254						Minimum	7					Mean	25.2
255						Maximum	76					Median	18
256						SD	21.42				Std. E	rror of Mean	6.774
257					Coefficient	t of Variation	0.85					Skewness	1.701
258							<u>!</u>	1					
259							Normal (GOF Test					
260					Shapiro Wilk 7	Test Statistic	0.82			Shapiro Wi	lk GOF Test		
261				5% S	Shapiro Wilk C	Critical Value	0.842		Data No	t Normal at	5% Significar	ice Level	
262					Lilliefors	Test Statistic	0.204			Lilliefors	GOF Test		
263				Ę	5% Lilliefors C	Critical Value	0.262		Data appe	ear Normal a	t 5% Significa	ance Level	
264					Data	appear App	roximate No	rmal at 5% S	ignificance	Level			
265													
266						As	suming Nor	mal Distributi	on				
267				95% N	ormal UCL					UCLs (Adju	sted for Ske	wness)	
268					95% Stu	dent's-t UCL	37.62				ed-CLT UCL (40.23
269							1				ed-t UCL (Jol		38.22
270							<u> </u>				•		
∠ /U													

271	A B C D E	F Gamma (G H I J K L GOF Test
272	A-D Test Statistic	0.277	Anderson-Darling Gamma GOF Test
273	5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level
274	K-S Test Statistic	0.159	Kolmogorov-Smirnov Gamma GOF Test
275	5% K-S Critical Value	0.27	Detected data appear Gamma Distributed at 5% Significance Level
276	Detected data appear	Gamma Di	stributed at 5% Significance Level
277			
278		Gamma	Statistics
279	k hat (MLE)	1.916	k star (bias corrected MLE) 1.408
280	Theta hat (MLE)	13.15	Theta star (bias corrected MLE) 17.9
281	nu hat (MLE)	38.32	nu star (bias corrected) 28.16
282	MLE Mean (bias corrected)	25.2	MLE Sd (bias corrected) 21.24
283			Approximate Chi Square Value (0.05) 17.05
284	Adjusted Level of Significance	0.0267	Adjusted Chi Square Value 15.57
285			
286			ma Distribution
287	95% Approximate Gamma UCL (use when n>=50))	41.61	95% Adjusted Gamma UCL (use when n<50) 45.58
288			0057
289	Objective Mills Took Obstication		GOF Test
290	Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	0.962 0.842	Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level
291	5% Snapiro Wilk Critical Value Lilliefors Test Statistic		Lilliefors Lognormal GOF Test
292	5% Lilliefors Critical Value	0.118	Data appear Lognormal at 5% Significance Level
293			at 5% Significance Level
294		Lognorman	2 0 % Olgrimodrico Ecror
295		Lognorma	Statistics
296	Minimum of Logged Data	<u> </u>	Mean of logged Data 2.944
297 298	Maximum of Logged Data		SD of logged Data 0.782
299			
300	Assı	ıming Logno	rmal Distribution
301	95% H-UCL	51.84	90% Chebyshev (MVUE) UCL 43.96
302	95% Chebyshev (MVUE) UCL	52.62	97.5% Chebyshev (MVUE) UCL 64.63
303	99% Chebyshev (MVUE) UCL	88.24	
304			
305	Nonparame	tric Distribu	tion Free UCL Statistics
306	Data appear to follow a I	Discernible I	Distribution at 5% Significance Level
307			
308	•		tribution Free UCLs
309	95% CLT UCL		95% Jackknife UCL 37.62
310	95% Standard Bootstrap UCL	35.85	95% Bootstrap-t UCL 47.3
311	95% Hall's Bootstrap UCL	88.61	95% Percentile Bootstrap UCL 36.8
312	95% BCA Bootstrap UCL	39.9	050/ Ohahirahai/Maari 04/1101 54/70
313	90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL	45.52 67.5	95% Chebyshev(Mean, Sd) UCL 54.73 99% Chebyshev(Mean, Sd) UCL 92.6
314	97.5% Chebysnev(Mean, Sd) UCL	07.5	99% Chebysnev(Mean, 50) UCL 92.6
315		Suggested	LICL to Use
316	95% Student's-t UCL	37.62	501 to 536
317	30 /o Gludent 5-t OCL	37.02	
318	When a data set follows an approx	imate (e.a. r	normal) distribution passing one of the GOF test
319		, •	distribution (e.g., gamma) passing both GOF tests in ProUCL
320			
321	Note: Suggestions regarding the selection of a 95%	UCL are pr	ovided to help the user to select the most appropriate 95% UCL.
322 323			a size, data distribution, and skewness.
324		•	ulation studies summarized in Singh, Maichle, and Lee (2006).
UZ#	· ·		- ' '

Detail Committee Committ	325	A B C D E However, simulations results will not cover all Real V	F World data se	G ets; for addition	H onal insight th	l ne user may	J want to consu	K ult a statisticia	L an.
		<u> </u>							
		Lead							
Total Number of Observations 15									
Total Number of Observations 15			General	Statistics					
Number of Missing Observations 0 1303 1303 1304 1305		Total Number of Observations	15			Number	of Distinct O	bservations	15
Maximum September Mean 1360 Maximum September Mean 1360 Maximum September Septem						Number	of Missing O	bservations	0
Maximum 9996 Median 874	-	Minimum	n 8					Mean	1360
State		Maximum	n 6956					Median	874
Normal GOF Test	335	SC	1812				Std. Er	rror of Mean	467.8
Normal GOF Test	336	Coefficient of Variation	1.332					Skewness	2.358
Shapiro Wilk Test Statistic 0.728	337			'					
Shapiro Wilk Fest Salatistic 0.728	338		Normal (GOF Test					
	339	Shapiro Wilk Test Statistic	0.728			-			
	340	5% Shapiro Wilk Critical Value	0.881		Data No	t Normal at 5	5% Significan	ce Level	
Data Not Normal at 5% Significance Level	341								
	342					t Normal at 5	5% Significan	ce Level	
Assuming Normal Distribution S5% Normal UCL S5% Normal UCL S5% UCLs (Adjusted for Skewness) 2434 248 95% Adjusted-CLT UCL (Chen-1995) 2434 248 95% Adjusted-CLT UCL (Chen-1995) 2434 248 95% Modified-t UCL (Johnson-1978) 2231 2231 248 248 95% Modified-t UCL (Johnson-1978) 2231 2231 248 95% Modified-t UCL (Johnson-1978) 2231 2231 2350	343	Data No	ot Normal at 5	5% Significa	nce Level				
	344								
	345		ssuming Nor	mal Distribu					
	346								
	347	95% Student's-t UCL	2184			•	,	,	
Samma GOF Test	348					95% Modifie	ed-t UCL (Joh	nson-1978)	2231
A-D Test Statistic 0.16	349								
Section Sec	350			GOF Test					
Section Sect	351								
Section Sec	352			Detecte				-	ce Level
Detected data appear Gamma Distributed at 5% Significance Level 356	353			D					
Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same Statistics Same	354						stributed at 5	% Significan	ce Level
Sama Statistics Sama Sama Statistics Sama 355	Detected data appea	ar Gamma Di	stributed at	5% Significar	nce Level				
Sas	356		Camma	Ctatiatias					
Theta hat (MLE) 2312 Theta star (bias corrected MLE) 2640 360 nu hat (MLE) 17.65 nu star (bias corrected 15.45 361 MLE Mean (bias corrected) 1360 MLE Sd (bias corrected) 1895 362 Approximate Chi Square Value (0.05) 7.577 363 Adjusted Level of Significance 0.0324 Adjusted Chi Square Value 6.907 364 365 Assuming Gamma Distribution 366 95% Approximate Gamma UCL (use when n>=50) 2773 95% Adjusted Gamma UCL (use when n<50) 3042 367 368 Lognormal GOF Test 370 Shapiro Wilk Test Statistic 0.941 Shapiro Wilk Lognormal GOF Test 370 5% Shapiro Wilk Critical Value 0.881 Data appear Lognormal at 5% Significance Level 371 Lilliefors Test Statistic 0.161 Lilliefors Lognormal GOF Test 372 5% Lilliefors Critical Value 0.22 Data appear Lognormal at 5% Significance Level 373 Data appear Lognormal at 5% Significance Level 374 Shapiro Wilk Critical Value 0.22 Data appear Lognormal at 5% Significance Level 374 Shapiro Wilk Critical Value 0.22 Data appear Lognormal at 5% Significance Level 375 Data appear Lognormal at 5% Significance Level 376 Maximum of Logged Data 2.079 Mean of logged Data 6.162 377 Maximum of Logged Data 8.847 SD of logged Data 1.876 377 377 378 384		k hat /MI E		Statistics		le e	star (bias sar	rooted MLEV	0.515
17.65 Nu star (bias corrected) 15.45			,				`		
MLE Mean (bias corrected) 1360 MLE Sd (bias corrected) 1895				-		i ileid s	•		
Approximate Chi Square Value (0.05) 7.577		•	*				•		
Adjusted Level of Significance		mean (bias corrected)	, .500		-	Approximate	•		
Assuming Gamma Distribution		Adjusted Level of Significance	0.0324				•	` ,	
Assuming Gamma Distribution 366 95% Approximate Gamma UCL (use when n>=50) 2773 95% Adjusted Gamma UCL (use when n<50)		.,		1		- 1			
95% Approximate Gamma UCL (use when n>=50) 2773 95% Adjusted Gamma UCL (use when n<50) 3042		A:	ssuming Gam	nma Distribu	ıtion				
Lognormal GOF Test				T		justed Gamr	na UCL (use	when n<50)	3042
Shapiro Wilk Test Statistic 0.941 Shapiro Wilk Lognormal GOF Test Shapiro Wilk Critical Value 0.881 Data appear Lognormal at 5% Significance Level Lilliefors Test Statistic 0.161 Lilliefors Lognormal GOF Test Shapiro Wilk Critical Value 0.881 Data appear Lognormal GOF Test Lilliefors Lognormal GOF Test Shapiro Wilk Critical Value 0.22 Data appear Lognormal at 5% Significance Level Data appear Lognormal at 5% Significance Level Lognormal Statistics Minimum of Logged Data 2.079 Mean of logged Data 6.162 Maximum of Logged Data 8.847 SD of logged Data 1.876		•		1			`	/	
Shapiro Wilk Test Statistic 0.941 Shapiro Wilk Lognormal GOF Test 5% Shapiro Wilk Critical Value 0.881 Data appear Lognormal at 5% Significance Level Lilliefors Test Statistic 0.161 Lilliefors Lognormal GOF Test 5% Lilliefors Critical Value 0.22 Data appear Lognormal at 5% Significance Level Data appear Lognormal at 5% Significance Level Lognormal Statistics Minimum of Logged Data 2.079 Mean of logged Data 6.162 Maximum of Logged Data 8.847 SD of logged Data 1.876			Lognorma	I GOF Test					
3705% Shapiro Wilk Critical Value0.881Data appear Lognormal at 5% Significance Level371Lilliefors Test Statistic0.161Lilliefors Lognormal GOF Test3725% Lilliefors Critical Value0.22Data appear Lognormal at 5% Significance Level373Data appear Lognormal at 5% Significance Level374Lognormal Statistics375Mean of logged Data6.162376Maximum of Logged Data2.079Mean of logged Data6.162377Maximum of Logged Data8.847SD of logged Data1.876		Shapiro Wilk Test Statistic	0.941		Shap	iro Wilk Log	normal GOF	Test	
371 Lilliefors Test Statistic 0.161 Lilliefors Lognormal GOF Test 372 5% Lilliefors Critical Value 0.22 Data appear Lognormal at 5% Significance Level 373 Data appear Lognormal at 5% Significance Level 374 375 Lognormal Statistics 376 Minimum of Logged Data 2.079 Mean of logged Data 6.162 377 Maximum of Logged Data 8.847 SD of logged Data 1.876	370	5% Shapiro Wilk Critical Value	0.881		Data appea	r Lognormal	at 5% Signific	cance Level	
3725% Lilliefors Critical Value0.22Data appear Lognormal at 5% Significance Level373374375376Minimum of Logged Data2.079Mean of logged Data6.162377Maximum of Logged Data8.847SD of logged Data1.876	371	Lilliefors Test Statistic	0.161		Lill	iefors Logno	ormal GOF To	est	
Data appear Lognormal at 5% Significance Level Lognormal Statistics Winimum of Logged Data 2.079 Mean of logged Data 6.162 377 Maximum of Logged Data 8.847 SD of logged Data 1.876	372	5% Lilliefors Critical Value	0.22		Data appea	r Lognormal	at 5% Signific	cance Level	
374 Lognormal Statistics 376 Minimum of Logged Data 2.079 Mean of logged Data 6.162 377 Maximum of Logged Data 8.847 SD of logged Data 1.876	373	Data appea	r Lognormal	at 5% Signi	ficance Level				
Lognormal Statistics376Minimum of Logged Data2.079Mean of logged Data6.162377Maximum of Logged Data8.847SD of logged Data1.876	374								
Minimum of Logged Data 2.079 Mean of logged Data 6.162 Maximum of Logged Data 8.847 SD of logged Data 1.876	375		Lognorma	al Statistics					
Maximum of Logged Data 8.847 SD of logged Data 1.876	376								6.162
	377	Maximum of Logged Data	8.847				SD of I	logged Data	1.876
	378								

379	A B C D E Assu	F uming Logno	G H I J K Dormal Distribution	L
380	95% H-UCL	24048	90% Chebyshev (MVUE) UCL	5710
381	95% Chebyshev (MVUE) UCL	7329	97.5% Chebyshev (MVUE) UCL	9576
382	99% Chebyshev (MVUE) UCL	13991		
383				
384	Nonparame	tric Distribu	tion Free UCL Statistics	
385	Data appear to follow a l	Discernible	Distribution at 5% Significance Level	
386	·		<u> </u>	
387	Nonpar	rametric Dis	stribution Free UCLs	
388	95% CLT UCL	2129	95% Jackknife UCL	2184
389	95% Standard Bootstrap UCL	2105	95% Bootstrap-t UCL	2925
390	95% Hall's Bootstrap UCL	5542	95% Percentile Bootstrap UCL	2162
391	95% BCA Bootstrap UCL	2337		
392	90% Chebyshev(Mean, Sd) UCL	2763	95% Chebyshev(Mean, Sd) UCL	3399
393	97.5% Chebyshev(Mean, Sd) UCL	4281	99% Chebyshev(Mean, Sd) UCL	6014
394		1	1	
395	_	Suggested	UCL to Use	
396	95% Adjusted Gamma UCL	3042		
397		-	1	
398	Note: Suggestions regarding the selection of a 95%	UCL are pr	rovided to help the user to select the most appropriate 95% UCL.	
399	Recommendations are bas	sed upon dat	ta size, data distribution, and skewness.	
400	These recommendations are based upon the result	Its of the sim	nulation studies summarized in Singh, Maichle, and Lee (2006).	
401	However, simulations results will not cover all Real W	orld data se	ets; for additional insight the user may want to consult a statisticia	ın.
402				
403				
	Mercury			
405				
406		General	Statistics	
407	Total Number of Observations	13	Number of Distinct Observations	13
408			Number of Missing Observations	2
409	Minimum	6	Mean	205.5
410	Maximum	1458	Median	19
411	SD	423	Std. Error of Mean	117.3
412	Coefficient of Variation	2.059	Skewness	2.625
413				
414		Normal (GOF Test	
415	Shapiro Wilk Test Statistic	0.554	Shapiro Wilk GOF Test	
416	5% Shapiro Wilk Critical Value	0.866	Data Not Normal at 5% Significance Level	
417	Lilliefors Test Statistic	0.36	Lilliefors GOF Test	
418	5% Lilliefors Critical Value	0.234	Data Not Normal at 5% Significance Level	
419	Data Not	Normal at 5	5% Significance Level	
420				
421	Ass	suming Norr	mal Distribution	
422	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
423	95% Student's-t UCL	414.6	95% Adjusted-CLT UCL (Chen-1995)	489.7
424			95% Modified-t UCL (Johnson-1978)	428.8
425				
426			GOF Test	
427	A-D Test Statistic		Anderson-Darling Gamma GOF Test	
428	5% A-D Critical Value	0.812	Data Not Gamma Distributed at 5% Significance Leve	el
429	K-S Test Statistic		Kolmogorov-Smirnov Gamma GOF Test	
430	5% K-S Critical Value		Data Not Gamma Distributed at 5% Significance Leve	el
431	Data Not Gamr	na Distribute	ed at 5% Significance Level	
432				

400	A B C D E	F Gamma	G Statistics	Н	I	J	K	L
433	k hat (MLE)	0.388			k	star (bias cor	rected MLE)	0.35
434	Theta hat (MLE)					star (bias cor	,	587.6
435	nu hat (MLE)	10.09			111010	•	s corrected)	9.092
436	MLE Mean (bias corrected)	205.5				MLE Sd (bia	,	347.4
437	inize mean (blue echieusea)	200.0			Annroximate	Chi Square	-	3.383
438	Adjusted Level of Significance	0.0301		•		djusted Chi S	` ′	2.905
439	,					-,	4.0.0	
440 441	As	sumina Gam	nma Distribu	ion				
442	95% Approximate Gamma UCL (use when n>=50))	552.3			justed Gamı	ma UCL (use	when n<50)	643.1
443	,,					•		
444		Lognorma	I GOF Test					
445	Shapiro Wilk Test Statistic	0.859		Shap	oiro Wilk Log	gnormal GOF	Test	
446	5% Shapiro Wilk Critical Value	0.866		Data Not I	Lognormal a	t 5% Significa	ance Level	
447	Lilliefors Test Statistic	0.239		Lill	liefors Logn	ormal GOF T	est	
448	5% Lilliefors Critical Value	0.234		Data Not I	Lognormal a	t 5% Significa	ance Level	
449	Data Not L	.ognormal at	t 5% Signific	ance Level				
450			· · · · · · · · · · · · · · · · · · ·					
451		Lognorma	I Statistics					
452	Minimum of Logged Data	1.792				Mean of	logged Data	3.621
453	Maximum of Logged Data	7.285				SD of	logged Data	1.833
454								
455	Assi	uming Logno	ormal Distrib	ution				
456	95% H-UCL	2065			90%	Chebyshev (MVUE) UCL	414.1
457	95% Chebyshev (MVUE) UCL	532.2			97.5%	Chebyshev (MVUE) UCL	696.1
458	99% Chebyshev (MVUE) UCL	1018						
459								
460	Nonparame	etric Distribu	tion Free UC	L Statistics				
461	Data do not f	ollow a Disc	ernible Distr	ibution (0.05	5)			
_								
462								
	Nonpa	rametric Dis	tribution Fre	e UCLs				
463	Nonpa 95% CLT UCL	rametric Dis	tribution Fre	e UCLs		95% Ja	ckknife UCL	414.6
463 464			tribution Fre	e UCLs			ckknife UCL tstrap-t UCL	414.6
463 464 465	95% CLT UCL	398.4	tribution Fre	e UCLs	95%		tstrap-t UCL	
463 464 465 466	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL	398.4 395.7 1214 512.2	tribution Fre	e UCLs		95% Boo Percentile Bo	tstrap-t UCL otstrap UCL	1121 418.4
464 465 466	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL	398.4 395.7 1214	tribution Fre	e UCLs	95% Ct	95% Boo Percentile Bo nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL	1121 418.4 716.9
463 464 465 466 467	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL	398.4 395.7 1214 512.2	tribution Fre	e UCLs	95% Ct	95% Boo Percentile Bo	tstrap-t UCL otstrap UCL an, Sd) UCL	1121 418.4
463 464 465 466 467 468 469	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL	398.4 395.7 1214 512.2 557.4 938.2		e UCLs	95% Ct	95% Boo Percentile Bo nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL	1121 418.4 716.9
463 464 465 466 467 468 469 470	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL	398.4 395.7 1214 512.2 557.4 938.2	tribution Fre	e UCLs	95% Ct	95% Boo Percentile Bo nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL	1121 418.4 716.9
463 464 465 466 467 468 469 470 471	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL	398.4 395.7 1214 512.2 557.4 938.2		e UCLs	95% Ct	95% Boo Percentile Bo nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL	1121 418.4 716.9
463 464 465 466 467 468 469 470 471	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL	398.4 395.7 1214 512.2 557.4 938.2 Suggested	UCL to Use		95% Ct 99% Ct	95% Boo Percentile Bo nebyshev(Me nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 469 470 471 472 473	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373	UCL to Use	p the user to	95% Ch 99% Ch	95% Boo Percentile Bo nebyshev(Me nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 469 470 471 472 473 474	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are base	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373	UCL to Use	p the user to distribution, a	95% Ct 99% Ct select the n	95% Boo Percentile Bo nebyshev(Me nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 469 470 471 472	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are based upon the resu	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are presed upon datalts of the sim	UCL to Use ovided to hele a size, data anulation studi	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss.	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 469 470 471 472 473 474 475	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are base	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are presed upon datalts of the sim	UCL to Use ovided to hele a size, data anulation studi	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss.	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 469 470 471 472 473 474 475 476	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are based upon the resu	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are presed upon datalts of the sim	UCL to Use ovided to hele a size, data anulation studi	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss.	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 470 471 472 473 474 475 476 477 478 479	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are based These recommendations are based upon the resu However, simulations results will not cover all Real W	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are presed upon datalts of the sim	UCL to Use ovided to hele a size, data anulation studi	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss.	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 470 471 472 473 474 475 476 477 478 479	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Rote: Suggestions regarding the selection of a 95% Recommendations are based upon the resu	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are presed upon datalts of the sim	UCL to Use ovided to hele a size, data anulation studi	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss.	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 470 471 472 473 474 475 476 477 478 479 480	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are based These recommendations are based upon the resu However, simulations results will not cover all Real W	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are prosed upon datalts of the sim/orld data se	Ovided to hele a size, data anulation studits; for addition	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss.	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL	1121 418.4 716.9 1373
463 464 465 466 467 468 470 471 472 473 474 475 476 477 478 479	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are based upon the resu However, simulations results will not cover all Real W	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are prosed upon datalts of the sim/orld data se	UCL to Use ovided to hele a size, data anulation studi	p the user to distribution, a es summariz	95% Cr 99% Cr select the n and skewnes red in Singh, ne user may	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss. Maichle, and want to consi	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL I Lee (2006). ult a statistici	1121 418.4 716.9 1373
463 464 465 467 468 470 471 472 473 474 475 476 477 478 479 480 481	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are based These recommendations are based upon the resu However, simulations results will not cover all Real W	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are prosed upon datalts of the sim/orld data se	Ovided to hele a size, data anulation studits; for addition	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes red in Singh, ne user may	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL d Lee (2006). ult a statistici	1121 418.4 716.9 1373
463 464 465 467 468 469 470 471 472 473 474 475 476 477 478 480 481 482	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are based upon the result However, simulations results will not cover all Real W Molybdenum Total Number of Observations	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are prosed upon datalts of the simulation of t	Ovided to hele a size, data anulation studits; for addition	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes red in Singh, ne user may	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nost appropria ss. Maichle, and want to consi	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL Lee (2006). Ult a statistici	1121 418.4 716.9 1373
463 464 465 466 467 468 470 471 472 473 474 475 476 477 480 481 482 483	95% CLT UCL 95% Standard Bootstrap UCL 95% Hall's Bootstrap UCL 95% BCA Bootstrap UCL 90% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev(Mean, Sd) UCL 97.5% Chebyshev (Mean, Sd) UCL 99% Chebyshev (Mean, Sd) UCL Note: Suggestions regarding the selection of a 95% Recommendations are based upon the resu However, simulations results will not cover all Real W	398.4 395.7 1214 512.2 557.4 938.2 Suggested 1373 UCL are prosed upon datalts of the sim/orld data se	Ovided to hele a size, data anulation studits; for addition	p the user to distribution, a es summariz	95% Ch 99% Ch select the n and skewnes red in Singh, ne user may	95% Boo Percentile Bo nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me nebyshev(Me	tstrap-t UCL otstrap UCL an, Sd) UCL an, Sd) UCL ate 95% UCL d Lee (2006). ult a statistici	1121 418.4 716.9 1373

487	Α	В	С	D	E SD	F 5.75	G	Н	I	J Std. E	K rror of Mean	L 2.348
488				Coefficien	nt of Variation	0.69					Skewness	1.077
489												
490			Note: Sa	mple size is s	mall (e.g., <1	0), if data ar	e collected us	sing ISM a	pproach, you	should use		
491			guidance	provided in IT	RC Tech Reg	Guide on IS	SM (ITRC, 20	12) to con	npute statistic	cs of interest.		
492			Fo	or example, yo	u may want to	o use Cheby	shev UCL to	estimate l	EPC (ITRC, 2	2012).		
493			Chebysh	ev UCL can b	e computed u	sing the No	nparametric a	and All UC	L Options of	ProUCL 5.1		
494												
495						Normal C	GOF Test					
496				Shapiro Wilk	Test Statistic	0.893			Shapiro W	ilk GOF Test		
497			5%	Shapiro Wilk (Critical Value	0.788		Data app	ear Normal a	at 5% Significa	ance Level	
498				Lilliefors	Test Statistic	0.219			Lilliefors	GOF Test		
499				5% Lilliefors (0.325				at 5% Significa	ance Level	
500					Data appea	ar Normal at	5% Significa	nce Level				
501												
502					As	suming Norr	mal Distribution					
503			95%	Normal UCL				959	• •	usted for Skev		
504				95% Stu	udent's-t UCL	13.06			-	ed-CLT UCL (1	13.3
505									95% Modifi	ed-t UCL (Joh	nnson-1978)	13.24
506												
507							GOF Test					
508					Test Statistic	0.255				Gamma GO		
509					Critical Value	0.702	Detected			istributed at 5		e Level
510					Test Statistic	0.214			<u> </u>	ov Gamma G		
511					Critical Value	0.335				istributed at 5	% Significanc	e Level
512				Detected	d data appear	Gamma Dis	stributed at 5	% Signification	ance Level			
513							OII					
514						Gamma	Statistics					4 400
515					k hat (MLE)	2.714				star (bias con	′	1.468
516					eta hat (MLE)	3.071			Theta	star (bias cor		5.677
517					nu hat (MLE)	32.56				•	s corrected)	17.62
518				MLE Mean (bi	as corrected)	8.333			A = = = = = = = = = = = = = = = = = = =	MLE Sd (bia e Chi Square v		6.878
519			۸di	justed Level of	Cianificance	0.0122				djusted Chi S	` '	9.114 7.018
520			Auj	justeu Level Oi	Significance	0.0122				ujusteu Cili Si	quare value	7.016
521					۸۵	suming Com	ıma Distributi	ion				
522	0	15% Annrovi	imate Camr	ma UCL (use v		16.11	iiia Distributi		diusted Cam	ma UCL (use	when n<50\	20.92
523		ο πρριοκί	a.c daiili	OOL (USE V		10.11		33 /0 A	ajuotou Gaili	a OOL (use		20.02
524						Lognormal	GOF Test					
525				Shapiro Wilk	Test Statistic	0.963	. 301 1001	Sha	piro Wilk I o	gnormal GOF	Test	
526			5%	Shapiro Wilk		0.788			•	l at 5% Signifi		
527				·	Test Statistic	0.178				ormal GOF To		
528				5% Lilliefors (0.325				l at 5% Signific		
529 530							 at 5% Signific					
530 531						. 0						
531 532						Lognorma	I Statistics					
532				Minimum of	Logged Data	1.099				Mean of	logged Data	1.925
534					Logged Data	2.89					logged Data	0.684
535					- -							
536					Assı	ıming Logno	rmal Distribu	ition				
537					95% H-UCL	22.56			90%	Chebyshev (I	MVUE) UCL	15.21
538			959	% Chebyshev	(MVUE) UCL	18.34				Chebyshev (I	,	22.69
539				% Chebyshev	` ′	31.23				- \	•	
540				-	•							
J40												

Data appear to follow a Discernible Distribution at 5% Significance Level Nonparametric Distribution Free UCLs		
543 Nonparametric Distribution Free UCLs		
Nonparametric Distribution Free UCLs		
95% CLT UCL 12.19 95% J	lackknife UCL	13.06
95% Standard Bootstrap UCL 11.84 95% Bo	ootstrap-t UCL	16.5
95% Hall's Bootstrap UCL 31.31 95% Percentile B	Bootstrap UCL	12.17
95% BCA Bootstrap UCL 12.5		
90% Chebyshev(Mean, Sd) UCL 15.38 95% Chebyshev(Mean, Sd) UCL 15.38	lean, Sd) UCL	18.57
550 97.5% Chebyshev(Mean, Sd) UCL 22.99 99% Chebyshev(Mean, Sd) UCL	lean, Sd) UCL	31.69
551 Suggested UCL to Use		
553 95% Student's-t UCL 13.06		
554		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropri	riate 95% UCL	
556 Recommendations are based upon data size, data distribution, and skewness.		
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, are	nd Lee (2006).	
However, simulations results will not cover all Real World data sets; for additional insight the user may want to cons	sult a statisticia	an.
559		
560		
561 Nickel		
562		
563 General Statistics		
564 Total Number of Observations 10 Number of Distinct	Observations	7
565 Number of Missing	Observations	3
566 Minimum 8	Mean	16.1
567 Maximum 23	Median	16
00 5000	Error of Mean	1.696
Operficient of Veriation 0.222	Skewness	-0.112
209		
570 Normal GOF Test		
01 : MEIL T. 101 : 1 0004	st	
572		
575		
504 Winter Office Notes A 200	cance Level	
575	Carlot Level	
570		
577 Assuming Normal Distribution		
576 S S S S S S S S S S S S S S S S S S S	ewness)	
05% Overland AUOU 40.04		18.83
050/ M. I'S 14101 (1	` ,	19.2
301	01113011-13/0)	13.4
582 Gamma GOF Test		
	OF Tost	
504 A D O Sistella Laboratoria del Companyo Companyo Companyo Laboratoria del Companyo Compan		20 010
585 5% A-D Critical Value 0.726 Detected data appear Gamma Distributed at	•	e Level
586 K-S Test Statistic 0.184 Kolmogorov-Smirnov Gamma (
587 5% K-S Critical Value 0.267 Detected data appear Gamma Distributed at	. 5% Significand	e Level
588 Detected data appear Gamma Distributed at 5% Significance Level		
589		
590 Gamma Statistics		0.440
k hat (MLE) 9.067 k star (bias co	•	6.413
592 Theta hat (MLE) 1.776 Theta star (bias co		2.51
393	ias corrected)	128.3
MLE Mean (bias corrected) 16.1 MLE Sd (bias corrected)	ias corrected)	6.357

595	A		В		С)	E		F	G	ì	ŀ	1	I Approximate	J Chi Squ	uare Va	K alue (0.05	5) .	L 103.1
596		-			Adju	sted Le	vel of	Significar	nce	0.0267					Ac	ljusted (Chi Squ	uare Valu	е	99.19
597																			_	
598									Assu	uming Gan	nma Dis	stribu	tion							
599		95%	Approx	imate	Gamma	a UCL (use wl	hen n>=5	50))	20.03			9	5% Ac	ljusted Gamr	na UCL	(use w	hen n<50))	20.82
600																				
601										Lognorma	GOF	Test								
602						•		est Statis		0.924				•	oiro Wilk Log					
603					5% S			critical Va		0.842			Data		ır Lognormal				el 	
604								est Statis		0.173					liefors Logno					
605					5	% Lillie		ritical Va		0.262	. =0(4	<u> </u>			ır Lognormal	at 5% S	Significa	ance Leve	əl ——	
606								Data app	oear L	Lognormal	at 5% \$	Signit	ricance	Leve	ll					
607										Lognorma										
608						Minim	ım of l	ogged D	oto		ai Statis	tics				Mac	on of lo	aged Det		2 722
609								_ogged D _ogged D		2.079								gged Dat		2.723
610						wiaxiiIIl	ann Of L	-ogged D	ald	3.135							וו סיי	yy c u Dat	.a	0.365
611									Ageiir	ming Logn	ormal D)jetrih	ution							
612								95% H-U		20.87		iou ID	Janon		90%	Chehvel	hev (M)	VUE) UC	:1	21.8
613					95%	Chehv		MVUE) U		24.36						•	•	VUE) UC		27.91
614 615						•	•	MVUE) U		34.89							(141		+	
616						,	(- , -												
617								Nonpara	ameti	ric Distribu	ition Fre	ee UC	CL Stat	tistics						
618						Data a	appeai	-							icance Level					
619																				
620								Nor	npara	ametric Dis	tributio	n Fre	e UCL	s					-	
621							95	% CLT U	JCL	18.89						95	% Jack	knife UC	L	19.21
622					95%	Standa	ard Bo	otstrap U	JCL	18.69						95%	Boots	trap-t UC	L	19.11
623					9	95% Ha	II's Bo	otstrap U	JCL	18.63					95% F	ercenti	le Boot	tstrap UC	L	18.8
624						95% B	CA Bo	otstrap U	JCL	18.8										
625					90% Cł	nebysh	ev(Mea	an, Sd) U	JCL	21.19					95% Ch	ebyshev	v(Mear	n, Sd) UC	L	23.49
626				97	7.5% Cł	nebysh	ev(Mea	an, Sd) U	JCL	26.69					99% Ch	ebyshev	v(Mear	n, Sd) UC	:L	32.98
627											•									
628										Suggested	UCL to	Use	1							
629						95	% Stud	dent's-t U	JCL	19.21										
630			_						050:									050/		
631		Note	: Sugg	estion									-		select the m		ropriate	e 95% UC	از. ـــــــ	
632		T I.		000000						· ·					and skewnes		السما	00 (0000	2)	
633								-							zed in Singh,				-	
634		nowev	ei, sim	iuiatioi	is resul	is Will N	IOI COV	ei ali Kea	aı vvo	niu data se	us, ior a	iuuitiC	ומו ins	signt th	ne user may	want to (consult	. a statisti	cian.	
635		NI	ote: Ec	r hiah	ly nego	tively-c	kewer	d data o	onfida	ence limito	(en C	:hen	Johns	on L	ognormal, ar	ıd Gamı	ma) mo	av not bo		
636			J.G. 1 C												vely skewed		-	., 1101.00		
637						2.10110		JIOOI1 6			auju			Poort	. 5., 5					
638																				
639 640	Silver																			
641	-																			
642										General	Statisti	cs								
643					Total	l Numb	er of O	bservatio	ons	8					Number	of Disti	inct Ob	servation	ıs	8
644															Number	of Miss	ing Ob	servation	ıs	7
645								Minim	ium	10								Mea	ın	49
646								Maxim	ium	190								Media	in	26.5
647								,	SD	59.96						S	Std. Erro	or of Mea	ın	21.2
648						Coef	fficient	of Variat	tion	1.224								Skewnes	ss	2.339
0											1								<u> </u>	

