SOIL INVESTIGATION REPORT

FOR

ENVIRONS MINING LEGACY PROJECT

NEVADA CITY ENVIRONS PROPERTY

APN 05-100-87

NEVADA CITY, CALIFORNIA

Prepared for:

Sierra Nevada Conservancy

11521 Blocker Street

Auburn, California 95603

Prepared by:

Sierra Streams Institute

431 Uren Street, Suite C

Nevada City, California 95959

December 9, 2015

Attention: Ms. Lynn Campbell

Sierra Nevada Conservancy

11521 Blocker Street

Auburn, California 95603

Project: Environs Mining Legacy Assessment Project

Environs Property APN 05-100-87

Nevada City, California

Transmittal: Soil Investigation Report

Dear Ms. Campbell,

Sierra Streams Institute (SSI) prepared this Soil Investigation Report to describe recent site investigation activates, soil sampling and analytical results from the City owned Environs Property located in Nevada City, California. The approximately 38-acre property known as the Environs Property comprises Nevada County assessor's parcel number (APN) 05-100-87. The project was conducted with funding from the Sierra Nevada Conservancy under the Environs Mining Legacy Assessment grant awarded to SSI in 2014.

If you have any questions regarding this report, please contact the undersigned.

Sincerely,

Sierra Streams Institute

Kyle Leach, P.G. 7108

Project Geologist

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INTRODUCTION

Sierra Streams Institute (SSI) has completed a reconnaissance of the approximately 38-acre property known as the Environs Property which comprises Nevada County assessor's parcel number (APN) 05-100-87. This report describes the results of our field reconnaissance, site mapping and historical research, soil sampling and analysis of identified areas of mine waste at the site. The project was funded by a Sierra Nevada Conservancy grant titled Environs Mining Legacy Assessment Project which was awarded to SSI in 2014. The assessment has focused on areas of the property which have not been previously investigated and/or cleaned up. The assessment has identified several mining features which include potential for both soil and surface water impacts. This report focuses on soil impacts only. Assessment and monitoring of surface water impacts are ongoing and will be reported under a separate cover at a later date.

PURPOSE AND SCOPE

The purpose of the Environs Mining Legacy Assessment Project was to complete an assessment of the 38-acre City owned Environs property in areas outside the Providence Mine site where previous assessment and cleanup projects have been recently completed. The project scope has included completing a field reconnaissance of the entire Environs parcel, mapping all identified mining features, performing soil and surface water sampling and analysis from identified mining features including two mine waste piles, a quartz stamp mill site, a mine drain tunnel and a mine adit discharge pipe, preparing a Soil Investigation Report and a Surface Water Monitoring Report (to be presented under separate cover), preparing remediation plans when warranted, coordinating with appropriate regulatory agencies to begin the California Environmental Quality Act (CEQA) permitting process, and identifying additional studies or data needed for permitting and CEQA review.

This interim Soil Investigation Report presents the results of the SSI's site reconnaissance, historical research, mapping, soil sampling and analysis.

SITE DESCRIPTION

The Environs Site is a 38-acre property owned by the City of Nevada City (APN 05-100-87), known as the "Environs Property". The site is located adjacent to the south side of Deer Creek, a tributary of the Yuba River and drinking water source for Nevada City, approximately one half to one (1) mile downstream of downtown Nevada City, California. The property is generally steeply sloping toward Deer Creek and is heavily wooded with a mature fir, oak and cedar forest. An approximately 2-acre area in the northwest corner of the Environs Property was occupied by the historic Providence Mine. This portion of the property was recently remediated and is included in this report. Providence Mine Road runs along the western edge of the property and crosses between the Providence Mine site and the Providence Quartz Mill site along the western edge of the property. The property is traversed by several segments of the recently completed Deer Creek Tribute Trail, a portion of which crosses Deer Creek on a suspension bridge and generally crosses from east to west through the site to Providence Mine Road. An upper "ditch trail" follows a historic mining era water conveyance ditch and also extends to Providence Mine Road. A spur trail extends from the Tribute Trail through the Providence Mine site ending directly across Providence Mine Road from the Quartz Mill site.

The eastern end of the site is accessed from Jordan Street which extends to the Nevada City Waste Water Treatment Plant located in the “cut out” area in the southeastern portion of the property. Figure 1 is a Site Location Map.

SITE HISTORY

A history of the Providence Mine site is presented in other documents including SSI’s January 15, 2014 Site Characterization Report and Removal Action Workplan (RAW) for the Providence Mine Site. Information relevant to this assessment includes the orientation of the Providence Mine inclined shaft which extended to the east from the Providence Mine site at dip of 35 to 40 degrees. Documents associated with the Providence Mine mention a drain tunnel extending from the 300 foot level (along the incline) to a location along Deer Creek which facilitated dewatering of the shaft.

The Providence Quartz Mill was located along Deer Creek to the west of the Providence Mine, one of the most productive gold mines in California with over $8 Million in production over a 75 year span. The Quartz Mill operated from the mid-1860s until 1902 when the Providence property was purchased by the adjacent Champion Mine and all gold processing was moved to the Champion site across Deer Creek to the north. The Providence Quartz Mill consisted of a 40 stamp mill which crushed the gold quartz ore, amalgam tables where mercury was used to recover a portion of the gold, a sulphurete room and chlorination works where chemicals were added to release additional gold and other metals from sulphide minerals in the crushed ore, and a roasting furnace used to further break down the ore and improve gold recovery. Fine grained sulphurete waste produced by this process and recently found at the site has a distinct purplish color (due to added potassium permanganate) and consistently has some of the highest heavy metal contaminant concentrations of any mine waste in the region.

After the Providence Mine closed in 1921, the mine and Quartz Mill sites were abandoned. All above ground structures were later removed and likely used as scrap for the war effort in the 1940s. The site has sat idle since that time except for the construction of Providence Mine Road in the late 1960s and subsequent off-hauling of a portion of the mine waste for use in the construction of the Gold Center Freeway between Nevada City and Grass Valley. The road passes between the Providence Mine site and the Providence Quartz Mill site. Grading for this paved road disturbed or covered much of the eastern and northern portions of the 40 Stamp Mill building site.

PROVIDENCE MINE CLEANUP

SSI and the City of Nevada City have recently completed a Brownfields cleanup of the Providence Mine site located across Providence Mine Road to the east of the Providence Quartz Mill site in the northwestern corner of the Environs property. The project was funded by two 2010 EPA Brownfields cleanup grants and was completed in Fall 2014. A subsequent Sierra Nevada Conservancy cleanup grant for the Providence Mine Remediation Project was used to complete cleanup of the steep eastern slope and active landslide portions of the mine site to the east of the two Brownfields cleanup sites. Field cleanup activities at the Providence

Mine site were completed in Fall 2015. Monitoring, erosion control and re-vegetation activates are ongoing.

SITE RECONNAISSANCE

Site reconnaissance activities were performed on several occasions between January and October 2015. SSI staff and volunteers hiked the property in transects approximately 50 feet apart in accessible areas of the site. Transects were made along the south bank of Deer Creek, along the Deer Creek Tribute Trail which traverses the property with two segments, between the trail and creek, between trail segments and above and below the trail. Figure 2 is a Site Map showing the location of significant site features. The following mining related features were observed during site reconnaissance of areas outside the Providence Mine site from west to east:

The Providence Quartz Mill site was located along the western edge of the property to the west of Providence Mine Road. Prior to completing a detailed reconnaissance of the Quartz Mill site, SSI reviewed a 1912 Sanborn Fire Insurance Map superimposed on a current map of the site which shows the locations from east to west, of the 40 Stamp Quartz Mill (inactive in 1912), Sulphurete Room, and Roasting Furnace. Current conditions at the abandoned Quartz Mill site consist of hummocky sloped terrain of apparently disturbed native soil in the eastern portion of the mill site and a graded area along Providence Mine Road in the northern portion of the mill site. To the west of the stamp mill in the Sulphurete Room location is a relatively level benched area strewn with broken and crushed quartz ore and fine grained purple soil (sulphurete waste). An exposed slope and additional piles of mine waste rock and mill tailings are located to the north and west of the Sulphurete Room area. The Roasting Furnace was located in an elongated level area which was apparently cut into native soil and rock along the western property boundary.

Two collapsed or covered mine adits (a horizontal mine working with one entry) were also observed in the central portion of the site, both located down steep slopes toward Deer Creek from the Tribute Trail. The more western adit (Adit 1) was approximately 6 feet in diameter and partially collapsed with a small opening which appeared to extend horizontally into the slope. A waste rock pile extended down slope to northeast of the adit to within 20 feet of Deer Creek. This waste rock pile (WR1) was approximately 100 cubic yards in volume with predominantly large rock fragments covered in moss on the top surface and north sides. Some finer grained mine spoils were exposed in the steep north slope of the pile, predominantly in areas which were extremely difficult to access.

A second adit (Adit 2) was located approximately 200 feet upstream to the east of Adit 1 and farther from the creek. Adit 2 was completely covered with native soil with a 2-inch diameter steel pipe extending from the buried adit to the top surface of a large mine waste pile. The pipe discharged rust colored water to a small ponded area (seasonally ranging from 2 feet to 6 feet in diameter) which percolates into the mine waste. The Mine Waste pile associated with Adit 2 (WR2) is approximately 100 feet by up to 50 feet and up to 25 feet in thickness with an estimated volume of 1,000 cubic yards of mine waste.

One apparent air shaft or shallow mine exploratory pit was observed in the central portion of the site approximately 40 feet down slope of the Tribute Trial and along the approximate alignment of the Providence inclined shaft. The collapsed shaft was approximately 10 feet in diameter and 6 feet deep with little apparent excavation spoils (air shafts were typically excavated from below with the spoils removed through the shaft). A second apparent air shaft or shallow exploration pit was observed along the lower Tribute Trail alignment, approximately 20 feet down an extremely steep slope from the trail and directly upslope of Adit 2. This feature consisted of an approximately 15 foot wide depression up to 10 feet deep and almost completely blocked by granitic boulders and rocks. The small openings visible appeared too small to present a physical hazard and suggested a near vertical orientation. This feature could be an air shaft connected to Adit 2 which could account for the limited but continuous water discharge from the pipe extending from the adit.

No apparent mine features were observed on areas of the property on the North side of Deer Creek or in the northeast or eastern portions of the property.

SOIL SAMPLING AND ANALYSIS

Soil sampling was performed at the two waste rock piles (WR1 and WR2) associated with the two adits on June 2, 2015. A total of three soil samples were obtained from the limited areas of fine grained mine waste on the WR1 stockpile. A total of 18 soil samples were obtained from the WR2 stockpile or from native soil at the toe of the stockpile. Figure 3 is a Sample Location Map for the Waste Rock Stockpiles. All samples were obtained within the top 6-inches of soil except for samples WR1-S3 (1.0 feet depth), WR-2-S6 (1.5 to 2.0 feet), WR2-S7 (0.5-1.0 feet) WR2-S8 (1.0-1.5 feet) and WR2-S11 (1.0-1.5 feet). Samples WR2-TS14, WR2-TS15, WR2-TS16 and WR2-TS18 were obtained from native soil immediately adjacent to the toe of slope at the west, northwest, north and northeast sides on the pile respectively.

Soil sampling was performed at the Providence Quartz Mill site in two events on July 7, 2015 and October 27, 2015. A total of 34 soil samples were obtained from the Quartz Mill site and upslope locations. Figure 4 is a Sample Location Map for the Quartz Mill area. Twenty near surface samples were obtained from near surface (0-6-inches) soil or mine waste during the initial sampling event. Based on a review of initial results, 14 follow up samples were obtained from the near surface (0-6-inches) and from hand dug sample pits to further define the extent of metal impacts to site soil. A total of seven near surface samples were obtained from the approximate Quartz Mill building site (“QM” samples). Twenty samples were obtained from the Waste Rock and Sulphurete Room (“WR” and “SR” samples) area, 15 from the near surface and 5 from depths of 0.5 feet to 1.5 feet. Hand sampling excavation depths in this area were limited due to shallow depths to hard bedrock or dense weathered rock. Four samples were also obtained from areas upslope of the quartz mill site (‘US” samples).

Soil samples from the site were analyzed for Title 22 priority pollutant metals by EPA Methods 6010A and 7471B. Based on a review of initial laboratory results, selected samples from the Quartz Mill site were also analyzed for soluble metals of concern (lead and mercury) by the Waste Extraction Test (WET) method with standard citrate soaking solution and the Toxic Characteristic Leaching Potential (TCLP) method, typically used to characterize waste for landfill disposal. Two selected samples were also analyzed by the WET method with a

deionized water (DI) soaking solution which may better approximate in-situ soil solubility. Copies of the analytical laboratory reports are included in Appendix A.

ANALYTICAL LABORATORY RESULTS- TOTAL METALS

Analytical results of soil samples from the site were compared with three threshold concentrations typically used to characterize soil at abandoned mine sites to establish constituents of concern (COCs): Total Threshold Limit Concentrations (TTLCs or Hazardous Waste levels), California Human Health Screening Levels (CHHSLs or cleanup goals for unrestricted land use) and typical background arsenic concentrations for the project area. Results were also compared with the site specific cleanup goals established at the adjacent Providence Mine site (Site Specific Goals for recreational site use and potential cleanup goals for a potential Quartz Mill site cleanup).

Results from the Quartz Mill site samples indicated significantly elevated levels of lead, mercury, arsenic, and to a lesser extent cadmium. Results from the WR1 stockpile samples and a limited number of samples from the WR2 stockpile were elevated in lead and to a lesser extent arsenic and cadmium. Other Title 22 metals were generally below typical levels of concern. Thus lead, mercury, arsenic and cadmium are considered COCs for the site. Results from the three sampling areas for each COC are summarized below:

<u>Quartz Mill Site</u>

Total lead: Lead concentrations in the 30 samples from the Quartz Mill site ranged from 74 milligrams per kilogram (mg/kg) to 20,000 mg/kg. Eight samples exceeded TTLC levels (1,000 mg/kg). 29 of 30 samples exceeded the CHHSL for lead (80 mg/kg) and 11 of 30 samples exceeded the Providence Mine cleanup goal (270 mg/kg).

Total mercury: Mercury concentrations ranged from 0.74 mg/kg to 100 mg/kg. 5 of 30 samples exceeded the TTLC for mercury (20 mg/kg), 8 of 30 samples equaled or exceeded the CHHSL for mercury (18 mg/kg). No site specific goal was established for mercury.

Total arsenic: Arsenic concentrations ranged from 11 mg/kg to 250 mg/kg. None of the samples exceeded the TTLC (500 mg/kg), all 30 samples exceeded the CHHSL for arsenic (0.07 mg/kg) and 15 of 30 samples exceeded typical regional background levels of arsenic (21 mg/kg).

Total Cadmium: Cadmium concentrations ranged from less than 1.0 mg/kg to 19 mg/kg. None of the samples exceeded the TTLC (100 mg/kg), 22 of 30 samples exceeded the CHHSL for cadmium (1.7 mg/kg). No site specific cleanup goal was established for cadmium.

<u>WR1</u>

Total lead: Lead concentrations in the 3 samples from WR1 ranged from 400 mg/kg to 530 mg/kg. None of the samples exceeded TTLC levels (1,000 mg/kg). All samples exceeded the CHHSL for lead (80 mg/kg) the Providence Mine cleanup goal (270 mg/kg).

Total mercury: Mercury concentrations ranged from 0.43 mg/kg to 1.4 mg/kg. None of the samples exceeded the TTLC for mercury (20 mg/kg) or CHHSL (18 mg/kg).

Total arsenic: Arsenic concentrations ranged from 11 mg/kg to 40 mg/kg. None of the samples exceeded the TTLC (500 mg/kg), all 3 samples exceeded the CHHSL for arsenic (0.07 mg/kg) and one sample exceeded typical regional background levels of arsenic (21 mg/kg).

Total Cadmium: Cadmium concentrations ranged from less than 2.1 mg/kg to 3.5 mg/kg. None of the samples exceeded the TTLC (100 mg/kg), all three samples exceeded the CHHSL for cadmium (1.7 mg/kg).

<u>WR2</u>

Total lead: Lead concentrations in the 18 samples from WR2 ranged from 7.3 mg/kg to 330 mg/kg. None of the samples exceeded TTLC levels (1,000 mg/kg). Four of 18 samples exceeded the CHHSL for lead (80 mg/kg) and two samples exceeded the Providence Mine cleanup goal (270 mg/kg).

Total mercury: Mercury concentrations ranged from 0.1 mg/kg to 0.61 mg/kg. None of the samples exceeded the TTLC for mercury (20 mg/kg) or CHHSL (18 mg/kg).

Total arsenic: Arsenic concentrations ranged from less than 1.0 mg/kg to 24 mg/kg. None of the samples exceeded the TTLC (500 mg/kg), at least 9 of 18 samples exceeded the CHHSL for arsenic (0.07 mg/kg) and 3 samples slightly exceeded typical regional background levels of arsenic (21 mg/kg).

Total Cadmium: Cadmium concentrations ranged from less than less than 1.0 mg/kg to 6.6 mg/kg. None of the samples exceeded the TTLC (100 mg/kg), 6 samples exceeded the CHHSL for cadmium (1.7 mg/kg).

ANALYTICAL LABORATORY RESULTS- SOLUBLE METALS

Sample WR21 (20,000 mg/kg total lead 250 mg/kg arsenic) was analyzed for soluble lead, arsenic and copper by the WET Method. Results indicated soluble lead at 560 milligrams per liter (mg/L), soluble arsenic at 1.0 mg/L and soluble copper at 2.4 mg/L.

WR21 was also analyzed for soluble lead by the TCLP method. Results indicated soluble lead at 230 mg/L.

Sample WR8-B (100 mg/kg total mercury) was analyzed for soluble mercury by the WET Method. Results indicated soluble mercury at 5.5 micrograms per liter (ug/L).

WR8-B was also analyzed for soluble mercury by the TCLP method. Results indicated soluble mercury was not detected above the practical quantitation limit (PQL) of 0.20 ug/L.

Sample WR10 (340 mg/kg total lead) and WR12 (580 mg/kg lead) was analyzed for soluble lead by the Deionized WET Method (used to approximate in-situ solubility at the Providence Mine site). Results indicated soluble lead was not detected in either sample above the PQL of 0.50 mg/L.

DISCUSSION

The lateral and vertical extent of soil exceeding TTLCs, CHHSLs and site specific cleanup goals are discussed below along with a preliminary discussion of relative cleanup priorities:

Quartz Mill Site

SSI reviewed the results and locations of soil samples analyzed for total and soluble metals and compared results with cleanup goals previously established for the nearby Providence Mine site (which has similar COC's and proposed land use) to estimate the surface area and volumes of soil which may require cleanup.