	A B C D E	F	G H I J K	L
649	Note: Sample size is small (e.g. <10	0) if data an	e collected using ISM approach, you should use	
650		-	SM (ITRC, 2012) to compute statistics of interest.	
651			shev UCL to estimate EPC (ITRC, 2012).	
652			nparametric and All UCL Options of ProUCL 5.1	
653			parametric and the Gold phone of the Gold	
654 655		Normal G	GOF Test	
656	Shapiro Wilk Test Statistic	0.675	Shapiro Wilk GOF Test	
657	5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
658	Lilliefors Test Statistic	0.316	Lilliefors GOF Test	
659	5% Lilliefors Critical Value	0.283	Data Not Normal at 5% Significance Level	
660	Data Not	Normal at 5	% Significance Level	
661				
662	Asa	suming Norn	nal Distribution	
663	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
664	95% Student's-t UCL	89.16	95% Adjusted-CLT UCL (Chen-1995)	102.6
665			95% Modified-t UCL (Johnson-1978)	92.09
666				
667		Gamma C		
668	A-D Test Statistic	0.549	Anderson-Darling Gamma GOF Test	
669	5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significanc	e Level
670	K-S Test Statistic	0.224	Kolmogorov-Smirnov Gamma GOF Test	
671	5% K-S Critical Value	0.3	Detected data appear Gamma Distributed at 5% Significanc	e Level
672	Detected data appear	Gamma Dis	stributed at 5% Significance Level	
673			Daniesies	
674	k hat (MLE)	Gamma S 1.224	k star (bias corrected MLE)	0.848
675	Theta hat (MLE)	40.04	Theta star (bias corrected MLE)	57.77
676	nu hat (MLE)	19.58	nu star (bias corrected)	13.57
677	MLE Mean (bias corrected)	49	MLE Sd (bias corrected)	53.2
678	MEE Medit (Side Corrected)		Approximate Chi Square Value (0.05)	6.279
679 680	Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	5.08
681	, ,		, , , ,	
682	Ass	suming Gam	ma Distribution	
683	95% Approximate Gamma UCL (use when n>=50)	105.9	95% Adjusted Gamma UCL (use when n<50)	130.9
684				
685		Lognormal	GOF Test	
686	Shapiro Wilk Test Statistic	0.932	Shapiro Wilk Lognormal GOF Test	
687	5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
688	Lilliefors Test Statistic	0.195	Lilliefors Lognormal GOF Test	
689	5% Lilliefors Critical Value	0.283	Data appear Lognormal at 5% Significance Level	
690	Data appear	Lognormal	at 5% Significance Level	
691				
692		Lognormal		
693	Minimum of Logged Data	2.303	Mean of logged Data	3.431
694	Maximum of Logged Data	5.247	SD of logged Data	0.954
695		unding Lagar	rmal Diatribution	
696		iming Logno 160.9	rmal Distribution 90% Chebyshev (MVUE) UCL	02.06
697	95% H-UCL 95% Chebyshev (MVUE) UCL	160.9	90% Chebyshev (MVUE) UCL 97.5% Chebyshev (MVUE) UCL	92.06
698	95% Chebyshev (MVUE) UCL	200.4	97.5% Chebysnev (MVOE) UCL	144.7
699	99 /0 Chebyshev (WVOE) OCL	200.4		
700	Nonnarame	etric Distribut	ion Free UCL Statistics	
701	•		Distribution at 5% Significance Level	
702		E		

	Α	В	С			D	E		F	G		Н		1		J		K	I	L
703								lonna	rametric Dis	etribution	Free I	ICI e								
704	<u> </u>					95	% CLT				1166 0	OLS				95% I	ackk	nife UCL	$\overline{}$	89.16
705				95% !	Stand	dard Bo												ap-t UCL		197.1
706						all's Bo								95%				trap UCL		85.5
707						BCA Bo								3070	, , , , ,	ontillo B	,00101		+	
708			90			nev(Me								95% C	`hehv	shev(M	ean	Sd) UCL	┿.	141.4
709						nev(Me									-	•		Sd) UCL		259.9
710					CDySii	CV(IVIC	un, Ou,	OOL	101.4					3370 0	лову	311CV(IVI	cari,			.55.5
711									Suggested	LUCL to I	lse									
712				959		usted C	- - - - -	. UCI		1 002 10 1									_	
713																				
714		Note: Suga	estions r	egardi	ina the	e selec	tion of	a 95%	6 UCL are p	rovided to	help t	he user	to sele	ect the	most	appropr	riate	95% UC	 :L.	
715									sed upon da							чрр. ор.				
716		These rec	commend						ılts of the sir							chle. ar	nd Le	e (2006)).	
717	H						•		Vorld data se									, ,		
718		, om								-, .s. uu		8'''			,	, 5511				
719 720											-								-	
720 721	Vanadium																			
722 723									General	Statistic	 S									
724				Total	Numb	per of C) bserva	ations						Numbe	er of D	Distinct	Obse	ervations	s	12
725														Numbe	er of N	lissing	Obse	ervations	s	3
726							Min	imum	98									Mear		182.7
727							Max	imum	261									Mediar	n 1	187.5
728								SD	55.65							Std.	Error	of Mear	n	16.06
729					Coe	efficient	of Var	iation										kewness		0.0729
730																				
731									Normal	GOF Tes	t									
732				Sł	hapirc	Wilk T	Test St	atistic	0.935				Sh	apiro W	Vilk G	OF Tes	st			
733					•	Wilk C						Data ap		•				e Level		
734					Lilli	iefors T	est St	atistic	0.167				L	illiefors	s GOI	F Test				
735				5%	% Lilli	efors C	Critical '	Value	0.243			Data ap	pear N	Normal	at 5%	Signific	cance	e Level		
736									⊥ ear Normal a	ıt 5% Sigi			•							
737																				
738								As	suming Nor	mal Distr	ibution]								
739			95	5% No	rmal	UCL							% UC	Ls (Adj	justed	for Sk	ewne	ess)		
740					95	5% Stu	dent's-	t UCL	211.5									en-1995) 2	209.5
741													959	% Modif	fied-t	UCL (Jo	ohnso	on-1978	i) 2	211.6
742									1											
743					-				Gamma	GOF Tes	it									
744						A-D T	Γest Sta	atistic	0.328			And	erson	-Darling	g Gar	nma G	OF T	est		
745					5%	A-D C	ritical	Value	0.73	Dete	cted d							Significa	ince	Level
746						K-S T	Test Sta	atistic	0.156			Kolmo	gorov	/-Smirn	ov G	amma (GOF	Test		
747			-		5%	6 K-S C	ritical '	Value	0.245	Dete	cted d	ata appe	ear Ga	amma D	Distrib	uted at	5% 5	Significa	ince	Level
748					De	tected	data a	ppear	r Gamma D	istributed	at 5%	Signific	ance	Level						
749																				
750									Gamma	Statistic	3									
751							k hat (MLE)	11.13					k	star	(bias co	orrect	ted MLE	.)	8.401
752						The	ta hat (MLE)	16.42					Theta	star	(bias co	orrect	ted MLE)	21.74
753						r	nu hat (MLE)	267.1						nu	star (bi	ias co	orrected) 2	201.6
754				ML	E Me	an (bia	s corre	ected)	182.7						MLI	E Sd (bi	ias co	orrected	i)	63.02
755					-				1				App	roximat	te Chi	Square	e Valu	ue (0.05	5) 1	169.8
756				Adjust	ted Le	evel of	Signific	cance	0.029					P	Adjust	ed Chi	Squa	re Value	e 1	165.3
, 50										1									一	<u></u>

	АВ	C D	E	F	G	Н	I	J	K	L
757			Αςς	suming Gam	ma Distributio					
758	95% Annroximate (Gamma UCL (use whe		216.9			sted Gam	ma LICI (use	e when n<50)	222.8
759			<i>,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	210.0					, when it 100)	
760 761				Lognormal	GOF Test					
761 762		Shapiro Wilk Tes	st Statistic	0.937		Shapir	o Wilk Log	gnormal GOI	F Test	
763		5% Shapiro Wilk Crit		0.859		•			ficance Level	
764		Lilliefors Tes		0.162			-	ormal GOF		
765		5% Lilliefors Crit	tical Value	0.243		Data appear l	Lognormal	at 5% Signif	ficance Level	
766		Di	ata appear	Lognormal	at 5% Signific	ance Level				
767										
768				Lognormal	l Statistics					
769		Minimum of Log	gged Data	4.585				Mean of	f logged Data	5.162
770		Maximum of Log	gged Data	5.565				SD of	f logged Data	0.322
771										
772			Assu	iming Logno	rmal Distribut	tion				
773			5% H-UCL	222.1				•	(MVUE) UCL	234.5
774		95% Chebyshev (M)	· ·	257.9			97.5%	Chebyshev	(MVUE) UCL	290.3
775		99% Chebyshev (M)	VUE) UCL	354						
776										
777					tion Free UCL					
778		Data appear t	o follow a [Discernible D	Distribution at	5% Significa	ance Leve	l		
779										
780					tribution Free	UCLs		050/ 1		044.5
781			CLT UCL	209.1	<u> </u>				ackknife UCL	211.5
782		95% Standard Boot	•	208.2	<u> </u>		050/		otstrap-t UCL	213.6
783		95% Hall's Boot	-	208.6	<u></u>		95%	Percentile Bo	ootstrap UCL	207.9
784		95% BCA Boot	•	207.8	<u> </u>		050/ 01		04/1101	252.7
785		90% Chebyshev(Mean 7.5% Chebyshev(Mean	,	230.9	<u> </u>			• `	ean, Sd) UCL ean, Sd) UCL	342.5
786		.5% Chebyshev(wear	i, Su) UCL	203	<u> </u>		99% CI	iebysnev(ivie	an, su) occ	342.5
787				Suggested	LICI to Lise					
788		95% Stude		211.5	002 10 000					
789			111011002	211.0						
790	Note: Suggestions	s regarding the selection	on of a 95%	UCL are pro	ovided to help	the user to s	elect the n	nost appropri	iate 95% UCL.	
791 792		Recommendation		· ·				7 7 7		
793	These recommer	ndations are based upo							d Lee (2006).	
794	However, simulation	ns results will not cover	all Real W	orld data set	s; for addition	al insight the	user may	want to cons	sult a statisticia	ın.
795										
796										
	Zinc									
798										
799				General	Statistics					
800		Total Number of Obs	servations	15			Numbe	r of Distinct (Observations	15
801							Number	r of Missing (Observations	0
802			Minimum	23					Mean	123
803			Maximum	550					Median	87
804			SD	126.9				Std. E	Error of Mean	32.77
805		Coefficient of	f Variation	1.032					Skewness	3.045
806										
807				Normal G	iOF Test	 -	<u> </u>			
808		Shapiro Wilk Tes		0.626	<u> </u>		-	ilk GOF Test		
809		5% Shapiro Wilk Crit		0.881	 	Data Not I		5% Significa	nce Level	
810		Lilliefors Tes	si Statistic	0.287			Lilletors	GOF Test		

	Α	В		С	D	Е	F	G	Н		I		J	K		L
811				5%	6 Lilliefors	Critical Value					Normal a	at 5% S	Significa	nce Level		
812						Data Not	t Normal at 5	% Significance	e Leve	el						
813																
814						As	suming Norr	nal Distribution								
815			9:	5% No	rmal UCL		100.7	<u> </u>			•	-	for Ske	•	<u> </u>	204.4
816					95% Sti	udent's-t UCL	180.7	 						(Chen-1995 hnson-1978		204.4 185
817											5% IVIOU	Jilleu-t	OCT (30	11115011-1976	ا (د	165
818							Gamma	GOF Test								
819					A-D	Test Statistic	0.629	1001	- Ar	nderso	on-Darli	na Gar	nma GC)F Test		
820 821						Critical Value		Detected (5% Significa	ance	Level
822						Test Statistic				• •				GOF Test		
823					5% K-S	Critical Value	0.225	Detected (5% Significa	ance	Level
824					Detecte	d data appea	r Gamma Di:	stributed at 5%	6 Signi	ificanc	e Level					
825																
826			-				Gamma	Statistics								
827						k hat (MLE)	1.829					k star	(bias co	rrected MLE	Ξ)	1.508
828					Th	eta hat (MLE)	67.24				Thet	ta star	(bias co	rrected MLE	Ξ)	81.58
829						nu hat (MLE)	54.88							as corrected	′	45.23
830				ML	E Mean (bi	ias corrected)	123						•	as corrected		100.2
831										Ap	•			Value (0.05		30.81
832				Adjust	ed Level o	f Significance	0.0324					Adjust	ed Chi S	Square Valu	ıe	29.34
833																
834		OF0/ A			1101 (-	ma Distributio)/ A -II	-110-	1	101 /		<u> </u>	100.0
835		95% Appro)ximate C	amma.	UCL (use	when n>=50)	180.6	Ĺ	95%	% Aaju:	sted Ga	ımma C	JCL (use	when n<50	J)	189.6
836							Lognorma	GOF Test								
837				Sł	naniro Wilk	Test Statistic		GOI TEST		Shanir	o Wilk I	oanori	mal GOI	F Test		
838						Critical Value		Ω						ficance Leve	el	
839 840					<u> </u>	Test Statistic							I GOF 1			
841				5%		Critical Value			Data ar					ficance Leve	el	
842						Data appear	r Lognormal	at 5% Significa	ance L	Level						
843																
844							Lognorma	l Statistics								
845				N	/linimum of	Logged Data	3.135						Mean of	logged Dat	ta	4.515
846				M	aximum of	Logged Data	6.31						SD of	logged Dat	ta	0.748
847																
848								rmal Distributi	ion							
849						95% H-UCL	194.1						-	(MVUE) UC		190.6
850					•	(MVUE) UCL	223.5	<u></u>			97.5	% Che	byshev ((MVUE) UC	;L 2	269.1
851				99% (nebyshev	(MVUE) UCL	358.7									
852						Nonners	otrio Diotalbas	tion Eros UC	Ctotic	ntico						
853					Data anno	•		tion Free UCL Distribution at			nce I c	vel				
854					ara appe				J /0 OI	- Grinice	IIICE LE	¥ C 1				
855						Nonna	rametric Die	tribution Free l	UCI e							
856						95% CLT UCL	176.9						95% .!=	ackknife UC	:[]	180.7
857 eee				95%		Sootstrap UCL	175.9					9		otstrap-t UC		259.2
858 850						Sootstrap UCL	393.8				959			ootstrap UC		180.9
859 860						Sootstrap UCL	214.3								+	
861			90			ean, Sd) UCL	221.3				95%	Cheby	shev(Me	ean, Sd) UC	;L 2	265.8
862					• •	ean, Sd) UCL	327.6						•	ean, Sd) UC		449
863						<u> </u>							,			
864							Suggested	UCL to Use								
UU-T															_	

	Α	В	С	D	E	F	G	Н	I	J	K	L
865			95	% Adjusted C	amma UCL	189.6						
866												
867	1	Note: Sugges	stions regard	ing the selec	tion of a 95%	6 UCL are pr	ovided to hel	p the user to	select the m	ost appropri	ate 95% UCL	
868			F	Recommenda	tions are bas	sed upon dat	a size, data	distribution, a	and skewnes	S.		
869		These recon	nmendations	are based u	pon the resu	lts of the sim	nulation studi	es summariz	ed in Singh,	Maichle, and	d Lee (2006).	
870	Но	wever, simul	ations result	s will not cov	er all Real W	orld data se	ts; for additio	nal insight th	ne user may v	want to cons	ult a statistic	an.
871												

	Α	В	С	D	E	F	G	Н	I	J	j	K	L
1					UCL Statis	itics for Unc	ensored Full	Data Sets					
2													
3	Det		ected Options		2/11/2021 11	L.EQ. 22 AM							
4	Date	# Time of Co	From File	ProUCL 5.12			Olug a via						
5				UCL UTL cor	ncentrations	USFS BIG E	iue_g.xis						
6	ļ,		III Precision	95%									
7				2000									
8	Number of	вооізігар	Operations	2000									
9													
10	Arsenic												
11	Algerile												
12						General	Statistics						
13			Total	I Number of Ol	hservations	16			Numb	er of Dist	tinct O	bservations	15
14					DOCIVATIONS	10						bservations	0
15					Minimum	22			- Number	or or iviis		Mean	100.8
16					Maximum	369						Median	69
17					SD	94.41					Std Er	ror of Mean	23.6
18				Coefficient	of Variation	0.937						Skewness	1.984
19					or variation	0.337	<u> </u>						1.304
20						Normal (GOF Test						
21			<u>S</u>	Shapiro Wilk To	est Statistic		101 1031		Shapiro W	/ilk GOE	Test		
22				Shapiro Wilk Cr				Data No	t Normal at			re I evel	
23				•	est Statistic					GOF T			
24	 			5% Lilliefors Cr		0.213		Data No	t Normal at			ce I evel	
25				- Lilliciois Gi		-	∣ 5% Significan			. 0 70 Olgi			
26													
27					As	sumina Norr	mal Distributi	on					
28			95% No	ormal UCL					UCLs (Adj	usted fo	r Skev	vness)	
29					dent's-t UCL	142.1			• •			Chen-1995)	152.1
30											•	nson-1978)	144.1
31 32													
33						Gamma	GOF Test						
34				A-D T	est Statistic			Ander	son-Darlin	g Gamm	a GOF	- Test	
35					ritical Value	0.753	Detected	d data appea		-			ice Level
36					est Statistic	0.163			orov-Smirn				
37				5% K-S C	ritical Value	0.218	Detected	d data appea					ice Level
38				Detected	data appear	r Gamma Di	 stributed at 5						
39													
40						Gamma	Statistics						
41				-	k hat (MLE)	1.695			k	star (bia	as corr	ected MLE)	1.419
42					a hat (MLE)							ected MLE)	71.01
43					u hat (MLE)					•		s corrected)	45.4
44			M	LE Mean (bias	7					MLE S	d (bias	s corrected)	84.58
45						1			Approximat	e Chi Sc	uare V	/alue (0.05)	30.94
46			Adjus	sted Level of S	Significance	0.0335			F	Adjusted	Chi Sc	quare Value	29.59
47						<u> </u>							
48					Ass	suming Gar	ıma Distributi	ion					
49	9	5% Approxi	imate Gamm	na UCL (use w	hen n>=50)	147.8		95% Ad	justed Gan	nma UCL	use v	when n<50)	154.6
50						<u> </u>							
51						Lognorma	GOF Test						
52			S	Shapiro Wilk To	est Statistic	0.966		Shap	oiro Wilk Lo	gnormal	GOF	Test	
53			5% S	Shapiro Wilk Cr	ritical Value	0.887		Data appea	r Lognorma	al at 5% S	Signific	ance Level	
54				Lilliefors T	est Statistic	0.109		Lill	iefors Logr	normal G	iOF T€	est .	
J T													

55	Α	В	С		D % Lilliefors C	E Critical Value	F 0.213	G	H Data appea	l r Lognormal	J at 5% Signifi	K cance Level	L
56						Data appear	Lognormal	at 5% Signific	cance Level	l			
57													
58							Lognorma	l Statistics					
59				ľ	Minimum of I	ogged Data	3.091					logged Data	4.29
60				N	laximum of I	ogged Data	5.911				SD of	logged Data	0.807
61													
62								rmal Distribu	ition				
63						95% H-UCL	167.3				Chebyshev (-	162.3
64					Chebyshev (191.3			97.5%	Chebyshev (MVUE) UCL	231.4
65				99% (Chebyshev (MVUE) UCL	310.3						
66						Nonnoromo	trio Diotribu	tion Free UC	l Ctatiatica				
67					Doto oppos	-		Distribution a		oonoo Lovo	<u> </u>		
68					Data appea	i to ioliow a	Discernible	JISH IDUHOH a	t 5% Sigilli	cance Leve			
69						Nonna	rametric Die	ribution Free	UCI e				
70					95	5% CLT UCL	139.6		. 0013		95% Ja	ckknife UCL	142.1
71				95%	Standard Bo		138.2					tstrap-t UCL	182
72 73					5% Hall's Bo	•	339.7			95% I	Percentile Bo	•	144.3
					95% BCA Bc		151.6			30.01			
74 75			909		ebyshev(Me	•	171.6			95% Ch	nebyshev(Me	an, Sd) UCL	203.6
76					ebyshev(Me		248.1				nebyshev(Me		335.6
77					-		<u> </u>	<u> </u>					
78							Suggested	UCL to Use					
79				959	% Adjusted 0	Gamma UCL	154.6						
80													
81		Note: Sugge	estions re	egard	ing the selec	tion of a 95%	UCL are pr	ovided to help	the user to	select the m	nost appropria	ate 95% UCL	
82							•	a size, data d					
83						·		ulation studie		•	•	, ,	
84	H	owever, simu	ulations r	result	s will not cov	er all Real W	orld data se	s; for additior	nal insight th	ne user may	want to consi	ult a statisticia	an.
85													
86													
67	Chromium												
88							Canaral	Statistics					
89			-	Total	Number of C	Observations	General 6	Statistics		Numbo	r of Distinct C	hearyations	5
90				ı uldl	MULLIDEL OF C	noei vali0118	U				of Missing C		10
91						Minimum	23			ivuilibel	or ivilositiy C	Mean	33
92						Maximum	44					Median	33.5
93						SD	9.338				Std F	rror of Mean	3.812
94 95					Coefficient	t of Variation	0.283				J.G. L	Skewness	0.0265
96					2.21								
96			Note:	Samp	ole size is sr	nall (e.g., <1	0), if data ar	e collected us	sing ISM ap	proach, you	should use		
98								SM (ITRC, 20		<u> </u>			
99				For e	example, you	ı may want t	o use Cheby	shev UCL to	estimate El	PC (ITRC, 2	012).		
100			Cheby	/shev	UCL can be	e computed u	sing the No	nparametric a	and All UCL	Options of	ProUCL 5.1		
101													
102							Normal (OF Test					
103				SI	hapiro Wilk	Γest Statistic	0.84			Shapiro Wi	lk GOF Test		
104			5	5% Sł	napiro Wilk C	Critical Value	0.788		Data appe	ear Normal a	t 5% Significa	ance Level	
105					Lilliefors	Γest Statistic	0.273				GOF Test		
106				5	% Lilliefors C	Critical Value	0.325			ear Normal a	t 5% Significa	ance Level	
107						Data appe	ar Normal at	5% Significa	ince Level				
-													

109	Α	В	С	D	E As	F suming Norr	G mal Distribution	Н	I	J	K		L
110			95% No	rmal UCL				95% UC	Ls (Adju	sted for S	kewness)		
111				95% Stu	dent's-t UCL	40.68		95%	6 Adjuste	d-CLT UC	L (Chen-199	5)	39.31
112								95	% Modifie	ed-t UCL (Johnson-197	8)	40.69
113													
114						Gamma	GOF Test						
115				A-D	Test Statistic	0.591		Anderson	-Darling	Gamma G	OF Test		
116				5% A-D C	Critical Value	0.698	Detected dat	ta appear G	amma Di	stributed a	nt 5% Signific	ance	Level
117				K-S	Test Statistic	0.301		Kolmogoro	v-Smirno	v Gamma	GOF Test		
118				5% K-S C	Critical Value	0.332	Detected dat	ta appear G	amma Di	stributed a	t 5% Signific	ance	Level
119				Detected	d data appea	r Gamma Di	stributed at 5% S	Significance	Level				
120													
121							Statistics						
122					k hat (MLE)	14.61				` .	corrected ML		7.415
123					eta hat (MLE)	2.259			Theta	•	corrected ML	-	4.45
124					nu hat (MLE)	175.3				,	bias correcte	-	88.98
125			MI	E Mean (bia	as corrected)	33				-	bias correcte	.	12.12
126								Арр			re Value (0.0	´	68.23
127			Adjus	ted Level of	Significance	0.0122			Ac	ljusted Ch	i Square Valı	ıe	61.7
128													
129							ma Distribution					<u> </u>	
130	9	5% Approxir	nate Gamma	UCL (use w	/hen n>=50))	43.03		95% Adjust	ed Gamn	na UCL (u	se when n<5	0)	47.59
131													
132					- . 0		GOF Test		14011				
133				•	Test Statistic	0.839	.	-	_	normal G			
134			5% 51	<u> </u>	Critical Value	0.788	Data				nificance Lev	eı	
135					Test Statistic	0.283	D-1			ormal GOF		-1	
136			5		Critical Value	0.325	at 5% Significant		gnormai	at 5% Sigi	nificance Lev	eı	
137					Data appear	Lognormai	at 5% Significant	Ce Level					
138						Lognorma	I Statistics						
139				Minimum of I	Logged Data	3.135				Mean	of logged Da	ta	3.462
140					Logged Data	3.784					of logged Da		0.29
141					99								
142 143					Ass	umina Loand	ormal Distribution	<u> </u>					
144					95% H-UCL	44.3			90%	Chebyshe	v (MVUE) UC	CL	44.75
144			95% (MVUE) UCL	50.07					v (MVUE) UC		57.45
146				, ,	MVUE) UCL	71.94				,	. , , , ,	+	
147				- \	•	1							
148					Nonparame	etric Distribu	tion Free UCL St	tatistics					
149				Data appea	·=		Distribution at 5%		ce Level				
150				· -									
151					Nonpa	rametric Dis	tribution Free UC	CLs					
152				95	5% CLT UCL	39.27				95%	Jackknife UC	L	40.68
153			95%	Standard Bo	ootstrap UCL	38.76				95% B	ootstrap-t UC	L	41.18
154			9	5% Hall's Bo	ootstrap UCL	36.6			95% F	Percentile	Bootstrap UC	L	38.67
155			(95% BCA Bo	ootstrap UCL	38.5							
156			90% Ch	ebyshev(Me	an, Sd) UCL	44.44			95% Ch	ebyshev(N	Mean, Sd) UC	L	49.62
157			97.5% Ch	ebyshev(Me	an, Sd) UCL	56.81			99% Ch	ebyshev(N	Mean, Sd) UC	L	70.93
158							•						
159						Suggested	UCL to Use						
160				95% Stu	dent's-t UCL	40.68							
161						<u>. </u>						_	
162		Note: Sugge:	stions regard	ing the selec	ction of a 95%	6 UCL are pr	ovided to help the	e user to sel	ect the m	ost appro	oriate 95% U	CL.	
												_	

163	A B C D E Recommendations are based as the second and the second are based as	F sed upon data	G H I J K a size, data distribution, and skewness.	L
164		•	ulation studies summarized in Singh, Maichle, and Lee (2006).	
165	·		s; for additional insight the user may want to consult a statisticial	n.
166	<u> </u>		· · · · · · · · · · · · · · · · · · ·	
167				
	Copper			
169				
170		General	Statistics	
171	Total Number of Observations	16	Number of Distinct Observations	14
172			Number of Missing Observations	0
173	Minimum	11	Mean	25.44
174	Maximum	72	Median	18.5
175	SD	17.82	Std. Error of Mean	4.456
176	Coefficient of Variation	0.701	Skewness	2.117
177		!		
178		Normal C	GOF Test	
179	Shapiro Wilk Test Statistic	0.681	Shapiro Wilk GOF Test	
180	5% Shapiro Wilk Critical Value		Data Not Normal at 5% Significance Level	
181	Lilliefors Test Statistic		Lilliefors GOF Test	
182	5% Lilliefors Critical Value		Data Not Normal at 5% Significance Level	
183	Data Not	t Normal at 5	% Significance Level	
184				
185		suming Norr	nal Distribution	
186	95% Normal UCL		95% UCLs (Adjusted for Skewness)	
187	95% Student's-t UCL	33.25	95% Adjusted-CLT UCL (Chen-1995)	35.29
188			95% Modified-t UCL (Johnson-1978)	33.64
189		Gamma (POE Toot	
190	A-D Test Statistic		Anderson-Darling Gamma GOF Test	
191	5% A-D Critical Value		Data Not Gamma Distributed at 5% Significance Leve	ı
192	K-S Test Statistic		Kolmogorov-Smirnov Gamma GOF Test	<u>'</u>
193	5% K-S Critical Value		Detected data appear Gamma Distributed at 5% Significance	e Level
194			Distribution at 5% Significance Level	
195 196	<u> </u>	•		
197		Gamma	Statistics	
198	k hat (MLE)	3.356	k star (bias corrected MLE)	2.768
199	Theta hat (MLE)	7.58	Theta star (bias corrected MLE)	9.189
200	nu hat (MLE)	107.4	nu star (bias corrected)	88.58
201	MLE Mean (bias corrected)	25.44	MLE Sd (bias corrected)	15.29
202		1	Approximate Chi Square Value (0.05)	67.88
203	Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	65.82
204				
205			ma Distribution	
206	95% Approximate Gamma UCL (use when n>=50)	33.19	95% Adjusted Gamma UCL (use when n<50)	34.23
207				
208		Lognormal		
209	Shapiro Wilk Test Statistic		Shapiro Wilk Lognormal GOF Test	
210	5% Shapiro Wilk Critical Value		Data Not Lognormal at 5% Significance Level	
211	Lilliefors Test Statistic		Lilliefors Lognormal GOF Test	
212	5% Lilliefors Critical Value		Data appear Lognormal at 5% Significance Level	
213	Data appear Appro	oximate Logn	ormal at 5% Significance Level	
214			I Céntinéine	
215	Minimum of Logged Data	Lognorma 2.398	Mean of logged Data	3.08
216	Willimum or Logged Data	2.330	iviean or logged Data	3.00

	Α		В		С		D		E	F	G		Н				J K	L
217						Maxi	mum c	of Logg	ged Data	4.277							SD of logged Data	0.529
218																		
219										uming Logno	rmal Di	stribu	tion					
220									6 H-UCL	33.25							Chebyshev (MVUE) UCL	34.96
221							•	•	JE) UCL	39.57					97.5	5% (Chebyshev (MVUE) UCL	45.97
222					999	% Che	byshe	v (MVL	JE) UCL	58.53								
223																		
224									•	etric Distribu								
225						Dat	ta app	ear to	follow a	Discernible	Distribu	tion a	t 5% Si	gnific	ance Le	vel		
226																		
227								050/ 0		rametric Dis	tribution	ree	UCLS				050/ 1 11 16 1101	00.05
228						·0/ O:			LT UCL	32.77							95% Jackknife UCL	33.25
229					95				rap UCL	32.46					0.5	0/ 5	95% Bootstrap-t UCL	46.58
230									rap UCL	76.82					95	% P	ercentile Bootstrap UCL	33.19
231					000/ /				rap UCL	35.19					050/	01		44.00
232							,		Sd) UCL	38.81							ebyshev(Mean, Sd) UCL	44.86
233					./.5% (snev(N	viean, S	Sd) UCL	53.27					99%	Cne	ebyshev(Mean, Sd) UCL	69.78
234	<u> </u>									Cumma-ta-1	1101 +-	Hes						
235						0E9/ ^	diveta	d Carr	ma LICI	Suggested	UCL TO	use					T	
236						20% A(ujuste	u Gam	ma UCL	34.23								
237					Mhon (o doto	cot fol	llowe o	n annray	imate (e.g.,	normal)	dictrib	ution n	ocin	a one of	tho	COE tost	
238			Mhon or												_		h GOF tests in ProUCL	
239			vviieii aț	ppiicai	JIE, IL IS	- Sugg	esieu	io use	a UCL D	aseu upon a	uistribu	lion (e	.y., yan	IIIIa)	passing	טטנ	II GOF lesis III FIOOCL	
240		- No	ito: Sugo	nestin	ne regs	ordina	tha sal	lection	of a 05%	LICL are pr	ovided t	o heln	the use	ar to	coloct the	o m	ost appropriate 95% UCL.	
241			ite. ougg	Jesiioi	- Is rega					sed upon dat								
242		TI	hese rec	comme	endatic												Maichle, and Lee (2006).	
243																	vant to consult a statisticia	an.
244											,					<u>.</u> , .		
245 246																		
247	Lead																	
248																		
249										General	Statistic	cs						
250	 I				Tot	tal Nur	nber o	of Obse	ervations	16					Num	ber	of Distinct Observations	15
251		-													Num	ber	of Missing Observations	0
252								N	/linimum	6							Mean	25.19
253	,							М	laximum	56							Median	21.5
254									SD	14.36							Std. Error of Mean	3.591
255						C	oefficie	ent of \	/ariation	0.57							Skewness	0.65
256										ı	1						I	
257	·									Normal (GOF Te	st						
258						Shap	iro Wil	k Test	Statistic	0.945					Shapiro	Wil	k GOF Test	
259					5%	Shapi	ro Will	k Critic	al Value	0.887			Data a	арреа	ar Norma	al at	5% Significance Level	
260						L	illiefor	s Test	Statistic	0.15					Lilliefo	ors (GOF Test	
261						5% L	illiefors		al Value	0.213					ar Norma	al at	5% Significance Level	
262				-				Da	ata appe	ar Normal a	5% Sig	nifica	nce Le	/el				
263																		
264						-			As	suming Nor	mal Dist	ributio	on					
265					95%	Norma	al UCL	_						5% (JCLs (A	djus	sted for Skewness)	
266						-	95% S	Student	's-t UCL	31.48					•		d-CLT UCL (Chen-1995)	31.72
267															95% Mod	difie	d-t UCL (Johnson-1978)	31.58
268																	1	
269				-						Gamma	GOF Te	st						
270							A-[D Test	Statistic	0.175			Ar	nders	on-Darli	ing	Gamma GOF Test	

271	A B C D E 5% A-D Critical Value	F 0.744	G H I J K Detected data appear Gamma Distributed at 5% Significance	L Level
272	K-S Test Statistic	0.114	Kolmogorov-Smirnov Gamma GOF Test	
273	5% K-S Critical Value	0.217	Detected data appear Gamma Distributed at 5% Significance	Level
274	Detected data appear	Gamma Di	stributed at 5% Significance Level	
275				
276		Gamma	Statistics	
277	k hat (MLE)	3.092	k star (bias corrected MLE)	2.554
278	Theta hat (MLE)	8.145	Theta star (bias corrected MLE)	9.862
279	nu hat (MLE)	98.95	nu star (bias corrected)	81.73
280	MLE Mean (bias corrected)	25.19	MLE Sd (bias corrected)	15.76
281			Approximate Chi Square Value (0.05)	61.9
282	Adjusted Level of Significance	0.0335	Adjusted Chi Square Value	59.94
283				
284	Ass	suming Gam	nma Distribution	
285	95% Approximate Gamma UCL (use when n>=50))	33.26	95% Adjusted Gamma UCL (use when n<50)	34.35
286				
287		Lognorma	I GOF Test	
288	Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Lognormal GOF Test	
289	5% Shapiro Wilk Critical Value	0.887	Data appear Lognormal at 5% Significance Level	
290	Lilliefors Test Statistic	0.117	Lilliefors Lognormal GOF Test	
291	5% Lilliefors Critical Value	0.213	Data appear Lognormal at 5% Significance Level	
292	Data appear	Lognormal	at 5% Significance Level	
293				
294			I Statistics	
295	Minimum of Logged Data	1.792	Mean of logged Data	3.056
296	Maximum of Logged Data	4.025	SD of logged Data	0.632
297				
298			ormal Distribution	
299	95% H-UCL	37.1	90% Chebyshev (MVUE) UCL	38.25
300	95% Chebyshev (MVUE) UCL	43.99	97.5% Chebyshev (MVUE) UCL	51.97
301	99% Chebyshev (MVUE) UCL	67.64		
302	No	and a Disabella .	ston Fore HOL Obsticator	
303	·		tion Free UCL Statistics Distribution at 5% Significance Level	
304	Data appear to follow a L		Distribution at 5% Significance Level	
305	Nonno	rometrie Die	tribution Free UCLs	
306	95% CLT UCL	31.09	95% Jackknife UCL	31.48
307	95% Standard Bootstrap UCL	30.85	95% Bootstrap-t UCL	32.15
308	95% Hall's Bootstrap UCL	31.99	95% Bootstrap-t OCL	31
309	95% BCA Bootstrap UCL	31.31	3370 Forceffule Bootstrap OCL	
310	90% Chebyshev(Mean, Sd) UCL	35.96	95% Chebyshev(Mean, Sd) UCL	40.84
311	97.5% Chebyshev(Mean, Sd) UCL	47.61	99% Chebyshev(Mean, Sd) UCL	60.92
312			22.1.2.1.1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.	
313 314		Suggested	UCL to Use	
315	95% Student's-t UCL	31.48		
316				
317	Note: Suggestions regarding the selection of a 95%	UCL are pr	ovided to help the user to select the most appropriate 95% UCL.	
318	Recommendations are bas	sed upon dat	a size, data distribution, and skewness.	
319	These recommendations are based upon the resul	Its of the sim	nulation studies summarized in Singh, Maichle, and Lee (2006).	
320	However, simulations results will not cover all Real W	orld data se	ts; for additional insight the user may want to consult a statisticiar	١.
321	_			
322				
	Mercury			
324				
~_7				

225	Α	В)	D	E	F General	G Statistics	Н	I	J	K		L
325 326				Total I	Number of (Observations				Numbe	er of Distin	nct Observa	ations	5
327										Numbe	r of Missi	ng Observa	ations	3
328						Minimum	3						Mean	5.154
329						Maximum	17					Me	edian	4
330						SD	3.716				St	d. Error of l	Mean	1.031
331					Coefficien	t of Variation	0.721					Skew	ness	3.105
332								L						
333							Normal (GOF Test						
334				Sł	napiro Wilk	Test Statistic	0.565			Shapiro W	ilk GOF 1	Гest		
335				5% Sh	apiro Wilk (Critical Value	0.866		Data No	ot Normal at	5% Signif	ficance Lev	el	
336					Lilliefors	Test Statistic	0.333			Lilliefors	GOF Te	st		
337				5%	% Lilliefors (Critical Value	0.234		Data No	ot Normal at	5% Signif	ficance Lev	el	
338						Data No	t Normal at 5	% Significan	ce Level					-
339														
340						As	ssuming Norr	mal Distributi	on					
341			95	5% No	rmal UCL				95%	6 UCLs (Adju	usted for	Skewness))	
342					95% Stu	ident's-t UCL	6.991			95% Adjuste	ed-CLT U	CL (Chen-	1995)	7.797
343										95% Modifi	ied-t UCL	(Johnson-	1978)	7.139
344													1	
345							Gamma	GOF Test						
346					A-D	Test Statistic	1.334		Ande	rson-Darling	g Gamma	GOF Test		
347					5% A-D (Critical Value	0.737	Da	ata Not Gan	nma Distribu	ted at 5%	Significand	ce Leve	I
348		K-S Test S 5% K-S Critica					0.24		_	gorov-Smirn				
349					5% K-S (Critical Value	0.238	Da	ata Not Gan	nma Distribu	ted at 5%	Significand	ce Leve	I
350							ma Distribute	ed at 5% Sigr	nificance Le	evel				
351														
352								Statistics						
353						k hat (MLE)					•	corrected	,	3.045
354						eta hat (MLE)				Theta	star (bias	corrected	MLE)	1.693
355						nu hat (MLE)						(bias corre	,	79.16
356				ML	E Mean (bia	as corrected)	5.154					(bias corre		2.954
357										Approximate	•	•	· '	59.66
358				Adjust	ted Level of	Significance	0.0301			Α	djusted C	thi Square \	√alue	57.26
359														
360							_	ıma Distributi						
361	9	5% Approxii	mate G	amma	UCL (use w	/hen n>=50))	6.838		95% Ad	djusted Gam	ma UCL (use when r	า<50)	7.126
362														
363						T . O		GOF Test		1 NAMI! !		205 -		
364					•	Test Statistic				piro Wilk Lo	-			
365				ე% Sh		Critical Value				Lognormal a			evel	
366						Test Statistic				lliefors Logn			ا مینوا	
367				5%		Critical Value				ar Lognorma	ı at 5% Si	gniticance	Level	
368					Data a	appear Appro	oximate Logn	ormal at 5%	Significand	e Levei				
369							can	I Statistics						
370					Ainimum -f	l oggod D-t-		l Statistics			Mac	n of loans	Doto	1 506
371						Logged Data Logged Data						n of logged O of logged		1.506 0.471
372				IV	axiiiiuiii 0ī	Logged Data	2.033				51	i logged וט כ	Dald	0.471
373						۸۵۵	umina Loana	ormal Distribu	ıtion					
374						95% H-UCL		יייום ביים ואוויים	14011	۵۵۰/-	Chehyeh	ev (MVUE)	IICI	6.995
375				95% (hehvehov	MVUE) UCL						ev (MVUE)		9.162
376						(MVUE) UCL				37.3%	OHEDYSH	CV (IVIVUE)	JOL	9.102
377				33 /0 C	orienystiev ((IVI V OL) UCL	11.04	<u> </u>						
378														

379	A B C D E Nonparame	F tric Distribu	G H I J K L ution Free UCL Statistics									
380	Data appear to follow a [Discernible I	Distribution at 5% Significance Level									
381												
382	Nonpar	ametric Dist	stribution Free UCLs									
383	95% CLT UCL	6.849	95% Jackknife UCL 6.991									
384	95% Standard Bootstrap UCL	6.72	95% Bootstrap-t UCL 10.4									
385	95% Hall's Bootstrap UCL	13.23	95% Percentile Bootstrap UCL 7.077									
386	95% BCA Bootstrap UCL	7.538										
387	90% Chebyshev(Mean, Sd) UCL	8.246	95% Chebyshev(Mean, Sd) UCL 9.646									
388	97.5% Chebyshev(Mean, Sd) UCL	11.59	99% Chebyshev(Mean, Sd) UCL 15.41									
389												
390		Suggested	I UCL to Use									
391	95% Student's-t UCL	6.991	or 95% Modified-t UCL 7.139									
392	or 95% H-UCL	6.685										
393												
394	Note: Suggestions regarding the selection of a 95%	UCL are pro	rovided to help the user to select the most appropriate 95% UCL.									
395			ita size, data distribution, and skewness.									
396			nulation studies summarized in Singh, Maichle, and Lee (2006).									
397	·		ets; for additional insight the user may want to consult a statistician.									
397			,									
398	ProUCL computes and output	ts H-statistic	ic based UCLs for historical reasons only.									
	· · · · · · · · · · · · · · · · · · ·		ues of UCL95 as shown in examples in the Technical Guide.									
400	It is therefore recommended to avoid the use of H-statistic based 95% UCLs.											
401			5 for skewed data sets which do not follow a gamma distribution.									
402												
403												
404	Molybdenum											
403	Worybuenum											
406		Gonoral	Statistics									
407	Total Number of Observations	8	Number of Distinct Observations 5									
408	Total Number of Observations	0										
409	Minimum	4	Ů,									
410	Minimum											
411	Maximum	15	Median 5.5									
412	SD	3.643	Std. Error of Mean 1.288									
413	Coefficient of Variation	0.53	Skewness 1.883									
414												
415		•	re collected using ISM approach, you should use									
416			ISM (ITRC, 2012) to compute statistics of interest.									
417			yshev UCL to estimate EPC (ITRC, 2012).									
418	Chebyshev UCL can be computed u	sing the No	onparametric and All UCL Options of ProUCL 5.1									
419												
420			GOF Test									
421	Shapiro Wilk Test Statistic	0.778	Shapiro Wilk GOF Test									
422	5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level									
423	Lilliefors Test Statistic	0.254	Lilliefors GOF Test									
424	5% Lilliefors Critical Value	0.283	Data appear Normal at 5% Significance Level									
425	Data appear Appr	oximate No	ormal at 5% Significance Level									
426												
427	Asa	suming Norr	rmal Distribution									
428	95% Normal UCL		95% UCLs (Adjusted for Skewness)									
429	95% Student's-t UCL	9.315	95% Adjusted-CLT UCL (Chen-1995) 9.91									
430			95% Modified-t UCL (Johnson-1978) 9.458									
431			, , ,									
		Gamma	GOF Test									
432			· · · · · ·									

433	Α	В		С		D A-l	D Tes	E st Statistio	F 0.516	6	G		H A n	nders	l on-Darl	ling (J na GO		K st	L
434						5% A-I	D Crit	ical Value	0.719)	Detected	d d	ata ap	pear	Gamma	a Dis	stribute	ed at 5	% Sig	nifican	ce Level
435						K-	S Tes	st Statistic	0.209)			Koln	nogo	ov-Sm	irnov	/ Gam	nma G	OF To	est	
436						5% K-8	S Crit	ical Value	0.295	5	Detected	d d	ata ap	pear	Gamma	a Dis	stribute	ed at 5	% Sig	nifican	ce Level
437						Detect	ted da	ata appea	r Gamma	Dist	ributed at 5	5%	Signif	ficand	e Leve	əl					
438									0	0	4 - 4! - 4!										
439							1.	I+ /NAL E			tatistics					To a	/l-:			I NAL EX	2.410
440								hat (MLE							The		•			d MLE)	3.418 2.011
441								hat (MLE							1116	eta s				rected)	54.69
442					N/I =	Moan (hat (MLE corrected	'									•		rected)	3.719
443					IVILL	ivicaii ((Dias (corrected	0.673	<u>,</u>				Δι	nrovin			•		(0.05)	38.7
444				Ac	diuste	d Level	of Sid	gnificance	0.019	5					рголіп			-		Value	35.32
445				710	ajuoto	<u> </u>	0, 0,	grimeariec	0.0100							/ (U)	juotou	0111 0	quaio	Value	
446								As	ssumina G	amn	na Distribut	itior	<u> </u>								
447 448		95% App	roxima	te Gam	ıma U	JCL (use	e whe	n n>=50)						Adju	sted G	amm	na UCI	L (use	when	n<50)	10.64
449		• • • • • • • • • • • • • • • • • • • •							1									•			
450									Lognorr	mal (GOF Test										
451					Sha	apiro Wil	lk Tes	st Statistic	0.89				S	hapir	o Wilk	Logr	norma	I GOF	Test		
452				5%	6 Sha	piro Wil	lk Crit	ical Value	0.818	3		Da	ata ap	pear	ognor	mal a	at 5%	Signifi	cance	e Level	
453						Lilliefor	rs Tes	st Statistic	0.191					Lillie	fors Lo	ogno	rmal (GOF T	est		
454					5%	Lilliefor	s Crit	ical Value	0.283	3		Da	ata ap	pear	ognor	mal a	at 5%	Signifi	cance	e Level	
455							Da	ata appea	r Lognorm	nal a	t 5% Signifi	fica	nce Le	evel							
456																					
457									Lognor	mal	Statistics										
458								gged Data												d Data	1.831
459					Ma	ximum	of Log	gged Data	a 2.708	3								SD of	logge	d Data	0.445
460																					
461											mal Distribi	outio	on								
462								5% H-UCL										•		E) UCL	10.04
463						•	•	VUE) UCL							97.	5% C	Chebys	shev (I	MVUE	E) UCL	13.54
464				99	1% Cr	iebysne	ev (IVI V	VUE) UCL	17.54												
465							N	lonnaram	etric Dietri	ihutia	on Free UC	<u> </u>	Statict	tice							
466						ata ann		-			istribution a				nce l e	evel					
467						ata app	,ou	0 1011011 0	Diocornib		iodibudion c	<u> </u>	عات در ر	J							
468								Nonpa	arametric [Distri	ibution Free	e U	JCLs								
469							95%	CLT UCL									9:	5% Ja	ckknif	fe UCL	9.315
470 471				95	5% St			strap UCL												-t UCL	11.7
472								strap UCL							95	5% P	ercen	tile Bo	otstra	p UCL	9.125
473					95	% BCA	Boots	strap UCL	9.25												
474				90%	Cheb	yshev(ľ	Mean	, Sd) UCL	10.74	\top					95%	Che	ebyshe	ev(Mea	an, So	d) UCL	12.49
475				97.5%	Cheb	yshev(ľ	Mean	, Sd) UCL	14.92						99%	Che	ebyshe	ev(Mea	an, So	d) UCL	19.69
476									1												
477									Suggest	ed U	ICL to Use)									
478						95% 5	Stude	nt's-t UCL	9.315	5											
479																					
480											ormal) distri			_							
481		Wher	applic	able, it i	is sug	gested	to us	e a UCL l	pased upor	n a d	istribution ((e.g	ı., gam	nma)	oassing	g bot	h GOF	tests	in Pro	oUCL	
482																					
483		Note: S	uggesti	ons reg		•				•	vided to hel	•						propria	ate 95	% UCL	
484		T1									size, data d									(0000)	
485											lation studie					-				,	
486	ŀ	nowever,	sımulat	ions res	sults \	wiii not d	cover	all Real \	vorid data	sets	; for additio	ona	ınsigl	nt the	user m	nay w	vant to	consu	uit a s	tatisticia	an.

	Α	В	С	[D	Е		F	G	Н	I	J		K	L
487															
488															
409	Nickel														
490								General	Statistics						
491			Tots	al Numb	er of O	heerva	ations	16	Statistics		Numb	or of Diet	inct Obse	nyations	11
492				יטוווטאווג	ei oi o	DSCIVA	1110115	10					sing Obse		0
493						Mini	imum	9			Numbe	CI OI IVIIS	sing Obse	Mean	20.69
494							imum	28						Median	20.5
495							SD	5.437				ç	Std. Error		1.359
496				Coe	fficient	of Vari		0.263						kewness	-0.246
497							duon	0.200							
498								Normal (GOF Test						
499 500				Shapiro	Wilk T	est Sta	atistic	0.94			Shapiro W	Vilk GOF	Test		
501				Shapiro '				0.887		Data appe				Level	
502				•		est Sta		0.127				s GOF T	-		
503				5% Lillie	efors C	ritical \	Value	0.213		Data appea	ar Normal	at 5% Sig	gnificance	Level	
504						Data	appea	ar Normal at	:5% Significaı	nce Level					
505															
506							Ass	suming Norr	mal Distributio	on n					
507			95% N	Normal L	JCL					95%	UCLs (Adj	justed fo	r Skewne	ss)	
508				95	% Stud	dent's-t	UCL	23.07			95% Adjust	ted-CLT	UCL (Che	n-1995)	22.83
509											95% Modif	fied-t UC	L (Johnso	n-1978)	23.06
510									1						
511								Gamma (GOF Test						
512					A-D T	est Sta	atistic	0.39		Anders	son-Darlin	g Gamm	a GOF Te	est	
513				5%	A-D C	ritical \	√alue	0.738	Detected	data appear					e Level
514						est Sta		0.117		_	orov-Smirn				
515						ritical \		0.215		data appear		Distribute	d at 5% S	ignificanc	e Level
516				Det	tected	data a	ppear	Gamma Dis	stributed at 5%	% Significan	nce Level				
517															
518									Statistics						44.00
519						k hat (I		13.51				•	s correcte	·	11.02
520						ta hat (I	•	1.531			Ineta	`	s correcte	,	1.878
521				41 E NA -		u hat (I		432.3					ar (bias co		352.6
522			IV	MLE Mea	an (bia	s corre	ctea)	20.69			\ nnrovimot		d (bias co	,	6.233 310.1
523				usted Le	wal of (Cianifia	20000	0.0335			Approximat		Chi Squa		305.5
524			Auju	JSIEG LE	everor	Signific	ance	0.0333				Aujusteu	Crii Squai	le value	305.5
525							Δεε	uming Gam	ma Distributio						
526		95% Approxir	mate Gamm	na UCL ((use wł	nen n>:		23.52			usted Gam	nma UCI	(use whe	en n<50)	23.87
527		, o , o , tppi oxiii			(400 111		00//				uotou dan		(400 11110		
528								Lognorma	GOF Test						
529 530				Shapiro	Wilk T	est Sta	atistic	0.896		Shap	iro Wilk Lo	gnormal	GOF Tes	st	
530				Shapiro '				0.887	[Data appear					
532						est Sta		0.125			iefors Logr		•		
533			,	5% Lillie				0.213	[Data appear				ce Level	
534						Data a	ppear	Lognormal	l at 5% Signific						
535															
536								Lognorma	l Statistics						
537				Minimu	um of L	.ogged	Data	2.197				Me	an of logg	jed Data	2.992
538			-	Maximu	um of L	ogged.	Data	3.332		-		5	SD of logg	jed Data	0.296
539									I.						
540							Assu	ming Logno	rmal Distribut	tion					

541	A B C D E 95% H-UCL	F 24.02	G	Н	90%	J Chebyshev (K MVUE) UCL	L 25.43
542	95% Chebyshev (MVUE) UCL	27.54			97.5%	Chebyshev (MVUE) UCL	30.48
543	99% Chebyshev (MVUE) UCL	36.24						
544								
545	Nonparame	tric Distribu	tion Free UCL	Statistics	3			
546	Data appear to follow a l	Discernible I	Distribution at	5% Signi	ficance Leve	əl		
547								
548	Nonpar	rametric Dist	tribution Free	JCLs				
549	95% CLT UCL	22.92				95% Ja	ckknife UCL	23.07
550	95% Standard Bootstrap UCL	22.88				95% Boo	tstrap-t UCL	22.94
551	95% Hall's Bootstrap UCL	22.9			95%	Percentile Bo	otstrap UCL	22.75
552	95% BCA Bootstrap UCL	22.75						
553	90% Chebyshev(Mean, Sd) UCL	24.77			95% C	hebyshev(Me	an, Sd) UCL	26.61
554	97.5% Chebyshev(Mean, Sd) UCL	29.18			99% C	hebyshev(Me	an, Sd) UCL	34.21
555							<u>"</u>	
556		Suggested	UCL to Use					
557	95% Student's-t UCL	23.07						
558			•					
559	Note: Suggestions regarding the selection of a 95%	UCL are pro	ovided to help	the user t	o select the	most appropri	ate 95% UCL.	
560	Recommendations are bas	sed upon dat	a size, data dis	stribution,	and skewne	SS.		
561	These recommendations are based upon the resu	Its of the sim	ulation studies	summar	ized in Singh	, Maichle, and	d Lee (2006).	
562	However, simulations results will not cover all Real W	orld data se	ts; for additiona	al insight	the user may	want to cons	ult a statisticia	an.
563								
564	Note: For highly negatively-skewed data, confid	dence limits	(e.g., Chen, Jo	ohnson, L	ognormal, a	nd Gamma) r	may not be	
565	reliable. Chen's and Johnson's me	ethods provi	de adjustment	s for posi	tvely skewe	d data sets.		
566								
567								
568	Vanadium							
569								
570			Statistics					
	Total Number of Observations	General 16	Statistics			er of Distinct C		15
570		16	Statistics			er of Distinct C er of Missing C	Observations	0
570 571	Minimum	16	Statistics				Observations Mean	0 242.6
570 571 572	Minimum Maximum	16 190 295	Statistics			er of Missing C	Observations Mean Median	0 242.6 239
570 571 572 573	Minimum Maximum SD	16 190 295 33.93	Statistics			er of Missing C	Mean Median Error of Mean	0 242.6 239 8.481
570 571 572 573 574	Minimum Maximum	16 190 295	Statistics			er of Missing C	Observations Mean Median	0 242.6 239
570 571 572 573 574 575	Minimum Maximum SD	16 190 295 33.93 0.14				er of Missing C	Mean Median Error of Mean	0 242.6 239 8.481
570 571 572 573 574 575 576	Minimum Maximum SD Coefficient of Variation	16 190 295 33.93 0.14 Normal C	Statistics GOF Test		Numbe	er of Missing C	Mean Median Firor of Mean Skewness	0 242.6 239 8.481
570 571 572 573 574 575 576	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic	16 190 295 33.93 0.14 Normal C			Number Shapiro W	er of Missing C Std. E	Mean Median Fror of Mean Skewness	0 242.6 239 8.481
570 571 572 573 574 576 577 578 579 580	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	16 190 295 33.93 0.14 Normal C 0.947 0.887		Data app	Shapiro W	Std. E /ilk GOF Test at 5% Significa	Mean Median Fror of Mean Skewness	0 242.6 239 8.481
570 571 572 573 574 575 576 577 578 579 580 581	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133			Shapiro Woear Normal	Std. E Wilk GOF Test at 5% Significates GOF Test	Mean Median Skewness	0 242.6 239 8.481
570 571 572 573 574 575 577 578 579 580 582 582	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213	GOF Test	Data app	Shapiro Woear Normal a	Std. E /ilk GOF Test at 5% Significa	Mean Median Skewness	0 242.6 239 8.481
570 571 572 572 573 575 575 576 577 580 580 582 583	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213		Data app	Shapiro Woear Normal a	Std. E Wilk GOF Test at 5% Significates GOF Test	Mean Median Skewness	0 242.6 239 8.481
570 571 572 573 574 575 576 578 578 581 582 583 584 584 584	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at	GOF Test	Data app	Shapiro Woear Normal a	Std. E Wilk GOF Test at 5% Significates GOF Test	Mean Median Skewness	0 242.6 239 8.481
570 571 572 572 573 575 577 577 580 581 582 583 584 585 585	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at	GOF Test	Data app	Shapiro Woear Normal a	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Skewness Mean Skewness	0 242.6 239 8.481
570 571 572 573 575 576 578 580 583 584 585 586 586 586 586 586 586 586 586 586 586 586 586 586 586 587 587 587 588	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at	GOF Test	Data app	Shapiro Woear Normal a Lilliefors pear Normal a	Std. E Wilk GOF Test at 5% Significat at 5% Significat at 5% Significat at 5% Significat	Mean Median Median Skewness ance Level ance Level	0 242.6 239 8.481 0.0525
570 571 572 573 575 576 577 578 582 582 584 585 587 687	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at	GOF Test	Data app	Shapiro Woear Normal a Lilliefors pear Normal a General Work of UCLs (Adj 95% Adjust	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Skewness ance Level ance Level wness) (Chen-1995)	0 242.6 239 8.481 0.0525
570 571 572 572 575 576 577 580 582 583 585 585 585 586 587 588	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at	GOF Test	Data app	Shapiro Woear Normal a Lilliefors pear Normal a General Work of UCLs (Adj 95% Adjust	Std. E Wilk GOF Test at 5% Significat at 5% Significat at 5% Significat at 5% Significat	Mean Median Median Skewness ance Level ance Level wness) (Chen-1995)	0 242.6 239 8.481 0.0525
570 571 572 573 575 575 578 580 583 586 587 588 588 588 588 588 588 588 588 588 588	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at suming Normal 257.4	GOF Test 5% Significar mal Distribution	Data app	Shapiro Woear Normal a Lilliefors pear Normal a General Work of UCLs (Adj 95% Adjust	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Skewness ance Level ance Level wness) (Chen-1995)	0 242.6 239 8.481 0.0525
570 571 572 572 573 575 577 578 580 582 585 587 588 589 590	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at	GOF Test	Data app ice Level n 959	Shapiro Wolear Normal a Lilliefors Dear Normal a Sear Norm	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Skewness ance Level ance Level wness) (Chen-1995) hnson-1978)	0 242.6 239 8.481 0.0525
570 571 572 573 575 575 578 580 583 586 587 588 588 588 588 588 588 588 588 588 588	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea Ass 95% Normal UCL 95% Student's-t UCL	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at suming Norm 257.4 Gamma C 0.294	GOF Test Soft Test GOF Test	Data applice Level	Shapiro Woear Normal a Lilliefors Dear Normal a Sear Norma	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Skewness ance Level ance Level wness) (Chen-1995) hnson-1978)	242.6 239 8.481 0.0525 256.6 257.4
570 571 572 572 573 575 577 578 580 582 585 587 588 589 590	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appear Ass 95% Normal UCL 95% Student's-t UCL A-D Test Statistic 5% A-D Critical Value	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at suming Norm 257.4 Gamma C 0.294 0.735	GOF Test Soft Test GOF Test	Data appointed by Data appoint	Shapiro Woear Normal a Lilliefors pear Normal a 95% Adjust 95% Modificar Gamma E	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Skewness ance Level ance Level (Chen-1995) hnson-1978)	242.6 239 8.481 0.0525 256.6 257.4
570 571 572 573 575 576 578 580 583 585 588 589 590 590 591	Minimum Maximum SD Coefficient of Variation Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value Lilliefors Test Statistic 5% Lilliefors Critical Value Data appea Ass 95% Normal UCL 95% Student's-t UCL	16 190 295 33.93 0.14 Normal C 0.947 0.887 0.133 0.213 ar Normal at suming Norm 257.4 Gamma C 0.294	GOF Test GOF Test GOF Test Detected of	Data apper Data apper	Shapiro Wood of the sear Normal of the search of the se	Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E Std. E	Mean Median Median Sirror of Mean Skewness ance Level ance Level (Chen-1995) hnson-1978) F Test Significance GOF Test	242.6 239 8.481 0.0525 256.6 257.4

595	Α		В		С		D etecte		appea	F r Gamma D	G stributed at	H 5% Signification	ance Le	vel	,	J		K	L
596																			
597										Gamma	Statistics								
598								k hat ((MLE)	53.97				k s	star (bi	as cor	rected	d MLE)	43.9
599							Th	eta hat ((MLE)	4.494			Т	heta	star (bi	as cor	rected	d MLE)	5.526
600								nu hat ((MLE)	1727					nu st	ar (bia	s cor	rected)	1405
601					М	LE M	ean (b	ias corre	ected)	242.6					MLE S	Sd (bia	s cor	rected)	36.61
602													Approx	imate	Chi S	quare '	Value	(0.05)	1319
603					Adjus	sted L	evel o	f Signific	cance	0.0335				Ac	djusted	Chi S	quare	· Value	1309
604											Į.								
605						-			As	suming Gar	nma Distribu	ıtion							
606		95% /	Approxi	imate	Gamma	a UCL	(use v	when n>	=50))	258.4		95% A	djusted	Gamn	na UCI	L (use	when	n<50)	260.3
607																			
608										Lognorma	I GOF Test						-		
609					S	Shapir	o Wilk	Test St	atistic	0.947		Sha	apiro Wil	lk Log	norma	I GOF	Test		
610					5% S	hapir	o Wilk	Critical	Value	0.887		Data appe	ar Logno	ormal	at 5%	Signifi	cance	e Level	
611						Lif	lliefors	Test St	atistic	0.126		L	illiefors	Logno	ormal C	GOF T	est		
612					5	5% Lil	liefors	Critical	Value	0.213		Data appe	ar Logno	ormal	at 5%	Signifi	cance	e Level	
613								Data a	ppear	r Lognormal	at 5% Signi	ficance Lev	el						
614																			
615										Lognorma	al Statistics								
616						Minin	num of	Logged	l Data	5.247					Ме	ean of	logge	d Data	5.482
617					1	Maxin	num of	Logged	l Data	5.687						SD of	logge	d Data	0.141
618																			
619									Assı	uming Logn	ormal Distrib	oution							
620								95% F	I-UCL	258.9				90%	Cheby	shev (I	MVUE	E) UCL	268.4
621					95%	Cheb	yshev	(MVUE) UCL	280			9	7.5%	Cheby	shev (I	MVUE	E) UCL	296.3
622					99%	Cheb	yshev	(MVUE) UCL	328.1								-	
623																			
624								Nonp	arame	etric Distribu	tion Free U	CL Statistics	 S						
625						Data	appe	ar to fol	low a	Discernible	Distribution	at 5% Signi	ficance	Level					
626																			
627								N	lonpa	rametric Dis	tribution Fre	e UCLs							
628							9	5% CLT	Γ UCL	256.5					9	5% Ja	ckknif	fe UCL	257.4
629					95%	Stan	dard B	ootstrap	UCL	256					959	% Boo	tstrap	-t UCL	257.8
630								ootstrap					!	95% F			-	ap UCL	256.6
631						95%	ВСА В	ootstrap	UCL	257.6									
632					90% Cr	nebys	hev(M	ean, Sd) UCL	268			95	5% Ch	ebysh	ev(Me	an, So	d) UCL	279.5
633						-	•	ean, Sd	•						•	•		d) UCL	327
634						-	-			I	I .								
635										Suggested	UCL to Use)							
636						9	5% St	udent's-	t UCL										
637										I	I .								
638		Note	: Sugge	estions	s regard	ding th	ne sele	ction of	a 95%	6 UCL are p	ovided to he	lp the user t	o select	the m	nost ap	propria	ate 95	% UCL	
639										sed upon da		-				-			
640		The	se reco	mmei						Its of the sin						le, and	l Lee	(2006).	
641								•		orld data se									
642																			
643																			
644	Zinc																		
645																			
										General	Statistics								
646					Total	l Num	ber of	Observa	ations				Nı	umber	r of Dis	tinct C) bsen	vations	13
647					. 5.01													vations	0
648															7110	g			