Results from the Quartz Mill area samples indicate an approximately 25 by 35 foot area of near surface soil and mine waste exceeds TTLC levels (Hazardous Waste). This area corresponds to the approximate former location of the Sulphurete room and adjacent areas. The depth to dense rock appears to range from 6-inches to over 1.5 feet in this area.

An irregular shaped area roughly 80 feet by 70 feet has soil metals exceeding the Providence Mine cleanup goals for lead, CHHSLs for mercury or cadmium or typical local background levels of arsenic. The depth of this impacted soil has not been determined but based on site observations and our experience with similar sites, likely ranges from one foot to over five feet.

Based on these results an estimated 50 cubic yards of soil at the site exceeds hazardous waste levels and roughly 200 to 400 cubic yards of soil and mine waste exceed the assumed secondary cleanup goals.

Soluble metal analysis has determined that a portion of the Hazardous Waste level soil with the highest detected total metals concentrations also exceeds the STLC and TCLP threshold levels for soluble lead and thus would be considered RCRA Hazardous Waste.

DI WET analysis suggests that soil which could potentially be left in place at the site may be considered a low threat to surface water and groundwater, however, due to the relatively high PQLs reported by the laboratory, additional solubility testing may be required.

Assuming similar remedial goals are established for the site to those at the adjacent Providence Mine site, soil exceeding Hazardous Waste levels would be required to be excavated and disposed of off-site. Soil exceeding secondary cleanup goals may be allowed to be excavated or consolidated and placed as fill on site with a clean soil cover, provided that an evaluation of metal solubility determines that the waste is not a significant threat to surface water or groundwater.

Waste Rock Stockpile WR1

Fine grained mine waste on the steep northern side of the WR1 Stockpile exceeds the site specific cleanup goal for lead as determined for the Providence Mine site as well as the CHHSL for cadmium and typical background levels of arsenic. However, the stockpile is located away from any commonly used trail or easy access point and thus has a very low potential to be regularly visited by the public. Additionally, the top stockpile surface is large angular rock with a mossy surface and the fine grained mine waste which was sampled is situated on a steep

inaccessible slope. Thus potential human exposure is very low. Thus, cleanup of this area would be a relatively low priority.

Waste Rock Stockpile WR2

Near surface mine waste in the WR2 stockpile is generally relatively low in total metal concentrations compared with other mine waste at the site. Only 2 of 18 samples exceeded the assumed secondary cleanup goal for lead of 270 mg/k, 7 of 18 samples slightly exceeded the CHHSL for cadmium and 2 of 18 samples exceeded typical local background concentrations for arsenic. Based on the relatively inaccessible location of stockpile WR2 down a steep wooded slope from the nearest trail and away from any roads, cleanup would be a relatively low priority.

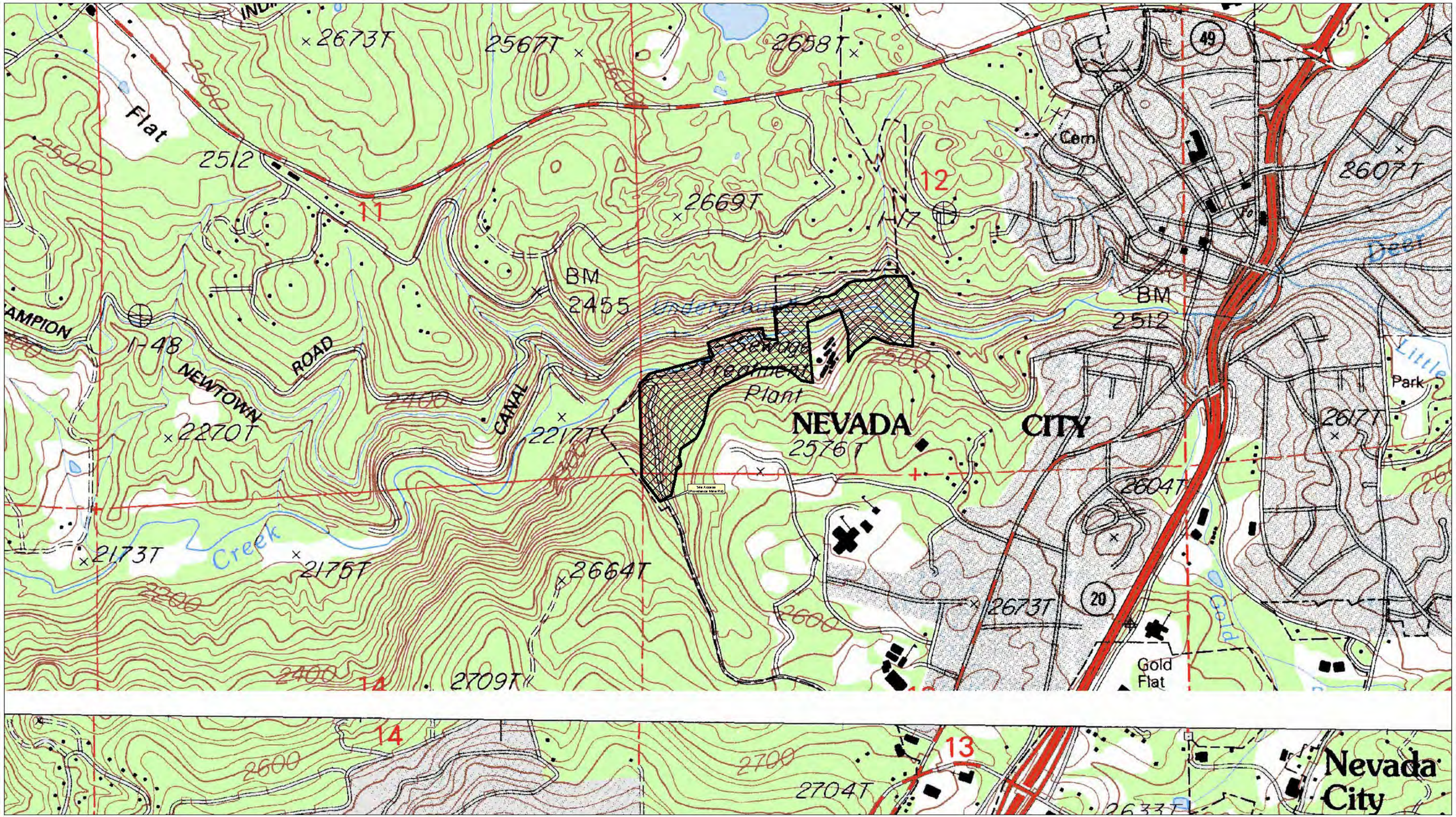
CONCLUSIONS AND RECOMMENDATIONS

A review of soil sample results from the Providence Quartz Mill site and the two mine waste stockpiles in the central portion of the site indicates extremely high concentrations of lead, mercury and arsenic in the Quartz Mill site which would require cleanup under any potential exposure scenario. Mine waste in the two stockpiles, while somewhat elevated in total metals, is located in relatively inaccessible areas away from any roadways or trails and thus would be a much lower cleanup priority. However, erosion control measures such as planting selected native plant species such as willow and honeysuckle is recommended to limit potential erosion of mine waste into Deer Creek.

SSI recommends that the City prepare an Assessment of Brownfields Cleanup Alternatives (ABCA) and apply for a Brownfields Cleanup Grant for the Providence Quartz Mill site.

Depending on the availability of funding, we also recommend preparation of a human health risk assessment and Removal Action Workplan (RAW) to inform and facilitate a site cleanup.

We also recommend limiting access to the Quartz Mill site and installing warning signs to discourage incidental exposure to mining contaminated soil.



Legend

Nevada City Environs Property

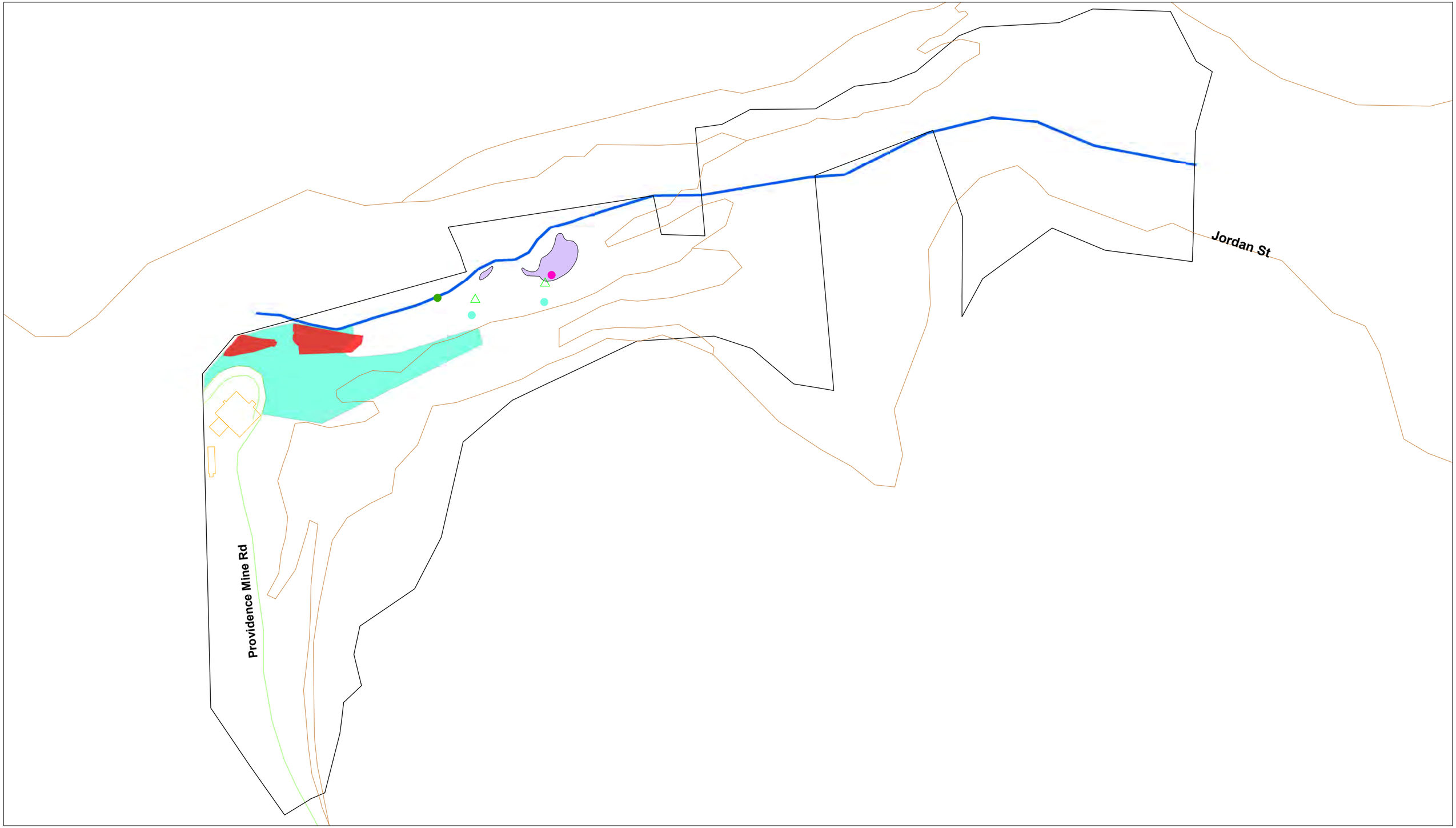
Sierra Streams Institute
Providence Mine
Figure 1: Site Location Map

Nevada City Quadrangle
T16N; R9E; Sec 11, 12, 13

N

1 inch = 833 feet

Miles
0 0.075 0.15 0.3



Legend

- Environs Parcel
- SNC Providence Project Boundary (775)
- Providence Mine Brownfield Site
- Providence Mine Road
- Deer Creek
- Deer Creek Tribute Trail
- Stamp Mill
- Mine Adit
- Adit Pipe
- Air Shaft
- Drain Tunnel
- Waste Rock Piles

Sierra Streams Institute
Sierra Nevada Conservancy - Environs Assessment

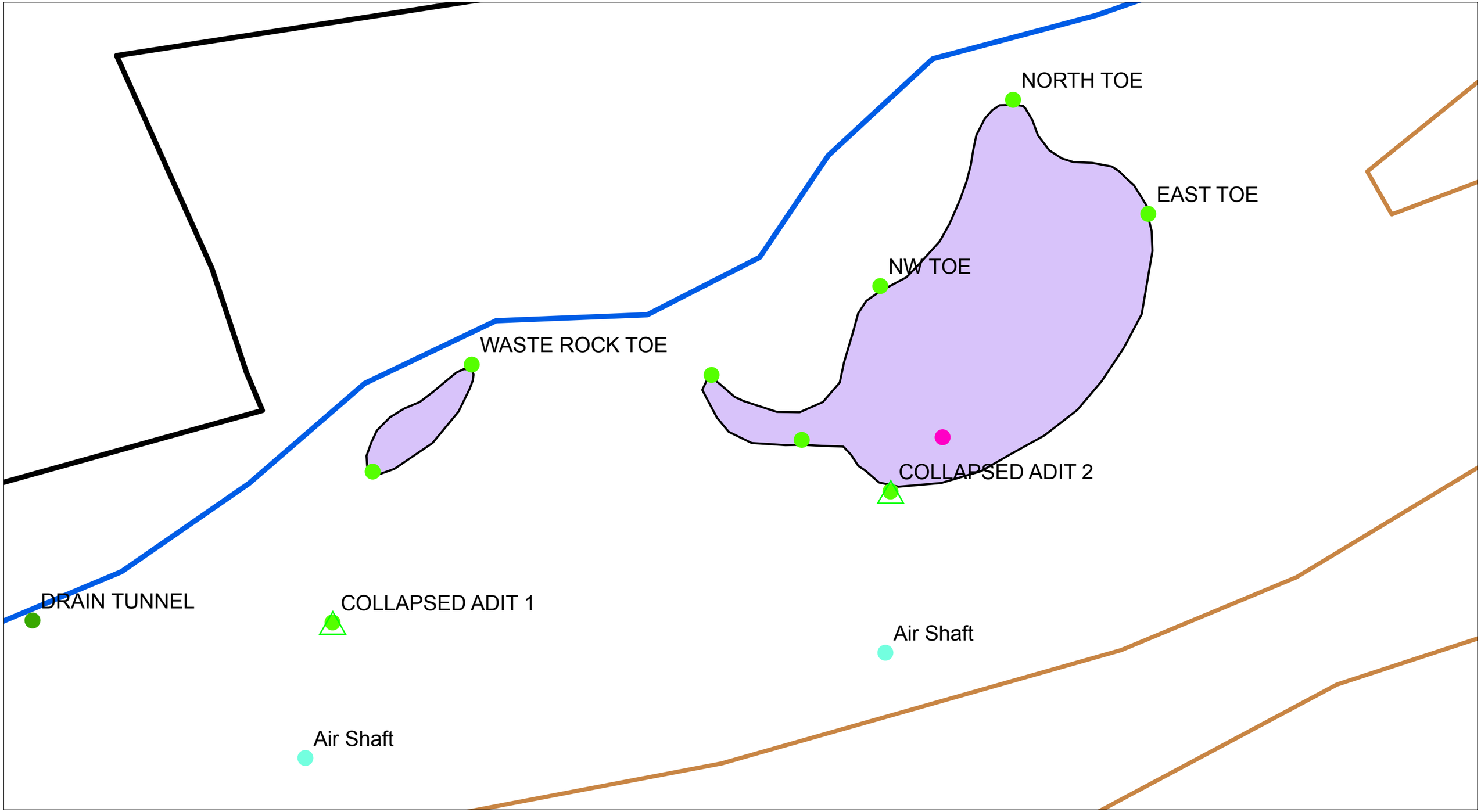
Figure 2 - Site Map

N

1 inch = 235 feet

0 0.025 0.05 0.1

Miles



Legend

- Environs Parcel
- Deer Creek
- Deer Creek Tribute Trail
- Waste Rock Piles
- Mine Features
- Adit Pipe
- Air Shaft
- Drain Tunnel
- Mine Adit

Sierra Streams Institute
Sierra Nevada Conservancy - Environs Assessment

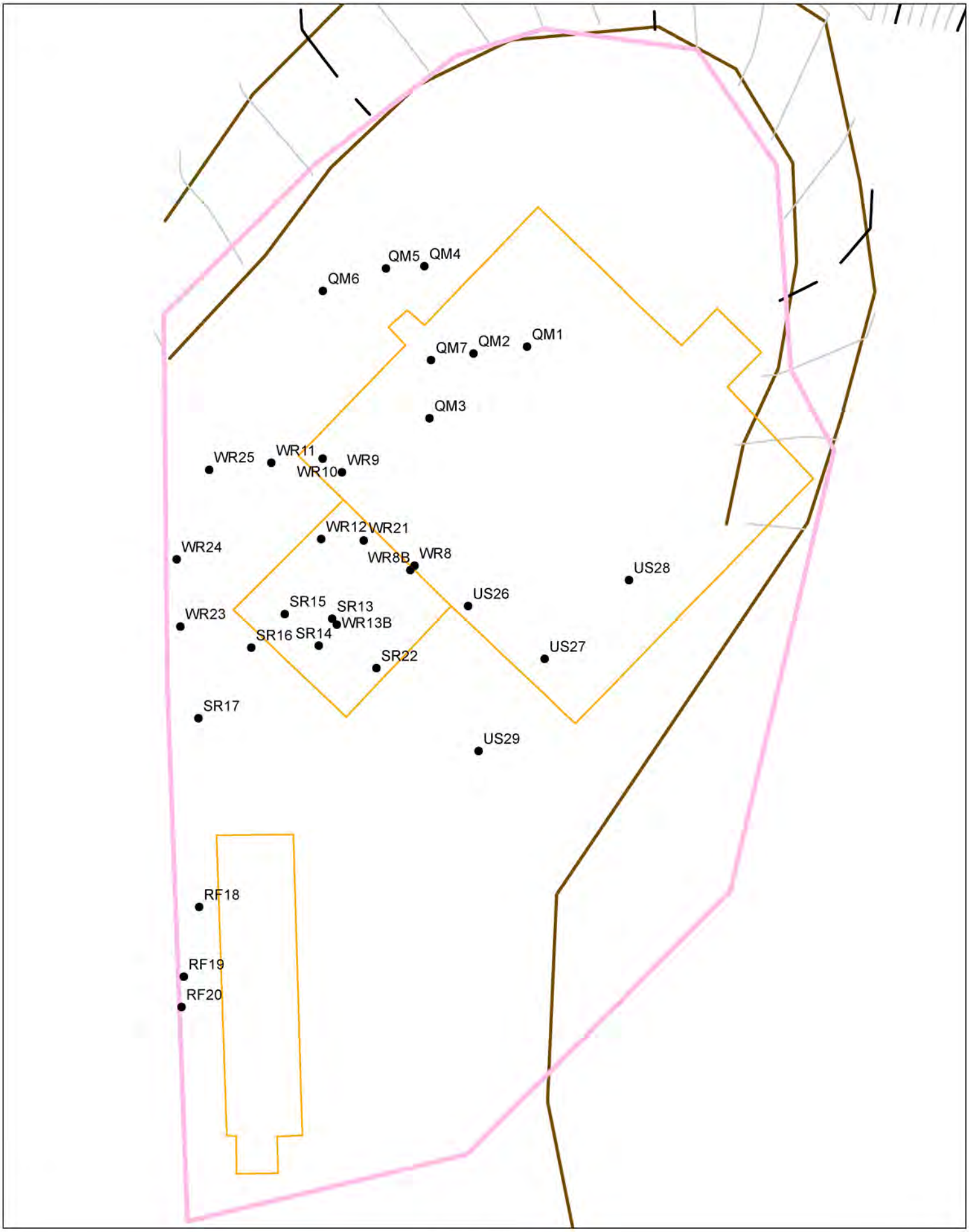
Figure 3: Sample Location Map Waste Rock Stockpiles