Maximum 83	649	Α	В	С	D	E Minimum	F 60	G	Н	I	J	K Mean	L 86.94
Second Second						Maximum	183						74
Sept						SD	30.13				Std. E	rror of Mean	7.534
Sept					Coefficient	t of Variation	0.347					Skewness	2.472
Sept								L					
Shapiro Wilk Teat Statistic 0.712 Shapiro Wilk GOF Teat							Normal C	3OF Test					
55% Shapiro Wilk Critical Value 0.887 Data Not Normal at 5% Significance Level				S	Shapiro Wilk T	Γest Statistic	0.712			Shapiro W	/ilk GOF Tes	t	
				5% S	hapiro Wilk C	Critical Value	0.887		Data No	ot Normal at	5% Significa	nce Level	
Data Not Normal at 5% Significance Level Data Not Normal at 5% Significance Level	-				Lilliefors T	Γest Statistic	0.246			Lilliefors	GOF Test		
				5	% Lilliefors C	Critical Value	0.213		Data No	ot Normal at	5% Significa	nce Level	
September Sep						Data Not	Normal at 5	% Significan	ce Level				
Page													
95% Normal UCL 95% Normal UCL 95% Adjusted of Skewness 104.3 95% Student's + UCL 10.1 95% Adjusted CLT UCL (Chen-1995) 104.3 100.9						Ass	suming Norr	nal Distribution	on				
95% Adjusted-CLT UCL (Chen-1995) 104.3 100.9 100.9 100.1				95% No	ormal UCL				95%	6 UCLs (Adj	usted for Ske	ewness)	-
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September Sep										95% Modif	ied-t UCL (Jo	hnson-1978)	100.9
Search Search													
A-D Test Statistic 1.77							Gamma (GOF Test					
See					A-D T	Test Statistic	1.17		Ande	rson-Darling	g Gamma GC	OF Test	
666 K.S Tost Statistic 0.221 Kolmogorov-Smirnov Gamma GOF Test 670 5% K.S Critical Value 0.215 Data Not Gamma Distributed at 5% Significance Level 672 Total Not Gamma Distributed at 5% Significance Level 673 Satistics 674 R kat (MLE) 1.219 R kat (bias corrected MLE) 9.964 675 Theta hat (MLE) 7.119 Theta star (bias corrected MLE) 8.725 676 MLE Mean (bias corrected) 39.0.8 nu star (bias corrected) 27.54 677 MLE Mean (bias corrected) 8.9.4 MLE Sd (bias corrected) 27.54 678 Adjusted Chis (bias corrected) 27.54 27.54 679 Adjusted Chi Square Value 27.52 28.5 679 Adjusted Chi Square Value 27.42 27.5 680 Saya Approximate Gamma UCL (use when n>=50) 95.8 95% Adjusted Gamma UCL (use when n<=50)					5% A-D C	Critical Value	0.738	Da	ata Not Gan	nma Distribu	ıted at 5% Siç	gnificance Lev	el
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672 Gamma Statistics 673 (A k hat (MLE) 12.21					Da	ita Not Gamr	na Distribute	ed at 5% Sigr	nificance Le	evel			-
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679 Adjusted Level of Significance 0.0335 Adjusted Chi Square Value 274.2 680 4 Assuming Garma Distribution 101.1 101.1 682 95% Approximate Gamma UCL (use when n≥=50)) 99.54 95% Adjusted Gamma UCL (use when n<50)										Approximat	e Chi Square	Value (0.05)	278.5
680 Assuming Gamma Distribution 681 95% Approximate Gamma UCL (use when n>=50)) 99.54 95% Adjusted Gamma UCL (use when n<50)				Adjus	sted Level of	Significance	0.0335			Д	djusted Chi S	Square Value	274.2
95% Approximate Gamma UCL (use when n>=50)) 99.54 95% Adjusted Gamma UCL (use when n<50) 101.1 683 684	680												
683 Lognormal GOF Test 684 Lognormal GOF Test 685 Shapiro Wilk Test Statistic 0.837 Shapiro Wilk Lognormal GOF Test 686 5% Shapiro Wilk Critical Value 0.887 Data Not Lognormal at 5% Significance Level 687 Lilliefors Test Statistic 0.212 Lilliefors Lognormal GOF Test 688 5% Lilliefors Critical Value 0.213 Data appear Lognormal at 5% Significance Level 689 Data appear Approximate Lognormal at 5% Significance Level 690 Lognormal Statistics 691 Lognormal Statistics 692 Minimum of Logged Data 4.094 Mean of logged Data 4.424 693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 Assuming Lognormal Distribution 695 Assuming Lognormal Colspan="4">Assuming Lognormal Colspan="4">Assuming Lognormal Colspan="4">Assuming Lognormal Colspan="4">Assuming Lognormal Colspan="4">Assuming Lognormal Colspan="4"	681					Ass	suming Gam	ma Distributi	on				
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686 5% Shapiro Wilk Critical Value 0.887 Data Not Lognormal at 5% Significance Level 687 Lilliefors Test Statistic 0.212 Lilliefors Lognormal GOF Test 688 5% Lilliefors Critical Value 0.213 Data appear Lognormal at 5% Significance Level 689 Lognormal at 5% Significance Level 690 Lognormal at 5% Significance Level 691 Lognormal Statistics 692 Minimum of Logged Data 4.094 Mean of logged Data 4.424 693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 Assuming Lognormal Distribution 695 Assuming Lognormal Distribution 696 95% H-UCL 98.99 90% Chebyshev (MVUE) UCL 104.6 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 Head of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of the color of	684						Lognormal	GOF Test					
	685			S	Shapiro Wilk T	Fest Statistic	0.837		Sha	piro Wilk Lo	gnormal GO	F Test	
688 5% Lilliefors Critical Value 0.213 Data appear Lognormal at 5% Significance Level 689 Data appear Approximate Lognormal at 5% Significance Level 690 Lognormal Statistics 691 Lognormal Statistics 692 Mean of logged Data 4.424 693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 Assuming Lognormal Distribution 695 Assuming Lognormal Distribution 696 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 Nonparametric Distribution Free UCL Statistics 700 Nonparametric Distribution at 5% Significance Level	686			5% S	•					•	•		
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690 Lognormal Statistics 692 Minimum of Logged Data 4.094 Mean of logged Data 4.424 693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 695 Assuming Lognormal Distribution 696 95% H-UCL 98.99 90% Chebyshev (MVUE) UCL 104.6 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 46.8 <td< td=""><th>688</th><td></td><td></td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td>ıl at 5% Signi</td><td>ficance Level</td><td></td></td<>	688			5							ıl at 5% Signi	ficance Level	
691 Lognormal Statistics 692 Minimum of Logged Data 4.094 Mean of logged Data 4.424 693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 Assuming Lognormal Distribution 695 Assuming Lognormal Distribution 696 95% H-UCL 98.99 90% Chebyshev (MVUE) UCL 104.6 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 99% Chebyshev (MVUE) UCL 146.8 699 Nonparametric Distribution Free UCL Statistics 700 Nonparametric Distribution at 5% Significance Level	689				Data a	ppear Appro	ximate Logn	ormal at 5%	Significand	e Level			
692 Minimum of Logged Data 4.094 Mean of logged Data 4.424 693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 Assuming Lognormal Distribution 696 Assuming Lognormal Distribution 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8	690												
693 Maximum of Logged Data 5.209 SD of logged Data 0.277 694 Assuming Lognormal Distribution 696 95% H-UCL 98.99 90% Chebyshev (MVUE) UCL 104.6 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 99% 700 Nonparametric Distribution Free UCL Statistics 701 Data appear to follow a Discernible Distribution at 5% Significance Level	691							l Statistics					
694 Assuming Lognormal Distribution 696 Power of the byshev (MVUE) UCL Power of the byshev (MVUE) UC	692												
695 Assuming Lognormal Distribution 696 95% H-UCL 98.99 90% Chebyshev (MVUE) UCL 104.6 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 99% 700 Nonparametric Distribution Free UCL Statistics 701 Data appear to follow a Discernible Distribution at 5% Significance Level 104.6	693				Maximum of L	ogged Data	5.209				SD of	logged Data	0.277
696 95% H-UCL 98.99 90% Chebyshev (MVUE) UCL 104.6 697 95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 698 99% Chebyshev (MVUE) UCL 146.8 99% 699 Nonparametric Distribution Free UCL Statistics 701 Data appear to follow a Discernible Distribution at 5% Significance Level	694												
95% Chebyshev (MVUE) UCL 112.9 97.5% Chebyshev (MVUE) UCL 124.3 99% Chebyshev (MVUE) UCL 146.8 Nonparametric Distribution Free UCL Statistics Data appear to follow a Discernible Distribution at 5% Significance Level	695							rmal Distribu	ition			/a.m.//	
698 99% Chebyshev (MVUE) UCL 146.8 699 700 Nonparametric Distribution Free UCL Statistics 701 Data appear to follow a Discernible Distribution at 5% Significance Level	696										•	` '	
699 700 Nonparametric Distribution Free UCL Statistics 701 Data appear to follow a Discernible Distribution at 5% Significance Level	697				• •	,				97.5%	Chebyshev	(MVUE) UCL	124.3
Nonparametric Distribution Free UCL Statistics Data appear to follow a Discernible Distribution at 5% Significance Level	698			99%	Chebyshev (I	MVUE) UCL	146.8						
701 Data appear to follow a Discernible Distribution at 5% Significance Level	699												
701	700					<u> </u>							
loozi	701				Data appea	r to follow a l	Discernible [Distribution a	t 5% Signif	icance Leve			
104	702												

	Α	В	С	D	E	F	G	Н	I	J	K	L
703					Nonpar	rametric Dist	tribution Free	e UCLs				
704				95	% CLT UCL	99.33				95% Ja	ckknife UCL	100.1
705			95%	Standard Bo	otstrap UCL	98.86				95% Boot	tstrap-t UCL	113.3
706			9	5% Hall's Bo	otstrap UCL	159.9			95% F	Percentile Bo	otstrap UCL	99.63
707			Ç	95% BCA Bo	otstrap UCL	103.4						
708			90% Ch	ebyshev(Me	an, Sd) UCL	109.5			95% Ch	ebyshev(Mea	an, Sd) UCL	119.8
709			97.5% Ch	ebyshev(Me	an, Sd) UCL	134			99% Ch	ebyshev(Mea	an, Sd) UCL	161.9
710												
711						Suggested	UCL to Use					
712				95% Stu	dent's-t UCL	100.1				or 95% Mo	dified-t UCL	100.9
713				or	95% H-UCL	98.99						
714												
715	١	Note: Sugges	stions regard	ing the selec	tion of a 95%	UCL are pro	ovided to help	p the user to	select the m	nost appropria	ate 95% UCL	
716			R	Recommenda	tions are bas	sed upon dat	a size, data d	distribution, a	and skewnes	s.		
717		These recor	nmendations	are based u	pon the resu	Its of the sim	ulation studie	es summariz	zed in Singh,	Maichle, and	I Lee (2006).	
718	Ho	wever, simul	lations result	s will not cov	er all Real W	orld data set	ts; for additio	nal insight th	ne user may	want to consu	ult a statistici	an.
719												
720			Prol	JCL comput	es and outpu	ıts H-statistic	c based UCL	s for historic	cal reasons	only.		
721												
722	·	·	lt	is therefore	recommende	ed to avoid the	he use of H-s	statistic bas	ed 95% UCL	.s.		
723	Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.											
724												

	A B C	D E	F	G H I J K Pensored Full Data Sets	L							
1		OCL Statist	ucs for Office	silsored Full Data Sets								
2	User Selected Options											
3	Date/Time of Computation	ProUCL 5.12/11/2021 11:	55·21 AM									
4	From File	UCL UTL concentrations		lue i.xls								
5 6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	Arsenic											
12												
13			General	Statistics								
14	Tota	I Number of Observations	9	Number of Distinct Observations	7							
15				Number of Missing Observations	0							
16		Minimum	4.2	Mean	8.6							
17		Maximum	17	Median	7.1							
18		SD	4.169	Std. Error of Mean	1.39							
19		Coefficient of Variation	0.485	Skewness	1.09							
20												
21	Note: Sam	nple size is small (e.g., <10)), if data are	e collected using ISM approach, you should use								
22	guidance p	rovided in ITRC Tech Reg	Guide on IS	M (ITRC, 2012) to compute statistics of interest.								
23	For	example, you may want to	use Cheby	shev UCL to estimate EPC (ITRC, 2012).								
24	Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.1											
25												
26			Normal G	OF Test								
27		Shapiro Wilk Test Statistic	0.9	Shapiro Wilk GOF Test								
28	5% S	Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level								
29		Lilliefors Test Statistic	0.196	Lilliefors GOF Test								
30	Ĺ	5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level								
31		Data appea	r Normal at	5% Significance Level								
32												
33			suming Norn	nal Distribution								
34	95% N	ormal UCL		95% UCLs (Adjusted for Skewness)								
35		95% Student's-t UCL	11.18	95% Adjusted-CLT UCL (Chen-1995)	11.42							
36				95% Modified-t UCL (Johnson-1978)	11.27							
37												
38		<u> </u>	Gamma C									
39		A-D Test Statistic	0.268	Anderson-Darling Gamma GOF Test								
40		5% A-D Critical Value	0.723	Detected data appear Gamma Distributed at 5% Significanc	e Level							
41		K-S Test Statistic	0.165	Kolmogorov-Smirnov Gamma GOF Test								
42		5% K-S Critical Value	0.28	Detected data appear Gamma Distributed at 5% Significanc	e Level							
43		Detected data appear	Gamma Dis	tributed at 5% Significance Level								
44				7. d d								
45			Gamma S		0.530							
46		k hat (MLE)	5.248	k star (bias corrected MLE)	3.573							
47		Theta hat (MLE)	1.639	Theta star (bias corrected MLE)	2.407							
48		nu hat (MLE)	94.47	nu star (bias corrected)	64.31							
49	M	ILE Mean (bias corrected)	8.6	MLE Sd (bias corrected)	4.55							
50	4.0	ated Level -f Oi 'f'	0.0004	Approximate Chi Square Value (0.05)	46.86							
51	Adju	sted Level of Significance	0.0231	Adjusted Chi Square Value	43.74							
52				Disadhudan								
53	050/ 4			ma Distribution	10.05							
54	95% Approximate Gamma	a UCL (use when n>=50))	11.8	95% Adjusted Gamma UCL (use when n<50)	12.65							

	Α		В		С		D	E	-	F	G	Н		I	,	J		K	L
55																			
56											I GOF Test								
57							iro Wilk			0.952			•	Vilk Log					
58					5%		ro Wilk (0.829		Data appe						e Level	
59							illiefors			0.135				s Logno					
60						5% Li	illiefors (0.274		Data appe		normal	at 5%	Signifi	icanc	e Level	
61								Data a	ppear	Lognormal	at 5% Signi	icance Lev	/el						
62																			
63											al Statistics								
64							mum of			1.435								ed Data	
65						Maxi	mum of	Logged	Data	2.833						SD of	logge	ed Data	0.468
66																			
67											ormal Distrib	ution							
68								95% H		12.51						•		E) UCL	
69							byshev (14.49				97.5% (Cheby	shev (MVU	E) UCL	17.04
70					999	% Che	byshev ((MVUE)	UCL	22.06									
71																			
72								•			tion Free U								
73						Dat	ta appea	ır to foll	ow a l	Discernible	Distribution	at 5% Sign	ificanc	e Level					
74																			
75											tribution Fre	e UCLs							
76								5% CLT		10.89								ife UCL	
77					95		ndard Bo			10.8								p-t UCL	
78							Hall's Bo			17.26				95% F	Percen	itile Bo	otstra	ap UCL	10.81
79							BCA Bo	•		11.22									
80							shev(Me			12.77						•		d) UCL	
81				9	7.5% (Cheby	shev(Me	an, Sd)	UCL	17.28				99% Ch	ebysh	ev(Me	an, S	d) UCL	22.43
82																			
83											UCL to Use								1
84							95% Stu	ident's-t	i UCL	11.18									
85																		<u> </u>	
86		Not	e: Sugge	estion	is rega					·	ovided to he	•				propri	ate 9	3% UCL	
87		-									ta size, data							(0000)	
88								-			nulation stud								
89	ŀ	Howe	ver, sımı	ulatio	ns resi	ults wi	II not co	ver all R	teal vv	orid data se	ets; for addition	onal insignt	the use	er may v	want to	o consi	uit a s	statistic	an.
90																			
91	Darium																		
92	Barium																		
93										Conoral	Statistics								
94					Tot	tal Ni	mber of (Oheon <i>i</i> c	ations	General 9	JIGUSUCS			Numbar	r of Dia	tinot C)hear	vations	7
95					101	aı ıvuf	IID C I OI (100115	<i>3</i>								vations	
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97									imum	93								Mean Median	
98								iviaxi	SD	15.48						C+4 L		of Mean	
99							oefficien	nt of \/o-		0.265						Jiu. E		ewness	
100							oemolen	- oi vaii	iauUII	U.ZUO								-wiless	1.303
101				NI.	to So	mnle (size ie c	mall (a	<u></u>	(1) if data or	re collected	ueina ISM	annroo	ch vou	ehoul	d uso			
102										•	SM (ITRC, 2								
103				yui						-	yshev UCL t	<u> </u>	-			ici est.	-		
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105					เฉทภิญ		L Call D	e comb	աւ Ե Ա Լ		niparameu10	anu All U	or obu	UIIS UI I	-1000	,L U. I			
106										Normal (GOF Test								
107						Shor	iro Wilk	Toct Ct	atictic	0.861	GOF T est		Sho	piro Wil	lk CO'	E Toot			
108						опар	IIO VVIIK	1031 316	JUSUC	0.001			SIId	PIIO WII	ik GUI	1 651			

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109										est Statisti		.238			•	- a ta ap ₁	P • • •	Lilliefo			-			
110						5'				itical Valu		.274				Data apı	pea					ance l	Level	
111 112										Data app			 t 5%	6 Signific			•				,			
113										• • •														
114										Δ	ssumi	ng Nor	mal	Distribu	ition	1								
115					95	5% No	rma	UCL	L							959	% U	CLs (Ad	djuste	ed for	Ske	wnes	s)	
116							ç	5% 5	Stude	ent's-t UC	L 68	3.04					95	% Adjus	sted-	CLT (JCL (Chen	-1995)	69.33
117																	9	5% Mod	lified-	-t UCI	L (Joh	nnson	-1978)	68.41
118											!													1
119											G	amma	GO	F Test										
120										est Statisti		.557						n-Darlii						
121							5			itical Valu		.721		Detecte	ed d									nce Level
122										est Statisti		.234						ov-Smir						
123										itical Valu		.279	Ш.						Distr	ribute	d at 5	Się	gnificar	nce Level
124								etec	ted d	data appe	ar Gan	nma Di	istrit	buted at	5%	Signific	anc	e Level						
125													01-											
126										- l+ /NAL F		amma	Sta	itistics					14-	/ -!-			I NAL EX	11.70
127										hat (MLE	1	7.52								•			d MLE)	
128								- 1		hat (MLE hat (MLE	-	.335						rnet		•			d MLE) rected)	
129						М	E M	ean (corrected	′	3.44									•		rected)	
130						IVIL	IVI	ean (Ulas	Corrected	1) 30). 44					Δr	proxima			•			
131						Adius	ted I	evel	of S	ignificanc	e 0	0231											Value	
132						, iajao	ica i	-0101	0, 0	- Igriiilearie	0.	0201							, taju	olou (0111 0	quuic	value	172.0
133										Α	ssumir	na Gan	nma	Distribu	ıtior	1								
134 135		95%	Appro	oxima	te Ga	amma	UCI	_ (use	e whe	en n>=50)		9.11	T				Adju	sted Ga	mma	UCL	(use	when	n<50)	71.65
136								•													•			
137											Log	norma	al GC	OF Test										
138						S	hapii	o Wi	lk Te	est Statisti	c 0	.91				Sha	apir	o Wilk L	.ognc	ormal	GOF	Test		
139					ļ	5% Sł	napir	o Wil	k Cri	itical Valu	e 0	.829			Da	ata appe	ear L	ognorm	al at	5% S	Signifi	cance	e Level	
140							Li	lliefo	rs Te	est Statisti	с 0	.252				L	illie	fors Log	norn	nal G	OF T	est		
141						5	% Lil	liefor	s Cri	itical Valu	е 0	.274			Da	ata appe	ear L	ognorm	al at	5% S	Signifi	cance	e Level	
142									D	ata appe	ar Logi	normal	at 5	5% Signi	fica	nce Lev	/el							
143																								
144													al St	tatistics										
145										ogged Dat		.584											d Data	
146						N	/laxir	num	of Lo	gged Dat	a 4	.533								S	SD of	logge	d Data	0.252
147												. 1 -		al Disci										
148									-		-		orma	al Distrib	outio	on		000	0/ 01	. o.b. · - '	barr /	N // / ! !	-) 1101	70 17
149						OE0/ 1	Ob a '	n e l-		5% H-UC		9.78	+								•		E) UCL	
150								•	•	IVUE) UC		9.86	-					97.5	‰ Cn	iebysl	nev (I	IVIVUE	E) UCL	89.14
151						<i>337</i> 0 (onet	ysne	V (IVI	ivu⊑) UC	L 10	7.4												
152										Nonparan	netric F)istrih:	ıtion	Free I	CI (Statietic	·s							
153							Det	ann		to follow a								nce l e	/el					
154							Jau	- որի	Jui	IOIIOW (וטוע		u . c	, 70 Oigil								
155										Nonn	arame	tric Dis	strib	ution Fre	e U	ICLs								
156									95%	6 CLT UC		5.93								95	% Ja	ckknit	fe UCL	68.04
157						95%	Stan	dard		tstrap UC		5.42											-t UCL	
158 159										tstrap UC			+					95%	% Pe				p UCL	
160										tstrap UC		9.44	+										-	
161					90					n, Sd) UC		3.92						95%	Cheb	yshe	v(Mea	an, So	d) UCL	80.93
162							•	•		n, Sd) UC		0.66								-	•		d) UCL	
102								,													•			

	Α		В		С		D		E	F	G		Н		I		J		K		L
163										Cummostod	LICI to Lies										
164							F0/ C+	م المصر ما الم	* I I C I		UCL to Use	•									
165							5% Sil	ıdent's-	-t UCL	68.04										Щ.	
166		Note	· Sugge	etions	e regard	ding th	مامء ما	ction of	f a 05%	6 UCL are pr	ovided to be	In the	usar t	s solor	t the m	noet a	nnronr	iata C	15% LIC	<u> </u>	
167		NOLE	. Sugge	55110113						sed upon da		-					ippiopi	late 3		L.	
168		The	se reco	ommei						ılts of the sin							hle an	ıd I er	e (2006)	١.	
169								-		orld data se					_						
170 171											10, 10. 00011										
171																					
	Chromiur	m																			
174																					
175										General	Statistics										
176					Total	Num	ber of (Observ	ations	10				١	lumbe	r of D	istinct (Obse	rvations	3	9
177														١	lumbei	r of M	issing (Obse	rvations	3	0
178								Mir	nimum	3.9									Mear	1	8.89
179								Max	kimum										Mediar	1	9.2
180									SD	2.628							Std. E	Error	of Mear		0.831
181						Co	efficier	t of Va	riation	0.296								Sk	ewness	3 -	-0.66
182																					
183						<u> </u>	14000	-			GOF Test			<u></u>							
184								Test St									OF Tes				
185	<u> </u>				5% S			Critical		0.842		D	ata app		ormal a		•	ance	Level		
186					E			Test St Critical		0.132 0.262			oto onn						Lovel		
187						% LIII	ierors			ar Normal a	t 5% Signific		ata app	ear ivo	ormai a	11 5%	Signific	ance	Level		
188								Date	appe	ai Noilliai a	t 3 /6 Sigillin	Carice	LEVE								
189									As	suming Nor	mal Distribu	ition									
190					95% No	ormal	UCL		710	ourning reor			95%	6 UCL	s (Adiu	ısted '	for Ske	ewne	ss)		
191 192								ıdent's-	t UCL	10.41					• •				en-1995))	10.07
192										-								•	n-1978		10.38
194											<u> </u>						-				
195										Gamma	GOF Test										
196							A-D	Test St	tatistic	0.39			Ande	rson-[Darling	Gam	ma GC	OF T€	est		
197						5%	% A-D	Critical	Value	0.725	Detecte	ed dat	a appe	ar Gar	nma Di	istribu	ited at	5% S	Significa	nce	Level
198							K-S	Test St	tatistic	0.171			Kolmo	gorov-	Smirno	ov Ga	mma C	GOF	Test		
199						59	% K-S	Critical	Value	0.267	Detecte	ed dat	a appe	ar Gar	nma Di	istribu	ited at	5% S	Significa	nce	Level
200						D	etecte	d data	appea	r Gamma Di	stributed at	5% S	Significa	nce L	evel						
201																					
202											Statistics										
203									(MLE)							•			ed MLE		7.293
204								eta hat		0.861					i heta :	•			ed MLE)	´	1.219
205					K 41			nu hat	. ,	206.5							•		rrected)	´	3.292
206					IVI	LE IVIE	ean (bi	as corr	ected)	8.89				Annra	vimo+-		•		orrected)	·	3.292
207					Δdius	stad I	evel of	Signifi	canco	0.0267				Appro					re Value		14.7
208					Aujus	JIGU L	.cvei Ol	Gigriill	cance	0.0207	<u> </u>				Α(ujusie	a on a	ual		1_'	17./
209									Αs	suming Gan	nma Distribi	ıtion									
210		95%	Approxi	imate	Gamma	a UCI	(use v	vhen n					95% A	djuster	d Gamr	ma U	CL (use	e whe	en n<50))	11.3
211			F F 1 2 KI				(233)	-1.16	//		[,			- (300			Ί	
212 213										Lognorma	I GOF Test										
214					S	Shapir	o Wilk	Test St	tatistic				Sha	piro W	ilk Log	gnorm	nal GO	F Tes	st		
215								Critical		0.842		Dat							ce Leve	ı	
216						Lil	liefors	Test St	tatistic	0.192	1		Li	lliefors	Logno	ormal	GOF	Test			
_ 10										I .	<u>I</u>										

217	Α	В	С		D % Lilliefors C	E Critical Value	F 0.262	G	H Data appea	l r Lognormal	J at 5% Signific	K cance Level	L
218						Data appear	Lognormal	at 5% Signific	cance Leve	I			
219													
220							Lognorma	l Statistics					
221					Minimum of I	Logged Data	1.361				Mean of I	ogged Data	2.136
222				1	Naximum of I	Logged Data	2.485				SD of I	ogged Data	0.352
223								<u> </u>					
224						Assı	ıming Logno	rmal Distribu	tion				
225						95% H-UCL	11.43			90%	Chebyshev (N	MVUE) UCL	11.96
226				95% (Chebyshev ((MVUE) UCL	13.33			97.5%	Chebyshev (N	MVUE) UCL	15.23
227				99% (Chebyshev ((MVUE) UCL	18.95						
228												Į.	
229						Nonparame	tric Distribut	tion Free UCL	_ Statistics				
230				-	Data appea	r to follow a	Discernible [Distribution at	t 5% Signifi	cance Level			
231													
232						Nonpa	rametric Dist	tribution Free	UCLs				
233					95	5% CLT UCL	10.26				95% Jac	ckknife UCL	10.41
234			-	95%	Standard Bo	ootstrap UCL	10.22				95% Boot	strap-t UCL	10.22
235				9	5% Hall's Bo	ootstrap UCL	10.08			95% F	Percentile Bo	otstrap UCL	10.09
236					95% BCA Bc	ootstrap UCL	9.98						
237			900	% Ch	ebyshev(Me	an, Sd) UCL	11.38			95% Ch	ebyshev(Mea	an, Sd) UCL	12.51
238			97.5	% Ch	ebyshev(Me	an, Sd) UCL	14.08			99% Ch	ebyshev(Mea	an, Sd) UCL	17.16
239							<u>.</u>				<u> </u>		
240							Suggested	UCL to Use					
241					95% Stu	ident's-t UCL	10.41						
242								L					
243		Note: Sugge	estions re	egard	ing the selec	ction of a 95%	UCL are pro	ovided to help	the user to	select the m	ost appropria	ite 95% UCL	
244				F		ations are bas	sed upon dat	a size, data di	istribution, ຄ	and skewnes	S.		
245		These reco	mmenda	ations	are based ι	pon the resu	Its of the sim	ulation studie	s summariz	ed in Singh,	Maichle, and	Lee (2006).	
246	Н	lowever, simu	ulations r	result	s will not cov	ver all Real W	orld data set	ts; for addition	nal insight th	ne user may	want to consu	ılt a statisticia	in.
247													
248		Note: For	r highly r	negat	ively-skewe	d data, confi	dence limits	(e.g., Chen, J	Johnson, Lo	ognormal, ar	nd Gamma) m	nay not be	
249			relial	ble. (Chen's and .	Johnson's mo	ethods provid	de adjustmen	ts for posit	vely skewed	data sets.		
250													
251													
	Cobalt												
253													
254							General	Statistics					
255			-	Total	Number of C	Observations	10			Number	of Distinct O	bservations	10
256										Number	of Missing O	bservations	0
257						Minimum	4.2					Mean	5.8
258						Maximum	7.9					Median	5.75
259						SD	1.065				Std. Er	ror of Mean	0.337
260					Coefficien	t of Variation	0.184					Skewness	0.642
261													
262							Normal C	GOF Test					
263				S	hapiro Wilk	Test Statistic	0.965			Shapiro Wi	lk GOF Test		
264				5% SI	napiro Wilk C	Critical Value	0.842		Data appe	ear Normal a	t 5% Significa	nce Level	
265					Lilliefors	Test Statistic	0.189			Lilliefors	GOF Test		
266				5	% Lilliefors C	Critical Value	0.262		Data appe	ear Normal a	t 5% Significa	nce Level	
267						Data appe	ar Normal at	5% Significa	nce Level				
268	<u> </u>												
269	*					As	suming Norr	mal Distribution	on				
270			95	% No	ormal UCL				95%	UCLs (Adju	sted for Skev	vness)	
<i>L1</i> 0													

271	Α	В	(С	D 95% Stud	E lent's-t UCL	F 6.417	G	Н	I 95% Adju	J sted-CLT UCL	K (Chen-1995)	L 6.427
272					-	-			-	95% Mod	lified-t UCL (Jo	ohnson-1978)	6.429
273													
274							Gamma (GOF Test					
275						est Statistic					ng Gamma Go		
276						ritical Value		Detected				5% Significan	ce Level
277						est Statistic				<u> </u>	rnov Gamma (
278						ritical Value						5% Significand	ce Level
279					Detected	data appea	r Gamma Dis	stributed at 59	% Significa	ance Level			
280								01-11-11					
281						k hat (MLE)		Statistics			k star (bias co	rrested MLEV	23.84
282						a hat (MLE)					ta star (bias co	*	0.243
283						u hat (MLE)				THE	,	ias corrected)	476.7
284				MI	E Mean (bias	. ,					•	ias corrected)	1.188
285				IVILI	_ ivicali (bias		3.0			Annroxim:	ate Chi Square	•	427.1
286				Adiust	ed Level of S	Significance	0.0267				Adjusted Chi	, ,	418.9
287				, .a, ao i			0.0207				- 10,00100 0111	oquaio raido	
288						As	sumina Gam	ma Distribution					
289 290		95% Approx	cimate G	amma l	UCL (use wh					djusted Ga	mma UCL (us	e when n<50)	6.6
291		•••									•	/	
292							Lognorma	I GOF Test					
293				Sh	apiro Wilk To	est Statistic	0.985		Sha	apiro Wilk L	ognormal GO	F Test	
294				5% Sha	apiro Wilk Cı	ritical Value	0.842	ſ	Data appe	ar Lognorm	nal at 5% Signi	ificance Level	
295					Lilliefors T	est Statistic	0.159		L	illiefors Log	gnormal GOF	Test	
296				5%	6 Lilliefors Ci	ritical Value	0.262	ľ	Data appe	ar Lognorm	nal at 5% Signi	ificance Level	
297					1	Data appear	r Lognormal	at 5% Signific	ance Lev	el			
298													
299							Lognorma	l Statistics					
300				N	linimum of L	ogged Data	1.435				Mean o	f logged Data	1.743
301				Ma	aximum of L	ogged Data	2.067				SD o	f logged Data	0.181
302													
303								ormal Distribut	tion				
304						95% H-UCL					% Chebyshev	,	6.796
305					hebyshev (N	•				97.5	% Chebyshev	(MVUE) UCL	7.874
306				99% C	hebyshev (N	/IVUE) UCL	9.105						
307						Nan	atala Diatali	Hom Front UC'	O4-41-11				
308						•		tion Free UCL			vol		
309				<u> </u>	Jaia appear	to iollow a	DISCERNIDIE I	Distribution at	. 0% SIGNI	incance Lev	vei		
310						Nonno	rametric Dic	tribution Free	IICI e				
311					OE(Nonpa % CLT UCL					05% I	ackknife UCL	6.417
312				95% 9	95° Standard Boo							otstrap-t UCL	6.549
313					5% Hall's Boo	•				959	% Percentile B		6.33
314					5% BCA Boo						C. GOOTHIIC D	23.0.1.up 00L	
315			90		ebyshev(Mea	•				95%	Chebyshev(M	ean, Sd) UCI	7.267
316					byshev(Mea						Chebyshev(M		9.15
317			J,.(, 20, 002	
318 319							Suggested	UCL to Use					
320					95% Stud	lent's-t UCL							
321													
322		Note: Sugg	estions	regardir	ng the select	ion of a 95%	6 UCL are pr	ovided to help	the user t	o select the	e most appropr	riate 95% UCL	
323				_	_		•	a size, data di					
324		These rec	ommend				•				jh, Maichle, ar	nd Lee (2006).	
J Z 4											**	` '	