N

1 inch = 30 feet

0 0.0025 0.005 0.01

Miles



Legend

- Providence Quartz Mill Sample Points
- Quartz Mill Features
- Providence Quartz Mill Area
- Providence Mine Road

Sierra Streams Institute
Sierra Nevada Conservancy - Environs Assessment

Figure 4: Sample Location Map Quartz Mill Area

N

1 inch = 30 feet

0 0.0025 0.005

Miles

Table 1. Environs Soil Sample Analyical Results

Environs Mine Waste Piles				
Sample number	As (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Cd (mg/kg)
CHHSL	0.07	80	18	1.7
TTLC	500	1000	20	100
WR1-S1	40	530	0.52	3.5
WR1-S2	11	400	0.43	3.0
WR1-S3	17	410	1.4	2.1
WR2-S1	<1.0	23	<0.1	6.6
WR2-S2	11	59	0.29	1.6
WR2-S3	23	170	0.45	1.8
WR2-S4	4.9	64	0.51	1.8
WR2-S5	20	330	0.57	2.8
WR2-S6	16	170	0.47	3.0
WR2-S7	24	330	0.27	3.3
WR2-S8	3.7	53	0.2	1.3
WR2-S9	<1.0	7.3	<0.1	<1.0
WR2-S10	<1.0	12	<0.1	<1.0
WR2-S11	<1.0	15	0.13	<1.0
WR2-S12	4.4	52	0.21	2.1
WR2-S13	<1.0	30	<0.1	<1.0
WR2-S14	<1.0	13	0.12	<1.0
WR2-S15	<1.0	7.5	<0.1	<1.0
WR2-S16	24	21	0.43	<1.0
WR2-S17	15	64	0.41	1.5
WR2-S18	24	16	0.61	<1.0

Providence Stamp Mill Area				
Sample number	As (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Cd (mg/kg)
CHHSL	0.07	80	18	1.7
TTLC	500	1000	20	100
QM-1	20	430	14	2.8
QM-2	13	98	1.5	<1.0
QM-3	13	190	3.8	1.4
QM-4	13	89	0.74	1.8
QM-5	15	89	0.86	2.7
QM-6	17	140	3.5	3.3
QM-7	11	74	1.4	2.1
WR-8	91	1800	44	5.8
WR-8B	57	1400	100	6.9
WR-9	56	1000	15	11
WR-9-.75'	53	1500	26	13
WR-9-1.5'	52	1400	26	10
WR-10	21	340	7.5	6.1
WR-11	38	750	11	8.1
WR-12	21	580	9.7	8.9
WR-21	250	20000	11	5.5
WR-21-1'	210	19000	19	6
WR-23	40	790	9.7	5.5
WR-24	43	930	19	8.4
WR-25	16	150	1.7	2.7
SR-13	40	1000	23	19
WR-13B	36	970	14	19
SR-14	19	150	2.2	<1.0
SR-15	18	800	6.1	11
SR-16	15	180	3.2	1.0
SR-17	11	93	1.1	<1.0
SR-22	68	740	4.5	11.0
RF-18	22	270	6.4	<1.0
RF-19	19	240	10	<1.0
RF-20	22	350	18	1.4

Surrounding Property				
Sample number	As (ppm)	Pb (ppm)	Hg (ppm)	Cd (ppm)
US-26	14	15	ND <0.10	1.1
US-27	12	12	ND <0.10	ND <1.0
US-28	12	15	ND <0.10	ND <1.0
US-29	7.8	14	ND <0.10	ND <1.0

ADVANCED TECHNOLOGY LABORATORIES

June 17, 2015

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TCEQ No. : T104704502

Re: ATL Work Order Number : 1502024
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on June 10, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR1-S1	1502024-01	Soil	6/02/15 12:00	6/10/15 9:14
WR1-S2	1502024-02	Soil	6/02/15 12:00	6/10/15 9:14
WR1-S3	1502024-03	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S1	1502024-04	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S2	1502024-05	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S3	1502024-06	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S4	1502024-07	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S5	1502024-08	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S6	1502024-09	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S7	1502024-10	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S8	1502024-11	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S9	1502024-12	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S10	1502024-13	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S11	1502024-14	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S12	1502024-15	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S13	1502024-16	Soil	6/02/15 14:00	6/10/15 9:14
WR2-TS14	1502024-17	Soil	6/02/15 14:00	6/10/15 9:14
WR2-TS15	1502024-18	Soil	6/02/15 15:00	6/10/15 9:14
WR2-TS16	1502024-19	Soil	6/02/15 15:00	6/10/15 9:14
WR2-S17	1502024-20	Soil	6/02/15 15:00	6/10/15 9:14
WR2-S18	1502024-21	Soil	6/02/15 15:00	6/10/15 9:14

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S1
Lab ID: 1502024-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Arsenic	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Barium	**120**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Cadmium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Chromium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Cobalt	**18**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Copper	**140**	2.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Lead	**530**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Molybdenum	**9.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Nickel	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Vanadium	**54**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Zinc	**81**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.52**	0.10	1	B5F0281	06/15/2015	06/15/15 14:34	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S2
Lab ID: 1502024-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Arsenic	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Barium	**140**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Cadmium	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Chromium	**3.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Cobalt	**15**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Copper	**120**	2.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Lead	**400**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Molybdenum	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Nickel	**4.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Zinc	**82**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.43**	0.10	1	B5F0281	06/15/2015	06/15/15 14:42	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S3
Lab ID: 1502024-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Arsenic	**17**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Barium	**97**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Cadmium	**2.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Chromium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Cobalt	**14**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Copper	**120**	2.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Lead	**410**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Molybdenum	**7.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Nickel	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Silver	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Vanadium	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Zinc	**62**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.4**	0.10	1	B5F0281	06/15/2015	06/15/15 14:44	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S1
Lab ID: 1502024-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Barium	**70**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Cadmium	**6.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Chromium	**1.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Cobalt	**4.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Lead	**23**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Molybdenum	**12**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Nickel	**1.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Thallium	**5.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Vanadium	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Zinc	**75**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 14:46	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S2
Lab ID: 1502024-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Arsenic	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Barium	**87**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Cadmium	**1.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Chromium	**4.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Cobalt	**9.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Copper	**54**	2.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Lead	**59**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Molybdenum	**6.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Nickel	**4.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Vanadium	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Zinc	**46**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.29**	0.10	1	B5F0281	06/15/2015	06/15/15 14:48	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S3
Lab ID: 1502024-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Arsenic	**23**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Barium	**46**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Cadmium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Chromium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Cobalt	**3.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Copper	**96**	2.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Lead	**170**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Nickel	**2.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Silver	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Thallium	**1.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Vanadium	**14**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Zinc	**43**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.45**	0.10	1	B5F0281	06/15/2015	06/15/15 14:50	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S4
Lab ID: 1502024-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Arsenic	**4.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Barium	**130**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Cadmium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Chromium	**5.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Cobalt	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Copper	**75**	2.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Lead	**64**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Molybdenum	**44**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Nickel	**5.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Silver	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Vanadium	**38**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Zinc	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.51**	0.10	1	B5F0281	06/15/2015	06/15/15 14:52	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S5
Lab ID: 1502024-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Arsenic	**20**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Barium	**88**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Cadmium	**2.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Chromium	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Cobalt	**8.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Copper	**150**	2.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Lead	**330**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Molybdenum	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Nickel	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Silver	**4.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Thallium	**2.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Vanadium	**29**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Zinc	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.57**	0.10	1	B5F0281	06/15/2015	06/15/15 14:58	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S6
Lab ID: 1502024-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Arsenic	**16**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Barium	**73**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Cadmium	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Chromium	**2.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Cobalt	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Copper	**90**	2.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Lead	**170**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Molybdenum	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Nickel	**2.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Silver	**4.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Thallium	**1.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Vanadium	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Zinc	**50**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.47**	0.10	1	B5F0281	06/15/2015	06/15/15 15:00	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S7
Lab ID: 1502024-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Arsenic	**24**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Barium	**44**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Cadmium	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Chromium	**2.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Cobalt	**10**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Copper	**140**	2.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Lead	**330**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Molybdenum	**8.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Nickel	**3.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Silver	**8.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Thallium	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Vanadium	**22**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Zinc	**71**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.27**	0.10	1	B5F0281	06/15/2015	06/15/15 15:02	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S8
Lab ID: 1502024-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Arsenic	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Barium	**58**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Cadmium	**1.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Chromium	**3.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Cobalt	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Copper	**62**	2.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Lead	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Molybdenum	**6.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Nickel	**5.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Zinc	**36**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.20**	0.10	1	B5F0281	06/15/2015	06/15/15 15:04	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Client Sample ID WR2-S9
Lab ID: 1502024-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Barium	**240**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Chromium	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Cobalt	**8.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Copper	**16**	2.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Lead	**7.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Nickel	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:06	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S10
Lab ID: 1502024-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Barium	**200**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Chromium	**4.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Cobalt	**9.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Copper	**18**	2.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Lead	**12**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Nickel	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Vanadium	**42**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:08	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S11
Lab ID: 1502024-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Barium	**220**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Chromium	**6.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Cobalt	**9.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Copper	**31**	2.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Lead	**15**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Nickel	**5.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Vanadium	**54**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.13**	0.10	1	B5F0281	06/15/2015	06/15/15 15:10	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S12
Lab ID: 1502024-15

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Arsenic	**4.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Barium	**130**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Cadmium	**2.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Chromium	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Cobalt	**9.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Copper	**41**	2.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Lead	**52**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Molybdenum	**9.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Nickel	**5.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Vanadium	**38**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Zinc	**58**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.21**	0.10	1	B5F0281	06/15/2015	06/15/15 15:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S13
Lab ID: 1502024-16

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Barium	**160**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Chromium	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Cobalt	**16**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Copper	**62**	2.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Lead	**30**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Molybdenum	**3.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Nickel	**5.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Vanadium	**47**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Zinc	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:14	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Client Sample ID WR2-TS14
Lab ID: 1502024-17

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Barium	**90**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Chromium	**8.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Cobalt	**6.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Lead	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Nickel	**5.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Vanadium	**61**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Zinc	**29**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.12**	0.10	1	B5F0281	06/15/2015	06/15/15 15:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-TS15
Lab ID: 1502024-18

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Barium	**230**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Chromium	**4.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Cobalt	**9.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Copper	**16**	2.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Lead	**7.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Nickel	**4.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Zinc	**55**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-TS16
Lab ID: 1502024-19

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Arsenic	**24**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Barium	**73**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Chromium	**9.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Cobalt	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Lead	**21**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Nickel	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Vanadium	**41**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Zinc	**32**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.43**	0.10	1	B5F0281	06/15/2015	06/15/15 15:24	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S17
Lab ID: 1502024-20

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Arsenic	**15**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Barium	**58**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Beryllium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Cadmium	**1.5**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Chromium	**2.0**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Cobalt	**5.7**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Copper	**45**	2.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Lead	**64**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Molybdenum	**27**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Nickel	**2.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Selenium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Silver	**5.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Thallium	**3.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Vanadium	**35**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Zinc	**33**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.41**	0.10	1	B5F0282	06/15/2015	06/15/15 15:35	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S18
Lab ID: 1502024-21

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Arsenic	**24**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Barium	**53**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Beryllium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Cadmium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Chromium	**9.2**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Cobalt	**4.7**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Copper	**17**	2.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Lead	**16**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Molybdenum	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Nickel	**4.5**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Selenium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Silver	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Thallium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Vanadium	**41**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Zinc	**22**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.61**	0.10	1	B5F0282	06/15/2015	06/15/15 15:43	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0277 - EPA 3050B_S									
Blank (B5F0277-BLK1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5F0277-BS1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	48.4485	2.0	50.0000		96.9	80 - 120			
Arsenic	45.8369	1.0	50.0000		91.7	80 - 120			
Barium	49.6778	1.0	50.0000		99.4	80 - 120			
Beryllium	46.6242	1.0	50.0000		93.2	80 - 120			
Cadmium	46.4546	1.0	50.0000		92.9	80 - 120			
Chromium	50.0640	1.0	50.0000		100	80 - 120			
Cobalt	47.7883	1.0	50.0000		95.6	80 - 120			
Copper	46.9236	2.0	50.0000		93.8	80 - 120			
Lead	47.9394	1.0	50.0000		95.9	80 - 120			
Molybdenum	46.2041	1.0	50.0000		92.4	80 - 120			
Nickel	47.3113	1.0	50.0000		94.6	80 - 120			
Selenium	44.1654	1.0	50.0000		88.3	80 - 120			
Silver	47.6280	1.0	50.0000		95.3	80 - 120			
Thallium	47.0126	1.0	50.0000		94.0	80 - 120			
Vanadium	49.5846	1.0	50.0000		99.2	80 - 120			
Zinc	44.7630	1.0	50.0000		89.5	80 - 120			
Matrix Spike (B5F0277-MS1)		**Source: 1502024-01**			Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	85.5230	2.0	125.000	ND	68.4	28 - 106			
Arsenic	138.232	1.0	125.000	40.2577	78.4	57 - 109			
Barium	211.635	1.0	125.000	116.800	75.9	18 - 159			
Beryllium	102.638	1.0	125.000	0.533714	81.7	61 - 107			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0277 - EPA 3050B_S (continued)									
Matrix Spike (B5F0277-MS1) - Continued		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Cadmium	98.5008	1.0	125.000	3.48955	76.0	53 - 104			
Chromium	106.517	1.0	125.000	3.51783	82.4	53 - 121			
Cobalt	118.493	1.0	125.000	18.2580	80.2	55 - 109			
Copper	275.054	2.0	125.000	144.685	104	58 - 124			
Lead	667.152	1.0	125.000	532.561	108	35 - 129			
Molybdenum	111.905	1.0	125.000	9.60249	81.8	57 - 108			
Nickel	102.227	1.0	125.000	4.64546	78.1	44 - 122			
Selenium	95.6250	1.0	125.000	ND	76.5	54 - 104			
Silver	108.933	1.0	125.000	0.225008	87.0	60 - 112			
Thallium	94.2168	1.0	125.000	ND	75.4	50 - 103			
Vanadium	158.554	1.0	125.000	54.1678	83.5	54 - 123			
Zinc	179.825	1.0	125.000	80.6545	79.3	29 - 132			
Matrix Spike Dup (B5F0277-MSD1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	89.1772	2.0	124.378	ND	71.7	28 - 106	4.18	20	
Arsenic	138.153	1.0	124.378	40.2577	78.7	57 - 109	0.0577	20	
Barium	209.009	1.0	124.378	116.800	74.1	18 - 159	1.25	20	
Beryllium	102.982	1.0	124.378	0.533714	82.4	61 - 107	0.334	20	
Cadmium	98.2728	1.0	124.378	3.48955	76.2	53 - 104	0.232	20	
Chromium	106.150	1.0	124.378	3.51783	82.5	53 - 121	0.345	20	
Cobalt	116.383	1.0	124.378	18.2580	78.9	55 - 109	1.80	20	
Copper	254.491	2.0	124.378	144.685	88.3	58 - 124	7.77	20	
Lead	604.438	1.0	124.378	532.561	57.8	35 - 129	9.86	20	
Molybdenum	113.255	1.0	124.378	9.60249	83.3	57 - 108	1.20	20	
Nickel	101.989	1.0	124.378	4.64546	78.3	44 - 122	0.233	20	
Selenium	96.8593	1.0	124.378	ND	77.9	54 - 104	1.28	20	
Silver	105.923	1.0	124.378	0.225008	85.0	60 - 112	2.80	20	
Thallium	96.3845	1.0	124.378	ND	77.5	50 - 103	2.27	20	
Vanadium	157.712	1.0	124.378	54.1678	83.2	54 - 123	0.532	20	
Zinc	173.073	1.0	124.378	80.6545	74.3	29 - 132	3.83	20	
Batch B5F0279 - EPA 3050B_S									
Blank (B5F0279-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0279 - EPA 3050B_S (continued)									
Blank (B5F0279-BLK1) - Continued					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5F0279-BS1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	46.8539	2.0	50.0000		93.7	80 - 120			
Arsenic	44.2343	1.0	50.0000		88.5	80 - 120			
Barium	48.6384	1.0	50.0000		97.3	80 - 120			
Beryllium	45.3075	1.0	50.0000		90.6	80 - 120			
Cadmium	45.5631	1.0	50.0000		91.1	80 - 120			
Chromium	48.7582	1.0	50.0000		97.5	80 - 120			
Cobalt	46.8793	1.0	50.0000		93.8	80 - 120			
Copper	45.8039	2.0	50.0000		91.6	80 - 120			
Lead	46.3129	1.0	50.0000		92.6	80 - 120			
Molybdenum	45.1240	1.0	50.0000		90.2	80 - 120			
Nickel	46.2659	1.0	50.0000		92.5	80 - 120			
Selenium	42.8488	1.0	50.0000		85.7	80 - 120			
Silver	46.4464	1.0	50.0000		92.9	80 - 120			
Thallium	45.1826	1.0	50.0000		90.4	80 - 120			
Vanadium	48.4633	1.0	50.0000		96.9	80 - 120			
Zinc	43.9676	1.0	50.0000		87.9	80 - 120			
Matrix Spike (B5F0279-MS1)		**Source: 1502024-20**			Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	88.7211	2.0	125.000	ND	71.0	28 - 106			
Arsenic	119.745	1.0	125.000	15.1603	83.7	57 - 109			
Barium	154.876	1.0	125.000	57.8524	77.6	18 - 159			
Beryllium	104.683	1.0	125.000	0.305927	83.5	61 - 107			
Cadmium	98.7435	1.0	125.000	1.49918	77.8	53 - 104			
Chromium	106.890	1.0	125.000	2.00668	83.9	53 - 121			
Cobalt	109.240	1.0	125.000	5.68821	82.8	55 - 109			
Copper	159.956	2.0	125.000	44.6175	92.3	58 - 124			
Lead	165.647	1.0	125.000	63.7962	81.5	35 - 129			
Molybdenum	129.438	1.0	125.000	27.2136	81.8	57 - 108			
Nickel	102.442	1.0	125.000	2.21040	80.2	44 - 122			
Selenium	99.8170	1.0	125.000	ND	79.9	54 - 104			
Silver	112.964	1.0	125.000	5.18934	86.2	60 - 112			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0279 - EPA 3050B_S (continued)									
Matrix Spike (B5F0279-MS1) - Continued		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Thallium	103.149	1.0	125.000	3.15709	80.0	50 - 103			
Vanadium	140.083	1.0	125.000	35.1667	83.9	54 - 123			
Zinc	126.824	1.0	125.000	33.1858	74.9	29 - 132			
Matrix Spike Dup (B5F0279-MSD1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	87.9726	2.0	125.000	ND	70.4	28 - 106	0.847	20	
Arsenic	118.952	1.0	125.000	15.1603	83.0	57 - 109	0.665	20	
Barium	164.469	1.0	125.000	57.8524	85.3	18 - 159	6.01	20	
Beryllium	105.051	1.0	125.000	0.305927	83.8	61 - 107	0.351	20	
Cadmium	100.558	1.0	125.000	1.49918	79.2	53 - 104	1.82	20	
Chromium	109.622	1.0	125.000	2.00668	86.1	53 - 121	2.52	20	
Cobalt	108.416	1.0	125.000	5.68821	82.2	55 - 109	0.757	20	
Copper	153.968	2.0	125.000	44.6175	87.5	58 - 124	3.82	20	
Lead	157.646	1.0	125.000	63.7962	75.1	35 - 129	4.95	20	
Molybdenum	118.742	1.0	125.000	27.2136	73.2	57 - 108	8.62	20	
Nickel	102.898	1.0	125.000	2.21040	80.5	44 - 122	0.444	20	
Selenium	99.8719	1.0	125.000	ND	79.9	54 - 104	0.0550	20	
Silver	112.717	1.0	125.000	5.18934	86.0	60 - 112	0.219	20	
Thallium	102.505	1.0	125.000	3.15709	79.5	50 - 103	0.626	20	
Vanadium	139.361	1.0	125.000	35.1667	83.4	54 - 123	0.517	20	
Zinc	130.060	1.0	125.000	33.1858	77.5	29 - 132	2.52	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0281 - EPA 7471_S									
Blank (B5F0281-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	ND	0.10			NR				
LCS (B5F0281-BS1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.721222	0.10	0.833333		86.5	80 - 120			
Matrix Spike (B5F0281-MS1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.28987	0.10	0.833333	0.524734	91.8	70 - 130			
Matrix Spike Dup (B5F0281-MSD1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.28728	0.10	0.819672	0.524734	93.0	70 - 130	0.201	20	
Post Spike (B5F0281-PS1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.010991		5.00000E-3	0.006297	93.9	85 - 115			
Batch B5F0282 - EPA 7471_S									
Blank (B5F0282-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	ND	0.10			NR				
LCS (B5F0282-BS1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.686546	0.10	0.833333		82.4	80 - 120			
Matrix Spike (B5F0282-MS1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.11429	0.10	0.833333	0.411133	84.4	70 - 130			
Matrix Spike Dup (B5F0282-MSD1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.19327	0.10	0.833333	0.411133	93.9	70 - 130	6.84	20	
Post Spike (B5F0282-PS1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.009943		5.00000E-3	4.9336E-3	100	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2015 715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL ☑ OnTrac ☐ FedEx ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☐	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 15.1		
	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Smith~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis — Encircle Sample Matrix — Container — QA/QC