225	A	B However, simu	C lations result	D s will not d	E cover all Real	F World data s	G sets; for addition	H nal insight th	l e user mav	J want to cons	K sult a statisticia	L nn.
325 326												
327												
	Copper											
329												
330						Genera	al Statistics					
331			Total	Number o	f Observation	ns 10			Numbe	r of Distinct (Observations	8
332									Number	r of Missing (Observations	0
333					Minimu	m 6.1					Mean	8.17
334					Maximu	_					Median	7.1
335						D 2.594				Std. E	rror of Mean	0.82
336				Coefficie	ent of Variation	on 0.318					Skewness	1.615
337												
338							I GOF Test		01 1 14			
339				•	k Test Statis			D-t- N-		Ik GOF Test		
340			5% Sr		k Critical Values S Test Statis			Data No		5% Significar	nce Level	
341			E		s Test Statis			Data Ma		GOF Test 5% Significar	neo Level	
342	<u> </u>		2,	/₀ Lilleiors			 t 5% Significan		t Normal at t	o /o olymiicai	ice Level	
343					Data I	tot itolillal a	. o /o Olgi illicali					
344						Assumina Na	ormal Distribution	on				
345			95% No	rmal UCL		, toouring re			UCLs (Adiu	sted for Ske	wness)	
346 347					Student's-t UC	CL 9.674					(Chen-1995)	9.967
348									-		hnson-1978)	9.744
349										•		
350						Gamm	GOF Test					
351				A-I	D Test Statis	tic 1.352		Ander	son-Darling	Gamma GC	F Test	
352				5% A-E	Critical Value	ue 0.725	Da	ata Not Gam	ma Distribut	ed at 5% Sig	nificance Leve	el le
353				K-	S Test Statis	tic 0.331		Kolmog	orov-Smirno	ov Gamma G	OF Test	
354				5% K-S	6 Critical Value	ue 0.266	Da	ata Not Gam	ma Distribut	ed at 5% Sig	nificance Leve	el e
355					Data Not Ga	mma Distrib	uted at 5% Sigr	nificance Le	vel			
356												
357							a Statistics					
358					k hat (ML					•	rrected MLE)	9.543
359				Т	heta hat (ML	•			Theta	•	rrected MLE)	0.856
360					nu hat (ML	1				•	as corrected)	190.9
361			ML	_E Mean (bias correcte	d) 8.17				,	as corrected)	2.645
362			A 11		. 0	0.0007				•	Value (0.05)	159.9
363			Adjus	tea Level	of Significan	ce 0.0267			A	ajustea Cni S	Square Value	155
364						Accumina Ca	ımma Distributi	ion				
365	<u> </u>	95% Approxir	mate Cammo	HCL (uso			וויוווום טופנווטענו		iusted Com	ma IICI (uso	when n<50)	10.06
366		20 /0 While	nate Gaillilla	JOL (USE	, wileli 11/-3(9.732			jusieu Gailli	na oci (use	, willett ti>00)	10.00
367						Lognorm	al GOF Test					
368			S	hapiro Wil	k Test Statis			Shar	oiro Wilk Loc	normal GOF	- Test	
369 370				•	k Critical Value			-	-	t 5% Signific		
370 371					s Test Statis					ormal GOF 1		
372			5		s Critical Valu					t 5% Signific		
373					Data No	t Lognormal	at 5% Significa					
374							·					
375						Lognorn	nal Statistics					
376			ı	Minimum o	of Logged Da	ta 1.808				Mean of	logged Data	2.063
377			N	/laximum d	of Logged Da	ta 2.565				SD of	logged Data	0.274
378												
-												

379	Α	В	С	D	E Assu	F uming Logno	G ormal Distri	H ibution	I	J	K	L
380					95% H-UCL	9.767			90%	Chebyshev	(MVUE) UCL	10.27
381			959	% Chebyshev (11.24					(MVUE) UCL	
382				% Chebyshev (,	15.21					,	
383					· · · · · ·	<u> </u>						
384					Nonparame	tric Distribu	tion Free U	JCL Statistics				
385					Data do not fo	ollow a Disc	ernible Dis	stribution (0.05	5)			
386												
387					Nonpar	rametric Dis	tribution Fr	ee UCLs				
388	·			95	5% CLT UCL	9.519				95% J	ackknife UCL	9.674
389			95°	% Standard Bo	ootstrap UCL	9.437				95% Bo	otstrap-t UCL	14.06
390				95% Hall's Bo	ootstrap UCL	19.97			95%	Percentile B	Sootstrap UCL	9.52
391	·			95% BCA Bo	ootstrap UCL	9.79						
392			90% (Chebyshev(Me	an, Sd) UCL	10.63			95% Cł	nebyshev(M	ean, Sd) UCL	. 11.75
393			97.5% (Chebyshev(Me	an, Sd) UCL	13.29			99% Cł	nebyshev(M	ean, Sd) UCL	16.33
394	·						1					
395						Suggested	UCL to Us	e				
396				95% Stu	ıdent's-t UCL	9.674				or 95% M	lodified-t UCL	9.744
397							1					+
398		Note: Sugg	estions rega	rding the selec	ction of a 95%	UCL are pr	ovided to he	elp the user to	select the n	nost appropr	riate 95% UC	L.
399	·			Recommenda	ations are bas	ed upon dat	a size, data	a distribution, a	and skewnes	SS.		
400		These rec	ommendatio	ns are based ι	upon the resul	Its of the sim	nulation stud	dies summariz	zed in Singh,	Maichle, ar	nd Lee (2006)	
401	ŀ	lowever, sim	ulations resu	ults will not cov	ver all Real W	orld data se	ts; for addit	ional insight th	ne user may	want to cons	sult a statistic	ian.
402	, 											
403												
	Mercury											
405												
406						General	Statistics					
407			Tota	al Number of C	Observations	6			Numbe	r of Distinct	Observations	6
408									Number	r of Missing	Observations	4
409					Minimum	0.02					Mean	0.749
410					Maximum	4.3					Median	0.043
411					SD	1.74				Std. I	Error of Mean	0.71
412	1			Coefficien	t of Variation	2.323					Skewness	2.449
413	1											
414			Note: Sar	mple size is sr	mall (e.g., <10	0), if data ar	e collected	l using ISM ap	proach, you	should use)	
415			guidance	provided in ITI	RC Tech Reg	Guide on I	SM (ITRC,	2012) to com	pute statistic	s of interes	it.	
416				r example, yo	-	-			•	•		
417			Chebysh	ev UCL can be	e computed u	ısing the No	nparametri	ic and All UCI	_ Options of	ProUCL 5.1	l	
418												
419						Normal (GOF Test					
420				Shapiro Wilk		0.506				ilk GOF Tes		
421			5%	Shapiro Wilk C		0.788		Data No	ot Normal at	•	ance Level	
422				Lilliefors	Test Statistic	0.486			Lilliefors	GOF Test		
423				5% Lilliefors C		0.325			ot Normal at §	5% Significa	ance Level	
424					Data Not	Normal at 5	i% Significa	ance Level				
425												
426			_		Ass	suming Norr	mal Distribu				_	
427			95%	Normal UCL					UCLs (Adju		•	
428				95% Stu	ident's-t UCL	2.18			-		(Chen-1995)	
429			_	_					95% Modifie	ed-t UCL (Jo	ohnson-1978)	2.299
430												
431							GOF Test					
432				A-D	Test Statistic	1.264		Ander	rson-Darling	Gamma Go	OF Test	

433	A E	В	С	D 5% A-D	E Critical Value	F 0.766	G	H Data Not Ga	iamma	l Distribu	ited at	J 5% Sigr	K nificand		L el
434				K-S	Test Statisti	c 0.463		Kolm	nogorov	/-Smirn	ov Ga	mma G	OF Tes	st	
435				5% K-S	Critical Value	e 0.357		Data Not Ga							el
436				С	Data Not Gan	 nma Distribut	⊥ ed at 5% Si	gnificance	Level						
437															
438						Gamma	Statistics								
439					k hat (MLE	0.302				k	star (b	ias corr	ected	MLE)	0.262
440				Th	eta hat (MLE	2.479				Theta	star (b	ias corr	ected	MLE)	2.857
441					nu hat (MLE	3.626					nu s	star (bia	s corre	cted)	3.146
442			ML	E Mean (b	ias corrected	0.749					MLE	Sd (bias	s corre	cted)	1.463
443									Арр	roximat	e Chi S	Square \	Value (0.05)	0.417
444			Adjus	ted Level c	of Significance	e 0.0122				Α	Adjuste	d Chi So	quare \	/alue	0.188
445							'								
446					Α	ssuming Gan	nma Distribu	ıtion							
447	95% Ap	proximate	Gamma	UCL (use	when n>=50)) 5.651		95%	Adjust	ed Gam	nma UC	CL (use	when r	า<50)	12.52
448							1								
449						Lognorma	I GOF Test								
450			Sh	napiro Wilk	Test Statisti	c 0.707		Sh	hapiro '	Wilk Lo	gnorm	al GOF	Test		
451			5% Sh	apiro Wilk	Critical Value	e 0.788		Data N	lot Logr	normal	at 5% 9	Significa	nce Le	vel	
452				Lilliefors	Test Statisti	c 0.363			Lilliefo	rs Logr	normal	GOF T	est		
453			59	% Lilliefors	Critical Value	e 0.325		Data N	lot Logr	normal	at 5% S	Significa	nce Le	evel	
454					Data Not	Lognormal a	t 5% Signific	cance Leve	el						
455															
456							al Statistics								
457					f Logged Dat						N	lean of I			-2.569
458			M	laximum of	f Logged Dat	a 1.459						SD of I	ogged	Data	2.034
459															
460						suming Logno	ormal Distrib	oution							
461					95% H-UC							yshev (N	•		1.021
462					(MVUE) UC					97.5%	Cheby	yshev (N	MVUE)	UCL	1.778
463			99% (hebyshev	(MVUE) UC	L 2.641									
464					Managana	and a Disamila	dan Fasa III	01 01-11-11							
465					·-	netric Distribu									
466					Data do not	follow a Disc	ernible Dist	ribution (U.	1.05)						
467					Nonn	arametric Dis	tribution Er	no LICLO							
468					NOIIP 95% CLT UC			e octs				95% Jac	okknifo	ПСІ	2.18
469			05%		Bootstrap UC							5% Boot			80.59
470					Bootstrap UC					95%		ntile Boo	•		2.164
471					Bootstrap UC					3370	1 0100	THE DO	осысар		2.104
472					lean, Sd) UC					95% C	hehvsl	nev(Mea	an. Sd\	UCI	3.845
473				• ,	lean, Sd) UC							nev(Mea			7.816
474 475					- ,,		<u> </u>				, 51	- (50	, 54)		
475 476						Suggested	UCL to Use								
477			9!	5% Hall's E	Bootstrap UC										
477					•		1								
479				R	ecommende	d UCL excee	ds the maxii	mum obser	rvation						
480															
481	In Case Bo	otstrap t a	nd/or Ha	II's Bootst	rap yields an	unreasonabl	y large UCL	. value, use	e 97.59	% or 99	% Che	byshev	(Mear	ո, Sd) Լ	JCL
482															
483	Note: S	Suggestion	s regardi	ng the sele	ection of a 95	% UCL are pr	ovided to he	lp the user	r to sele	ect the i	most a	ppropria	te 95%	6 UCL.	
484			R	ecommend	dations are b	ased upon da	ta size, data	distribution	n, and	skewne	ess.				
485	These	e recomme	ndations	are based	upon the res	ults of the sin	nulation stud	lies summa	arized i	n Singh	n, Maicl	nle, and	Lee (2	2006).	
486	However	, simulatio	ns results	s will not co	over all Real	World data se	ts; for additi	onal insigh	nt the us	ser may	want t	o consu	ılt a sta	atisticia	n.
700								_							

	Α	В	С		D	E		F	G	Н	l	J		K	L
487															
488	Nickel														
489															
490								General	Statistics						
491			Tota	al Numbe	er of O	hearva	tions	10	Statistics		Numb	er of Dieti	nct Obse	rvations	9
492					ei di O		1110113	10					ing Obse		0
493						Mini	imum	3.5			- Tunio		g 0500	Mean	5.12
494							imum	9.5						Median	4.6
495							SD	1.795				S	Std. Error		0.568
496				Coef	fficient	of Vari		0.351						ewness	1.824
497 498															
499								Normal (OF Test						
500				Shapiro	Wilk T	est Sta	atistic	0.818			Shapiro W	/ilk GOF	Test		
501			5% 5	Shapiro \	Wilk C	ritical \	√alue	0.842		Data No	t Normal at	5% Sign	ificance L	evel	
502				Lillie	efors T	est Sta	atistic	0.216			Lilliefors	s GOF Te	est		
503			- i	5% Lillie	efors C	ritical \	√alue	0.262		Data appe	ear Normal	at 5% Sig	nificance	Level	
504					Data	appea	r Appro	oximate No	rmal at 5% Sig	gnificance	Level				
505															
506							Ass	uming Norr	nal Distributio	on					
507			95% N	lormal L	JCL					95%	UCLs (Adj	usted for	Skewne	ss)	
508				959	% Stud	lent's-t	UCL	6.16			95% Adjus	ted-CLT (JCL (Che	n-1995)	6.404
509											95% Modi	fied-t UCI	_(Johnso	n-1978)	6.215
510															
511								Gamma (GOF Test						
512						est Sta		0.456			rson-Darlin				
513				5%	A-D C			0.725	Detected	data appea					e Level
514						est Sta		0.166		_	orov-Smirr				
515					K-S C			0.267		data appea		Distribute	d at 5% S	ignificand	e Level
516				Dei	tectea	data a	ppear	Gamma Dis	stributed at 59	% Significal	nce Level				
517	1							Gamma	Statistics						
518						k hat (I	MIE	11.2	Statistics		L	etar (hia	s correcte	ad MLE)	7.904
519						a hat (I	- 1	0.457				•	s correcte	1	0.648
520						u hat (I	,	223.9				•	r (bias co	1	158.1
521			N	/ILE Mea		•	· · ·	5.12					d (bias co	,	1.821
522											Approximat		•	,	130
523 524			Adju	usted Le	vel of S	Signific	ance	0.0267					Chi Squar		125.6
525													<u> </u>		
526							Assı	uming Gam	ma Distributio	on					
527		5% Approxir	nate Gamm	a UCL ((use wh	nen n>:	=50))	6.225		95% Ad	ljusted Gan	nma UCL	(use whe	en n<50)	6.444
528															
529								Lognormal	GOF Test						
530				Shapiro	Wilk T	est Sta	atistic	0.912		Shap	oiro Wilk Lo	gnormal	GOF Tes	st	
531			5% S	Shapiro \				0.842]	Data appea	•		•	ce Level	
532				Lillie	efors T	est Sta	atistic	0.15			liefors Logı				
533			Ę	5% Lillie				0.262		Data appea		al at 5% S	Significand	ce Level	
534						Data a	ppear l	Lognormal :	at 5% Signific	ance Leve	l				
535															
536				B 41 1			<u> </u>	Lognorma	I Statistics					15.	4.500
537				Minimu				1.253					an of logg		1.588
538				Maximu	um of L	ogged	Data	2.251				S	D of logg	ed Data	0.303
539							A-		mad Distrik	Non					
540							ASSUR	IIIII LOGNO	rmal Distribut	uOff					

541	Α	E	3		С)	95% H-UC		F 6.26	G		Н		l 9)% (Chebys		MVUE)		6.578
542					95%	Cheby	shev ((MVUE) UC	CL 7	7.248					97.	5% (Chebys	shev (I	MVUE)) UCL	8.178
543					99%	Cheby	shev (MVUE) UC	CL 10	0											
544																					
545								Nonparar	metric [Distribu	ıtion Free	UCL	Statisti	cs							
546						Data	appea	r to follow	a Disce	ernible	Distributi	on at	5% Sig	nific	ance Lo	vel					
547																					
548								Nonp	parame	tric Dis	tribution	Free l	JCLs								
549							95	5% CLT UC	CL 6	6.054							9	5% Ja	ckknife	UCL	6.16
550					95%	Standa	ard Bo	ootstrap UC	CL 6	5.013							959	% Boo	tstrap-	t UCL	7.009
551					ç	5% Ha	ill's Bo	ootstrap UC	CL 10	0.68					95	% P	ercent	tile Bo	otstrap	UCL	6.05
552						95% B	CA Bo	ootstrap UC	CL 6	5.27											
553					90% Cł	ebysh	ev(Me	an, Sd) UC	CL 6	6.823					95%	Che	ebyshe	ev(Mea	an, Sd)) UCL	7.594
554				97	7.5% Cł	ebysh	ev(Me	an, Sd) UC	CL 8	3.665					99%	Che	ebyshe	ev(Mea	an, Sd)) UCL	10.77
555									-												
556									Sug	gested	UCL to U	se									
557						95	% Stu	dent's-t UC	CL 6	6.16											
558											1										
559				٧	Vhen a	data se	t follo	ws an appr	oximate	e (e.g.,	normal) d	stribu	tion pa	ssin	g one o	the	GOF t	est			
560		Whe	n appl	licab	le, it is s	sugges	ted to	use a UCL	based	upon a	distribution	on (e.	g., gam	ma)	passing	bot	h GOF	tests	in Pro	UCL	
561																					
562		Note: S	Sugges	stion	s regard	ling the	seled	ction of a 95	5% UCI	L are pr	rovided to	help t	he use	to	select th	e m	ost ap	oropria	ate 95%	% UCL.	
563					F	Recomi	menda	ations are b	oased u	pon da	ta size, da	ıta dis	tributio	n, aı	nd skew	nes	S.				
564		These	recor	mme	ndation	s are b	ased ι	upon the re	sults of	the sin	nulation st	udies	summa	rize	d in Sir	gh,	Maichl	e, and	Lee (2	2006).	
	Н	owever,		latior	ns resul	ts will n	ot cov	er all Real	World	data se	ets; for add	litiona	ıl insigh	t the	e user m	ay v	ant to	consi	ult a sta	atisticia	n.
565	Н	owever,		latior	ns resul	ts will n	ot cov	ver all Real	World	data se	ets; for add	litiona	ıl insigh	t the	user m	ay v	vant to	consu	ult a sta	atisticia	n.
565 566	Н	owever,		latior	ns resul	ts will n	ot cov	ver all Real	World	data se	ets; for add	litiona	al insigh	t the	e user m	iay v	ant to	consu	ult a sta	atisticia	n.
565 566 567	H Vanadium			lation	ns resul	ts will r	ot cov	ver all Real	World	data se	ets; for add	litiona	al insigh	t the	e user m	iay v	vant to	consu	ult a sta	atisticia	n.
565 566 567 568				lation	ns resul	ts will r	not cov	ver all Real	World	data se	ets; for add	litiona	al insigh	t the	e user m	iay v	vant to	consu	ult a sta	atisticia	n.
565 566 567 568 569				lation	ns resul	ts will r	not cov	ver all Real			ets; for add		al insigh	t the	e user m	iay v	vant to	consu	ult a sta	atisticia	n.
565 566 567 568 569 570				lation				ver all Real	G	èeneral			al insigh	t the					ult a sta		n. 8
565 566 567 568 569 570				lation					G	èeneral			al insigh	t the	Nun	nber	of Dis	tinct C		ations	
565 566 567 568 569 570 571				lation					G ns 10	General			al insigh	t the	Nun	nber	of Dis	tinct C) bserva	ations	8
565 566 567 568 569 570 571 572 573				lation				Dbservation	Gns 10	General 0 9			al insigh	t the	Nun	nber	of Dis	tinct C) bserva	ations	8 0
565 566 567 568 569 570 571 572 573 574				lation				Dbservatior Minimu Maximu	Gns 10 m 19 m 69	General 0 9			al insigh	t the	Nun	nber	of Dis	tinct C) bserva	ations ations Mean edian	8 0 40
565 566 568 569 570 571 572 573 574 575				lation		Numb	er of (Dbservatior Minimu Maximu	Gns 10m 19m 65D 19	General 0 9			al insigh	t the	Nun	nber	of Dis	tinct C	Observa Observa M	ations ations Mean edian	8 0 40 34.5
565 566 567 568 569 571 572 573 574 575				lation		Numb	er of (Dbservatior Minimu Maximu S	Gns 10m 19m 65D 19	General 0 9 5 5.49			al insigh	t the	Nun	nber	of Dis	tinct C	Observa Observa M	ations ations Mean edian Mean	8 0 40 34.5 4.899
565 566 567 568 569 570 571 572 573 574 575 576 577				lation		Numb	er of (Dbservatior Minimu Maximu S	Gns 10 11 11 11 11 11 11 11 11 11 11 11 11	General 0 9 5 5 5.49 0.387			al insigh	t the	Nun	nber	of Dis	tinct C	Observa Observa M	ations ations Mean edian Mean	8 0 40 34.5 4.899
565 566 567 568 570 571 572 575 575 577 577 578 578				lation	Total	Numb	er of C	Dbservatior Minimu Maximu S	Gns 10 m 19 m 69 Dn 0	General 0 9 5 5 5.49 0.387	Statistics		al insigh		Nun	hber	of Dis	tinct C sing C	Observa Observa M	ations ations Mean edian Mean	8 0 40 34.5 4.899
565 566 567 568 569 570 572 574 575 576 577 578 579 579				lation	Total	Numb	er of C	Observation Minimu Maximu S t of Variatio	Gns 10 m 19 m 68 D 19 Don 0	General 0 9 5 5.49 0.387	Statistics				Nun Nun	nber	of Dissof Missof	tinct Cosing Costdering Observa Observa M rror of Skew	ations ations Mean edian Mean wness	8 0 40 34.5 4.899	
565 566 567 568 570 572 572 575 576 577 578 579 580				lation	Total	Numb Coe Shapiro hapiro	er of (Dbservation Minimu Maximu S t of Variatio	Gns 10 m 19 m 69 DD 19 DDn 00 Ntic 00 ue 00	6eneral 0 9 5 5.49 0.387 lormal (Statistics				Nun Nun Shapiro	will all at	of Dissof Missof	sing C Std. E	Observa Observa M rror of Skew	ations ations Mean edian Mean wness	8 0 40 34.5 4.899
565 566 567 568 570 570 573 575 575 578 579 580 581				lation	Total	Numb Coe Shapiro hapiro Lillid	er of (fficien Wilk Wilk (efors	Dbservation Minimu Maximu St of Variation	Gns 10 m 19 m 69 Dn 0 N N tic 0 ue 0 tic 0	9 5 5.49 0.387 lormal (Statistics		Data a	рреа	Nun Nun Shapiro	Will al at	of Dissof Missof	tinct Cosing Cost Std. El	M Pror of Skew	ations ations Mean dedian Mean wness evel	8 0 40 34.5 4.899
565 566 567 568 570 572 573 574 577 577 578 579 580 581 582 582				lation	Total	Numb Coe Shapiro hapiro Lillid	er of (fficien Wilk Wilk (efors	Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu	Gns 10 m 19 m 69 N N N N N N N N N N N N N N N N N N N	6eneral 0 9 5 5 5.49 0.387 lormal 0 0.921 0.842 0.197 0.262	Statistics		Data a	ppea	Nun Nun Shapiro ar Norm Lillief	Will al at	of Dissof Missof	tinct Cosing Cost Std. El	M Pror of Skew	ations ations Mean dedian Mean wness evel	8 0 40 34.5 4.899
565 566 567 568 570 572 575 575 577 578 580 581 582 583				lation	Total	Numb Coe Shapiro hapiro Lillid	er of (fficien Wilk Wilk (efors	Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu	Gns 10 m 19 m 69 N N N N N N N N N N N N N N N N N N N	6eneral 0 9 5 5 5.49 0.387 lormal 0 0.921 0.842 0.197 0.262	Statistics GOF Test		Data a	ppea	Nun Nun Shapiro ar Norm Lillief	Will al at	of Dissof Missof	tinct Cosing Cost Std. El	M Pror of Skew	ations ations Mean dedian Mean wness evel	8 0 40 34.5 4.899
565 566 567 568 570 570 573 574 575 578 578 581 582 583 584				lation	Total	Numb Coe Shapiro hapiro Lillid	er of (fficien Wilk Wilk (efors	Minimu Maximu S t of Variatio Test Statist Critical Valu Test Statist Critical Valu Data app	Gns	9 5 5.49 0.387 lormal (0.921 0.842 0.197 0.262 ormal a	Statistics GOF Test	ifican	Data a Data a	ppea	Nun Nun Shapiro ar Norm Lillief	Will al at	of Dissof Missof	tinct Cosing Cost Std. El	M Pror of Skew	ations ations Mean dedian Mean wness evel	8 0 40 34.5 4.899
565 566 567 568 570 572 573 575 577 577 580 581 582 584 585 584 585					Total	Numb Coe Shapiro hapiro Lillie	er of (fficien Wilk Wilk (efors (Minimu Maximu S t of Variatio Test Statist Critical Valu Test Statist Critical Valu Data app	Gns	9 5 5.49 0.387 lormal (0.921 0.842 0.197 0.262 ormal a	Statistics GOF Test	ifican	Data a Data a ce Lev	ppea	Nun Nun Shapiro ar Norm Lillief	Will al at at at at	of Disorder of Misorder of Mis	tinct Cosing Cost Std. E	Observa Marror of Skew	ations ations Mean edian Mean vness evel	8 0 40 34.5 4.899
565 566 567 568 570 570 573 575 575 578 578 580 583 584 585 585 585 586					Total	Numb Coe Shapiro hapiro Lillie % Lillie	er of (fficien Wilk Wilk (efors efors (Minimu Maximu S t of Variatio Test Statist Critical Valu Test Statist Critical Valu Data app	m 19 m 69 D 19 D N N tic 0 Uue 0 D D D D D D D D D D D D D D D D D D D	9 5 5.49 0.387 lormal (0.921 0.842 0.197 0.262 ormal a	Statistics GOF Test	ifican	Data a Data a ce Lev	ppea	Num Num Shapiro ar Norm Lillief ar Norm	Will all at toors (all at at adjust	of Dissof Missof South Steel for Total Steel for the steel	tinct Cosing Cost Std. Electronical Std. Electro	Morror of Skew	ations ations Mean dedian Mean wness evel	8 0 40 34.5 4.899
565 566 567 568 570 570 573 574 575 578 581 582 584 585 586 587 7					Total	Numb Coe Shapiro hapiro Lillie % Lillie	er of (fficien Wilk Wilk (efors efors (Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu Data app	m 19 m 69 D 19 D N N tic 0 Uue 0 D D D D D D D D D D D D D D D D D D D	Seneral 0 9 5 5.49 0.387 lormal 0 0.921 0.842 0.197 0.262 ormal a	Statistics GOF Test	ifican	Data a Data a ce Lev	ppea	Num Num Shapiro ar Norm Lillief ar Norm	Will al at at adjusted	of Dissof Missof Missof Signature (Control of the Control of the C	sing C Std. E	Morror of Skew	ations ations Mean Mean wness evel evel	8 0 40 34.5 4.899 0.552
565 566 567 568 570 572 575 575 576 577 580 582 585					Total	Numb Coe Shapiro hapiro Lillie % Lillie	er of (fficien Wilk Wilk (efors efors (Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu Data app	m 19 m 69 D 19 D N N tic 0 Uue 0 D D D D D D D D D D D D D D D D D D D	Seneral 0 9 5 5.49 0.387 lormal 0 0.921 0.842 0.197 0.262 ormal a	Statistics GOF Test	ifican	Data a Data a ce Lev	ppea	Num Num Shapiro ar Norm Lillief ar Norm JCLs (A	Will al at at adjusted	of Dissof Missof Missof Signature (Control of the Control of the C	sing C Std. E	Morror of Skew	ations ations Mean Mean wness evel evel	8 0 40 34.5 4.899 0.552
565 566 567 568 570 570 573 575 575 578 578 581 582 583 586 587 588 589 589 589 589					Total	Numb Coe Shapiro hapiro Lillie % Lillie	er of (fficien Wilk Wilk (efors efors (Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu Data app	G	Seneral 0 9 5 5.49 0.387 lormal (0.921 0.842 0.197 0.262 ormal a 8.98	Statistics GOF Test	ifican	Data a Data a ce Lev	ppea	Num Num Shapiro ar Norm Lillief ar Norm JCLs (A	Will al at at adjusted	of Dissof Missof Missof Signature (Control of the Control of the C	sing C Std. E	Morror of Skew	ations ations Mean Mean wness evel evel	8 0 40 34.5 4.899 0.552
565 566 567 568 570 572 573 575 577 578 582 582 583 584 585 587 588 587 588 587 588 589 590					Total	Numb Coe Shapiro hapiro Lillie % Lillie	er of (fficien Wilk (efors (efors (JCL % Stu	Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu Data app	m 19 m 69 m 69 N N O O O O O O O O O O O O O O O O O O	Seneral 0 9 5 5.49 0.387 lormal (0.921 0.842 0.197 0.262 ormal a 8.98	Statistics GOF Test t 5% Sign	ifican	Data a Data a ce Lev	ppea	Num Num Shapiro ar Norm Lillief ar Norm JCLs (A	Will al at at adjusted diffie	of Dison of Mison of	sing C Std. E	Marror of Skew Skew Skew Chennson-	eations ations Mean Mean wness evel evel 1995) 1978)	8 0 40 34.5 4.899 0.552
565 566 567 568 570 571 572 575 576 578 580 583 584 585 588 588 589 590 591					Total	Numb Coe Shapiro hapiro Lillie Sormal U 95	er of (fficien Wilk Wilk (efors JCL % Stu	Minimu Maximu St of Variation Test Statist Critical Valu Data app	Gns 10 m 19 m 63 D 19 Don 0 Notic 0 ue 0 tic 0 pear No Assumi	6eneral 0 9 5 5.49 0.387 0.921 0.842 0.197 0.262 ormal a	GOF Test	ifican	Data a ce Lev	ppea	Num Num Shapiro ar Norm Lillief ar Norm JCLs (A 5% Adj 95% Mo	Will all at adjusted difficulting (of Dissof Missof	Std. Electrical Std. Electrica	Morror of Skew Skew Skew Skew Skew Skew Skew Skew	eations ations Mean Mean wness evel evel 1995) 1978)	8 0 40 34.5 4.899 0.552 48.97 49.12
565 566 567 568 570 571 572 573 574 575 576 577 578 578 581 582 583 584 585 586 587 588 589 590 591					Total	Numb Coe Shapiro hapiro Lillie Sormal U 95	er of (fficien Wilk (efors (### Sturm A-D (Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Test Statist Critical Valu Data app	G 19 19 19 19 19 19 19	6eneral 0 9 5 5 5.49 0.387 lormal 0 0.921 0.197 0.262 lormal a lormal a 0.307	GOF Test	ifican	Data a Data a ce Lev And lata apple	ppea	Num Num Shapiro ar Norm Lillief ar Norm JCLs (A 5% Adj 95% Mo	Will all at ors (diffice diffice ty difficulty difficu	of Dissof Missof	Std. En Std. En Test gnifica r Skev UCL (CL (John	Months of the second of the se	evel evel 1995) 1978)	8 0 40 34.5 4.899 0.552 48.97 49.12
565 566 567 568 570 571 572 575 576 577 578 580 581 585 585 588 589 590 591 591 591					Total	Numb Coe Chapiro Lillie Dormal U 95	er of (fficien Wilk (efors (efors (A-D (K-S (Disservation Minimu Maximu S t of Variation Test Statist Critical Valu Data app	m 19 m 69 m 69 m 69 m 69 m 69 m 69 m 69	6eneral 0 9 5 5 5.49 0.387 lormal 0 0.197 0.262 ormal a 0.307 0.727	Statistics GOF Test t 5% Sign mal Distri GOF Tes	ifican bution	Data a Data a ce Lev An An kolr	ppea ppea si 9 9	Shapiro ar Norm Lillief ar Norm JCLs (A 5% Adji 95% Mo	Will all at at difficulties a Disting (ing)	of Dissof Missof	tinct Cosing Cost Std. Engrification of Skew UCL (John La Gold at 5 ma	Morror of Skew ance Leance Le	evel evel 1995) 1978)	8 0 40 34.5 4.899 0.552 48.97 49.12

595	Α		В		С		D etected	E d data ap		F r Gamma Di	G stributed at	H 5% Signifi	canc	e Level		J		K	L	
596																				
597										Gamma	Statistics									
598								k hat (N	ЛLE)	7.499				k	star (b	ias cor	recte	d MLE)	5.31	6
599							The	eta hat (N	ЛLE)	5.334				Theta	star (b	ias cor	recte	d MLE)	7.52	5
600								nu hat (N	ЛLE)	150					nu s	tar (bia	as cor	rected)	106.3	
601					М	LE M	ean (bia	as correc	cted)	40					MLE	Sd (bia	as cor	rected)	17.35	5
602													Ap	proximate	e Chi S	Square	Value	e (0.05)	83.52	2
603					Adjus	sted L	evel of	Significa	ance	0.0267				Α	djuste	d Chi S	quare	e Value	80.02	2
604											1									
605						-			Ass	suming Gan	nma Distribi	ution					-			
606		95%	Approx	imate	Gamma	a UCL	(use w	vhen n>=	50))	50.92		95%	Adju	sted Gam	ma UC	CL (use	wher	า n<50)	53.15	5
607										1										
608										Lognorma	I GOF Test							-		
609					S	Shapir	o Wilk	Test Sta	tistic	0.954		Sh	hapir	o Wilk Lo	gnorm	al GOF	Test	t		
610					5% S	hapir	o Wilk (Critical V	alue	0.842		Data app	ear L	ognorma	l at 5%	Signif	icance	e Level	İ	
611						Lif	liefors	Test Sta	tistic	0.154			Lillie	fors Logn	ormal	GOF T	est			\dashv
612					5	5% Lil	liefors (Critical V	alue	0.262		Data app	ear L	ognorma	l at 5%	Signif	icanc	e Level		\dashv
613								Data ap	pear	Lognormal	at 5% Sign	ificance Le	vel							\dashv
614																				\dashv
615										Lognorma	l Statistics									\dashv
616						Minin	num of	Logged I	Data	2.944					M	lean of	logge	ed Data	3.62	1
617					1	Maxin	num of	Logged I	Data	4.174						SD of	logge	ed Data	0.39	2
618																				\dashv
619									Assı	uming Logno	ormal Distri	bution								
620								95% H-	UCL	52.95				90%	Cheby	/shev (MVUI	E) UCL	. 55.09	3
621					95%	Cheb	yshev ((MVUE)	UCL	61.91				97.5%	Cheby	/shev (MVUI	E) UCL	. 71.38	3
622					99%	Cheb	yshev ((MVUE)	UCL	89.98									+	
623																				_
624								Nonpa	rame	etric Distribu	tion Free U	CL Statistic	cs							
625						Data	appea	ar to folk	w a l	Discernible	Distribution	at 5% Sigi	nifica	nce Leve	ı					
626																				\dashv
627								No	onpar	rametric Dis	tribution Fro	ee UCLs								\dashv
628							9	5% CLT	UCL	48.06					ç	95% Ja	ckkni	ife UCL	. 48.98	3
629					95%	Stan	dard Bo	ootstrap	UCL	47.66					95	5% Boo	tstrar	o-t UCL	50.33	3
630					ç	95% F	lall's Bo	ootstrap	UCL	49.19				95%	Percei	ntile Bo	otstra	ap UCL	. 48	_
631								ootstrap												\dashv
632					90% Cł	nebys	hev(Me	ean, Sd)	UCL	54.7				95% CI	nebysh	nev(Me	an, S	d) UCL	61.35	<u></u>
633						-	•	ean, Sd)		70.59				99% CI	-	•		•		
634						-					1									\dashv
635										Suggested	UCL to Use	9								=
636						9	5% Stu	udent's-t		48.98									T	\dashv
637										<u> </u>	1									\dashv
638		Note	: Sugge	estions	s regard	ding th	ne seled	ction of a	95%	6 UCL are pr	ovided to he	elp the user	r to se	elect the n	nost a	opropri	ate 95	5% UCI	 L.	\dashv
639										sed upon da		-				•				\dashv
640		The	se reco	omme						Its of the sin						nle, and	d Lee	(2006).		=
641										orld data se										\dashv
642																				=
643																				\dashv
644	Zinc																			\dashv
645																				\dashv
										General	Statistics									\dashv
646					Total	l Num	ber of 0	Observat	tions					Numbe	r of Di	stinct (Obser	vations	8	-
647					. 5.01					-				Numbe						\dashv
648															J. 1411	··· · · · ·			ــــــــــــــــــــــــــــــــــــــ	