ITEM	Lab No.	Sample ID / Location	Date	Time	Select Metals (Hg, As, Se, Pb)	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Select Soil Matrix	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	Enter Custom Matrix	TAT	# 4oz	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (AcO); 6=NaOH; 7=NA2S2O3	REMARKS
1	1502024 - 1	WR1 - S1	6/2/15	12pm	X																		X						X			1		
2	- 2	WR1 - S2		12 pm																														
3	- 3	WR1 - S3		12 PM																														
4	- 4	WR2 - S1		12 PM																														
5	- 5	WR2 - S2		12 PM																														
6	- 6	WR2 - S3		1 pm																														
7	- 7	WR2 - S4		1 pm																														
8	- 8	WR2 - S5		1 pm																														
9	- 9	WR2 - S6		1 pm																														
10	- 10	WR2 - S7		1 pm																														

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples, air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	1100		6/10/15	914

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2013 0715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:		
☐ Other:	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Selen~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis: Spiked 22 Metals; Select Analysis; Enter Custom Analysis
Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix
TAT; Container — Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Bedjar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NAS2O3
QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	Spiked 22 Metals	TAT	Type	Material	REMARKS
1	1502024-11	WR2-S8	6/2/15	1pm	X	X Standard	402	1	
2	-12	WR2-S9		1pm					
3	-13	WR2-S10		2pm					
4	-14	WR2-S11		2pm					
5	-15	WR2-S12		2pm					
6	-16	WR2-S13		2pm					
7	-17	WR2-TS14		2pm					
8	-18	WR2-TS15		3pm					
9	-19	WR2-TS16		3pm					
10	-20	WR2-S17		3pm					

TERMS

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   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
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7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
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10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	11:00		6/8/15	9:14
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 3 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:201[illegible]715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☐	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:		
	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Selen~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis: Select Analysis / Enter Custom Analysis
Encircle Sample Matrix: Select Soil Matrix, Select Solid Matrix, Select Water Matrix, Select Wastewater Matrix, Select Aqueous Matrix, Enter Custom Matrix

ITEM	Lab No.	Sample ID / Location	Date	Time	Select Analysis: 17 Metals 22 Metals	Select Soil Matrix	TAT	Container #	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn ((Ac)2; 6=NaOH; 7=NaEDTA	REMARKS
1	1502024-21	WR2-S18	6/2/15	3pm	X	X	Standard			1		
2												
3												
4												
5												
6												
7												
8												
9												
10												

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

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Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	11:00	[illegible]	6/10/15	9:14
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES

July 16, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502373
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on July 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-1	1502373-01	Soil	7/07/15 10:00	7/09/15 11:18
QM-2	1502373-02	Soil	7/07/15 10:00	7/09/15 11:18
QM-3	1502373-03	Soil	7/07/15 10:00	7/09/15 11:18
QM-4	1502373-04	Soil	7/07/15 10:00	7/09/15 11:18
QM-5	1502373-05	Soil	7/07/15 10:00	7/09/15 11:18
QM-6	1502373-06	Soil	7/07/15 10:00	7/09/15 11:18
QM-7	1502373-07	Soil	7/07/15 11:00	7/09/15 11:18
WR-8	1502373-08	Soil	7/07/15 11:00	7/09/15 11:18
WR-9	1502373-09	Soil	7/07/15 11:00	7/09/15 11:18
WR-10	1502373-10	Soil	7/07/15 11:00	7/09/15 11:18
WR-11	1502373-11	Soil	7/07/15 12:00	7/09/15 11:18
WR-12	1502373-12	Soil	7/07/15 12:00	7/09/15 11:18
SR-13	1502373-13	Soil	7/07/15 12:00	7/09/15 11:18
SR-14	1502373-14	Soil	7/07/15 12:00	7/09/15 11:18
SR-15	1502373-15	Soil	7/07/15 12:00	7/09/15 11:18
SR-16	1502373-16	Soil	7/07/15 12:00	7/09/15 11:18
SR-17	1502373-17	Soil	7/07/15 12:00	7/09/15 11:18
RF-18	1502373-18	Soil	7/07/15 13:00	7/09/15 11:18
RF-19	1502373-19	Soil	7/07/15 13:00	7/09/15 11:18
RF-20	1502373-20	Soil	7/07/15 13:00	7/09/15 11:18

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-1
Lab ID: 1502373-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Arsenic	**20**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Barium	**150**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Cadmium	**2.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Chromium	**43**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Copper	**97**	2.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Lead	**430**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Molybdenum	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Nickel	**26**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 11:58	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Thallium	**4.1**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Vanadium	**87**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Zinc	**120**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**14**	2.0	20	B5G0179	07/12/2015	07/13/15 14:10	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-2
Lab ID: 1502373-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Barium	**190**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Beryllium	**1.2**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Chromium	**56**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Copper	**62**	2.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Lead	**98**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Nickel	**34**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Thallium	**5.6**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Vanadium	**110**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Zinc	**60**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.5**	0.10	1	B5G0179	07/12/2015	07/13/15 13:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-3
Lab ID: 1502373-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Barium	**170**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Cadmium	**1.4**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Chromium	**41**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Cobalt	**12**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Copper	**68**	2.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Lead	**190**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Nickel	**27**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Thallium	**3.9**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Vanadium	**93**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Zinc	**80**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.8**	1.0	10	B5G0179	07/12/2015	07/13/15 14:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-4
Lab ID: 1502373-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Cadmium	**1.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Chromium	**43**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Copper	**63**	2.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Lead	**89**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Molybdenum	**1.5**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Nickel	**25**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Thallium	**3.1**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Vanadium	**77**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Zinc	**74**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.74**	0.10	1	B5G0179	07/12/2015	07/13/15 13:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-5
Lab ID: 1502373-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Arsenic	**15**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Barium	**100**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Cadmium	**2.7**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Chromium	**38**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Copper	**77**	2.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Lead	**89**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Molybdenum	**1.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Nickel	**24**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Thallium	**2.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Vanadium	**69**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Zinc	**88**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.86**	0.10	1	B5G0179	07/12/2015	07/13/15 13:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-6
Lab ID: 1502373-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Arsenic	**17**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Barium	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Cadmium	**3.3**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Chromium	**47**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Copper	**78**	2.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Lead	**140**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Molybdenum	**2.8**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Nickel	**29**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Thallium	**2.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Vanadium	**84**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Zinc	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.5**	1.0	10	B5G0179	07/12/2015	07/13/15 14:13	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-7
Lab ID: 1502373-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Arsenic	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Beryllium	**1.3**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Cadmium	**2.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Chromium	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Cobalt	**20**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Copper	**88**	2.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Lead	**74**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Nickel	**26**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Thallium	**3.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Vanadium	**100**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Zinc	**89**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.4**	0.10	1	B5G0179	07/12/2015	07/13/15 13:26	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-8
Lab ID: 1502373-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Arsenic	**91**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Barium	**72**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Beryllium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Cadmium	**5.8**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Chromium	**36**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Cobalt	**14**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Copper	**430**	4.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Lead	**1800**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Molybdenum	**17**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Nickel	**28**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Selenium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Silver	**2.0**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Thallium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Vanadium	**76**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Zinc	**750**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**44**	5.0	50	B5G0179	07/12/2015	07/13/15 14:15	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-9
Lab ID: 1502373-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Arsenic	**56**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Barium	**69**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Cadmium	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Chromium	**18**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Copper	**310**	2.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Lead	**1000**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Molybdenum	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Nickel	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Selenium	**2.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Silver	**28**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Thallium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Vanadium	**32**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Zinc	**340**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**15**	5.0	50	B5G0179	07/12/2015	07/13/15 14:17	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Client Sample ID WR-10
Lab ID: 1502373-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Arsenic	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Barium	**140**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Cadmium	**6.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Chromium	**29**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Cobalt	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Copper	**110**	2.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Lead	**340**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Molybdenum	**5.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Nickel	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Thallium	**1.4**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Vanadium	**68**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Zinc	**270**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**7.5**	2.0	20	B5G0179	07/12/2015	07/13/15 14:19	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-11
Lab ID: 1502373-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Arsenic	**38**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Cadmium	**8.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Chromium	**40**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Cobalt	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Copper	**160**	2.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Lead	**750**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Molybdenum	**6.9**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Nickel	**28**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Thallium	**2.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Vanadium	**77**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Zinc	**310**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**11**	2.0	20	B5G0179	07/12/2015	07/13/15 14:21	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-12
Lab ID: 1502373-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Arsenic	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Barium	**100**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Cadmium	**8.9**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Chromium	**25**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Cobalt	**16**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Lead	**580**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Molybdenum	**4.4**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Nickel	**22**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Thallium	**1.7**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Vanadium	**60**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Zinc	**2000**	2.0	2	B5G0177	07/13/2015	07/14/15 09:30	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**9.7**	2.0	20	B5G0179	07/12/2015	07/13/15 14:23	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-13
Lab ID: 1502373-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Arsenic	**40**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Barium	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Cadmium	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Chromium	**32**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Cobalt	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Copper	**250**	2.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Lead	**1000**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Molybdenum	**8.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Nickel	**38**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 12:01	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Thallium	**1.2**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Vanadium	**71**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Zinc	**710**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**23**	5.0	50	B5G0179	07/12/2015	07/13/15 14:25	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-14
Lab ID: 1502373-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Arsenic	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Chromium	**47**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Lead	**150**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Molybdenum	**4.2**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Nickel	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Selenium	**1.9**	1.0	1	B5G0177	07/13/2015	07/14/15 12:03	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Thallium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Vanadium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Zinc	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**2.2**	0.20	2	B5G0179	07/12/2015	07/13/15 14:31	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-15
Lab ID: 1502373-15

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Arsenic	**18**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Barium	**83**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Cadmium	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Chromium	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Cobalt	**23**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Copper	**230**	2.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Lead	**800**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Molybdenum	**5.7**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Nickel	**44**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Thallium	**1.4**	1.0	1	B5G0177	07/13/2015	07/14/15 12:05	
Vanadium	**86**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Zinc	**420**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**6.1**	2.0	20	B5G0179	07/12/2015	07/13/15 14:41	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-16
Lab ID: 1502373-16

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Arsenic	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Barium	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Cadmium	**1.0**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Chromium	**49**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Cobalt	**12**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Lead	**180**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Molybdenum	**1.8**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Nickel	**33**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Thallium	**2.3**	1.0	1	B5G0177	07/13/2015	07/14/15 12:07	
Vanadium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Zinc	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.2**	1.0	10	B5G0179	07/12/2015	07/13/15 14:43	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-17
Lab ID: 1502373-17

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Arsenic	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Chromium	**46**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Cobalt	**16**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Copper	**130**	2.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Lead	**93**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Nickel	**37**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Thallium	**4.5**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Vanadium	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Zinc	**72**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.1**	0.10	1	B5G0179	07/12/2015	07/13/15 13:53	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-18
Lab ID: 1502373-18

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Arsenic	**22**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Barium	**72**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Beryllium	**1.0**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Chromium	**80**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Cobalt	**8.3**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Copper	**140**	2.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Lead	**270**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Nickel	**39**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Selenium	**3.2**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Thallium	**4.4**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Vanadium	**93**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Zinc	**83**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**6.4**	2.0	20	B5G0179	07/12/2015	07/13/15 14:45	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-19
Lab ID: 1502373-19

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Arsenic	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Barium	**74**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Chromium	**51**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Cobalt	**7.8**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Copper	**150**	2.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Lead	**240**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Nickel	**27**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Selenium	**2.3**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Thallium	**3.9**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Vanadium	**92**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Zinc	**77**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**10**	2.0	20	B5G0179	07/12/2015	07/13/15 14:47	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-20
Lab ID: 1502373-20