649	Α	В		С		D	E Minimur	F n 24	G	Н		I		J	K Mea	an	L 33
650							Maximur	n 51							Media	an	32
651							SI	8.206						Std. E	rror of Mea	an	2.595
652						Coefficie	nt of Variatio	n 0.249							Skewne	ss	1.143
653																	
654								Normal	GOF Test								
655					Sh	apiro Wilk	Test Statisti	0.898			Shap	piro W	ilk GO	F Test			
656				5	% Sh	apiro Wilk	Critical Valu	e 0.842		Data app	ear No	ormal a	at 5% S	Signific	ance Leve	1	
657						Lilliefors	Test Statisti	0.168			Lill	liefors	GOF	Test			
658					5%	Lilliefors	Critical Valu	e 0.262		Data app	ear No	ormal a	at 5% S	Signific	ance Leve	1	
659							Data app	ear Normal a	t 5% Signific	ance Level							
660																	
661							Δ	ssuming No	mal Distribut								
662				959	% Nor	mal UCL				95%					wness)		
663						95% St	udent's-t UC	37.76				-			(Chen-199	1	38.27
664											95%	Modifi	ed-t U	CL (Jo	hnson-197	8)	37.91
665																	
666									GOF Test		_						
667							Test Statisti								F Test		
668							Critical Valu		Detected	d data appe					_	ance	e Level
669							Test Statisti		.						OF Test		
670							Critical Valu			d data appe			ıstrıbu	ted at t	% Signific	ance	e Level
671						Detecte	d data appe	ar Gamma D	istributed at 5	5% Significa	ance Lo	evel					
672								Commo	Ctatiatics								
673							Is bot (NAL E		Statistics			l.	-4- · · /l-		wa ata d MI		12.0
674						Th	k hat (MLE eta hat (MLE	'					•		rected ML rected ML		13.9 2.375
675						111	nu hat (MLE	•				Пеца			s correcte		277.9
676					MII	= Moon (b	ias corrected	·							is correcte	.	8.852
677					IVILI	_ IVICALI (DI	ias corrected) 33			Annro	vimate		` `	Value (0.0	′	240.3
678					Δdiust	ed Level o	f Significanc	e 0.0267			Дррго			•	quare Value	′	234.2
679					lajaot		- Cigimicano	0.0207					ajuoto	0111 0	qualo van		
680							Α	ssumina Gai	nma Distribut	tion							
681 682		95% Appi	roxim	ate Ga	mma l	JCL (use v	when n>=50				djusted	d Gamı	ma UC	CL (use	when n<5	0)	39.16
683		• • • • • • • • • • • • • • • • • • • •				`		<u> </u>									
684								Lognorma	al GOF Test								
685					Sh	apiro Wilk	Test Statisti	_		Sha	piro W	/ilk Log	gnorm	al GOF	Test		
686				5	% Sh	apiro Wilk	Critical Valu	e 0.842		Data appea	ar Logr	normal	l at 5%	Signif	icance Lev	el	
687						Lilliefors	Test Statisti	0.173		Li	illiefors	Logn	ormal	GOF T	est		
688					5%	Lilliefors	Critical Valu	e 0.262		Data appea	ar Logr	normal	l at 5%	Signif	icance Lev	el	
689							Data appe	ar Lognorma	at 5% Signif	icance Leve	el						
690																	
691								Lognorm	al Statistics								
692					N	linimum of	Logged Dat	a 3.178					M	lean of	logged Da	ta	3.471
693					M	aximum of	Logged Dat	a 3.932						SD of	logged Da	ta	0.234
694																	
695									ormal Distrib	ution							
696							95% H-UC						-	,	MVUE) UC		40.31
697						-	(MVUE) UC				(97.5%	Cheby	yshev (MVUE) UC	;L	48.25
698				9	99% C	hebyshev	(MVUE) UC	57.31						_			
699																	
700							<u> </u>		ution Free UC								
701					l	Data appe	ar to follow a	Discernible	Distribution a	at 5% Signif	ficance	e Leve	e l				
702																	
			_														

	Α	В	С	D	E	F	G	Н	I	J	K	L
703					Nonpa	rametric Dist	tribution Free	UCLs				
704				95	% CLT UCL	37.27				95% Ja	ckknife UCL	37.76
705			95%	Standard Bo	otstrap UCL	37.06				95% Boo	otstrap-t UCL	39.36
706			9	5% Hall's Bo	otstrap UCL	40.36			95% F	Percentile Bo	otstrap UCL	37.1
707				95% BCA Bo	otstrap UCL	37.7						
708			90% Ch	ebyshev(Me	an, Sd) UCL	40.78			95% Ch	ebyshev(Me	an, Sd) UCL	44.31
709			97.5% Ch	ebyshev(Me	an, Sd) UCL	49.2			99% Ch	ebyshev(Me	an, Sd) UCL	58.82
710												
711						Suggested	UCL to Use					
712				95% Stu	dent's-t UCL	37.76						
713												
714	١	Note: Sugges	stions regard	ing the selec	tion of a 95%	6 UCL are pro	ovided to help	p the user to	o select the m	ost appropria	ate 95% UCL	
715			F	Recommenda	itions are bas	sed upon dat	a size, data d	distribution,	and skewnes	S.		
716		These recor	nmendations	are based u	pon the resu	lts of the sim	ulation studie	es summari	zed in Singh,	Maichle, and	J Lee (2006).	
717	Ho	wever, simu	lations result	s will not cov	er all Real W	/orld data set	ts; for additio	nal insight t	the user may v	want to cons	ult a statisticia	an.
718												

	A B C	D E	F	G H		J	K	L
1		UCL Statis	Stics for Unc	ensored Full Data Se	≥ts			
2	Llass Calastad Outie							
3	User Selected Option Date/Time of Computation		1.E4.2C AM					
4	From File			Plue byle				
5			USFS BIG B	Jue_n.xis				
6	Full Precision Confidence Coefficier							
7								
8	Number of Bootstrap Operation	S 2000						
9								
10	Arsenic							
11	Alsonio							
12			General	Statistics				
13	Tr	otal Number of Observations			Numh	ber of Distinct C	hservations	8
14		Add trainiber of Observations	10			per of Missing C		0
15		Minimum	4			——————————————————————————————————————	Mean	12.5
16		Maximum					Median	8
17	 	SD				Std E	Frror of Mean	2.522
18		Coefficient of Variation				Jiu. E	Skewness	0.704
19			0.030				OKEWI1699	0.704
20			Normal (GOF Test				
21		Shapiro Wilk Test Statistic		103L	Shaniro \	Wilk GOF Test	<u> </u>	
22	Б 0/	6 Shapiro Wilk Critical Value		Data :	<u>-</u>	l at 5% Significa		
23	570	Lilliefors Test Statistic		Data a		rs GOF Test		
24		5% Lilliefors Critical Value	0.262	Data		at 5% Significar	nce I evel	
25				rmal at 5% Significar				
26								
27		Δς	sumina Norr	mal Distribution				
28	95%	Normal UCL			95% UCLs (Ac	djusted for Ske	wness)	
29	50%	95% Student's-t UCL	17.12		•	sted-CLT UCL (•	17.25
30			17.12		•	lified-t UCL (Jol	` '	17.22
31							11110011 1070)	
32			Gamma (GOF Test				
33		A-D Test Statistic			nderson-Darlir	ng Gamma GO)F Test	-
34		5% A-D Critical Value		Detected data ap		-		e Level
35		K-S Test Statistic				nov Gamma G		
36		5% K-S Critical Value				outed at 5% Sig		<u></u>
37		Detected data follow Ap						
38								
40			Gamma	Statistics				
		k hat (MLE)				k star (bias cor	rected MLE)	2.055
41 42		Theta hat (MLE)				ta star (bias cor		6.083
42		nu hat (MLE)				•	as corrected)	41.1
44		MLE Mean (bias corrected)				MLE Sd (bia	*	8.72
45					Approxima	ate Chi Square	*	27.41
46	Ac	djusted Level of Significance	0.0267			Adjusted Chi S		25.48
46			_				•	
47		As	suming Gam	nma Distribution				
48	95% Approximate Gam	nma UCL (use when n>=50))	=		6 Adjusted Gar	mma UCL (use	when n<50)	20.16
	1, 22.5	11					/	
50 51			Lognorma	I GOF Test				
		Shapiro Wilk Test Statistic			Shapiro Wilk L	ognormal GOF	- Test	
52	5%	6 Shapiro Wilk Critical Value			-	nal at 5% Signifi		
53 54		Lilliefors Test Statistic			. •	normal GOF T		
04								

55	Α		В		С	5%	D Lillie		E Critical Va	alue	F 0.262		G	Da	H ata appe	ear L	l ognorn	nal a	at 5%	J Signi	ifica		< Level	L	
56									Data ap	pear	Lognormal	at 5	% Signi	ifica	nce Lev	el .									
57																									
58											Lognorma	al Sta	atistics												
59						N	linimu	m of l	Logged D	Data	1.386								N	lean o	f lo	gged	d Data	2.3	34
60						М	aximu	m of l	Logged D	Data	3.258									SD o	f lo	gged	d Data	0.6	645
61												-													
62										Assu	ming Logn	orma	al Distril	butic	n										
63									95% H-U	JCL	21.6						90)% (Cheby	yshev	(M)	/UE) UCL	20.3	32
64					9	5% C	hebys	hev (MVUE) (JCL	23.87						97.5	5% C	Cheby	yshev	(M)	/UE) UCL	28.8	81
65					9	9% C	hebys	shev (MVUE) (JCL	38.5														
66												_													
67									Nonpar	ramet	tric Distribu	ution	Free U	CL S	Statistic	s									
68						ı	Data a	ppea	r to follo	w a C	Discernible	Dist	ribution	at 5	% Signi	ifica	nce Le	vel							
69																									
70									No	npara	ametric Dis	stribu	ition Fre	ee U	CLs										
71								95	5% CLT U	JCL	16.65								(95% Ja	ack	knife	UCL	17.	12
72					ç	95% 5	Standa	ard Bo	otstrap l	JCL	16.3								95	5% Bo	ots	trap-	t UCL	17.	7
73									otstrap (15.81						95	5% P		ntile B				16.0	
74									otstrap l		16.8														-
75					90%				an, Sd) l		20.07						95%	Che	ebysł	nev(Me	ear	. Sd) UCL	23.4	49
76								•	an, Sd) l		28.25									nev(Me			•	37.	59
							-,															,	,		
77											Suggested	UCI	L to Use	•											
78							959	% Stu	dent's-t l		17.12	T													
79										302	.,													<u> </u>	
80					Wher	n a da	ata set	follo	ws an an	nroxii	mate (e.g.,	norm	nal) dist	ribut	ion pass	sina	one of	the	GOF	test					
81		Wh	en anr						-		sed upon a				-	_					s ir	Pro	UCI		
82							.99001							(0.9	., 9	, [, 200							
83		Note:	Sugge	estion	ns red	nardii	na the	selec	tion of a	95%	UCL are p	rovid	ed to he	eln th	ne user t	to se	lect the	e m	ost a	ppropr	riate	959	% UCI		
84		. 1010.	- Guggo		.0.0						ed upon da									рргорг			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
85		Thes	e reco		endat						ts of the sir									nle. an	nd L	ee (2006).		
86	Ho								•		orld data se							•		-		•			
87																		-,							
88																									
89	Copper																								
30	эорро:																								
91											General	l Stat	rietice												
92					Т	otal N	dumbe	er of C	Observati	ions	10						Num	her	of Di	stinct	Ωh	serv	ations	8	
93						Olai i	Tarribo	,, 0, 0		10110										ssing				0	
94									Minim	num	10						Nulli		J: 1VII	Joniy	JD.		Mean	15.2	2
95									Maxim		23	-											ledian	14.	
96									ividXIII	SD	4.614									S+A 1	Frr		Mean	14.	
97							Coeff	ficien	t of Varia		0.304									Oiu. I			vness	0.4	
98							CUEII	1101011	. Or varid	i.iOi I	0.504											OVE	WIIC33	0.4	
99											Normal	GOF	Toot												
100						CI-	onir- 1	۱۸/:۱۱، -	Toot Ct-1	iotic		J	162[-	honi	\A/:=	٠	C Tac	.+				
101					E(Test Stati Critical Va		0.897				Data app		hapiro					00	ovol		
102					٥,	/o ON			Test Stat					L	Jaia app	pear	Lilliefo			•	uarı	CE L	evel		
103						FO					0.219)ot	nc:					nc :-	as '	01121		
104						5%	o LIIIIE	iors (Critical Va		0.262	1 E0/	Oi!"		Data app		ivorma	aı at	. 5% S	signific	can	ce L	evel		
105									Data a	ippea	r Normal a	at 5%	Signific	cand	e Level	ı									
106												•	D'												
100										Ass	suming Nor	rmal	Distribu	ition											
107					6	,	mal U										CLs (A	,.							

109	A	В	С	95% Stud	E dent's-t UCL	F 17.87	G	Н	I 95% Adjust	J ed-CLT UCL	K (Chen-1995)	L 17.8
110	-								95% Modif	ied-t UCL (Jo	hnson-1978)	17.91
111						1						
112						Gamma	GOF Test					
113				A-D T	est Statistic	0.528				g Gamma GC		
114					Critical Value	0.725	Detected				5% Significan	ce Level
115					est Statistic	0.236			~	ov Gamma G		
116					Critical Value	0.267				Distributed at	5% Significan	ce Level
117				Detected	data appea	r Gamma Di	stributed at 59	% Significa	ance Level			
118												
119					1. l+ /N/I (T)		Statistics			t / -		0.054
120					k hat (MLE)	12.27 1.239				star (bias co	,	8.654
121					ta hat (MLE) nu hat (MLE)	245.4			Ineta	star (bias co	as corrected)	1.756
122			M	LE Mean (bia	, ,	15.2				`	as corrected)	5.167
123			IVI		is corrected)	13.2			Annrovimat	e Chi Square	•	143.7
124			Δdius	sted Level of \$	Significance	0.0267			• • • • • • • • • • • • • • • • • • • •	Adjusted Chi S	` '	139
125			- Adjus		Oigriillearice	0.0207				tajastea om e	oquaic value	
126					Ass	sumina Gam	ma Distribution	on				
127 128		95% Approxi	mate Gamma	a UCL (use wh		18.31			diusted Gam	ıma UCL (use	when n<50)	18.93
129									-,		,	
130						Lognorma	GOF Test					
131			S	Shapiro Wilk T	est Statistic	0.898		Sha	piro Wilk Lo	gnormal GOI	F Test	
132			5% S	hapiro Wilk C	ritical Value	0.842	I	Data appe	ar Lognorma	al at 5% Signif	ficance Level	
133				Lilliefors T	est Statistic	0.224		L	Iliefors Logr	normal GOF	Гest	
134			5	5% Lilliefors C	ritical Value	0.262	I	Data appe	ar Lognorma	al at 5% Signif	ficance Level	
135					Data appear	Lognormal	at 5% Signific	ance Lev	el			
136				-								
137	-					Lognorma	l Statistics					
138				Minimum of L	ogged Data	2.303				Mean of	logged Data	2.68
139			ı	Maximum of L	ogged Data	3.135				SD of	logged Data	0.303
140												
141							rmal Distribu	tion				
142					95% H-UCL	18.64				Chebyshev	,	19.59
143				Chebyshev (N	-	21.58			97.5%	Chebyshev	(MVUE) UCL	24.34
144			99%	Chebyshev (N	MVUE) UCL	29.77						
145					N		5 1101	Ober 19 and 19				
146				Data annas	•		tion Free UCL			-1		
147				Data appear	r to lollow a	Discernible	Distribution at	. 5% Signi	ilcance Leve)		
148					Nonna	rametric Dis	tribution Free	IICI e				
149				95	% CLT UCL	17.6		0013		95% 1	ackknife UCL	17.87
150			95%	Standard Bo		17.53					otstrap-t UCL	17.96
151				95% Hall's Bo	•	17.46			95%	Percentile Bo	•	17.50
152				95% BCA Bo	·	17.16						
153 154				nebyshev(Mea	•	19.58			95% C	hebyshev(Me	ean, Sd) UCL	21.56
155				nebyshev(Mea		24.31				hebyshev(Me	,	29.72
156					,	<u> </u>	<u> </u>			- ,	,	
157						Suggested	UCL to Use					
158				95% Stud	dent's-t UCL	17.87						
159						<u> </u>	<u> </u>					
160		Note: Sugge	estions regard	ling the selec	tion of a 95%	6 UCL are pr	ovided to help	the user t	o select the	most appropri	iate 95% UCL	
161			F	Recommenda	tions are bas	sed upon dat	a size, data di	stribution,	and skewne	ess.		
162		These reco	mmendations	s are based u	pon the resu	Its of the sim	ulation studie	s summar	zed in Singh	n, Maichle, an	d Lee (2006).	

162	A	B However, simul	C lations result	ts will no		E r all Real \	F World data se	G ets: for addition	H nal insight the	l e user mav	J want to cons	K sult a statisticia	L an.
163 164													
165													
166	Lead						-						
167													
168							General	Statistics					
169			Total	Numbe	er of Ob	servation	s 10			Numbe	r of Distinct	Observations	5
170										Numbe	r of Missing	Observations	0
171						Minimun	n 6					Mean	7.7
172						Maximun						Median	7.5
173						SI					Std. I	Error of Mean	0.423
174				Coeff	ficient o	of Variation	n 0.174					Skewness	0.334
175													
176	<u> </u>							GOF Test					
177	<u> </u>			•		est Statistic				•	ilk GOF Tes		
178	 		5% SI			itical Value			Data appea		t 5% Signific	cance Level	
179						est Statistic			Dota -:		GOF Test	nones I I	
180	 		5	% Lillie	iors Cr	Data ann		t 5% Significa		ar inormal a	it 5% Signific	cance Level	
181	<u> </u>					рака арр		.t 5% Significa	ince Level				
182	 					^	ecumina No	mal Distribution					
183			95% No	ormal I	ICI					ICI e (Adii	sted for Ske	ewness)	
184						ent's-t UCI	8.475					(Chen-1995)	8.443
185					70 Otaat	51113-1 001	0.470			•		ohnson-1978)	8.483
186												76 1676)	
187 188							Gamma	GOF Test					
189					A-D Te	est Statistic		1	Anders	on-Darling	Gamma GO	OF Test	
190				5% /	A-D Cri	itical Value	e 0.724	Detected		_		5% Significand	ce Level
191					K-S Te	st Statisti	c 0.197				ov Gamma (
192				5%	K-S Cr	itical Value	e 0.266	Detected	data appear	Gamma D	istributed at	5% Significand	ce Level
193				Det	ected o	lata appe	ar Gamma D	istributed at 5°	% Significan	ce Level			
194													
195							Gamma	Statistics					
196					k	hat (MLE) 37.19			k	star (bias co	rrected MLE)	26.1
197					Theta	hat (MLE	*			Theta	•	rrected MLE)	0.295
198						hat (MLE					•	as corrected)	522
199			ML	LE Mea	ın (bias	corrected) 7.7				`	as corrected)	1.507
200									Α	• •	•	e Value (0.05)	470
201			Adjus	sted Lev	vel of S	ignificance	e 0.0267			A	djusted Chi S	Square Value	461.5
202	<u> </u>												
203	 	0E0/ A '		- 1101 /				nma Distributi ⊤		rate of C	1101 /	b	0.744
204	 	95% Approxin	nate Gamma	ı UCL (ı	use wh	en n>=50)) 8.552	<u> </u>	95% Adji	usted Gam	ma UCL (use	e when n<50)	8.711
205							Lognorma	al GOF Test					
206				Shanira	\/\/iIレ T~	est Statistic		HIGOF 18ST	Shor!	ro Wilk Lo	normal GO	F Teet	
207				•		itical Value			-		-	ficance Level	
208						est Statisti		+			ormal GOF		
209			5			itical Value		+				ficance Level	
210								at 5% Signific		- 3	2.2.70 2.9711	2	
211													
212 213							Lognorm	al Statistics					
214				Minimu	m of Lo	gged Data		T			Mean o	f logged Data	2.028
215						gged Data		+				f logged Data	0.173
216													
210													

217	А	В	С	D	E Ass	F uming Logno	G ormal Distri	H bution	I	J	K	L
218					95% H-UCL	8.584			90%	Chebyshev (MVUE) UCL	8.968
219			95%	Chebyshev (MVUE) UCL	9.542			97.5%	Chebyshev (MVUE) UCL	10.34
220			99%	Chebyshev (MVUE) UCL	11.9						
221							1				<u> </u>	
222					Nonparame	etric Distribu	tion Free U	CL Statistic	:S			
223				Data appea	r to follow a	Discernible	Distribution	at 5% Sign	ificance Leve	el		
224												
225					Nonpa	rametric Dis	tribution Fr	ee UCLs				
226				95	5% CLT UCL	8.396				95% Ja	ckknife UCL	8.475
227			95%	Standard Bo	otstrap UCL	8.36				95% Boo	tstrap-t UCL	8.511
228			S	95% Hall's Bo	otstrap UCL	8.452			95%	Percentile Bo	otstrap UCL	8.4
229				95% BCA Bo	otstrap UCL	8.3						
230			90% Cł	nebyshev(Me	an, Sd) UCL	8.969			95% C	hebyshev(Me	an, Sd) UCL	9.544
231			97.5% Cł	nebyshev(Me	an, Sd) UCL	10.34			99% C	hebyshev(Me	an, Sd) UCL	11.91
232							•					
233						Suggested	UCL to Us	•				
234				95% Stu	dent's-t UCL	8.475						
235												
236	1	Note: Sugge		_		-				most appropri	ate 95% UCL	
237				Recommenda								
238										n, Maichle, and	**	
239	Но	wever, simu	lations resul	ts will not cov	er all Real W	Vorld data se	ts; for addit	onal insight	the user may	want to cons	ult a statisticia	an.
240												
241												
242	Mercury											
243												
244							Statistics					
245			I otal	I Number of C	bservations	6				er of Distinct C		2
246									Numbe	er of Missing C		2
247					Minimum						Mean	3.167
248					Maximum	4				0:1.5	Median	3
249				0 (" :	SD	0.408				Std. E	rror of Mean	0.167
250				Coefficien	t of Variation	0.129					Skewness	2.449
251			No.			0) 16 1 1						
252				<u> </u>		-				u should use		
253			•				•	•	•	ics of interest.	•	
254				example, you	•	•			•	•		
255			Chebyshe	V UCL can be	e computea (using the No	nparametri	c and All UC	JE Options o	f ProUCL 5.1		
256						Normal (GOF Test					
257			c	Shapiro Wilk	Test Statistic		307 1 8 81		Shaniro M	/ilk GOF Test		
258				Shapiro Wilk C		0.496		Data N	-	5% Significar		
259			ე% S		Test Statistic			Data N		s GOF Test	ice Level	
260			E	Lilletors 5% Lilliefors C		0.492		Doto N			nco Lovo!	
261				0 LINETOIS (U.325 t Normal at 5	 		not indititiat at	: 5% Significar	ice Level	
262					Data NO	. Nomiai at 5	no Significa	TICE LEVEI				
					۸۰	suming Nor	mal Dietrib	ıtion				
					AS	ounning 1900	ווומו טוטנווטנ 		% IICl e /^4	usted for Ske	wnese)	
264			QE0/, NI.					90	™ OOF9 (Wal	usiou iui SKO	***11000)	
264 265			95% N	ormal UCL	dent's_t I ICI	3 503			95% Adius	ted_CLT LICL	Chen_1005\	3 610
264265266			95% N		dent's-t UCL	3.503			-	ted-CLT UCL (`	3.619
264265266267			95% N		dent's-t UCL	3.503			-	ted-CLT UCL (fied-t UCL (Jol	`	3.619 3.53
268			95% N		dent's-t UCL		GOE Toot		-		`	
264265266267			95% No	95% Stu	dent's-t UCL	Gamma	GOF Test	A 4	95% Modif		nnson-1978)	

271	A B C D 5% A	E -D Critical Value	F 0.696	G Di	H ata Not Gamn	I na Distribu	J ted at 5% Sig	K nificance Leve	L el
272	k	-S Test Statistic	0.506		Kolmogo	rov-Smirn	ov Gamma G	OF Test	
273	5% K	-S Critical Value	0.332	Da	ata Not Gamn				el
274		Data Not Gami	na Distribute	⊔ ed at 5% Sig	nificance Lev	rel			
275									
276			Gamma	Statistics					
277		k hat (MLE)	81.86			k	star (bias cor	rected MLE)	41.04
278		Theta hat (MLE)	0.0387			Theta	star (bias cor	rected MLE)	0.0772
279		nu hat (MLE)	982.4			-	nu star (bia	s corrected)	492.5
280	AALE AA	(bias corrected)	3.167				MLE Sd (bia	s corrected)	0.494
281					A	pproximate	e Chi Square	Value (0.05)	442
282	Adjusted Leve	el of Significance	0.0122			Α	djusted Chi S	quare Value	424.6
283				1				<u>'</u>	
284		Ass	suming Gam	ıma Distribut	ion				
285	95% Approximate Gamma UCL (us	se when n>=50))	3.528		95% Adjı	usted Gam	ma UCL (use	when n<50)	3.673
286				1				<u>'</u>	
287			Lognormal	GOF Test					
288	Shapiro W	/ilk Test Statistic	0.496		Shapi	ro Wilk Lo	gnormal GOF	Test	
289	5% Shapiro W	ilk Critical Value	0.788				at 5% Significa		
290	Lilliefo	ors Test Statistic	0.492				ormal GOF T		
291	5% Lilliefo	ors Critical Value	0.325			ognormal a	at 5% Significa	ance Level	
292		Data Not L	ognormal at	5% Significa	ance Level				
293									
294				l Statistics					
295		of Logged Data	1.099					logged Data	1.147
296	Maximum	of Logged Data	1.386				SD of	logged Data	0.117
297									
298				rmal Distribi	ution		0		
299		95% H-UCL	3.513				Chebyshev (,	3.621
300	•	ev (MVUE) UCL	3.827			97.5%	Chebyshev (MVUE) UCL	4.113
301	99% Chebysh	ev (MVUE) UCL	4.676						
302		Nonnarama	trio Dietribut	tion Free UC	1 Statistics				
303		•			ibution (0.05)				
304		Data do not r	Ollow a Disc						
305		Nonna	rametric Dist	tribution Free	e UCI s				
306		95% CLT UCL	3.441				95% Ja	ckknife UCL	N/A
307	95% Standar	d Bootstrap UCL	N/A					tstrap-t UCL	N/A
308	050/ 11 111	s Bootstrap UCL	N/A			95%	Percentile Bo		N/A
309	0.00	A Bootstrap UCL	N/A					- >-	
310 311	200/ 01 1	•	3.667			95% C	hebyshev(Me	an, Sd) UCL	3.893
312		* *	4.207				hebyshev(Me	,	4.825
313	·	. ,		l			- '	,	
314			Suggested	UCL to Use					
315	050/	Student's-t UCL	3.503				or 95% Mo	dified-t UCL	3.53
316				<u> </u>					
317		election of a 95%	UCL are pro	ovided to hel	p the user to s	select the r	nost appropria	ate 95% UCL.	
318		endations are bas	sed upon dat	a size, data d	distribution, ar	nd skewne	SS.		
319		ed upon the resu	Its of the sim	ulation studi	es summarize	d in Singh	, Maichle, and	l Lee (2006).	
320		cover all Real W	orld data set	ts; for additio	nal insight the	user may	want to consi	ult a statisticia	ın.
321									
322									
	Nickel								
324									

225	Α	В		С	D	E	F General	G Statistics	Н	l		J	k		L
325 326				Total	Number of (Observations				Numb	er of Dis	stinct C	bserva	ations	8
327										Numbe	er of Mis	ssing C	Observa	ations	0
328						Minimum	14							Mean	19.7
329						Maximum	30						M	edian	20
330						SD	4.644					Std. E	rror of	Mean	1.469
331					Coefficien	t of Variation	0.236						Skew	vness	1.054
332															
333							Normal C	GOF Test							
334				SI	napiro Wilk	Test Statistic	0.906			Shapiro W	Vilk GO	F Test			
335				5% Sh	napiro Wilk (Critical Value	0.842		Data app	ear Normal	at 5% S	Significa	ance Le	evel	
336					Lilliefors	Test Statistic	0.21			Lilliefors	s GOF	Test			
337				59	% Lilliefors (Critical Value	0.262		Data app	ear Normal	at 5% S	Significa	ance Le	evel	
338						Data appe	ar Normal at	5% Significa	ance Level						
339															
340						As	suming Norr	nal Distributi	ion						
341				95% No	rmal UCL				95%	UCLs (Adj	justed f	or Ske	wness))	
342					95% Stu	ident's-t UCL	22.39			95% Adjus	ted-CLT	ΓUCL ((Chen-	1995)	22.64
343										95% Modi	fied-t U	CL (Jol	hnson-	1978)	22.47
344								L							
345							Gamma (GOF Test							
346					A-D	Test Statistic	0.328		Ande	rson-Darlin	g Gamr	ma GO	F Test		
347					5% A-D (Critical Value	0.725	Detected	d data appea	ar Gamma [Distribut	ted at 5	% Sigr	nificano	e Level
348					K-S	Test Statistic	0.177		Kolmoç	gorov-Smirr	nov Gar	mma G	OF Te	st	
349					5% K-S (Critical Value	0.266	Detected	d data appea	ar Gamma [Distribut	ted at 5	% Sigr	nificano	e Level
350					Detected	d data appea	r Gamma Dis	stributed at 5	3% Significa	nce Level					
351															
352							Gamma	Statistics							
353						k hat (MLE)	21.53			k	k star (b	ias cor	rected	MLE)	15.14
354						eta hat (MLE)				Theta	a star (b	ias cor	rected	MLE)	1.301
355						nu hat (MLE)						•	s corre		302.8
356				ML	E Mean (bia	as corrected)	19.7						s corre	-	5.063
357										Approximat				` '	263.5
358				Adjus	ted Level of	Significance	0.0267				Adjusted	d Chi S	quare \	Value	257.1
359															
360							suming Gam	ma Distribut							
361	9	5% Approxii	mate (Gamma	UCL (use w	vhen n>=50))	22.64		95% Ac	djusted Gan	nma UC	CL (use	when i	n<50)	23.2
362															
363								GOF Test							
364					•	Test Statistic			·	piro Wilk Lo	•				
365				5% Sh		Critical Value				ar Lognorma		_		Level	
366				= -		Test Statistic				lliefors Logi					
367				59		Critical Value		. Fo. 6:		ar Lognorma	al at 5%	Signifi	cance	Level	
368						Data appear	r Lognormal	at 5% Signifi	cance Leve) 					
369							1	104-11-11							
370								I Statistics						D . ¹	0.055
371						Logged Data					М		logged		2.957
372				N	iaximum of l	Logged Data	3.401					SD of	logged	Data	0.225
373						A -		mad District	utlan						
374							uming Logno	ırmaı Distribi	non	0000	/ OL 1	le =: "	V 4/ 1/ 1/ /	LIO!	22.01
375				050/ 1		95% H-UCL					6 Cheby	•			23.91
376					-	(MVUE) UCL				97.5%	6 Cheby	/snev (WVUE)	UCL	28.48
377				99% ((MVUE) UCL	33.69								
378															