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Arsenic	**22**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Barium	**94**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Beryllium	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Cadmium	**1.4**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Chromium	**42**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Cobalt	**11**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Copper	**140**	2.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Lead	**350**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Molybdenum	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Nickel	**32**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Selenium	**2.0**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Silver	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Thallium	**6.1**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Vanadium	**86**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Zinc	**93**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**18**	5.0	50	B5G0180	07/12/2015	07/13/15 14:33	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0177 - EPA 3050B_S									
Blank (B5G0177-BLK1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5G0177-BS1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	45.8232	2.0	50.0000		91.6	80 - 120			
Arsenic	44.0781	1.0	50.0000		88.2	80 - 120			
Barium	47.2030	1.0	50.0000		94.4	80 - 120			
Beryllium	45.3593	1.0	50.0000		90.7	80 - 120			
Cadmium	44.7165	1.0	50.0000		89.4	80 - 120			
Chromium	47.9251	1.0	50.0000		95.9	80 - 120			
Cobalt	46.1278	1.0	50.0000		92.3	80 - 120			
Copper	48.9339	2.0	50.0000		97.9	80 - 120			
Lead	45.5758	1.0	50.0000		91.2	80 - 120			
Molybdenum	48.7444	1.0	50.0000		97.5	80 - 120			
Nickel	46.0806	1.0	50.0000		92.2	80 - 120			
Selenium	41.3485	1.0	50.0000		82.7	80 - 120			
Silver	45.8322	1.0	50.0000		91.7	80 - 120			
Thallium	44.9632	1.0	50.0000		89.9	80 - 120			
Vanadium	47.1206	1.0	50.0000		94.2	80 - 120			
Zinc	43.2900	1.0	50.0000		86.6	80 - 120			
Matrix Spike (B5G0177-MS1)		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	63.5129	2.0	125.000	ND	50.8	28 - 106			
Arsenic	83.5756	1.0	125.000	0.549600	66.4	57 - 109			
Barium	192.497	1.0	125.000	113.847	62.9	18 - 159			
Beryllium	84.5412	1.0	125.000	1.00294	66.8	61 - 107			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0177 - EPA 3050B_S (continued)									
Matrix Spike (B5G0177-MS1) - Continued		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Cadmium	75.2921	1.0	125.000	ND	60.2	53 - 104			
Chromium	100.916	1.0	125.000	16.6260	67.4	53 - 121			
Cobalt	87.7460	1.0	125.000	8.55013	63.4	55 - 109			
Copper	152.357	2.0	125.000	40.5713	89.4	58 - 124			
Lead	80.0530	1.0	125.000	3.89531	60.9	35 - 129			
Molybdenum	76.9315	1.0	125.000	ND	61.5	57 - 108			
Nickel	90.8793	1.0	125.000	12.0324	63.1	44 - 122			
Selenium	77.8190	1.0	125.000	ND	62.3	54 - 104			
Silver	86.0875	1.0	125.000	ND	68.9	60 - 112			
Thallium	80.9266	1.0	125.000	5.79196	60.1	50 - 103			
Vanadium	117.986	1.0	125.000	34.3448	66.9	54 - 123			
Zinc	130.107	1.0	125.000	55.8794	59.4	29 - 132			
Matrix Spike Dup (B5G0177-MSD1)		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	62.6374	2.0	125.000	ND	50.1	28 - 106	1.39	20	
Arsenic	86.0482	1.0	125.000	0.549600	68.4	57 - 109	2.92	20	
Barium	204.716	1.0	125.000	113.847	72.7	18 - 159	6.15	20	
Beryllium	87.5206	1.0	125.000	1.00294	69.2	61 - 107	3.46	20	
Cadmium	77.0958	1.0	125.000	ND	61.7	53 - 104	2.37	20	
Chromium	103.658	1.0	125.000	16.6260	69.6	53 - 121	2.68	20	
Cobalt	90.1107	1.0	125.000	8.55013	65.2	55 - 109	2.66	20	
Copper	152.188	2.0	125.000	40.5713	89.3	58 - 124	0.111	20	
Lead	82.8500	1.0	125.000	3.89531	63.2	35 - 129	3.43	20	
Molybdenum	80.6236	1.0	125.000	ND	64.5	57 - 108	4.69	20	
Nickel	93.4194	1.0	125.000	12.0324	65.1	44 - 122	2.76	20	
Selenium	81.5087	1.0	125.000	ND	65.2	54 - 104	4.63	20	
Silver	88.0734	1.0	125.000	ND	70.5	60 - 112	2.28	20	
Thallium	83.3367	1.0	125.000	5.79196	62.0	50 - 103	2.93	20	
Vanadium	121.716	1.0	125.000	34.3448	69.9	54 - 123	3.11	20	
Zinc	130.523	1.0	125.000	55.8794	59.7	29 - 132	0.319	20	
Batch B5G0178 - EPA 3050B_S									
Blank (B5G0178-BLK1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0178 - EPA 3050B_S (continued)									
Blank (B5G0178-BLK1) - Continued					Prepared: 7/13/2015 Analyzed: 7/13/2015				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5G0178-BS1)					Prepared: 7/13/2015 Analyzed: 7/13/2015				
Antimony	45.4378	2.0	50.0000		90.9	80 - 120			
Arsenic	43.9709	1.0	50.0000		87.9	80 - 120			
Barium	47.0538	1.0	50.0000		94.1	80 - 120			
Beryllium	45.2533	1.0	50.0000		90.5	80 - 120			
Cadmium	44.0508	1.0	50.0000		88.1	80 - 120			
Chromium	47.9214	1.0	50.0000		95.8	80 - 120			
Cobalt	46.2578	1.0	50.0000		92.5	80 - 120			
Copper	48.5846	2.0	50.0000		97.2	80 - 120			
Lead	45.0358	1.0	50.0000		90.1	80 - 120			
Molybdenum	48.3974	1.0	50.0000		96.8	80 - 120			
Nickel	45.7675	1.0	50.0000		91.5	80 - 120			
Selenium	40.9602	1.0	50.0000		81.9	80 - 120			
Silver	45.9142	1.0	50.0000		91.8	80 - 120			
Thallium	44.6304	1.0	50.0000		89.3	80 - 120			
Vanadium	47.3435	1.0	50.0000		94.7	80 - 120			
Zinc	42.7714	1.0	50.0000		85.5	80 - 120			
Matrix Spike (B5G0178-MS1)		**Source: 1502373-20**			Prepared: 7/13/2015 Analyzed: 7/13/2015				
Antimony	72.1714	2.0	125.000	ND	57.7	28 - 106			
Arsenic	113.238	1.0	125.000	21.9436	73.0	57 - 109			
Barium	178.637	1.0	125.000	94.0059	67.7	18 - 159			
Beryllium	93.3127	1.0	125.000	0.948675	73.9	61 - 107			
Cadmium	83.1470	1.0	125.000	1.42726	65.4	53 - 104			
Chromium	135.824	1.0	125.000	42.4811	74.7	53 - 121			
Cobalt	96.8476	1.0	125.000	10.7324	68.9	55 - 109			
Copper	244.496	2.0	125.000	140.035	83.6	58 - 124			
Lead	423.772	1.0	125.000	345.386	62.7	35 - 129			
Molybdenum	88.3895	1.0	125.000	ND	70.7	57 - 108			
Nickel	117.190	1.0	125.000	32.0863	68.1	44 - 122			
Selenium	85.5427	1.0	125.000	2.03997	66.8	54 - 104			
Silver	94.2580	1.0	125.000	ND	75.4	60 - 112			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0178 - EPA 3050B_S (continued)									
Matrix Spike (B5G0178-MS1) - Continued		**Source: 1502373-20**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Thallium	89.1145	1.0	125.000	6.12574	66.4	50 - 103			
Vanadium	176.281	1.0	125.000	85.5700	72.6	54 - 123			
Zinc	167.032	1.0	125.000	93.4828	58.8	29 - 132			
Matrix Spike Dup (B5G0178-MSD1)		**Source: 1502373-20**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	75.5937	2.0	125.000	ND	60.5	28 - 106	4.63	20	
Arsenic	115.220	1.0	125.000	21.9436	74.6	57 - 109	1.74	20	
Barium	181.407	1.0	125.000	94.0059	69.9	18 - 159	1.54	20	
Beryllium	96.5352	1.0	125.000	0.948675	76.5	61 - 107	3.39	20	
Cadmium	85.2366	1.0	125.000	1.42726	67.0	53 - 104	2.48	20	
Chromium	136.493	1.0	125.000	42.4811	75.2	53 - 121	0.491	20	
Cobalt	98.7126	1.0	125.000	10.7324	70.4	55 - 109	1.91	20	
Copper	249.898	2.0	125.000	140.035	87.9	58 - 124	2.19	20	
Lead	406.404	1.0	125.000	345.386	48.8	35 - 129	4.18	20	
Molybdenum	91.9658	1.0	125.000	ND	73.6	57 - 108	3.97	20	
Nickel	118.560	1.0	125.000	32.0863	69.2	44 - 122	1.16	20	
Selenium	90.0422	1.0	125.000	2.03997	70.4	54 - 104	5.13	20	
Silver	96.2403	1.0	125.000	ND	77.0	60 - 112	2.08	20	
Thallium	90.5119	1.0	125.000	6.12574	67.5	50 - 103	1.56	20	
Vanadium	181.468	1.0	125.000	85.5700	76.7	54 - 123	2.90	20	
Zinc	168.352	1.0	125.000	93.4828	59.9	29 - 132	0.788	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0179 - EPA 7471_S									
Blank (B5G0179-BLK1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	ND	0.10			NR				
LCS (B5G0179-BS1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.826522	0.10	0.833333		99.2	80 - 120			
Matrix Spike (B5G0179-MS1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	1.09799	0.10	0.833333	0.169821	111	70 - 130			
Matrix Spike Dup (B5G0179-MSD1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.956224	0.10	0.819672	0.169821	95.9	70 - 130	13.8	20	
Post Spike (B5G0179-PS1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.008078		5.00000E-3	0.002038	121	85 - 115			M1
Batch B5G0180 - EPA 7471_S									
Blank (B5G0180-BLK1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	ND	0.10			NR				
LCS (B5G0180-BS1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.840524	0.10	0.833333		101	80 - 120			
Matrix Spike (B5G0180-MS1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	17.5185	5.0	0.833333	18.4914	-117	70 - 130			M1
Matrix Spike Dup (B5G0180-MSD1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	19.7357	5.0	0.833333	18.4914	149	70 - 130	11.9	20	M1
Post Spike (B5G0180-PS1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.450718		5.00000E-3	0.221897	4580	85 - 115			M1

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Notes and Definitions

M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED ATECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 3.2		
☐ Other:	4. SEALED	☐	☑	Blue ice		

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959
Tel: 530 265 6090 x 203
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: Kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote No:
PO #:
Special Instructions/Comments: Total Title 22 Metals incl Mercury. Please hold remaining sample for possible additional solubility analysis

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 7000(Title 22 Metals); TO-15

Encircle Sample Matrix: SOILS SEDIMENT / SLUDGE; SOLIDS / WIPE/ FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

TAT

Container: # 802 Glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn ((Ac)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 7000(Title 22 Metals)	TO-15	SOILS SEDIMENT / SLUDGE	SOLIDS / WIPE/ FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	# 802 Glass	REMARKS
1	1502373-1	QM-1	7/7/15	10 am							X		X						X	
2	-2	QM-2		10 am							X									
3	-3	QM-3		10: am							X									
4	-4	QM-4		10: am							X									
5	-5	QM-5		10: am							X									
6	-6	QM-6		10: am							X									
7	-7	QM-7		11: am							X									
8	-8	WR-8		11: am							X									
9	-9	WR-9		11: am							X									
10	-10	WR-10		11: am							X									

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	7/8/15	11:00	Branch Manager	7/9/15	08:53
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport: ☐ Client ☐ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other: _____

Sample Conditions Upon Receipt

Condition	Y	N	Condition	Y	N
1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 3.2		
4. SEALED	☐	☑	Blue Ice		

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959
Tel: 530 265 6090 x 203
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: kleach@sgmail.com
Company: Sierra Streams Inst.
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote No:
PO #:
Special Instructions/Comments: see pg 1 Standard TAT

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE / FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

Container: # 802 Glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn ((Ac)2; 6=NaOH; 7=NA2S2O3

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	SOIL / SEDIMENT / SLUDGE	SOLIDS / WIPE / FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	#	REMARKS
1	1502373-11	WR-11	7/7/15	12pm							X		X						X	
2	-12	WR-12									X									
3	-13	SR-13									X									
4	-14	SR-14									X									
5	-15	SR-15									X									
6	-16	SR-16									X									
7	-17	SR-17									X									
8	-18	RF-18		1pm							X									
9	-19	RF-19									X									
10	-20	RF-20									X									

TERMS

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   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
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   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
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11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Kyle Leach — Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	7/8/15	11:00	ABSWEN FRANGIONI	7/9/15	08:53
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

November 06, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1503729
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on October 30, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR8-B	1503729-01	Soil	10/27/15 10:00	10/30/15 9:00
WR21	1503729-02	Soil	10/27/15 10:10	10/30/15 9:00
WR21-1'	1503729-03	Soil	10/27/15 10:16	10/30/15 9:00
WR9-.75	1503729-04	Soil	10/27/15 10:24	10/30/15 9:00
WR13-B	1503729-05	Soil	10/27/15 10:30	10/30/15 9:00
WR9-1.5'	1503729-06	Soil	10/27/15 10:08	10/30/15 9:00
SR22	1503729-07	Soil	10/27/15 10:00	10/30/15 9:00
WR23	1503729-08	Soil	10/27/15 10:44	10/30/15 9:00
WR24	1503729-09	Soil	10/27/15 10:50	10/30/15 9:00
WR25	1503729-10	Soil	10/27/15 10:56	10/30/15 9:00
US26	1503729-11	Soil	10/27/15 11:00	10/30/15 9:00
US27	1503729-12	Soil	10/27/15 11:10	10/30/15 9:00
US28	1503729-13	Soil	10/27/15 11:20	10/30/15 9:00
US29	1503729-14	Soil	10/27/15 11:30	10/30/15 9:00

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR8-B
Lab ID: 1503729-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Arsenic	**57**	2.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Barium	**100**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Cadmium	**6.9**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Chromium	**39**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Cobalt	**21**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Copper	**510**	2.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Lead	**1400**	2.0	2	B5K0014	11/02/2015	11/02/15 17:10	D6
Molybdenum	**17**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Nickel	**29**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Selenium	**3.6**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Silver	**8.1**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Thallium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Vanadium	**72**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Zinc	**480**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**100**	10	100	B5K0015	11/02/2015	11/03/15 11:16	

STLC Mercury by AA (Cold Vapor) EPA 7470A

Analyst: SB

Analyte	Result (ug/L)	PQL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**5.4**	1.0	1	B5K0178	11/06/2015	11/06/15 13:06	

TCLP Mercury by AA (Cold Vapor) by EPA 7470A

Analyst: SB

Analyte	Result (ug/L)	PQL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.20	1	B5K0162	11/05/2015	11/06/15 12:48	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR21
Lab ID: 1503729-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	40	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Arsenic	**250**	20	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Barium	**51**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Cadmium	**5.5**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Chromium	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Cobalt	**4.4**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Copper	**340**	2.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Lead	**20000**	20	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Molybdenum	**14**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Nickel	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Selenium	**3.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Silver	**73**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Thallium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Vanadium	**23**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Zinc	**630**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	

TCLP Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**230**	1.0	20	B5K0138	11/05/2015	11/06/15 09:38	D6

STLC Metals by ICP-AES by EPA 6010B

Analyst: RR

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Arsenic	**1.0**	1.0	20	B5K0176	11/06/2015	11/06/15 10:18	
Copper	**2.4**	1.0	20	B5K0176	11/06/2015	11/06/15 10:18	
Lead	**560**	2.5	50	B5K0176	11/06/2015	11/06/15 10:30	D6

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR21

Lab ID: 1503729-02

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**11**	5.0	50	B5K0015	11/02/2015	11/03/15 11:18	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Client Sample ID WR21-1'
Lab ID: 1503729-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	40	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Arsenic	**210**	20	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Barium	**44**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Cadmium	**6.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Chromium	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Cobalt	**7.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Copper	**380**	2.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Lead	**19000**	20	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Molybdenum	**16**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Nickel	**14**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Selenium	**2.1**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Silver	**57**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Thallium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Vanadium	**23**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Zinc	**780**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**19**	5.0	50	B5K0015	11/02/2015	11/03/15 11:20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR9-.75