379	A	В	С	D N	E lonparame	F etric Distribu	G tion Free U	H CL Statistics	I	J	K	L
380				Data appear to	o follow a	Discernible I	Distribution	at 5% Signifi	icance Leve	I		
381												
382	1				Nonpar	rametric Dist	tribution Fre	e UCLs				
383				95%	CLT UCL	22.12				95% Ja	ckknife UCL	22.39
384			95%	Standard Boots	strap UCL	21.94				95% Boo	tstrap-t UCL	23.19
385			6	95% Hall's Boots	strap UCL	23.96			95% !	Percentile Bo	otstrap UCL	22.2
386				95% BCA Boots	strap UCL	22.3						
387	, 		90% Ch	nebyshev(Mean	, Sd) UCL	24.11			95% Ch	nebyshev(Me	an, Sd) UCL	26.1
388			97.5% Cr	nebyshev(Mean	, Sd) UCL	28.87			99% Cr	nebyshev(Me	an, Sd) UCL	34.31
389						1	1					
390						Suggested	UCL to Use					
391				95% Stude	nt's-t UCL	22.39						
392												
393		Note: Sugge	estions regard	ding the selectio	n of a 95%	UCL are pr	ovided to he	lp the user to	select the n	nost appropri	ate 95% UCL	
394			F	Recommendatio	ns are bas	sed upon dat	a size, data	distribution,	and skewnes	SS.		
395		These reco	mmendations	s are based upo	n the resu	Its of the sim	nulation stud	ies summariz	zed in Singh,	, Maichle, and	d Lee (2006).	
396	Н			ts will not cover								an.
396 397												
398												
	Vanadium											
400						General	Statistics					
401			Total	I Number of Obs	servations				Numbe	er of Distinct C)bservations	10
402				Tramber of Obc		10				r of Missing C		0
403					Minimum	228	<u> </u>			- Or Wildshing C	Mean	294.3
404					Maximum						Median	291
405	<u> </u>				SD	43.14				Std E	rror of Mean	13.64
406				Coefficient of							Skewness	0.132
407					variation	0.147					Skewiless	0.132
408						Normal (GOF Test					
409			c	Shapiro Wilk Tes	at Statistic		JOF TEST		Shopiro W	ilk GOF Test		
410				shapiro Wilk Crit				Data ann		at 5% Significa		
411			 	•				— Бата арре		GOF Test	ance Level	
412				Lilliefors Tes								
413			5	5% Lilliefors Crit					ear Normal a	nt 5% Significa	ance Level	
414					Jata appe	ar Normal at	: 5% Signific	ance Level				
415												
416					As:	suming Norr	mal Distribu					
417			95% No	ormal UCL					• •	usted for Ske	<u>-</u>	
418				95% Stude	nt's-t UCL	319.3			-	ed-CLT UCL (`	317.3
419									95% Modifie	ed-t UCL (Joh	nnson-1978)	319.4
420												
421							GOF Test					
422					st Statistic					Gamma GO		
423				5% A-D Crit	ical Value	0.724	Detecte	d data appea	ar Gamma D	istributed at 5	5% Significand	ce Level
424		-	-	K-S Tes	st Statistic	0.165		Kolmog	orov-Smirno	ov Gamma G	OF Test	
425				5% K-S Crit	ical Value	0.266	Detecte	d data appea	ar Gamma D	istributed at 5	5% Significand	ce Level
426				Detected da	ata appear	r Gamma Dis	stributed at	5% Significa	nce Level			
427												
428						Gamma	Statistics					
429				k	hat (MLE)	51.43			k	star (bias cor	rected MLE)	36.07
430				Theta	hat (MLE)	5.722	<u> </u>		Theta	star (bias cor	rected MLE)	8.159
					hat (MLE)		<u> </u>				as corrected)	721.4
431			M	LE Mean (bias o	, ,	294.3	 			,	as corrected)	49
432										03 (510		

A B C D E F 433												G	Н	I Approximate	J Chi Square	K Value (0.05)	L 660.1
434					Adj	usted	Level o	f Signifi	cance	0.0267				Ac	ljusted Chi S	quare Value	649.9
435																	
436									As	suming Gai	mma C	Distribut	ion				
437		95%	Approx	kimate	e Gamn	na UC	L (use v	when n>	>=50))	321.6			95% Ad	djusted Gamn	na UCL (use	when n<50)	326.7
438																	
439										Lognorma	al GOI	F Test					
440						Shap	iro Wilk	Test St	atistic	0.974			Sha	piro Wilk Log	normal GOF	Test	
441					5%	Shapi	ro Wilk	Critical	Value	0.842			Data appea	ar Lognormal	at 5% Signifi	cance Level	
442						L	illiefors	Test St	atistic	0.157			Li	lliefors Logno	rmal GOF T	est	
443						5% L	lliefors	Critical	Value	0.262			Data appea	ar Lognormal	at 5% Signifi	cance Level	
444								Data a	appea	r Lognorma	l at 5%	6 Signifi	cance Leve	el			
445																	
446										Lognorm	al Stat	tistics					
447						Mini	mum of	Logged	d Data	5.429					Mean of	logged Data	5.675
448						Maxi	mum of	Logged	d Data	5.9					SD of	logged Data	0.148
449											•					!	
450										uming Logn	ormal	Distribu	ition				
451								95% F	H-UCL	322.5				90% (Chebyshev (I	MVUE) UCL	335.6
452					95%	6 Che	byshev	(MVUE) UCL	354.3				97.5% (Chebyshev (I	MVUE) UCL	380.3
453					99%	6 Che	byshev	(MVUE) UCL	431.3							
454											•						
455										etric Distrib							
456						Da	ta appe	ar to fol	llow a	Discernible	Distri	ibution a	t 5% Signif	icance Level			
457																	
458										rametric Di	stribut	tion Free	UCLs				
459								5% CL							95% Ja	ckknife UCL	319.3
460					959		ndard B									tstrap-t UCL	320
461							Hall's B							95% F	Percentile Bo	otstrap UCL	316.8
462							BCA B										
463							shev(M		·						ebyshev(Mea	-	353.8
464				(97.5% C	Cheby	shev(M	ean, Sd) UCL	379.5				99% Ch	ebyshev(Mea	an, Sd) UCL	430
465																	
466										Suggested	UCL	to Use					
467							95% Sti	udent's-	t UCL	319.3							
468																	
469		Note	e: Sugg	gestio	ns rega					-				select the m		ate 95% UCL	
470										•				and skewnes			
471								-						zed in Singh,			
472		Howev	er, sim	nulatio	ons resu	ılts wi	II not co	ver all F	Real V	Vorld data se	ets; foi	r additio	nal insight t	he user may v	want to consi	ult a statisticia	an.
473																	
474																	
	Zinc																
476										0	10: "	-al					
477					-	-1 N '	- da -	Ol		Genera	ı Statis	STICS		K) '	af Dian in C	Nh	10
478					I Ota	aı Mur	nber of	Observ	ations	10	_				of Distinct C		10
479								B 4:	dine	22	\bot			Number	of Missing C		0
480									nimum		\perp					Mean	56.2 55
481								IVIAX	kimum		\perp				Ct-l F	Median	
482							ooff:-:-	o+ cf \ /.	SD		_				Std. E	rror of Mean	4.417
483						C	oefficier	it ot vai	ilation	0.249						Skewness	0.544
484										Na	005	Tost					
485						Cha-	iro \\/:II-	Took O	otioti -	Normal	GOF	rest		Chemire Mari	L COE Tast		
486	<u> </u>					onap	iro Wilk	rest St	austic	0.958				Snapiro Wil	k GOF Test		

	407	Α		В		C		l napir	D o Will	k Cri	E tical Value		F 842		G		H)ata app	ear	l Normal	at 5%	J 6 Sianif	ficar	K nce Le		L
	487																ata app								
Data appear Normal et S% Significance Level							5									D)ata app						nce Le	vel	
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95% Normal UCL 95% Student's 10 1 1 1 1 1 1 1 1											Α	ssumin	g Nor	mal [Distribut	tion									
						95	5% No	rma	I UCL	_							95%	6 UC	CLs (Ad	juste	d for Sk	kew	ness)		
									95% S	Stude	ent's-t UCL	_ 64	.3					959	% Adjus	ted-C	LT UC	L (C	hen-1	995)	64.28
																		95	% Modi	ified-t	UCL (J	Johr	nson-1	978)	64.42
A-D Test Statistic 0.241												Ga	mma	GOF	Test										
Syk A-D Critical Value 0.725 Detected data appear Gamma Distributed at 5% Significance Level									A-l	D Te	st Statistic	0.	241				Ande	ersor	n-Darlin	g Ga	mma G	OF	Test		
Section Sect								5	% A-E	O Cri	tical Value	e 0.	725		Detecte	d da	ta appe	ar G	amma l	Distrib	outed a	t 5%	6 Signi	ificanc	e Level
Detected data appear Gamma Distributed at 5% Significance Level									K-	S Te	st Statistic	0.	139				Kolmo	goro	v-Smiri	nov G	amma	GO	F Tes	t	
Detected data appear Gamma Distributed at 5% Significance Level								5	% K-S	S Cri	tical Value	e 0.	266		Detecte	d da	ta appe	ar G	amma l	Distrib	outed a	t 5%	6 Signi	ificanc	e Level
Samma Statistics 17.91								0	etect	ted d	ata appea	ar Gam	ma Di	istrib	uted at 5	5% \$	Significa	ance	Level						
Nation Nation	504											Ga	amma	Stati	istics										
Theta hat (MLE) 3.138										k	hat (MLE) 17	.91						I	k star	(bias c	corre	cted N	ΛLE)	12.6
Section Sec									Т	heta	hat (MLE) 3.	138						Theta	a star	(bias c	corre	ected N	ΛLE)	4.459
MLE Mean (bias corrected) 56.2 MLE Sd (bias corrected) 15.83										nu	hat (MLE) 358	.2							nι	ı star (b	bias	correc	cted)	252
Approximate Chi Square Value (0.05)							ML	E M	ean (bias	corrected) 56	.2							ML	E Sd (b	bias	correc	cted)	15.83
Adjusted Level of Significance 0.0267																		App	oroxima	te Ch	i Squar	re V	alue (0).05)	216.3
State							Adjus	ted I	evel	of Si	gnificance	e 0.0)267						,	Adjus	ted Chi	i Sq	uare V	alue	210.5
Syst Syst																									
513 95% Approximate Gamma UCL (use when n>=50) 65.49 95% Adjusted Gamma UCL (use when n<50) 67.28											A	ssumin	g Gan	nma	Distribu	tion									
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Lognormal GOF Test		-																							
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517 5% Shapiro Wilk Critical Value 0.842 Data appear Lognormal at 5% Significance Level							S	hapi	ro Wil	lk Te	st Statistic	0.	965				Sha	piro	Wilk Lo	ognor	mal GC	OF	Гest	-	
Statistic Data appear Lilliefors Test Statistic D.148 Lilliefors Lognormal GOF Test						,	5% Sł	napir	o Will	k Cri	tical Value	e 0.	842			Da	ta appe	ar Lo	gnorma	al at 5	% Sigr	nific	ance L	.evel	
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Data appear Lognormal at 5% Significance Level	519						5'	% Lil	liefor	s Cri	tical Value	e 0.	262			Da	ta appe	ar Lo	gnorm	al at 5	% Sigr	nific	ance L	.evel	
Lognormal Statistics Lognormal Statistics	520									D	ata appea	ar Logn	ormal	at 59	% Signif	ficar	ice Leve	el							
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523 Minimum of Logged Data 3.497 Mean of logged Data 4.001 524 Maximum of Logged Data 4.443 SD of logged Data 0.253 525 526 Assuming Lognormal Distribution 527 95% H-UCL 66.39 90% Chebyshev (MVUE) UCL 69.8 528 95% Chebyshev (MVUE) UCL 75.94 97.5% Chebyshev (MVUE) UCL 84.47 529 99% Chebyshev (MVUE) UCL 101.2 84.47 530 Nonparametric Distribution Free UCL Statistics 531 Nonparametric Distribution at 5% Significance Level 533 Nonparametric Distribution Free UCLs 533 95% CLT UCL 63.46 95% Jackknife UCL 64.3 536 95% Standard Bootstrap UCL 62.95 95% Bootstrap-t UCL 65.11 537 95% Hall's Bootstrap UCL 67.47 95% Percentile Bootstrap UCL 63.2 538 95% BCA Bootstrap UCL 63.5 95% Chebyshev (Mean, Sd) UCL 75.45	522											Log	norma	al Sta	tistics								-		
524 Maximum of Logged Data 4.443 SD of logged Data 0.253 525 526 Assuming Lognormal Distribution 527 95% H-UCL 66.39 90% Chebyshev (MVUE) UCL 69.8 528 95% Chebyshev (MVUE) UCL 75.94 97.5% Chebyshev (MVUE) UCL 84.47 529 99% Chebyshev (MVUE) UCL 101.2 530 Nonparametric Distribution Free UCL Statistics 531 Nonparametric Distribution at 5% Significance Level 532 Data appear to follow a Discernible Distribution at 5% Significance Level 533 Nonparametric Distribution Free UCLs 534 Nonparametric Distribution Free UCLs 535 95% CLT UCL 63.46 95% Jackknife UCL 64.3 536 95% Standard Bootstrap UCL 62.95 95% Bootstrap-t UCL 65.11 537 95% Hall's Bootstrap UCL 63	523						ı	Minir	num (of Lo	gged Data	a 3.	497								Mean	of Ic	gged I	Data	4.001
Assuming Lognormal Distribution	524						N	/laxir	num (of Lo	gged Data	a 4.	443								SD	of Ic	gged	Data	0.253
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527 95% H-UCL 66.39 90% Chebyshev (MVUE) UCL 69.8 528 95% Chebyshev (MVUE) UCL 75.94 97.5% Chebyshev (MVUE) UCL 84.47 529 99% Chebyshev (MVUE) UCL 101.2 1	526										Ass	suming	Logno	orma	l Distrib	utio	n								
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529 99% Chebyshev (MVUE) UCL 101.2 530 Nonparametric Distribution Free UCL Statistics 532 Data appear to follow a Discernible Distribution at 5% Significance Level 533 534 Nonparametric Distribution Free UCLs 535 95% CLT UCL 63.46 95% Jackknife UCL 64.3 536 95% Standard Bootstrap UCL 62.95 95% Bootstrap-t UCL 65.11 537 95% Hall's Bootstrap UCL 67.47 95% Percentile Bootstrap UCL 63.2 538 95% BCA Bootstrap UCL 63.5 539 90% Chebyshev(Mean, Sd) UCL 69.45 95% Chebyshev(Mean, Sd) UCL 75.45	528								-	•			.94						97.5%	6 Che	byshev	v (M	VUE)	UCL	84.47
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Nonparametric Distribution Free UCL Statistics	530											,		•											
Data appear to follow a Discernible Distribution at 5% Significance Level	531									١	Nonparam	etric D	istribu	ıtion	Free UC	CL S	tatistics	3							
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536 95% Standard Bootstrap UCL 62.95 95% Bootstrap-t UCL 65.11 537 95% Hall's Bootstrap UCL 67.47 95% Percentile Bootstrap UCL 63.2 538 95% BCA Bootstrap UCL 63.5 539 90% Chebyshev(Mean, Sd) UCL 69.45 95% Chebyshev(Mean, Sd) UCL 75.45	535												.46												64.3
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540 97.5% Chebyshev(Mean, Sd) UCL 83.78 99% Chebyshev(Mean, Sd) UCL 100.1	539							•	•												•				
	540					97.5	% Ch	ebys	hev(I	Mear	ı, Sd) UCI	_ 83	.78						99% (Cheby	shev(N	Леа	n, Sd)	UCL	100.1

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541																
542						Suggested	UCL to Use									
543				95% Stu	dent's-t UCL	64.3										
544		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL														
545		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.														
546			F	Recommenda	tions are bas	sed upon dat	a size, data d	distribution, a	and skewnes	S.						
547		These recor	nmendations	are based u	pon the resu	ılts of the sim	ulation studi	es summariz	ed in Singh,	Maichle, and	d Lee (2006)					
548	Но	wever, simul	lations result	s will not cov	er all Real W	orld data se	ts; for additio	nal insight th	e user may v	want to cons	ult a statistic	ian.				
549																

Big Blue Mill Kern County, Californias

Arsenic	D_Arsenic	Chromium	D_Chromium	Copper	D_Copper	Lead	D_Lead	Mercury	D_Mercury	Molybdenum	D_Molybdenum	Nickel	D_Nickel	Vanadium	D_Vanadium	Zinc	D_Zinc
17.0	1	28.0	1	27	1	57	1			4.0	1	23.0	1	227.0	1	137	1
8.0	1	26.0	1	24	1	74	1	5.00	1	4.0	1	15.0	1	274.0	1	94	1
19.0	1			14	1	38	1	5.00	1	4.0	1	20.0	1	242.0	1	112	1
11.0	1			17	1	25.0	1			6.0	1	12.0	1	133.0	1	135.0	1
12.0	1	33.0	1	20	1	25	1	4.0	1	4.0	1	15.0	1	220.0	1	112	1
13.0	1			10	1	23	1			7.0	1	13.0	1	199	1	84	1
12.0	1			18	1	67	1			3.0	1	13.0	1	203	1	88	1
11.0	1			37	1	66.0	1			11.0	1	13.0	1	149.0	1	172.0	1
16.0	1			36	1	64	1			16.0	1	14.0	1	111.0	1	236.0	1
17.0	1			14	1	23	1			7.0	1	14.0	1	198.0	1	103	1
13	1	27	1	16	1	43	1	3	1	4	1	13	1	194	1	109	1
16	1			16	1	32	1			7	1	14	1	229	1	101	1
15	1			17	1	33	1	4	1	6	1	16	1	204	1	115	1
13	1			24	1	45	1	4	1	13	1	19	1	214	1	162	1
15	1	36	1	19	1	43	1	4	1	4	1	24	1	226	1	109	1
38	1			20	1	29	1	6	1	33	1			114	1	213	1
16	1			14	1	22	1			6	1	17	1	163	1	111	1
20	1			21	1	36	1	6	1	6	1	16	1	236	1	108	1
17	1	25	1	21	1	36	1	3	1	5	1	18	1	199	1	106	1
15	1			17	1	27	1	3	1	3	1	14	1	229	1	98	1
19	1	24	1	26	1	59	1	3	1	6	1	13	1	209	1	128	1

Background Statistics for Uncensored Full Data Sets User Selected Options Date/Time of Computation ProUCL 5.12/11/2021 11:39:03 AM From File C:\Users\Oscar\Documents\ECM Consultants\Project Files\US Forest Service\Big Blue\UCL UTL Full Precision OFF Confidence Coefficient 95% New or Future K Observations 1 Number of Bootstrap Operations 2000 Arsenic Arsenic Total Number of Observations 21 Number of Distinct Observation 1 Number of Distinct Observations 21 Number of Distinct Observation 51 Number of Distinct Observation 51 Number of Distinct Observation 51 Number of Distinct Observation 51 Number of Distinct Observation 51 Number of Distinct Observation 52 Number of Distinct Observation 54 Number of Distinct Observation 55 Number of Di	concentrations					
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From File C:\Users\Oscar\Documents\ECM Consultants\Project Files\US Forest Service\Big Blue\UCL UTL Full Precision OFF Confidence Coefficient 95% New or Future K Observations 1 Number of Bootstrap Operations 2000 Arsenic General Statistics Total Number of Observations 21 Number of Distinct Observation 21 Number of Distinct Observation 21	concentrations					
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21 Critical Values for Background Threshold Values (BTVs)						
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	L) 2.56					
Normal COF Test						
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Shapiro Wilk Test Statistic 0.728 Shapiro Wilk GOF Test						
5% Shapiro Wilk Critical Value 0.908 Data Not Normal at 5% Significance Level						
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Data Not Normal at 5% Significance Level						
31 Declaration of Challette Assemble News I Distribution						
Background Statistics Assuming Normal Distribution	(-) 00 10					
95% UTL with 95% Coverage 29.85 90% Percentile	. ,					
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35 95% USL 31.09 99% Percentile	(z) 29.59					
36 Commo COF Took						
Gamma GOF Test						
A-D Test Statistic 0.813 Anderson-Darling Gamma GOF Test	aval					
5% A-D Critical Value 0.743 Data Not Gamma Distributed at 5% Significance	.evei					
K-S Test Statistic 0.18 Kolmogorov-Smirnov Gamma GOF Test	ones Level					
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Detected data follow Appr. Gamma Distribution at 5% Significance Level						
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40 The 1 (A) F) 4 F(4)	·					
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nu hat (MLE) 434.1 nu star (bias correcte	*					
48 MLE Mean (bias corrected) 15.86 MLE Sd (bias corrected)	(d) 5.318					
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95% HW Approx. Gamma UTL with 95% Coverage 30.4						

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Shapira Wilk Test Statistic	56																								
Second Second Nilk Critical Value 0.908	57														GOF Test										
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646 Sea Section of Section (Section Section	62									Data	а арр	ear Appr	oximate	Logn	ormal at 5%	Signif	ficano	e Le	vel						
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							95	ο% L	JIL	with													` '		4
Nonparametric Distribution Free Background Statistics												•											` ,		4
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Nonparametric Upper Limits for Background Threshold Values 73 Order of Statistic, r. 21 95% UTL with 95% Coverage 9.38. 3.4 74 Approx, f used to compute achieved Co. 5.5 1.105 Approximate Actual Confidence Coefficient achieved by UTL 9.68. 7.5 76 95% Percentile Bootstrap UTL with 95% Coverage 95% UPL 95% UPL 95% UPL 95% UPL 95% UPL 95% Chebyshev UPL 95% Chebyshev UPL 95% Chebyshev UPL 95% Chebyshev UPL 95% Chebyshev UPL 95% UP									υa	ıa app	pear /	-pproxim	ale Gal	ınııd L	วเอนเมนต์ปก ส	al 070 S	JUNI	icano	e Lev	CI					-
Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set free of outliers										Non	nare	metric I Ir	ner I i~	nite for	r Backgroun	d Thro	ehold	اھ/\ ا	IDE						-
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Approximate Sample Size needed to achieve specified CC 59					Δnr	nrov	fu	sed.	to o					105	Annrovima	ate Acti	ıal ∩	nnfida						0.659	-
75 95% Percentile Bootstrap UTL with 95% Coverage 38 95% BCA Bootstrap UTL with 95% Coverage 38 95% BCA Bootstrap UTL with 95% Coverage 38 95% Percentile 19 19 19 19 19 19 19 1					, ,PF	J. U.A.,	, ı u	Juu	0	ompul	.c acl		1.									•			1
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77				- 01001				ир с		•••••				2						P 0 . L			_		1
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Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. Thromium Chromium Total Number of Observations Total Number of Observations Number of Distinct Observations Number of Missing Observations Number of Missing Observations Median Medi																									-
Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Residually and consists of observations collected from clean unimpacted locations. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. Chromium Chromium Total Number of Observations T																									1
Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. Chromium Total Number of Observations Number of Distinct Observations Number of Missing Observations Number of Missing Observations Number of Missing Observations Median Prist Quartile Second Largest Meximum Mex																									1
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers And consists of observations collected from clean unimpacted locations. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations and false negatives provided the data represents a background data set free of outliers The use of USL tends to positives and false negatives provided the data represents a background data set free of outliers Background false negatives provided the data represents a background data set free of outliers The use of USL tends to positives and false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false positives and false negatives provided the data represents a background false positives and false negatives provided the data represents a background false positives and false negatives provided the data represents a background false negatives provided the data represents a background false negatives provided the data represents a background false positives and false negatives provided the data represents a background false positives and false negativ			1	Note: Th	he u	ıse c	of U	SL to	end	s to yie	eld a	conserva	tive esti	mate	of BTV, espe	ecially	when	the s	ample	e size	starts	exceeding	20.		1
And and consists of observations collected from clean unimpacted locations. The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. Chromium Chromium Chromium Chromium Total Number of Observations Total Number of Observations Total Number of Observations Total Number of Observations Total Number of Missing Observations Total Number of Distinct O																									1
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV. Chromium Chromium General Statistics Total Number of Observations Minimum Min													-			-									1
86 represents a background data set and when many onsite observations need to be compared with the BTV. 87 Chromium 89 Chromium 90 General Statistics 91 Total Number of Observations 7 Number of Distinct Observations 7 92 Number of Missing Observations 14 93 Second Largest 33 Median 27 94 Second Largest 33 Median 27 95 Maximum 36 Third Quartile 30.5 96 Mean of logged Data 28.43 Second Largest 30.5 98 Coefficient of Variation 0.156 Second Largest 3.338 Second Largest 3.05 98 Mean of logged Data 3.338 Second Largest 3.05 99					The	e us	e of	fUS	L te	nds to	prov	ide a bala	nce bet	ween	false positiv	es and	false	nega	atives	provi	ded the	e data			1
87 88 Chromium 89 90 General Statistics 90 Number of Distinct Observations 7 92					repi	rese	nts	a ba	ackg	round	l data	set and v	when ma	any on	site observa	ations n	need t	o be	comp	ared v	vith th	e BTV.			1
88 Chromium 89 General Statistics 91 Total Number of Observations 7 Number of Distinct Observations 7 92 Number of Missing Observations 14 93 Minimum 24 First Quartile 25.5 94 Second Largest 33 Median 27 95 Second Largest 33 Median 27 96 Maximum 36 Third Quartile 30.5 96 Mean 28.43 SD of logant Skewness 1.03 98 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93																									1
Second Largest 33 Median 27		Chromium	า																						1
90 General Statistics 91 Total Number of Observations 7 Number of Distinct Observations 7 92 Number of Missing Observations 14 93 Minimum 24 First Quartile 25.5 94 Second Largest 33 Median 27 95 Maximum 36 Third Quartile 30.5 96 Mean 28.43 SD 4.42 97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 100 Critical Values for Background Threshold Values (BTVs)																									1
92 Number of Missing Observations 14 93 Minimum 24 First Quartile 25.5 94 Second Largest 33 Median 27 95 Maximum 36 Third Quartile 30.5 96 Mean 28.43 SD 4.42 97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 100 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93		General S	Statis	tics																					1
93 Minimum 24 First Quartile 25.5 94 Second Largest 33 Median 27 95 Maximum 36 Third Quartile 30.5 96 Mean 28.43 SD 4.42 97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 100 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	91						Т	otal	Nur	nber o	of Obs	servations	s 7						Numl	ber of	Distin	ct Observa	tions	7	
94 Second Largest 33 Median 27 95 Maximum 36 Third Quartile 30.5 96 Mean 28.43 SD 4.42 97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	92																		Numb	per of	Missir	ng Observa	tions	14	
95 Maximum 36 Third Quartile 30.5 96 Mean 28.43 SD 4.42 97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	93																								
96 Mean 28.43 SD 4.42 97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	94									5	Secor	nd Larges													
97 Coefficient of Variation 0.156 Skewness 1.03 98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	95																					Third Qu			
98 Mean of logged Data 3.338 SD of logged Data 0.14 99 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	96																							4.429	
99 100 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	97																							1.034	1
100 Critical Values for Background Threshold Values (BTVs) 101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	98									Mean	of log	gged Data	a 3.3	338							SD	of logged	Data	0.149	1
101 Tolerance Factor K (For UTL) 3.399 d2max (for USL) 1.93	99																								1
	100														nd Threshol	d Valu	es (B	TVs)					1		1
102	101						T	Toler	ranc	e Fac	tor K	(For UTL) 3.3	399							C	d2max (for	USL)	1.938	1
Name of OOF Task	102																								1
Normal GOF Test								_	ıl-	\ * **	u. -				JOF Test			٥:		\A#!!! 4		·			1
Shapiro Wilk Test Statistic 0.881 Shapiro Wilk GOF Test							F									D :			•						1
105 5% Shapiro Wilk Critical Value 0.803 Data appear Normal at 5% Significance Level							55	% St								Data	а арр						evel		4
106 Lilliefors Test Statistic 0.253 Lilliefors GOF Test								E1								D-+	0.05-						avel.		-
107 5% Lilliefors Critical Value 0.304 Data appear Normal at 5% Significance Level								5'	% L	illetor					EW Classes			ear N	iorma	ı at 5%	∞ Sign	шсапсе с	evei		-
Data appear Normal at 5% Significance Level	11Ω										<u> </u>	лака арр	ear Nor	ınaı at	0% SIGNITIO	ance L	-evei]

100	A B C D E	F	G H I J K L
109	Background S	tatistics Ass	ssuming Normal Distribution
110	95% UTL with 95% Coverage		90% Percentile (z) 34.1
111	95% UPL (t)		95% Percentile (z) 35.71
112	95% USL	37.01	99% Percentile (z) 38.73
113 114	200 002	37.31	50% F 616011110 (2)
115		Gamma	a GOF Test
116	A-D Test Statistic	0.43	Anderson-Darling Gamma GOF Test
117	5% A-D Critical Value	0.708	Detected data appear Gamma Distributed at 5% Significance Level
118	K-S Test Statistic	0.239	Kolmogorov-Smirnov Gamma GOF Test
119	5% K-S Critical Value	0.311	Detected data appear Gamma Distributed at 5% Significance Level
120	Detected data appear	r Gamma Di	Distributed at 5% Significance Level
121			
122			a Statistics
123	k hat (MLE)		k star (bias corrected MLE) 29.32
124	Theta hat (MLE)		Theta star (bias corrected MLE) 0.97
125	nu hat (MLE)	715.9	nu star (bias corrected) 410.4
126	MLE Mean (bias corrected)	28.43	MLE Sd (bias corrected) 5.251
127			
128	-		ssuming Gamma Distribution
129	95% Wilson Hilferty (WH) Approx. Gamma UPL	38.09	90% Percentile 35.33
130	95% Hawkins Wixley (HW) Approx. Gamma UPL	38.15	95% Percentile 37.58
131	95% WH Approx. Gamma UTL with 95% Coverage	45.41	99% Percentile 42.05
132	95% HW Approx. Gamma UTL with 95% Coverage	45.71	
133	95% WH USL	37.37	95% HW USL 37.42
134		1	-LOOF T
135	Charries Wills Took Chakishia		nal GOF Test
136	Shapiro Wilk Test Statistic 5% Shapiro Wilk Critical Value	0.904	Shapiro Wilk Lognormal GOF Test Data appear Lognormal at 5% Significance Level
137	5% Shapiro Wilk Childal Value Lilliefors Test Statistic	0.803	Lilliefors Lognormal GOF Test
138	5% Lilliefors Critical Value	0.229	Data appear Lognormal at 5% Significance Level
139			al at 5% Significance Level
140		Lognorman	and the organicanos cover
141	Background Sta	atistics assu	suming Lognormal Distribution
142	95% UTL with 95% Coverage	46.73	90% Percentile (z) 34.08
143 144	95% UPL (t)		95% Percentile (z) 35.97
145	95% USL	37.58	99% Percentile (z) 39.82
146			
147	Nonparametric	Distribution	on Free Background Statistics
148	<u> </u>		at 5% Significance Level
149			
150	Nonparametric Upp	oer Limits fo	for Background Threshold Values
151	Order of Statistic, r	7	95% UTL with 95% Coverage 36
152	Approx, f used to compute achieved CC	0.368	Approximate Actual Confidence Coefficient achieved by UTL 0.302
153			Approximate Sample Size needed to achieve specified CC 59
154	95% Percentile Bootstrap UTL with 95% Coverage	36	95% BCA Bootstrap UTL with 95% Coverage 36
155	95% UPL	36	90% Percentile 34.2
156	90% Chebyshev UPL	42.63	95% Percentile 35.1
157	95% Chebyshev UPL	49.07	99% Percentile 35.82
158	95% USL	36	
159			
160	•		e of BTV, especially when the sample size starts exceeding 20.
161	•	•	the data set represents a background data set free of outliers
162	and consists of observa	ations collect	cted from clean unimpacted locations.

163	A B	C D E The use of USL tends to provide a balan	F nce between	G false positiv	H es and false	l negatives pro	J K ovided the data		L
164		represents a background data set and wh	nen many on	nsite observa	ntions need to	be compare	ed with the BTV.		
165									
166	Connor								
167									
168	General Statistics								
169		Total Number of Observations	21			Number	of Distinct Observatio	ns	13
170		Minimum	10				First Quart	ile	16
171		Second Largest	36				Medi	an	19
172		Maximum	37				Third Quart	ile	24
173		Mean	20.38				5	SD	6.83
174		Coefficient of Variation	0.335				Skewne	ss	1.173
175		Mean of logged Data	2.966				SD of logged Da	ita	0.315
176									
177		Critical Values for	or Backgrou	nd Threshol	d Values (BT	Vs)			
178		Tolerance Factor K (For UTL)	2.371				d2max (for US	L)	2.58
179							· ·	-	
180			Normal (GOF Test					
181		Shapiro Wilk Test Statistic				Shapiro Wil	lk GOF Test		
182		5% Shapiro Wilk Critical Value	0.908		Data No		5% Significance Level		
183		Lilliefors Test Statistic	0.178				GOF Test		
184		5% Lilliefors Critical Value	0.188		Data appe	ar Normal at	t 5% Significance Leve	I	
		Data appear Appr	roximate No	rmal at 5% s					
185 186									
		Background S	tatistics Ass	sumina Norn	nal Distribution	on			
187		95% UTL with 95% Coverage					90% Percentile	z)	29.13
188		95% UPL (t)	32.44				95% Percentile	` ′	31.62
189		95% USL	38				99% Percentile	` '	36.27
190								/	
191			Gamma (GOF Test					
192		A-D Test Statistic	0.412		Ander	son-Darling	Gamma GOF Test		
193		5% A-D Critical Value	0.743	Detecte			stributed at 5% Signific	ance	e Level
194		K-S Test Statistic	0.135				v Gamma GOF Test		
195		5% K-S Critical Value	0.189	Detecte	•		stributed at 5% Signific	ance	e Level
196		Detected data appear							
197				on Datou at	o /o Olgilillodi				
198			Gamma	Statistics					
199		k hat (MLE)	10.44			k s	star (bias corrected ML	F)	8.976
200		Theta hat (MLE)	1.953				star (bias corrected ML	´	2.271
201		nu hat (MLE)	438.3				nu star (bias correcte		377
202		MLE Mean (bias corrected)	20.38				MLE Sd (bias correcte		6.803
203							52 (2100 00110010	-/	
204		Background St	tatistics Ass	umina Gam	ma Distributio	on			
205	000/ 14/	/ilson Hilferty (WH) Approx. Gamma UPL		y daili	2100115000		90% Percent	ile	29.44
206	050/ 11	wkins Wixley (HW) Approx. Gamma UPL	33.28				95% Percent		32.71
207	050/ 14/11 4	pprox. Gamma UTL with 95% Coverage	38.84				99% Percent		39.44
208	050/ 184/	pprox. Gamma UTL with 95% Coverage	39.29				3370 1 GICEIII		
209	-	95% WH USL	40.96				95% HW U	SI T	41.55
210		3370 WIT USE	±0.50				33/01144 0		
211			Lognorma	I GOF Test					
212		Shapiro Wilk Test Statistic	0.967	GOFTEST	Shor	iro Wilk I on	normal GOF Test		
213		5% Shapiro Wilk Critical Value	0.907		<u> </u>		at 5% Significance Lev	امر	
214		•					<u> </u>	CI	
215		Lilliefors Test Statistic 5% Lilliefors Critical Value	0.116 0.188			•	ormal GOF Test at 5% Significance Lev	(O)	
216		5% Lilleiois Critical value	U. 168		⊔ata appea	Lognormal	at 5 % Significance Lev	el .	

	A B C D E	F r Lognormal	G H I J K A Stanford British B	L
217	- Data appear	Lognomia	at 0% digitilication Level	
218	Background Str	atistics assu	ming Lognormal Distribution	
219	95% UTL with 95% Coverage		90% Percentile (z)	29.08
220 221	95% UPL (t)		95% Percentile (z)	32.62
222	95% USL		99% Percentile (z)	40.44
223			()	
223	Nonparametric	Distribution	Free Background Statistics	
225	•		rmal at 5% Significance Level	
226			<u> </u>	
227	Nonparametric Upp	per Limits for	r Background Threshold Values	
228	Order of Statistic, r	21	95% UTL with 95% Coverage	37
229	Approx, f used to compute achieved CC	1.105	Approximate Actual Confidence Coefficient achieved by UTL	0.659
230			Approximate Sample Size needed to achieve specified CC	59
231	95% Percentile Bootstrap UTL with 95% Coverage	37	95% BCA Bootstrap UTL with 95% Coverage	37
232	95% UPL	36.9	90% Percentile	27
233	90% Chebyshev UPL		95% Percentile	36
234	95% Chebyshev UPL		99% Percentile	36.8
235	95% USL			
236			<u> </u>	
237	Note: The use of USL tends to yield a conservati	ive estimate	of BTV, especially when the sample size starts exceeding 20.	
238	-		ne data set represents a background data set free of outliers	
239	<u> </u>		ed from clean unimpacted locations.	
240			false positives and false negatives provided the data	
241			site observations need to be compared with the BTV.	
242	<u> </u>		· · · · · · · · · · · · · · · · · · ·	
243	Lead			
244				
245	General Statistics			
246	Total Number of Observations	21	Number of Distinct Observations	17
247	Minimum	22	First Quartile	27
248	Second Largest	67	Median	36
249	Maximum	74	Third Quartile	57
250	Mean	41.29	SD	16.71
251	Coefficient of Variation	0.405	Skewness	0.637
252	Mean of logged Data	3.645	SD of logged Data	0.397
253		1		
254	Critical Values f	or Backgrou	nd Threshold Values (BTVs)	
255	Tolerance Factor K (For UTL)	2.371	d2max (for USL)	2.58
256		1	· · · · · · · · · · · · · · · · · · ·	
257		Normal (GOF Test	
258	Shapiro Wilk Test Statistic	0.898	Shapiro Wilk GOF Test	
259	5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level	
260	Lilliefors Test Statistic	0.149	Lilliefors GOF Test	
261	5% Lilliefors Critical Value	0.188	Data appear Normal at 5% Significance Level	
262	Data appear App	roximate No	rmal at 5% Significance Level	
263				
264	Background S	Statistics Ass	suming Normal Distribution	
265	95% UTL with 95% Coverage		90% Percentile (z)	62.7
266	95% UPL (t)	70.79	95% Percentile (z)	68.78
267	95% USL	84.41	99% Percentile (z)	80.17
268		1		
269		Gamma	GOF Test	
270	A-D Test Statistic	0.574	Anderson-Darling Gamma GOF Test	
∠/ U			y	

271	A B C D E 5% A-D Critical Value	F 0.744	G H I J K Detected data appear Gamma Distributed at 5% Significance	L Level
272	K-S Test Statistic	0.13	Kolmogorov-Smirnov Gamma GOF Test	
273	5% K-S Critical Value	0.19	Detected data appear Gamma Distributed at 5% Significance	Level
274	Detected data appear	Gamma Di	stributed at 5% Significance Level	
275				
276		Gamma	Statistics	
277	k hat (MLE)	6.749	k star (bias corrected MLE)	5.817
278	Theta hat (MLE)	6.117	Theta star (bias corrected MLE)	7.098
279	nu hat (MLE)	283.5	nu star (bias corrected)	244.3
280	MLE Mean (bias corrected)	41.29	MLE Sd (bias corrected)	17.12
281				
282	Background St	tatistics Ass	uming Gamma Distribution	
283	95% Wilson Hilferty (WH) Approx. Gamma UPL	74.17	90% Percentile	64.18
284	95% Hawkins Wixley (HW) Approx. Gamma UPL	74.81	95% Percentile	72.87
285	95% WH Approx. Gamma UTL with 95% Coverage	89.75	99% Percentile	91.11
286	95% HW Approx. Gamma UTL with 95% Coverage	91.48		
287	95% WH USL	95.6	95% HW USL	97.84
288			· · · · · · · · · · · · · · · · · · ·	
289		Lognorma	I GOF Test	
290	Shapiro Wilk Test Statistic	0.932	Shapiro Wilk Lognormal GOF Test	
291	5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level	
292	Lilliefors Test Statistic	0.128	Lilliefors Lognormal GOF Test	
293	5% Lilliefors Critical Value	0.188	Data appear Lognormal at 5% Significance Level	
294	Data appear	Lognormal	at 5% Significance Level	
295				
296	Background Sta	atistics assu	ming Lognormal Distribution	
297	95% UTL with 95% Coverage	98.16	90% Percentile (z)	63.67
298	95% UPL (t)	77.17	95% Percentile (z)	73.56
299	95% USL	106.7	99% Percentile (z)	96.44
300				
301	Nonparametric	Distribution	Free Background Statistics	
302	Data appear Appr	roximate No	rmal at 5% Significance Level	
303				
304	Nonparametric Upp	per Limits fo	r Background Threshold Values	
305	Order of Statistic, r	21	95% UTL with 95% Coverage	74
306	Approx, f used to compute achieved CC	1.105	Approximate Actual Confidence Coefficient achieved by UTL	0.659
307			Approximate Sample Size needed to achieve specified CC	59
308	95% Percentile Bootstrap UTL with 95% Coverage	74	95% BCA Bootstrap UTL with 95% Coverage	74
309	95% UPL	73.3	90% Percentile	66
310	90% Chebyshev UPL	92.6	95% Percentile	67
311	95% Chebyshev UPL	115.8	99% Percentile	72.6
312	95% USL	74		
313				
314	<u> </u>		of BTV, especially when the sample size starts exceeding 20.	
315	-	=	ne data set represents a background data set free of outliers	
316			ed from clean unimpacted locations.	
317			false positives and false negatives provided the data	
318	represents a background data set and wh	hen many or	nsite observations need to be compared with the BTV.	
319				
320	Mercury			
321				
322	General Statistics			
323	Total Number of Observations	12	Number of Distinct Observations	4
324			Number of Missing Observations	9

325	Α	В	С	D	E Minimum	F 3	G	Н		1		J	K First Quartile	L3
326				Sec	cond Largest	6							Median	4
327					Maximum	6						7	Third Quartile	5
328					Mean	4.167							SD	1.115
329				Coefficien	t of Variation	0.268							Skewness	0.56
330				Mean of	logged Data	1.395						SD of	f logged Data	0.263
331														
332				Crif	tical Values fo	or Backgrou	nd Threshol	d Values (BTVs)					
333			Tole	erance Factor	K (For UTL)	2.736						d2n	nax (for USL)	2.285
334							!							
335						Normal (GOF Test							
336			;	Shapiro Wilk	Test Statistic	0.859			Sha	piro W	ilk GOF	- Tes	t	
337			5% 9	Shapiro Wilk (Critical Value	0.859		Data ap	pear No	ormal a	at 5% S	ignific	cance Level	
338				Lilliefors	Test Statistic	0.226			Li	lliefors	GOF T	Test		
339				5% Lilliefors (Critical Value	0.243		Data ap	pear No	ormal a	at 5% S	ignific	cance Level	
340					Data appea	ar Normal at	5% Signific	ance Leve	əl					
341														
342					Background S	tatistics Ass	suming Norm	al Distribu	ution					
343			95%		% Coverage	7.216							Percentile (z)	5.595
344					95% UPL (t)	6.25					!	95% I	Percentile (z)	6
345					95% USL	6.714					!	99% I	Percentile (z)	6.76
346					-									
347						Gamma	GOF Test							
348				A-D	Test Statistic	0.681		And	lerson-l	Darling	Gamm	na GC	OF Test	
349					Critical Value	0.731	Detected						5% Significan	ce Level
350				K-S	Test Statistic	0.209							OF Test	
351					Critical Value	0.245					istribute	ed at	5% Significan	ce Level
352				Detected	d data appear	r Gamma Dis	stributed at 5	5% Signific	cance L	.evel				
353														
354							Statistics							
355					k hat (MLE)	15.82					•		rrected MLE)	11.92
356					eta hat (MLE)	0.263				Theta	`		rrected MLE)	0.35
357					nu hat (MLE)	379.6						•	as corrected)	286
358			N	ILE Mean (bia	as corrected)	4.167					MLE S	Sd (bia	as corrected)	1.207
359														
360		050/ 145	11116 . 0		ackground St		uming Gamr	na Distribu	ution				20/ 5	
361			, ,	NH) Approx. (6.448							% Percentile	5.769
362			- `	HW) Approx. (6.48							5% Percentile	6.33
363				UTL with 95	ŭ	7.803						99	% Percentile	7.475
364	95	™ Appr	ox. Gamma	UTL with 95	5% Coverage 5% WH USL	7.906 7.076						^	EO/ LIM/ LICE	7 107
365				9	5% WH USL	7.076						9	95% HW USL	7.137
366						Lognorma	I GOE Toot							
367				Shapiro Wilk	Tost Statistic	0.867	I GOF Test	C.L	apiro W	Ville I a	anorma	100	E Tost	
368				Shapiro Wilk (0.859			-				ficance Level	
369			5% 8	•	Test Statistic	0.859			ear Log Lilliefor			•		
370				5% Lilliefors (0.204							ficance Level	
371				/o LilliefOfS (Data appear		at 5% Signif			nomal	ı αι 3%	Sigrill	Level	
372					nara ahhear	Logitorillal	at J/O SIGNIT	cance Lev	V CI					
373				Do.	ckground Sta	atietice seem	mina Loaner	mal Dietrik	hution					
374			050/		% Coverage	8.278	ining Logilor	ווופו טוסנווו	DuuUII		-	۹ <u>۵</u> % ۱	Percentile (z)	5.65
375			35%		95% UPL (t)	6.593							Percentile (z)	6.216
376					95% UPL (t)	7.353							Percentile (z)	7.434
377					90% USL	7.333						<i>33</i> /₀ l	- ercennie (2)	7.404
378														

379	A B C D E Nonparametric D	F Distribution	G Free Backgro	H ound Statis	tics	J	K	L
380	Data appear	r Normal at	5% Significa	nce Level				
381								
382	Nonparametric Uppe	er Limits for	Background	Threshold	Values			
383	Order of Statistic, r	12			95% (UTL with 9	5% Coverage	6
384	Approx, f used to compute achieved CC	0.632	Approximate	e Actual Co	onfidence Co	efficient ach	nieved by UTL	0.46
385			Approxima	ate Sample	Size neede	d to achieve	e specified CC	59
386	95% Percentile Bootstrap UTL with 95% Coverage	6		95% BC	A Bootstrap I	UTL with 9	5% Coverage	6
387	95% UPL	6				9	0% Percentile	5.9
388	90% Chebyshev UPL	7.647				9	5% Percentile	6
389	95% Chebyshev UPL	9.224				9	9% Percentile	6
390	95% USL	6						
391			<u> </u>					
392	Note: The use of USL tends to yield a conservative	e estimate o	of BTV, espec	ially when	the sample s	size starts e	xceeding 20.	
393	Therefore, one may use USL to estimate a BTV o	nly when th	ne data set rer	oresents a	background (data set fre	e of outliers	
394	and consists of observati	ions collect	ed from clean	unimpacte	ed locations.			
395	The use of USL tends to provide a balance					ovided the	data	
396	represents a background data set and whe		· · · · · · · · · · · · · · · · · · ·		•			
396 397			-		<u> </u>			
	Molybdenum							
399	•							
	General Statistics							
+00	Total Number of Observations	21			Numbe	r of Distinct	Observations	9
401	Minimum	3					First Quartile	4
402 400	Second Largest	16					Median	6
403	Maximum	33					Third Quartile	7
404	Mean	7.571					SD	6.698
405	Coefficient of Variation	0.885					Skewness	3.079
406	Mean of logged Data	1.817				SD	of logged Data	0.586
407	Wearr of logged Data	1.017					n logged Data	0.500
408	Critical Values for	r Backgrou	nd Threehold	Values (B	T\/e\			
409	Tolerance Factor K (For UTL)	2.371	ila Tillesilola	Values (D		d2	max (for USL)	2.58
410	Tolerance Factor IV (For OTE)	2.071					max (ioi oot)	2.00
411		Normal C	GOF Test					
412	Shapiro Wilk Test Statistic	0.608	JOF Test		Shapiro Wi	IL COE To		
413	5% Shapiro Wilk Critical Value	0.008		Data N	ot Normal at			
414	Lilliefors Test Statistic	0.344		Data No		GOF Test		
415				Data N			anaa Laval	
416	5% Lilliefors Critical Value	0.188	W Clanifica-		ot Normal at \$	o oigniiica	THE LEVEL	
417	Data Not N		% Significand	~ revei				
418	Bashana 10	otiotics A -	umajna Na	al Diatelle :				
419	Background Sta			וטנוזאטע וו	.UN		Deve	10.15
420	95% UTL with 95% Coverage	23.45					Percentile (z)	16.15
421	95% UPL (t)	19.39					Percentile (z)	18.59
422	95% USL	24.85				99%	Percentile (z)	23.15
423								
424		Gamma (JOF Test					
425	A-D Test Statistic	1.517			rson-Darling			
426	5% A-D Critical Value	0.751	Da				ignificance Leve	∌l
427	K-S Test Statistic	0.275			gorov-Smirno			
428	5% K-S Critical Value	0.191				ed at 5% Si	ignificance Leve	əl
429	Data Not Gamma	a Distribute	∌d at 5% Sign	ificance Le	evel			
430		0	Chatlatian					
430 431		Gamma	Statistics				orrected MLE)	

433	A B C D E Theta hat (MLE)	F 2.954	954 Theta star (bias corrected MLE)							
434	nu hat (MLE)	107.7			nu star (bias corrected)	93.61				
435	MLE Mean (bias corrected)	7.571			MLE Sd (bias corrected)	5.072				
436					,					
437	Background St	tatistics Ass	uming Gamn	na Distributi	on					
438	95% Wilson Hilferty (WH) Approx. Gamma UPL	17.64			90% Percentile	14.36				
439	95% Hawkins Wixley (HW) Approx. Gamma UPL	17.51			95% Percentile	17.36				
440	95% WH Approx. Gamma UTL with 95% Coverage	23.27			99% Percentile	23.98				
441	95% HW Approx. Gamma UTL with 95% Coverage	23.47								
442	95% WH USL	25.46			95% HW USL	25.85				
443										
444			I GOF Test							
445	Shapiro Wilk Test Statistic	0.869		-	piro Wilk Lognormal GOF Test					
446	5% Shapiro Wilk Critical Value	0.908			Lognormal at 5% Significance Level					
447	Lilliefors Test Statistic	0.222			liefors Lognormal GOF Test					
448	5% Lilliefors Critical Value	0.188			Lognormal at 5% Significance Level					
449	Data Not L	ognormal at	t 5% Significa	ince Level						
450										
451	Background Sta		ming Lognorr	nal Distribu						
452	95% UTL with 95% Coverage	24.7			90% Percentile (z)	13.04				
453	95% UPL (t)	17.32			95% Percentile (z)	16.13				
454	95% USL	27.92			99% Percentile (z)	24.06				
455										
456	Nonparametric									
457	Data do not fo	ollow a Disc	ernidie Distri	bution (U.Ut	o)					
458	Nonparametric Upp	ou Limito fo	n Bookensund	Threehold	Value					
459	Order of Statistic, r	21		33						
460	Approx, f used to compute achieved CC	1.105	Approximat	0.659						
461	Approx, ruseu to compute acmeved CC	1.103	Approximat	59						
462	95% Percentile Bootstrap UTL with 95% Coverage	33	Approxim	33						
463	95% UPL	31.3		13						
464	90% Chebyshev UPL	28.14		16						
465	95% Chebyshev UPL	37.45		95% Percentile 99% Percentile	29.6					
466	95% USL	33		33% Forcentiale	25.0					
467 469	3370 001									
468 460	Note: The use of USL tends to yield a conservative	ve estimate	of BTV, espe	cially when	the sample size starts exceeding 20.					
469	Therefore, one may use USL to estimate a BTV				•					
470 471	and consists of observa	-			•					
471	The use of USL tends to provide a balan			•						
473	represents a background data set and wh		-							
474		<u> </u>								
475	Nickel									
476										
	General Statistics									
478	Total Number of Observations	20	Number of Distinct Observations							
479			Number of Missing Observations							
480	Minimum	12								
481	Second Largest	23								
482	Maximum	24								
483	Mean	15.8 SD								
484	Coefficient of Variation	0.216			Skewness	1.259				
485	Mean of logged Data	2.74			SD of logged Data	0.199				
486										

487	Α	В	С	C	E Critical Values	F for Backgrou	G Ind Thresho	H old Values (B	TVs)	J	К	L	
488			Tole	erance Facto	or K (For UTL	2.396				d2ı	max (for USL)	2.557	
489													
490						in .	GOF Test						
491					k Test Statistic				Shapiro Wi				
492			5% 5	<u> </u>	Critical Value			Data No	ot Normal at !		ance Level		
493					s Test Statistic					GOF Test			
494				5% Lilliefors	S Critical Value		EN Cientific		ot Normal at !	5% Significa	ance Level		
495					Data No	ot Normal at 5	5% Significa	ance Level					
496					Background	Statistics As	suming Nor	mal Distribution	on				
497			95%		95% Coverage				OII	90%	Percentile (z)	20.17	
498					95% UPL (t						Percentile (z)	21.41	
499					95% USL	-					Percentile (z)	23.74	
500 501													
502						Gamma	GOF Test						
503				A-E	D Test Statistic	c 0.929		Ander	rson-Darling	Gamma G	OF Test		
504				5% A-D	Critical Value	e 0.74	1	Data Not Gam	nma Distribut	ed at 5% Si	ignificance Lev	el	
505				K-S	S Test Statistic	0.202	<u> </u>	Kolmog	orov-Smirno	ov Gamma (GOF Test		
506				5% K-S	Critical Value	e 0.193	!	Data Not Gam	nma Distribut	ed at 5% Si	ignificance Lev	el	
507					Data Not Gan	ıma Distribut	ed at 5% Si	ignificance Le	evel				
508													
509							Statistics						
510					k hat (MLE	-				•	orrected MLE)	21.65	
511						*			Theta	•	orrected MLE)	0.73 866.1	
512		nu hat (MI MLE Mean (bias correct					15.8 nu star (bias corrected MLE Sd (bias corrected MLE Sd (bias corrected must be seen to be seen						
513		MLE Mean (bias correcte) 15.8				MLE Sd (b	ias corrected)	3.395	
514					Da alamana da	04-41-41 4		Di adib di					
515		OF0/ \M/ila	: f ()		. Gamma UPI		uming Gan	nma Distributi	ion	0/	0% Percentile	20.28	
516				,	Gamma UPI						5% Percentile	21.77	
517	9		·		95% Coverage		<u> </u>				9% Percentile	24.75	
518					95% Coverage						370 1 GIGGITATIO		
519					95% WH USI		-				95% HW USL	25.35	
520 521													
522						Lognorma	I GOF Test	<u> </u>					
523				Shapiro Will	k Test Statistic	0.893		Shar	piro Wilk Log	normal GO	F Test		
524			5% 5	Shapiro Wilk	Critical Value	e 0.905		Data Not	Lognormal a	t 5% Signific	cance Level		
525				Lilliefors	s Test Statistic	0.195		Lil	liefors Logno	ormal GOF	Test		
526			!	5% Lilliefors	S Critical Value				Lognormal a	t 5% Signific	cance Level		
527					Data Not	Lognormal at	t 5% Signifi	cance Level					
528													
529					·=		ming Logno	ormal Distribu	ition				
530			95%	UTL with 9	95% Coverage						Percentile (z)	19.98	
531					95% UPL (t	•					Percentile (z)	21.48	
532					95% USI	25.74				99%	Percentile (z)	24.59	
533					Nonnoromot-	o Dietribution	Ereo Pools	ground Statis	tice				
534					•			ground Statis stribution (0.05					
535							בווווטופ טוצ		•1				
536				None	parametric I li	per Limite fo	r Backgrou	nd Threshold	Values				
537					er of Statistic,	-	. 200Ng1001			JTL with 9	5% Coverage	24	
538		Ar	pprox. f user		e achieved CC		Approxim	nate Actual Co			_	0.642	
539 540							1	imate Sample			-	59	
540							1.15.57		. , , , , ,				

541	A	B 95% Percentil	C e Bootstrap U	D JTL with	E 95% Coverage	F 24	G	95% B	l CA Bootstrap U	J JTL with	K 95% Coverage	L 24
542					95% UPL	23.95					90% Percentile	20.3
543				90% C	hebyshev UPL	26.29					95% Percentile	23.05
544				95% C	hebyshev UPL	31.04					99% Percentile	23.81
545					95% USL	24						
546						II.	1					
547		Note: The	use of USL to	ends to yie	eld a conservat	ive estimate	of BTV, esp	ecially whe	n the sample si	ize starts	exceeding 20.	
548		Therefore	, one may us	e USL to	estimate a BTV	only when th	ne data set r	epresents a	a background d	ata set fr	ee of outliers	
549				and con	sists of observa	ations collect	ed from clea	an unimpac	ted locations.			
550		Т	he use of USI	L tends to	provide a balar	nce between	false positiv	es and fals	se negatives pro	ovided the	e data	
551		re	presents a ba	ckground	data set and w	hen many or	site observ	ations need	I to be compare	ed with the	BTV.	
552												
553	Vanadium	1										
554												
555	General S	Statistics										
556			Total	Number o	of Observations	21			Number	of Distino	ct Observations	19
557					Minimum	111					First Quartile	194
558				5	Second Largest						Median	204
559					Maximum						Third Quartile	227
560					Mean	198.7					SD	42.49
561				Coeffici	ent of Variation	0.214					Skewness	-0.765
562				Mean	of logged Data	5.266				SD	of logged Data	0.243
563											·	
564				C	Critical Values f	or Backgrou	nd Thresho	ld Values (BTVs)			
565			Toler	ance Fac	tor K (For UTL)	2.371				d	2max (for USL)	2.58
566											·	
567						Normal (GOF Test					
568				•	lk Test Statistic				Shapiro Wil			
569			5% Sh	napiro Will	k Critical Value	0.908		Data ap	pear Normal at			
570				Lilliefor	rs Test Statistic	0.218			Lilliefors	GOF Tes	t	
571			59		s Critical Value	0.188			Not Normal at 5	5% Signifi	cance Level	
572				Da	ata appear App	roximate No	rmal at 5%	Significanc	e Level			
573												
574					Background S		uming Nor	mal Distribu	ution			
575			95% U	JTL with	95% Coverage						% Percentile (z)	253.2
576					95% UPL (t)						% Percentile (z)	268.6
577					95% USL	308.4				999	% Percentile (z)	297.6
578						_						
579							GOF Test					
580					D Test Statistic				lerson-Darling			
581					O Critical Value						Significance Leve	el
582					S Test Statistic				ogorov-Smirno			
583					S Critical Value	0.189				ed at 5% S	Significance Leve	el
584					Data Not Gam	ma Distribute	ed at 5% Si	gnificance l	Level			
585												
586							Statistics					
587					k hat (MLE)	19.59				•	corrected MLE)	16.82
588				Т	heta hat (MLE)				Theta s	•	corrected MLE)	11.81
589					nu hat (MLE)						(bias corrected)	706.5
590			ML	_E Mean (bias corrected)	198.7				MLE Sd ((bias corrected)	48.45
591												
592					Background S		uming Gam	ma Distribu	ution			
		95% Wilso	on Hilferty (W	H) Approx	x. Gamma UPL	287.2		_			90% Percentile	262.8
593			,	,	x. Gamma UPL	289.5					95% Percentile	284.5

595	A	B 95% WH Appro	C ox. Gamma U	D JTL with	E 95% Coverage	F 324.3	G	Н		,	J K 99% Percentile	L 328.4		
596		95% HW Appro	ox. Gamma U	JTL with	95% Coverage	328.8								
597					95% WH USL	337.9	95% HW USL 343.2							
598														
599		Lognormal GOF Test												
600			Sł	hapiro W	ilk Test Statistic	0.856		Shap	oiro Wilk L	ognorma	I GOF Test			
601			5% Sh	0.908	Data Not Lognormal at 5% Significance Level									
602				Lilliefo	ors Test Statistic	0.265		Lil	liefors Log	normal (GOF Test			
603			59	% Lilliefo	rs Critical Value	0.188		Data Not	Lognormal	at 5% S	ignificance Level			
604					Data Not I	ognormal at	5% Significa	ance Level						
605														
606		Background Statistics assuming Lognormal Distribution												
607	050/ UTL with 050/ Owner at 244.0									264.5				
608					95% UPL (t)	297.5					95% Percentile (z)	289		
609					95% USL	362.8					99% Percentile (z)	341.1		
610														
611		Nonparametric Distribution Free Background Statistics												
612		Data appear Approximate Normal at 5% Significance Level												
613		<u> </u>												
614		Nonparametric Upper Limits for Background Threshold Values												
615				Orc	der of Statistic, r	21			95%	6 UTL wi	th 95% Coverage	274		
616		Approx, f used to compute achieved CC 1.105 Approximate Actual Confidence Coefficient achiev						t achieved by UTL	0.659					
617							Approxim	nate Sample	ample Size needed to achieve specified CC					
618		95% Percentile	e Bootstrap U	JTL with	95% Coverage	274		95% BCA Bootstrap UTL with 95% Coverage						
619					95% UPL	270.8	90% Percentile					236		
620				90% (Chebyshev UPL	329.2		242						
621				95% (388.3		267.6							
622	95% Chebyshev UPL 388.3 99% Percentile 267.6 95% USL 274													
623														
624		Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.												
625		Therefore	, one may us	e USL to	estimate a BTV	only when th	ne data set re	presents a b	ackground	d data se	t free of outliers			
626				and co	nsists of observa	ations collect	ed from clear	n unimpacte	d locations) <u>.</u>				
627		Tł	ne use of USI	L tends to	o provide a balar	nce between	false positive	es and false	negatives	provided	the data			
628		rep	oresents a ba	ckground	d data set and w	hen many on	site observat	tions need to	be compa	ared with	the BTV.			
629														
630	Zinc													
631														
	General	Statistics												
633			Total	Number	of Observations	21			Numb	er of Dis	stinct Observations	19		
634	Minimum					84		First Quartile	103					
635		Second Largest				213		111						
636	Maximum				236		135							
637	Mean					125.4		39.68						
638	Coefficient of Variation					0.316		1.724						
639		Mean of logged Data 4.793 SD of logged Data						0.272						
640														
641					Critical Values f	or Backgrou	nd Threshold	d Values (B	ΓVs)					
642			Toler		ctor K (For UTL)			•	-		d2max (for USL)	2.58		
643														
644		Normal GOF Test												
645			SI	hapiro W	ilk Test Statistic				Shapiro V	Wilk GOI	- Test			
646		5% Shapiro Wilk Critical Value					B Data Not Normal at 5% Significance Level							
647		Lilliefors Test Statistic 0.27 Lilliefors GOF Test												
			59		rs Critical Value			Data No						
648		5% Lilliefors Critical Value 0.188 Data Not Normal at 5% Significance Level												

649	A B C D E Data Not	F Normal at 5	G H I J K Significance Level	L									
650													
651	Background Statistics Assuming Normal Distribution												
652	95% UTL with 95% Coverage 219.5 90% Percentile (z) 176.2												
653	95% UPL (t)	195.4	95% Percentile (z)	190.6									
654	95% USL	227.8	99% Percentile (z)	217.7									
655													
656		Gamma (GOF Test										
657	A-D Test Statistic	1.249	Anderson-Darling Gamma GOF Test										
658	5% A-D Critical Value	Data Not Gamma Distributed at 5% Significance Leve	el										
659	K-S Test Statistic	0.252	Kolmogorov-Smirnov Gamma GOF Test										
660	5% K-S Critical Value	0.189	Data Not Gamma Distributed at 5% Significance Leve	el									
661	Data Not Gamr	na Distribute	ed at 5% Significance Level										
662			-										
663	Gamma Statistics												
664	In the AMEN AND TO SERVICE AND THE SERVICE AND												
665	Theta hat (MLE)	9.609	Theta star (bias corrected MLE)	11.22									
	nu hat (MLE)	548	nu star (bias corrected)	471.1									
666	MLE Mean (bias corrected)	125.4	MLE Sd (bias corrected)	37.44									
667	(2.02 3233004)		24 (5.55 55.15564)	-									
668	Background Statistics Assuming Gamma Distribution												
669	95% Wilson Hilferty (WH) Approx. Gamma UPL	194.7	90% Percentile	175.1									
670	95% Hawkins Wixley (HW) Approx. Gamma UPL	194.7	95% Percentile	192.6									
671	95% WH Approx. Gamma UTL with 95% Coverage	225	99% Percentile	228.5									
672	95% HW Approx. Gamma UTL with 95% Coverage	226.1	3378 T 6166 Maile										
673	95% WH USL	236.2	95% HW USL	237.8									
674	30 % WIT 60L		30701111 332	207.0									
675	Lognormal GOE Teet												
676	Lognormal GOF Test Shapiro Wilk Test Statistic 0.881 Shapiro Wilk Lognormal GOF Test												
677	5% Shapiro Wilk Critical Value	0.908	Data Not Lognormal at 5% Significance Level										
678	Lilliefors Test Statistic	0.236	Lilliefors Lognormal GOF Test										
679	5% Lilliefors Critical Value	0.230	Data Not Lognormal at 5% Significance Level										
680			5% Significance Level										
681	Data Not L	- Ogrionnar at	5 % Oignincance Level										
682	Rackground Sta	tietice accu	ming Lognormal Distribution										
683	95% UTL with 95% Coverage	229.9	90% Percentile (z)	170.9									
684	95% UPL (t)	195	95% Percentile (z)	188.7									
685	95% USL	243.4	99% Percentile (z)	227.1									
686	95% 05L	243.4	99% Percentile (2)	227.1									
687	Nonnoromotrio	Distribution	Eroo Bookground Statistics										
688	•		Free Background Statistics ernible Distribution (0.05)										
689	Data do not to		eniibie Distribution (0.03)										
690	Managangtiis He	orlimite f	r Pookground Throshold Volume										
691			r Background Threshold Values	226									
692	Order of Statistic, r		95% UTL with 95% Coverage	236									
693	Approx, f used to compute achieved CC	1.105	Approximate Actual Confidence Coefficient achieved by UTL	0.659 59									
694	OE9/ Deventile Destation LITE with OE9/ On	226	Approximate Sample Size needed to achieve specified CC										
695	95% Percentile Bootstrap UTL with 95% Coverage	236	95% BCA Bootstrap UTL with 95% Coverage	236									
696	95% UPL	233.7	90% Percentile	172									
697	90% Chebyshev UPL	247.2	95% Percentile	213									
698	95% Chebyshev UPL	302.4	99% Percentile	231.4									
699	95% USL	236											
700	No. 7		of DTV/ connectable of the stat										
701	•		of BTV, especially when the sample size starts exceeding 20.										
702	i neretore, one may use USL to estimate a BTV	only when th	ne data set represents a background data set free of outliers										

	Α	В	С	D	E	F	G	Н	I	J	K	L
703	and consists of observations collected from clean unimpacted locations.											
704	The use of USL tends to provide a balance between false positives and false negatives provided the data											
705	represents a background data set and when many onsite observations need to be compared with the BTV.											
706												