Lab ID: 1503729-04

Title 22 Metals by ICP-AES EPA 6010B **Analyst: RR**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	10	5	B5K0014	11/02/2015	11/02/15 17:29	D6
Arsenic	**53**	5.0	5	B5K0014	11/02/2015	11/02/15 17:29	D6
Barium	**97**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Beryllium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Cadmium	**13**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Chromium	**22**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Cobalt	**14**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Copper	**210**	10	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Lead	**1500**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Molybdenum	**18**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Nickel	**22**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Selenium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Silver	**26**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Thallium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Vanadium	**47**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Zinc	**460**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**26**	5.0	50	B5K0015	11/02/2015	11/03/15 11:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR13-B
Lab ID: 1503729-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Arsenic	**36**	2.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Barium	**130**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Beryllium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Cadmium	**19**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Chromium	**37**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Cobalt	**24**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Copper	**220**	4.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Lead	**970**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Molybdenum	**9.2**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Nickel	**47**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Selenium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Silver	**3.9**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Thallium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Vanadium	**75**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Zinc	**720**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**14**	5.0	50	B5K0015	11/02/2015	11/03/15 11:24	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR9-1.5'
Lab ID: 1503729-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	**3.3**	2.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Arsenic	**52**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Barium	**90**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Cadmium	**10**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Chromium	**23**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Cobalt	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Copper	**240**	2.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Lead	**1400**	5.0	5	B5K0052	11/03/2015	11/04/15 11:41	D6
Molybdenum	**20**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Nickel	**23**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Selenium	**2.3**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Silver	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Vanadium	**50**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Zinc	**390**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**26**	5.0	50	B5K0055	11/03/2015	11/04/15 11:41	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID SR22
Lab ID: 1503729-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Arsenic	**68**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Barium	**74**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Cadmium	**11**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Chromium	**25**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Cobalt	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Copper	**190**	2.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Lead	**740**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Molybdenum	**21**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Nickel	**27**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Selenium	**5.1**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Silver	**22**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Vanadium	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Zinc	**310**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**4.5**	2.0	20	B5K0055	11/03/2015	11/04/15 11:43	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR23
Lab ID: 1503729-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Arsenic	**40**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Barium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Cadmium	**5.5**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Chromium	**21**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Cobalt	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Copper	**230**	2.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Lead	**790**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Molybdenum	**5.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Nickel	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Selenium	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Silver	**6.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Vanadium	**56**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Zinc	**220**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**9.7**	2.0	20	B5K0055	11/03/2015	11/04/15 11:45	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR24
Lab ID: 1503729-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Arsenic	**43**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Barium	**89**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Cadmium	**8.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Chromium	**36**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Cobalt	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Copper	**170**	2.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Lead	**930**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Molybdenum	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Nickel	**30**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Selenium	**3.2**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Silver	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Vanadium	**61**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Zinc	**390**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**19**	5.0	50	B5K0055	11/03/2015	11/04/15 11:47	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR25
Lab ID: 1503729-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Arsenic	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Barium	**140**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Cadmium	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Chromium	**39**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Cobalt	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Copper	**120**	2.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Lead	**150**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Molybdenum	**6.5**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Nickel	**25**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Selenium	**2.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Silver	**1.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Vanadium	**80**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Zinc	**100**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.7**	0.10	1	B5K0055	11/03/2015	11/04/15 10:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US26
Lab ID: 1503729-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Arsenic	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Barium	**180**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Cadmium	**1.1**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Chromium	**80**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Cobalt	**19**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Copper	**68**	2.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Lead	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Molybdenum	**2.3**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Nickel	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Selenium	**2.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Vanadium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Zinc	**51**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:14	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US27
Lab ID: 1503729-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Arsenic	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Barium	**130**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Chromium	**75**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Cobalt	**19**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Copper	**72**	2.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Lead	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Molybdenum	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Nickel	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Selenium	**4.1**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Vanadium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Zinc	**43**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US28
Lab ID: 1503729-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Arsenic	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Barium	**100**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Chromium	**55**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Cobalt	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Copper	**75**	2.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Lead	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Molybdenum	**2.6**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Nickel	**36**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Selenium	**2.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Vanadium	**97**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Zinc	**38**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:18	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US29
Lab ID: 1503729-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Arsenic	**7.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Barium	**210**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Chromium	**63**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Cobalt	**17**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Copper	**39**	2.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Lead	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Molybdenum	**1.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Nickel	**40**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Selenium	**2.2**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Vanadium	**92**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Zinc	**46**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0014 - EPA 3050B_S									
Blank (B5K0014-BLK1)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
Blank (B5K0014-BLK2)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
LCS (B5K0014-BS1)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	50.7756	1.0	50.0000		102	80 - 120			
Beryllium	48.1478	1.0	50.0000		96.3	80 - 120			
Cadmium	48.6105	1.0	50.0000		97.2	80 - 120			
Chromium	51.6108	1.0	50.0000		103	80 - 120			
Cobalt	49.0124	1.0	50.0000		98.0	80 - 120			
Copper	49.1727	2.0	50.0000		98.3	80 - 120			
Lead	48.0093	1.0	50.0000		96.0	80 - 120			
Molybdenum	50.3312	1.0	50.0000		101	80 - 120			
Nickel	48.3439	1.0	50.0000		96.7	80 - 120			
Selenium	44.4272	1.0	50.0000		88.9	80 - 120			
Silver	48.3074	1.0	50.0000		96.6	80 - 120			
Thallium	50.5248	1.0	50.0000		101	80 - 120			
Vanadium	49.2443	1.0	50.0000		98.5	80 - 120			
Zinc	45.9146	1.0	50.0000		91.8	80 - 120			
LCS (B5K0014-BS2)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	48.6075	2.0	50.0000		97.2	80 - 120			
Arsenic	48.8113	1.0	50.0000		97.6	80 - 120			
Matrix Spike (B5K0014-MS1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0014 - EPA 3050B_S (continued)									
Matrix Spike (B5K0014-MS1) - Continued		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	190.215	1.0	125.000	95.3322	75.9	18 - 159			
Beryllium	99.3511	1.0	125.000	0.383649	79.2	61 - 107			
Cadmium	98.3036	1.0	125.000	1.37893	77.5	53 - 104			
Chromium	131.041	1.0	125.000	27.6064	82.7	53 - 121			
Cobalt	104.878	1.0	125.000	8.73980	76.9	55 - 109			
Copper	130.870	2.0	125.000	20.6394	88.2	58 - 124			
Lead	98.8968	1.0	125.000	3.91384	76.0	35 - 129			
Molybdenum	98.6790	1.0	125.000	2.34100	77.1	57 - 108			
Nickel	119.545	1.0	125.000	22.8191	77.4	44 - 122			
Selenium	95.2810	1.0	125.000	ND	76.2	54 - 104			
Silver	102.144	1.0	125.000	ND	81.7	60 - 112			
Thallium	97.5902	1.0	125.000	2.00708	76.5	50 - 103			
Vanadium	147.832	1.0	125.000	49.6292	78.6	54 - 123			
Zinc	138.239	1.0	125.000	46.0876	73.7	29 - 132			
Matrix Spike (B5K0014-MS2)		**Source: 1503684-01RE1**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	77.4334	2.0	125.000	ND	61.9	28 - 106			
Arsenic	128.988	1.0	125.000	27.5562	81.1	57 - 109			
Matrix Spike Dup (B5K0014-MSD1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	190.106	1.0	125.000	95.3322	75.8	18 - 159	0.0573	20	
Beryllium	100.044	1.0	125.000	0.383649	79.7	61 - 107	0.695	20	
Cadmium	99.3634	1.0	125.000	1.37893	78.4	53 - 104	1.07	20	
Chromium	129.937	1.0	125.000	27.6064	81.9	53 - 121	0.846	20	
Cobalt	106.426	1.0	125.000	8.73980	78.1	55 - 109	1.47	20	
Copper	130.726	2.0	125.000	20.6394	88.1	58 - 124	0.110	20	
Lead	104.286	1.0	125.000	3.91384	80.3	35 - 129	5.30	20	
Molybdenum	100.865	1.0	125.000	2.34100	78.8	57 - 108	2.19	20	
Nickel	119.763	1.0	125.000	22.8191	77.6	44 - 122	0.182	20	
Selenium	98.4744	1.0	125.000	ND	78.8	54 - 104	3.30	20	
Silver	103.390	1.0	125.000	ND	82.7	60 - 112	1.21	20	
Thallium	96.7735	1.0	125.000	2.00708	75.8	50 - 103	0.840	20	
Vanadium	149.933	1.0	125.000	49.6292	80.2	54 - 123	1.41	20	
Zinc	139.314	1.0	125.000	46.0876	74.6	29 - 132	0.775	20	
Matrix Spike Dup (B5K0014-MSD2)		**Source: 1503684-01RE1**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	81.0953	2.0	125.000	ND	64.9	28 - 106	4.62	20	
Arsenic	130.602	1.0	125.000	27.5562	82.4	57 - 109	1.24	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0052 - EPA 3050B_S									
Blank (B5K0052-BLK1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5K0052-BS1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	48.4280	2.0	50.0000		96.9	80 - 120			
Arsenic	46.5596	1.0	50.0000		93.1	80 - 120			
Barium	50.6490	1.0	50.0000		101	80 - 120			
Beryllium	47.9524	1.0	50.0000		95.9	80 - 120			
Cadmium	48.2329	1.0	50.0000		96.5	80 - 120			
Chromium	50.9384	1.0	50.0000		102	80 - 120			
Cobalt	49.0270	1.0	50.0000		98.1	80 - 120			
Copper	48.4809	2.0	50.0000		97.0	80 - 120			
Lead	48.1681	1.0	50.0000		96.3	80 - 120			
Molybdenum	49.5391	1.0	50.0000		99.1	80 - 120			
Nickel	48.1495	1.0	50.0000		96.3	80 - 120			
Selenium	44.2294	1.0	50.0000		88.5	80 - 120			
Silver	49.3429	1.0	50.0000		98.7	80 - 120			
Thallium	49.6844	1.0	50.0000		99.4	80 - 120			
Vanadium	49.1347	1.0	50.0000		98.3	80 - 120			
Zinc	51.3014	1.0	50.0000		103	80 - 120			
Matrix Spike (B5K0052-MS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	98.5828	2.0	125.000	0.859013	78.2	28 - 106			
Arsenic	112.234	1.0	125.000	2.08859	88.1	57 - 109			
Barium	150.099	1.0	125.000	45.2340	83.9	18 - 159			
Beryllium	112.308	1.0	125.000	0.377467	89.5	61 - 107			
Cadmium	105.149	1.0	125.000	ND	84.1	53 - 104			
Chromium	207.452	1.0	125.000	105.795	81.3	53 - 121			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0052 - EPA 3050B_S (continued)									
Matrix Spike (B5K0052-MS1) - Continued		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Cobalt	113.217	1.0	125.000	4.95417	86.6	55 - 109			
Copper	136.921	2.0	125.000	18.0394	95.1	58 - 124			
Lead	110.873	1.0	125.000	3.30797	86.1	35 - 129			
Molybdenum	120.681	1.0	125.000	8.45354	89.8	57 - 108			
Nickel	115.348	1.0	125.000	7.96403	85.9	44 - 122			
Selenium	107.259	1.0	125.000	0.509803	85.4	54 - 104			
Silver	111.107	1.0	125.000	ND	88.9	60 - 112			
Thallium	108.816	1.0	125.000	ND	87.1	50 - 103			
Vanadium	134.490	1.0	125.000	24.3424	88.1	54 - 123			
Zinc	131.083	1.0	125.000	29.2925	81.4	29 - 132			
Matrix Spike Dup (B5K0052-MSD1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	100.129	2.0	125.000	0.859013	79.4	28 - 106	1.56	20	
Arsenic	115.262	1.0	125.000	2.08859	90.5	57 - 109	2.66	20	
Barium	154.592	1.0	125.000	45.2340	87.5	18 - 159	2.95	20	
Beryllium	113.519	1.0	125.000	0.377467	90.5	61 - 107	1.07	20	
Cadmium	106.172	1.0	125.000	ND	84.9	53 - 104	0.968	20	
Chromium	214.955	1.0	125.000	105.795	87.3	53 - 121	3.55	20	
Cobalt	114.382	1.0	125.000	4.95417	87.5	55 - 109	1.02	20	
Copper	140.067	2.0	125.000	18.0394	97.6	58 - 124	2.27	20	
Lead	111.278	1.0	125.000	3.30797	86.4	35 - 129	0.365	20	
Molybdenum	119.839	1.0	125.000	8.45354	89.1	57 - 108	0.700	20	
Nickel	116.597	1.0	125.000	7.96403	86.9	44 - 122	1.08	20	
Selenium	106.543	1.0	125.000	0.509803	84.8	54 - 104	0.670	20	
Silver	112.538	1.0	125.000	ND	90.0	60 - 112	1.28	20	
Thallium	108.107	1.0	125.000	ND	86.5	50 - 103	0.654	20	
Vanadium	136.994	1.0	125.000	24.3424	90.1	54 - 123	1.84	20	
Zinc	135.536	1.0	125.000	29.2925	85.0	29 - 132	3.34	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

TCLP Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0138 - EPA 3010A_S									
Blank (B5K0138-BLK1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	ND	0.050			NR				
LCS (B5K0138-BS1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	0.942737	0.050	1.00000		94.3	80 - 120			
Matrix Spike (B5K0138-MS1)		**Source: 1503729-02**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	231.459	1.0	2.50000	225.889	223	77 - 121			D6, M1
Matrix Spike Dup (B5K0138-MSD1)		**Source: 1503729-02**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	227.992	1.0	2.50000	225.889	84.2	77 - 121	1.51	20	D6

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

STLC Metals by ICP-AES by EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0176 - STLC_S Extraction									
Blank (B5K0176-BLK1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	ND	1.0			NR				
Copper	ND	1.0			NR				
Lead	ND	1.0			NR				
LCS (B5K0176-BS1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	1.86205		2.00000		93.1	80 - 120			
Copper	2.08158		2.00000		104	80 - 120			
Lead	1.98020		2.00000		99.0	80 - 120			
Duplicate (B5K0176-DUP1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	ND	1.0		ND	NR			20	
Copper	0.236780	1.0		0.239484	NR		1.14	20	
Lead	0.226691	1.0		0.227873	NR		0.520	20	
Matrix Spike (B5K0176-MS1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	2.68246		2.50000	0.159260	101	90 - 110			
Copper	2.76153		2.50000	0.239484	101	62 - 129			
Lead	2.58336		2.50000	0.227873	94.2	44 - 130			
Matrix Spike Dup (B5K0176-MSD1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	2.57406		2.50000	0.159260	96.6	90 - 110	4.12	20	
Copper	2.68186		2.50000	0.239484	97.7	62 - 129	2.93	20	
Lead	2.56495		2.50000	0.227873	93.5	44 - 130	0.715	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0015 - EPA 7471_S									
Blank (B5K0015-BLK1)				Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	ND	0.10			NR				
LCS (B5K0015-BS1)				Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.791380	0.10	0.833333		95.0	80 - 120			
Matrix Spike (B5K0015-MS1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.880681	0.10	0.833333	0.021069	103	70 - 130			
Matrix Spike Dup (B5K0015-MSD1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.865426	0.10	0.833333	0.021069	101	70 - 130	1.75	20	
Post Spike (B5K0015-PS1)		**Source: 1503700-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.005692		5.00000E-3	0.000542	103	85 - 115			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0055 - EPA 7471_S									
Blank (B5K0055-BLK1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	ND	0.10			NR				
LCS (B5K0055-BS1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.771171	0.10	0.833333		92.5	80 - 120			
Matrix Spike (B5K0055-MS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.976980	0.10	0.833333	0.178078	95.9	70 - 130			
Matrix Spike Dup (B5K0055-MSD1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.945413	0.10	0.833333	0.178078	92.1	70 - 130	3.28	20	
Post Spike (B5K0055-PS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.007262		5.00000E-3	0.002137	103	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

STLC Mercury by AA (Cold Vapor) EPA 7470A - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0178 - EPA 245.1/7470_S									
Blank (B5K0178-BLK1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	ND	0.20			NR				
LCS (B5K0178-BS1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	10.1760	0.20	10.0000		102	80 - 120			
Matrix Spike (B5K0178-MS1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	56.8608	1.0	50.0000	5.43035	103	70 - 130			
Matrix Spike Dup (B5K0178-MSD1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	57.7780	1.0	50.0000	5.43035	105	70 - 130	1.60	20	
Post Spike (B5K0178-PS1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	6.40506		5.00000	1.08607	106	85 - 115			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

TCLP Mercury by AA (Cold Vapor) by EPA 7470A - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0162 - EPA 245.1/7470_S									
Blank (B5K0162-BLK1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	ND	0.20			NR				
LCS (B5K0162-BS1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.1488	0.20	10.0000		101	80 - 120			
Matrix Spike (B5K0162-MS1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.1860	0.20	10.0000	ND	102	70 - 130			
Matrix Spike Dup (B5K0162-MSD1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.3801	0.20	10.0000	ND	104	70 - 130	1.89	20	
Post Spike (B5K0162-PS1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	5.34538		5.00000	0.023284	106	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Notes and Definitions

M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only					ATLCOC Ver:20130715
Method of Transport	Sample Conditions Upon Receipt				
	Condition	Y	N	Condition	Y N
Client / ATL	1. CHILLED	YES		5. # OF SAMPLES MATCH COC	
FedEx / OnTrac	2. HEADSPACE (VOA)			6. PRESERVED	
GSO	3. CONTAINER INTACT			7. COOLER TEMP, deg C: 6.0	
Other:	4. SEALED				

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street
City: Nevada City
State: CA
Zip: 95959
Tel: (530) 256-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: (SSI) Sierra Streams Institute
Address: 431 Uren St
City: Nevada City
State: CA
Zip: 95959

SEND INVOICE TO: same as SEND REPORT TO
Attn: same
Email:
Company:
Address:
City:
State:
Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #:
PO #:

Special Instructions/Comments: Please 72 hr Rush initial Title 22 metals on 5 samples this COC then run WET Metals and TCLP on sample with highest total lead and mercury results

Encircle or Write Requested Analysis: Select Analysis; Select Analysis; 6010 / 7000 (Title 22 Metals); Select Analysis; Select Analysis; Select Analysis; Select Analysis; Select Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis

Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix

Container: # 8oz glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NAS2O3

QA/QC: Routine / Caltrans / Legal / RWQCB / Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	6010 / 7000 (Title 22 Metals)	TAT	# 8oz glass	REMARKS
1	1507779 - 1	WR8-B	10/27/15	10:00 am	X	3	X	
2	2	WR21	10/27/15	10:10 am	X	3	X	
3	3	WR21-1'	10/27/15	10:16 am	X	3	X	
4	4	WR9-.75	10/27/15	10:24 am	X	3	X	
5	5	SR13-B	10/27/15	10:30 am	X	3	X	
6								
7								
8								
9								
10								

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	10/28/15	8 am		10/30/15	9am
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only					ATLCOC Ver:20130715
Method of Transport	Sample Conditions Upon Receipt				
	Condition	Y	N	Condition	Y	N
Client ✓ / FedEx / GSO / Other: / ATL / OnTrac	1. CHILLED	yes		5. # OF SAMPLES MATCH COC	
	2. HEADSPACE (VOA)			6. PRESERVED	
	3. CONTAINER INTACT			7. COOLER TEMP, deg C: 6.0	
	4. SEALED				

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street
City: Nevada City State: CA Zip: 95959
Tel: (530) 256-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: kleach08@gmail.com
Company: SSI
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: same as SEND REPORT TO
Attn: same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #:
PO #:
Special Instructions/Comments: Standard TAT these 9 samples for Title 22 metals

QA/QC: Routine, Caltrans, Legal, RWQCB Level IV

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	Select Analysis	Select Analysis	6010 / 7000 (Title 22 Metals)	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Select Soil Matrix	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	Enter Custom Matrix	TAT	Container: # 4oz glass	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NaOSO3	REMARKS
1	1503729 - 6	WR9-1.5'	10/27/15	10:08 am			X																						5	82				
2	7	SR22	10/27/15	10:00 am			X																						5	X				
3	8	WR23	10/27/15	10:44 am			X																						5	X				
4	9	WR24	10/27/15	10:50 am			X																						5	X				
5	10	WR25	10/27/15	10:56 am			X																						5	X				
6	11	US26	10/27/15	11:00 am			X																						5	X				
7	12	US27	10/27/15	11:10 am			X																						5	X				
8	13	US28	10/27/15	11:20 am			X																						5	X				
9	14	US29	10/27/15	11:30 am			X																						5	X				
10																																		

TERMS

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   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
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   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	10/28/15	8 am	[illegible]	10/28/15	9:00

Diane Galvan

From: Kyle [kleach08@gmail.com]
Sent: Tuesday, November 03, 2015 6:37 PM
To: Diane Galvan
Subject: Re: Partial/Draft Results - SNC Environs (1503729-01/05)

Hi Diane
Please also add soluble arsenic and copper for sample WR21
Thanks
Kyle

Sent from my iPhone

November 16, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502373
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on July 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR-10	1502373-10	Soil	7/07/15 11:00	7/09/15 11:18
WR-12	1502373-12	Soil	7/07/15 12:00	7/09/15 11:18

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Client Sample ID WR-10

Lab ID: 1502373-10

STLC DI Metals by ICP-AES by EPA 6010B **Analyst: RR**

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.50	10	B5K0399	11/13/2015	11/13/15 13:53	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Client Sample ID WR-12
Lab ID: 1502373-12

STLC DI Metals by ICP-AES by EPA 6010B **Analyst: RR**

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.50	10	B5K0399	11/13/2015	11/13/15 14:05	

QUALITY CONTROL SECTION

STLC DI Metals by ICP-AES by EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0399 - STLC DI_S Extraction									
Blank (B5K0399-BLK1)				Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	ND	0.50			NR				
LCS (B5K0399-BS1)				Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.02350		2.00000		101	80 - 120			
Matrix Spike (B5K0399-MS1)		**Source: 1502373-10**		Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.54619		2.50000	0.035656	100	70 - 130			
Matrix Spike Dup (B5K0399-MSD1)		**Source: 1502373-10**		Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.56023		2.50000	0.035656	101	70 - 130	0.550	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

From: Kyle [kleach08@gmail.com]
Sent: Monday, November 09, 2015 6:00 PM
To: Diane Galvan
Subject: Re: Phone Message

Thank you
Yes please run the WET DI analysis for soluble lead on samples WR-10 WR 12 and WR-24 Standard turn around time
Thanks
Kyle

Sent from my iPhone

On Nov 9, 2015, at 3:53 PM, Diane Galvan <Diane@atlglobal.com> wrote:

Hi Kyle,

I've received your voice message and have been informed by our Sample Receiving we do have enough of samples WR10 (1502373-10), WR12 (1502373-12) and WR24 (1503729-09) remaining for WET-DI analysis. You may request the additional analysis via email correspondence or on a Chain of Custody, whichever you prefer.

Thanks,

Diane Galvan
Project Manager

<image001.jpg>**Advanced Technology Laboratories**
www.atlglobal.com
Tel: (562) 989-4045 ext. 238
Fax: (562) 989-4040

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ADVANCED TECHNOLOGY LABORATORIES

June 17, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502024
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on June 10, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR1-S1	1502024-01	Soil	6/02/15 12:00	6/10/15 9:14
WR1-S2	1502024-02	Soil	6/02/15 12:00	6/10/15 9:14
WR1-S3	1502024-03	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S1	1502024-04	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S2	1502024-05	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S3	1502024-06	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S4	1502024-07	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S5	1502024-08	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S6	1502024-09	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S7	1502024-10	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S8	1502024-11	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S9	1502024-12	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S10	1502024-13	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S11	1502024-14	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S12	1502024-15	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S13	1502024-16	Soil	6/02/15 14:00	6/10/15 9:14
WR2-TS14	1502024-17	Soil	6/02/15 14:00	6/10/15 9:14
WR2-TS15	1502024-18	Soil	6/02/15 15:00	6/10/15 9:14
WR2-TS16	1502024-19	Soil	6/02/15 15:00	6/10/15 9:14
WR2-S17	1502024-20	Soil	6/02/15 15:00	6/10/15 9:14
WR2-S18	1502024-21	Soil	6/02/15 15:00	6/10/15 9:14

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S1
Lab ID: 1502024-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Arsenic	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Barium	**120**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Cadmium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Chromium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Cobalt	**18**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Copper	**140**	2.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Lead	**530**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Molybdenum	**9.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Nickel	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Vanadium	**54**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Zinc	**81**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.52**	0.10	1	B5F0281	06/15/2015	06/15/15 14:34	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S2
Lab ID: 1502024-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Arsenic	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Barium	**140**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Cadmium	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Chromium	**3.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Cobalt	**15**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Copper	**120**	2.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Lead	**400**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Molybdenum	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Nickel	**4.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Zinc	**82**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.43**	0.10	1	B5F0281	06/15/2015	06/15/15 14:42	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S3
Lab ID: 1502024-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Arsenic	**17**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Barium	**97**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Cadmium	**2.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Chromium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Cobalt	**14**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Copper	**120**	2.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Lead	**410**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Molybdenum	**7.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Nickel	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Silver	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Vanadium	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Zinc	**62**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.4**	0.10	1	B5F0281	06/15/2015	06/15/15 14:44	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S1
Lab ID: 1502024-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Barium	**70**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Cadmium	**6.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Chromium	**1.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Cobalt	**4.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Lead	**23**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Molybdenum	**12**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Nickel	**1.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Thallium	**5.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Vanadium	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Zinc	**75**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 14:46	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S2
Lab ID: 1502024-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Arsenic	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Barium	**87**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Cadmium	**1.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Chromium	**4.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Cobalt	**9.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Copper	**54**	2.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Lead	**59**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Molybdenum	**6.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Nickel	**4.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Vanadium	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Zinc	**46**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.29**	0.10	1	B5F0281	06/15/2015	06/15/15 14:48	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S3
Lab ID: 1502024-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Arsenic	**23**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Barium	**46**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Cadmium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Chromium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Cobalt	**3.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Copper	**96**	2.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Lead	**170**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Nickel	**2.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Silver	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Thallium	**1.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Vanadium	**14**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Zinc	**43**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.45**	0.10	1	B5F0281	06/15/2015	06/15/15 14:50	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S4
Lab ID: 1502024-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Arsenic	**4.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Barium	**130**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Cadmium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Chromium	**5.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Cobalt	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Copper	**75**	2.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Lead	**64**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Molybdenum	**44**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Nickel	**5.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Silver	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Vanadium	**38**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Zinc	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.51**	0.10	1	B5F0281	06/15/2015	06/15/15 14:52	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S5
Lab ID: 1502024-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Arsenic	**20**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Barium	**88**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Cadmium	**2.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Chromium	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Cobalt	**8.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Copper	**150**	2.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Lead	**330**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Molybdenum	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Nickel	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Silver	**4.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Thallium	**2.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Vanadium	**29**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Zinc	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.57**	0.10	1	B5F0281	06/15/2015	06/15/15 14:58	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S6
Lab ID: 1502024-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Arsenic	**16**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Barium	**73**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Cadmium	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Chromium	**2.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Cobalt	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Copper	**90**	2.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Lead	**170**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Molybdenum	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Nickel	**2.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Silver	**4.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Thallium	**1.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Vanadium	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Zinc	**50**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.47**	0.10	1	B5F0281	06/15/2015	06/15/15 15:00	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S7
Lab ID: 1502024-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Arsenic	**24**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Barium	**44**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Cadmium	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Chromium	**2.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Cobalt	**10**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Copper	**140**	2.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Lead	**330**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Molybdenum	**8.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Nickel	**3.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Silver	**8.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Thallium	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Vanadium	**22**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Zinc	**71**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.27**	0.10	1	B5F0281	06/15/2015	06/15/15 15:02	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S8
Lab ID: 1502024-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Arsenic	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Barium	**58**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Cadmium	**1.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Chromium	**3.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Cobalt	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Copper	**62**	2.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Lead	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Molybdenum	**6.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Nickel	**5.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Zinc	**36**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.20**	0.10	1	B5F0281	06/15/2015	06/15/15 15:04	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Client Sample ID WR2-S9
Lab ID: 1502024-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Barium	**240**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Chromium	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Cobalt	**8.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Copper	**16**	2.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Lead	**7.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Nickel	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:06	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S10
Lab ID: 1502024-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Barium	**200**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Chromium	**4.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Cobalt	**9.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Copper	**18**	2.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Lead	**12**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Nickel	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Vanadium	**42**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:08	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S11
Lab ID: 1502024-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Barium	**220**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Chromium	**6.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Cobalt	**9.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Copper	**31**	2.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Lead	**15**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Nickel	**5.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Vanadium	**54**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.13**	0.10	1	B5F0281	06/15/2015	06/15/15 15:10	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S12
Lab ID: 1502024-15

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Arsenic	**4.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Barium	**130**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Cadmium	**2.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Chromium	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Cobalt	**9.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Copper	**41**	2.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Lead	**52**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Molybdenum	**9.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Nickel	**5.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Vanadium	**38**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Zinc	**58**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.21**	0.10	1	B5F0281	06/15/2015	06/15/15 15:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S13
Lab ID: 1502024-16

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Barium	**160**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Chromium	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Cobalt	**16**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Copper	**62**	2.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Lead	**30**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Molybdenum	**3.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Nickel	**5.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Vanadium	**47**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Zinc	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:14	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Client Sample ID WR2-TS14
Lab ID: 1502024-17

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Barium	**90**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Chromium	**8.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Cobalt	**6.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Lead	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Nickel	**5.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Vanadium	**61**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Zinc	**29**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.12**	0.10	1	B5F0281	06/15/2015	06/15/15 15:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-TS15
Lab ID: 1502024-18

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Barium	**230**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Chromium	**4.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Cobalt	**9.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Copper	**16**	2.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Lead	**7.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Nickel	**4.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Zinc	**55**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-TS16
Lab ID: 1502024-19

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Arsenic	**24**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Barium	**73**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Chromium	**9.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Cobalt	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Lead	**21**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Nickel	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Vanadium	**41**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Zinc	**32**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.43**	0.10	1	B5F0281	06/15/2015	06/15/15 15:24	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S17
Lab ID: 1502024-20

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Arsenic	**15**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Barium	**58**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Beryllium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Cadmium	**1.5**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Chromium	**2.0**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Cobalt	**5.7**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Copper	**45**	2.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Lead	**64**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Molybdenum	**27**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Nickel	**2.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Selenium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Silver	**5.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Thallium	**3.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Vanadium	**35**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Zinc	**33**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.41**	0.10	1	B5F0282	06/15/2015	06/15/15 15:35	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S18
Lab ID: 1502024-21

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Arsenic	**24**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Barium	**53**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Beryllium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Cadmium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Chromium	**9.2**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Cobalt	**4.7**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Copper	**17**	2.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Lead	**16**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Molybdenum	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Nickel	**4.5**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Selenium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Silver	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Thallium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Vanadium	**41**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Zinc	**22**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.61**	0.10	1	B5F0282	06/15/2015	06/15/15 15:43	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0277 - EPA 3050B_S									
Blank (B5F0277-BLK1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5F0277-BS1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	48.4485	2.0	50.0000		96.9	80 - 120			
Arsenic	45.8369	1.0	50.0000		91.7	80 - 120			
Barium	49.6778	1.0	50.0000		99.4	80 - 120			
Beryllium	46.6242	1.0	50.0000		93.2	80 - 120			
Cadmium	46.4546	1.0	50.0000		92.9	80 - 120			
Chromium	50.0640	1.0	50.0000		100	80 - 120			
Cobalt	47.7883	1.0	50.0000		95.6	80 - 120			
Copper	46.9236	2.0	50.0000		93.8	80 - 120			
Lead	47.9394	1.0	50.0000		95.9	80 - 120			
Molybdenum	46.2041	1.0	50.0000		92.4	80 - 120			
Nickel	47.3113	1.0	50.0000		94.6	80 - 120			
Selenium	44.1654	1.0	50.0000		88.3	80 - 120			
Silver	47.6280	1.0	50.0000		95.3	80 - 120			
Thallium	47.0126	1.0	50.0000		94.0	80 - 120			
Vanadium	49.5846	1.0	50.0000		99.2	80 - 120			
Zinc	44.7630	1.0	50.0000		89.5	80 - 120			
Matrix Spike (B5F0277-MS1)		**Source: 1502024-01**			Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	85.5230	2.0	125.000	ND	68.4	28 - 106			
Arsenic	138.232	1.0	125.000	40.2577	78.4	57 - 109			
Barium	211.635	1.0	125.000	116.800	75.9	18 - 159			
Beryllium	102.638	1.0	125.000	0.533714	81.7	61 - 107			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0277 - EPA 3050B_S (continued)									
Matrix Spike (B5F0277-MS1) - Continued		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Cadmium	98.5008	1.0	125.000	3.48955	76.0	53 - 104			
Chromium	106.517	1.0	125.000	3.51783	82.4	53 - 121			
Cobalt	118.493	1.0	125.000	18.2580	80.2	55 - 109			
Copper	275.054	2.0	125.000	144.685	104	58 - 124			
Lead	667.152	1.0	125.000	532.561	108	35 - 129			
Molybdenum	111.905	1.0	125.000	9.60249	81.8	57 - 108			
Nickel	102.227	1.0	125.000	4.64546	78.1	44 - 122			
Selenium	95.6250	1.0	125.000	ND	76.5	54 - 104			
Silver	108.933	1.0	125.000	0.225008	87.0	60 - 112			
Thallium	94.2168	1.0	125.000	ND	75.4	50 - 103			
Vanadium	158.554	1.0	125.000	54.1678	83.5	54 - 123			
Zinc	179.825	1.0	125.000	80.6545	79.3	29 - 132			
Matrix Spike Dup (B5F0277-MSD1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	89.1772	2.0	124.378	ND	71.7	28 - 106	4.18	20	
Arsenic	138.153	1.0	124.378	40.2577	78.7	57 - 109	0.0577	20	
Barium	209.009	1.0	124.378	116.800	74.1	18 - 159	1.25	20	
Beryllium	102.982	1.0	124.378	0.533714	82.4	61 - 107	0.334	20	
Cadmium	98.2728	1.0	124.378	3.48955	76.2	53 - 104	0.232	20	
Chromium	106.150	1.0	124.378	3.51783	82.5	53 - 121	0.345	20	
Cobalt	116.383	1.0	124.378	18.2580	78.9	55 - 109	1.80	20	
Copper	254.491	2.0	124.378	144.685	88.3	58 - 124	7.77	20	
Lead	604.438	1.0	124.378	532.561	57.8	35 - 129	9.86	20	
Molybdenum	113.255	1.0	124.378	9.60249	83.3	57 - 108	1.20	20	
Nickel	101.989	1.0	124.378	4.64546	78.3	44 - 122	0.233	20	
Selenium	96.8593	1.0	124.378	ND	77.9	54 - 104	1.28	20	
Silver	105.923	1.0	124.378	0.225008	85.0	60 - 112	2.80	20	
Thallium	96.3845	1.0	124.378	ND	77.5	50 - 103	2.27	20	
Vanadium	157.712	1.0	124.378	54.1678	83.2	54 - 123	0.532	20	
Zinc	173.073	1.0	124.378	80.6545	74.3	29 - 132	3.83	20	
Batch B5F0279 - EPA 3050B_S									
Blank (B5F0279-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0279 - EPA 3050B_S (continued)									
Blank (B5F0279-BLK1) - Continued					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5F0279-BS1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	46.8539	2.0	50.0000		93.7	80 - 120			
Arsenic	44.2343	1.0	50.0000		88.5	80 - 120			
Barium	48.6384	1.0	50.0000		97.3	80 - 120			
Beryllium	45.3075	1.0	50.0000		90.6	80 - 120			
Cadmium	45.5631	1.0	50.0000		91.1	80 - 120			
Chromium	48.7582	1.0	50.0000		97.5	80 - 120			
Cobalt	46.8793	1.0	50.0000		93.8	80 - 120			
Copper	45.8039	2.0	50.0000		91.6	80 - 120			
Lead	46.3129	1.0	50.0000		92.6	80 - 120			
Molybdenum	45.1240	1.0	50.0000		90.2	80 - 120			
Nickel	46.2659	1.0	50.0000		92.5	80 - 120			
Selenium	42.8488	1.0	50.0000		85.7	80 - 120			
Silver	46.4464	1.0	50.0000		92.9	80 - 120			
Thallium	45.1826	1.0	50.0000		90.4	80 - 120			
Vanadium	48.4633	1.0	50.0000		96.9	80 - 120			
Zinc	43.9676	1.0	50.0000		87.9	80 - 120			
Matrix Spike (B5F0279-MS1)		**Source: 1502024-20**			Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	88.7211	2.0	125.000	ND	71.0	28 - 106			
Arsenic	119.745	1.0	125.000	15.1603	83.7	57 - 109			
Barium	154.876	1.0	125.000	57.8524	77.6	18 - 159			
Beryllium	104.683	1.0	125.000	0.305927	83.5	61 - 107			
Cadmium	98.7435	1.0	125.000	1.49918	77.8	53 - 104			
Chromium	106.890	1.0	125.000	2.00668	83.9	53 - 121			
Cobalt	109.240	1.0	125.000	5.68821	82.8	55 - 109			
Copper	159.956	2.0	125.000	44.6175	92.3	58 - 124			
Lead	165.647	1.0	125.000	63.7962	81.5	35 - 129			
Molybdenum	129.438	1.0	125.000	27.2136	81.8	57 - 108			
Nickel	102.442	1.0	125.000	2.21040	80.2	44 - 122			
Selenium	99.8170	1.0	125.000	ND	79.9	54 - 104			
Silver	112.964	1.0	125.000	5.18934	86.2	60 - 112			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0279 - EPA 3050B_S (continued)									
Matrix Spike (B5F0279-MS1) - Continued		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Thallium	103.149	1.0	125.000	3.15709	80.0	50 - 103			
Vanadium	140.083	1.0	125.000	35.1667	83.9	54 - 123			
Zinc	126.824	1.0	125.000	33.1858	74.9	29 - 132			
Matrix Spike Dup (B5F0279-MSD1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	87.9726	2.0	125.000	ND	70.4	28 - 106	0.847	20	
Arsenic	118.952	1.0	125.000	15.1603	83.0	57 - 109	0.665	20	
Barium	164.469	1.0	125.000	57.8524	85.3	18 - 159	6.01	20	
Beryllium	105.051	1.0	125.000	0.305927	83.8	61 - 107	0.351	20	
Cadmium	100.558	1.0	125.000	1.49918	79.2	53 - 104	1.82	20	
Chromium	109.622	1.0	125.000	2.00668	86.1	53 - 121	2.52	20	
Cobalt	108.416	1.0	125.000	5.68821	82.2	55 - 109	0.757	20	
Copper	153.968	2.0	125.000	44.6175	87.5	58 - 124	3.82	20	
Lead	157.646	1.0	125.000	63.7962	75.1	35 - 129	4.95	20	
Molybdenum	118.742	1.0	125.000	27.2136	73.2	57 - 108	8.62	20	
Nickel	102.898	1.0	125.000	2.21040	80.5	44 - 122	0.444	20	
Selenium	99.8719	1.0	125.000	ND	79.9	54 - 104	0.0550	20	
Silver	112.717	1.0	125.000	5.18934	86.0	60 - 112	0.219	20	
Thallium	102.505	1.0	125.000	3.15709	79.5	50 - 103	0.626	20	
Vanadium	139.361	1.0	125.000	35.1667	83.4	54 - 123	0.517	20	
Zinc	130.060	1.0	125.000	33.1858	77.5	29 - 132	2.52	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0281 - EPA 7471_S									
Blank (B5F0281-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	ND	0.10			NR				
LCS (B5F0281-BS1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.721222	0.10	0.833333		86.5	80 - 120			
Matrix Spike (B5F0281-MS1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.28987	0.10	0.833333	0.524734	91.8	70 - 130			
Matrix Spike Dup (B5F0281-MSD1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.28728	0.10	0.819672	0.524734	93.0	70 - 130	0.201	20	
Post Spike (B5F0281-PS1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.010991		5.00000E-3	0.006297	93.9	85 - 115			
Batch B5F0282 - EPA 7471_S									
Blank (B5F0282-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	ND	0.10			NR				
LCS (B5F0282-BS1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.686546	0.10	0.833333		82.4	80 - 120			
Matrix Spike (B5F0282-MS1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.11429	0.10	0.833333	0.411133	84.4	70 - 130			
Matrix Spike Dup (B5F0282-MSD1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.19327	0.10	0.833333	0.411133	93.9	70 - 130	6.84	20	
Post Spike (B5F0282-PS1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.009943		5.00000E-3	4.9336E-3	100	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2015 715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL ☑ OnTrac ☐ FedEx ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☐	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 15.1		
	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Smith~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis — Encircle Sample Matrix — Container — QA/QC

ITEM	Lab No.	Sample ID / Location	Date	Time	Select Metals (Hg, As, Se, Pb)	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Select Soil Matrix	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	Enter Custom Matrix	TAT	# 4oz	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (AcO); 6=NaOH; 7=NA2S2O3	REMARKS
1	1502024 - 1	WR1 - S1	6/2/15	12pm	X																		X						X			1		
2	- 2	WR1 - S2		12 pm																														
3	- 3	WR1 - S3		12 PM																														
4	- 4	WR2 - S1		12 PM																														
5	- 5	WR2 - S2		12 PM																														
6	- 6	WR2 - S3		1 pm																														
7	- 7	WR2 - S4		1 pm																														
8	- 8	WR2 - S5		1 pm																														
9	- 9	WR2 - S6		1 pm																														
10	- 10	WR2 - S7		1 pm																														

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples, air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	1100		6/10/15	914

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2013 0715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:		
☐ Other:	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Selen~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis: Spiked 22 Metals; Select Analysis; Enter Custom Analysis
Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix
TAT; Container — Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Bedjar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NAS2O3
QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	Spiked 22 Metals	TAT	Type	Material	REMARKS
1	1502024-11	WR2-S8	6/2/15	1pm	X	X Standard	402	1	
2	-12	WR2-S9		1pm					
3	-13	WR2-S10		2pm					
4	-14	WR2-S11		2pm					
5	-15	WR2-S12		2pm					
6	-16	WR2-S13		2pm					
7	-17	WR2-TS14		2pm					
8	-18	WR2-TS15		3pm					
9	-19	WR2-TS16		3pm					
10	-20	WR2-S17		3pm					

TERMS

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   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
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8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
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As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	11:00		6/8/15	9:14
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 3 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:201[illegible]715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☐	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:		
	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Selen~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis: Select Analysis / Enter Custom Analysis
Encircle Sample Matrix: Select Soil Matrix, Select Solid Matrix, Select Water Matrix, Select Wastewater Matrix, Select Aqueous Matrix, Enter Custom Matrix

ITEM	Lab No.	Sample ID / Location	Date	Time	Select Analysis: 17 Metals 22 Metals	Select Soil Matrix	TAT	Container #	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn ((Ac)2; 6=NaOH; 7=NaEDTA	REMARKS
1	1502024-21	WR2-S18	6/2/15	3pm	X	X	Standard			1		
2												
3												
4												
5												
6												
7												
8												
9												
10												

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

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As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	11:00	[illegible]	6/10/15	9:14
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES

July 16, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502373
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on July 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-1	1502373-01	Soil	7/07/15 10:00	7/09/15 11:18
QM-2	1502373-02	Soil	7/07/15 10:00	7/09/15 11:18
QM-3	1502373-03	Soil	7/07/15 10:00	7/09/15 11:18
QM-4	1502373-04	Soil	7/07/15 10:00	7/09/15 11:18
QM-5	1502373-05	Soil	7/07/15 10:00	7/09/15 11:18
QM-6	1502373-06	Soil	7/07/15 10:00	7/09/15 11:18
QM-7	1502373-07	Soil	7/07/15 11:00	7/09/15 11:18
WR-8	1502373-08	Soil	7/07/15 11:00	7/09/15 11:18
WR-9	1502373-09	Soil	7/07/15 11:00	7/09/15 11:18
WR-10	1502373-10	Soil	7/07/15 11:00	7/09/15 11:18
WR-11	1502373-11	Soil	7/07/15 12:00	7/09/15 11:18
WR-12	1502373-12	Soil	7/07/15 12:00	7/09/15 11:18
SR-13	1502373-13	Soil	7/07/15 12:00	7/09/15 11:18
SR-14	1502373-14	Soil	7/07/15 12:00	7/09/15 11:18
SR-15	1502373-15	Soil	7/07/15 12:00	7/09/15 11:18
SR-16	1502373-16	Soil	7/07/15 12:00	7/09/15 11:18
SR-17	1502373-17	Soil	7/07/15 12:00	7/09/15 11:18
RF-18	1502373-18	Soil	7/07/15 13:00	7/09/15 11:18
RF-19	1502373-19	Soil	7/07/15 13:00	7/09/15 11:18
RF-20	1502373-20	Soil	7/07/15 13:00	7/09/15 11:18

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-1
Lab ID: 1502373-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Arsenic	**20**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Barium	**150**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Cadmium	**2.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Chromium	**43**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Copper	**97**	2.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Lead	**430**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Molybdenum	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Nickel	**26**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 11:58	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Thallium	**4.1**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Vanadium	**87**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Zinc	**120**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**14**	2.0	20	B5G0179	07/12/2015	07/13/15 14:10	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-2
Lab ID: 1502373-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Barium	**190**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Beryllium	**1.2**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Chromium	**56**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Copper	**62**	2.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Lead	**98**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Nickel	**34**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Thallium	**5.6**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Vanadium	**110**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Zinc	**60**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.5**	0.10	1	B5G0179	07/12/2015	07/13/15 13:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-3
Lab ID: 1502373-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Barium	**170**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Cadmium	**1.4**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Chromium	**41**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Cobalt	**12**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Copper	**68**	2.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Lead	**190**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Nickel	**27**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Thallium	**3.9**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Vanadium	**93**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Zinc	**80**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.8**	1.0	10	B5G0179	07/12/2015	07/13/15 14:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-4
Lab ID: 1502373-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Cadmium	**1.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Chromium	**43**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Copper	**63**	2.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Lead	**89**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Molybdenum	**1.5**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Nickel	**25**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Thallium	**3.1**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Vanadium	**77**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Zinc	**74**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.74**	0.10	1	B5G0179	07/12/2015	07/13/15 13:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-5
Lab ID: 1502373-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Arsenic	**15**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Barium	**100**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Cadmium	**2.7**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Chromium	**38**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Copper	**77**	2.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Lead	**89**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Molybdenum	**1.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Nickel	**24**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Thallium	**2.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Vanadium	**69**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Zinc	**88**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.86**	0.10	1	B5G0179	07/12/2015	07/13/15 13:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-6
Lab ID: 1502373-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Arsenic	**17**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Barium	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Cadmium	**3.3**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Chromium	**47**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Copper	**78**	2.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Lead	**140**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Molybdenum	**2.8**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Nickel	**29**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Thallium	**2.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Vanadium	**84**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Zinc	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.5**	1.0	10	B5G0179	07/12/2015	07/13/15 14:13	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-7
Lab ID: 1502373-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Arsenic	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Beryllium	**1.3**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Cadmium	**2.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Chromium	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Cobalt	**20**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Copper	**88**	2.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Lead	**74**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Nickel	**26**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Thallium	**3.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Vanadium	**100**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Zinc	**89**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.4**	0.10	1	B5G0179	07/12/2015	07/13/15 13:26	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-8
Lab ID: 1502373-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Arsenic	**91**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Barium	**72**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Beryllium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Cadmium	**5.8**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Chromium	**36**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Cobalt	**14**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Copper	**430**	4.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Lead	**1800**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Molybdenum	**17**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Nickel	**28**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Selenium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Silver	**2.0**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Thallium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Vanadium	**76**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Zinc	**750**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**44**	5.0	50	B5G0179	07/12/2015	07/13/15 14:15	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-9
Lab ID: 1502373-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Arsenic	**56**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Barium	**69**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Cadmium	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Chromium	**18**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Copper	**310**	2.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Lead	**1000**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Molybdenum	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Nickel	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Selenium	**2.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Silver	**28**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Thallium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Vanadium	**32**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Zinc	**340**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**15**	5.0	50	B5G0179	07/12/2015	07/13/15 14:17	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Client Sample ID WR-10
Lab ID: 1502373-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Arsenic	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Barium	**140**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Cadmium	**6.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Chromium	**29**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Cobalt	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Copper	**110**	2.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Lead	**340**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Molybdenum	**5.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Nickel	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Thallium	**1.4**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Vanadium	**68**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Zinc	**270**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**7.5**	2.0	20	B5G0179	07/12/2015	07/13/15 14:19	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-11
Lab ID: 1502373-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Arsenic	**38**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Cadmium	**8.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Chromium	**40**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Cobalt	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Copper	**160**	2.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Lead	**750**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Molybdenum	**6.9**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Nickel	**28**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Thallium	**2.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Vanadium	**77**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Zinc	**310**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**11**	2.0	20	B5G0179	07/12/2015	07/13/15 14:21	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-12
Lab ID: 1502373-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Arsenic	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Barium	**100**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Cadmium	**8.9**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Chromium	**25**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Cobalt	**16**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Lead	**580**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Molybdenum	**4.4**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Nickel	**22**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Thallium	**1.7**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Vanadium	**60**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Zinc	**2000**	2.0	2	B5G0177	07/13/2015	07/14/15 09:30	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**9.7**	2.0	20	B5G0179	07/12/2015	07/13/15 14:23	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-13
Lab ID: 1502373-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Arsenic	**40**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Barium	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Cadmium	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Chromium	**32**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Cobalt	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Copper	**250**	2.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Lead	**1000**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Molybdenum	**8.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Nickel	**38**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 12:01	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Thallium	**1.2**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Vanadium	**71**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Zinc	**710**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**23**	5.0	50	B5G0179	07/12/2015	07/13/15 14:25	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-14
Lab ID: 1502373-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Arsenic	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Chromium	**47**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Lead	**150**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Molybdenum	**4.2**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Nickel	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Selenium	**1.9**	1.0	1	B5G0177	07/13/2015	07/14/15 12:03	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Thallium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Vanadium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Zinc	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**2.2**	0.20	2	B5G0179	07/12/2015	07/13/15 14:31	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-15
Lab ID: 1502373-15

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Arsenic	**18**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Barium	**83**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Cadmium	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Chromium	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Cobalt	**23**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Copper	**230**	2.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Lead	**800**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Molybdenum	**5.7**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Nickel	**44**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Thallium	**1.4**	1.0	1	B5G0177	07/13/2015	07/14/15 12:05	
Vanadium	**86**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Zinc	**420**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**6.1**	2.0	20	B5G0179	07/12/2015	07/13/15 14:41	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-16
Lab ID: 1502373-16

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Arsenic	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Barium	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Cadmium	**1.0**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Chromium	**49**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Cobalt	**12**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Lead	**180**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Molybdenum	**1.8**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Nickel	**33**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Thallium	**2.3**	1.0	1	B5G0177	07/13/2015	07/14/15 12:07	
Vanadium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Zinc	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.2**	1.0	10	B5G0179	07/12/2015	07/13/15 14:43	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-17
Lab ID: 1502373-17

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Arsenic	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Chromium	**46**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Cobalt	**16**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Copper	**130**	2.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Lead	**93**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Nickel	**37**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Thallium	**4.5**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Vanadium	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Zinc	**72**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.1**	0.10	1	B5G0179	07/12/2015	07/13/15 13:53	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-18
Lab ID: 1502373-18

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Arsenic	**22**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Barium	**72**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Beryllium	**1.0**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Chromium	**80**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Cobalt	**8.3**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Copper	**140**	2.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Lead	**270**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Nickel	**39**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Selenium	**3.2**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Thallium	**4.4**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Vanadium	**93**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Zinc	**83**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**6.4**	2.0	20	B5G0179	07/12/2015	07/13/15 14:45	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-19
Lab ID: 1502373-19

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Arsenic	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Barium	**74**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Chromium	**51**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Cobalt	**7.8**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Copper	**150**	2.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Lead	**240**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Nickel	**27**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Selenium	**2.3**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Thallium	**3.9**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Vanadium	**92**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Zinc	**77**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**10**	2.0	20	B5G0179	07/12/2015	07/13/15 14:47	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-20
Lab ID: 1502373-20

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Arsenic	**22**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Barium	**94**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Beryllium	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Cadmium	**1.4**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Chromium	**42**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Cobalt	**11**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Copper	**140**	2.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Lead	**350**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Molybdenum	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Nickel	**32**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Selenium	**2.0**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Silver	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Thallium	**6.1**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Vanadium	**86**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Zinc	**93**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**18**	5.0	50	B5G0180	07/12/2015	07/13/15 14:33	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0177 - EPA 3050B_S									
Blank (B5G0177-BLK1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5G0177-BS1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	45.8232	2.0	50.0000		91.6	80 - 120			
Arsenic	44.0781	1.0	50.0000		88.2	80 - 120			
Barium	47.2030	1.0	50.0000		94.4	80 - 120			
Beryllium	45.3593	1.0	50.0000		90.7	80 - 120			
Cadmium	44.7165	1.0	50.0000		89.4	80 - 120			
Chromium	47.9251	1.0	50.0000		95.9	80 - 120			
Cobalt	46.1278	1.0	50.0000		92.3	80 - 120			
Copper	48.9339	2.0	50.0000		97.9	80 - 120			
Lead	45.5758	1.0	50.0000		91.2	80 - 120			
Molybdenum	48.7444	1.0	50.0000		97.5	80 - 120			
Nickel	46.0806	1.0	50.0000		92.2	80 - 120			
Selenium	41.3485	1.0	50.0000		82.7	80 - 120			
Silver	45.8322	1.0	50.0000		91.7	80 - 120			
Thallium	44.9632	1.0	50.0000		89.9	80 - 120			
Vanadium	47.1206	1.0	50.0000		94.2	80 - 120			
Zinc	43.2900	1.0	50.0000		86.6	80 - 120			
Matrix Spike (B5G0177-MS1)		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	63.5129	2.0	125.000	ND	50.8	28 - 106			
Arsenic	83.5756	1.0	125.000	0.549600	66.4	57 - 109			
Barium	192.497	1.0	125.000	113.847	62.9	18 - 159			
Beryllium	84.5412	1.0	125.000	1.00294	66.8	61 - 107			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0177 - EPA 3050B_S (continued)									
Matrix Spike (B5G0177-MS1) - Continued		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Cadmium	75.2921	1.0	125.000	ND	60.2	53 - 104			
Chromium	100.916	1.0	125.000	16.6260	67.4	53 - 121			
Cobalt	87.7460	1.0	125.000	8.55013	63.4	55 - 109			
Copper	152.357	2.0	125.000	40.5713	89.4	58 - 124			
Lead	80.0530	1.0	125.000	3.89531	60.9	35 - 129			
Molybdenum	76.9315	1.0	125.000	ND	61.5	57 - 108			
Nickel	90.8793	1.0	125.000	12.0324	63.1	44 - 122			
Selenium	77.8190	1.0	125.000	ND	62.3	54 - 104			
Silver	86.0875	1.0	125.000	ND	68.9	60 - 112			
Thallium	80.9266	1.0	125.000	5.79196	60.1	50 - 103			
Vanadium	117.986	1.0	125.000	34.3448	66.9	54 - 123			
Zinc	130.107	1.0	125.000	55.8794	59.4	29 - 132			
Matrix Spike Dup (B5G0177-MSD1)		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	62.6374	2.0	125.000	ND	50.1	28 - 106	1.39	20	
Arsenic	86.0482	1.0	125.000	0.549600	68.4	57 - 109	2.92	20	
Barium	204.716	1.0	125.000	113.847	72.7	18 - 159	6.15	20	
Beryllium	87.5206	1.0	125.000	1.00294	69.2	61 - 107	3.46	20	
Cadmium	77.0958	1.0	125.000	ND	61.7	53 - 104	2.37	20	
Chromium	103.658	1.0	125.000	16.6260	69.6	53 - 121	2.68	20	
Cobalt	90.1107	1.0	125.000	8.55013	65.2	55 - 109	2.66	20	
Copper	152.188	2.0	125.000	40.5713	89.3	58 - 124	0.111	20	
Lead	82.8500	1.0	125.000	3.89531	63.2	35 - 129	3.43	20	
Molybdenum	80.6236	1.0	125.000	ND	64.5	57 - 108	4.69	20	
Nickel	93.4194	1.0	125.000	12.0324	65.1	44 - 122	2.76	20	
Selenium	81.5087	1.0	125.000	ND	65.2	54 - 104	4.63	20	
Silver	88.0734	1.0	125.000	ND	70.5	60 - 112	2.28	20	
Thallium	83.3367	1.0	125.000	5.79196	62.0	50 - 103	2.93	20	
Vanadium	121.716	1.0	125.000	34.3448	69.9	54 - 123	3.11	20	
Zinc	130.523	1.0	125.000	55.8794	59.7	29 - 132	0.319	20	
Batch B5G0178 - EPA 3050B_S									
Blank (B5G0178-BLK1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0178 - EPA 3050B_S (continued)									
Blank (B5G0178-BLK1) - Continued					Prepared: 7/13/2015 Analyzed: 7/13/2015				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5G0178-BS1)					Prepared: 7/13/2015 Analyzed: 7/13/2015				
Antimony	45.4378	2.0	50.0000		90.9	80 - 120			
Arsenic	43.9709	1.0	50.0000		87.9	80 - 120			
Barium	47.0538	1.0	50.0000		94.1	80 - 120			
Beryllium	45.2533	1.0	50.0000		90.5	80 - 120			
Cadmium	44.0508	1.0	50.0000		88.1	80 - 120			
Chromium	47.9214	1.0	50.0000		95.8	80 - 120			
Cobalt	46.2578	1.0	50.0000		92.5	80 - 120			
Copper	48.5846	2.0	50.0000		97.2	80 - 120			
Lead	45.0358	1.0	50.0000		90.1	80 - 120			
Molybdenum	48.3974	1.0	50.0000		96.8	80 - 120			
Nickel	45.7675	1.0	50.0000		91.5	80 - 120			
Selenium	40.9602	1.0	50.0000		81.9	80 - 120			
Silver	45.9142	1.0	50.0000		91.8	80 - 120			
Thallium	44.6304	1.0	50.0000		89.3	80 - 120			
Vanadium	47.3435	1.0	50.0000		94.7	80 - 120			
Zinc	42.7714	1.0	50.0000		85.5	80 - 120			
Matrix Spike (B5G0178-MS1)		**Source: 1502373-20**			Prepared: 7/13/2015 Analyzed: 7/13/2015				
Antimony	72.1714	2.0	125.000	ND	57.7	28 - 106			
Arsenic	113.238	1.0	125.000	21.9436	73.0	57 - 109			
Barium	178.637	1.0	125.000	94.0059	67.7	18 - 159			
Beryllium	93.3127	1.0	125.000	0.948675	73.9	61 - 107			
Cadmium	83.1470	1.0	125.000	1.42726	65.4	53 - 104			
Chromium	135.824	1.0	125.000	42.4811	74.7	53 - 121			
Cobalt	96.8476	1.0	125.000	10.7324	68.9	55 - 109			
Copper	244.496	2.0	125.000	140.035	83.6	58 - 124			
Lead	423.772	1.0	125.000	345.386	62.7	35 - 129			
Molybdenum	88.3895	1.0	125.000	ND	70.7	57 - 108			
Nickel	117.190	1.0	125.000	32.0863	68.1	44 - 122			
Selenium	85.5427	1.0	125.000	2.03997	66.8	54 - 104			
Silver	94.2580	1.0	125.000	ND	75.4	60 - 112			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0178 - EPA 3050B_S (continued)									
Matrix Spike (B5G0178-MS1) - Continued		**Source: 1502373-20**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Thallium	89.1145	1.0	125.000	6.12574	66.4	50 - 103			
Vanadium	176.281	1.0	125.000	85.5700	72.6	54 - 123			
Zinc	167.032	1.0	125.000	93.4828	58.8	29 - 132			
Matrix Spike Dup (B5G0178-MSD1)		**Source: 1502373-20**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	75.5937	2.0	125.000	ND	60.5	28 - 106	4.63	20	
Arsenic	115.220	1.0	125.000	21.9436	74.6	57 - 109	1.74	20	
Barium	181.407	1.0	125.000	94.0059	69.9	18 - 159	1.54	20	
Beryllium	96.5352	1.0	125.000	0.948675	76.5	61 - 107	3.39	20	
Cadmium	85.2366	1.0	125.000	1.42726	67.0	53 - 104	2.48	20	
Chromium	136.493	1.0	125.000	42.4811	75.2	53 - 121	0.491	20	
Cobalt	98.7126	1.0	125.000	10.7324	70.4	55 - 109	1.91	20	
Copper	249.898	2.0	125.000	140.035	87.9	58 - 124	2.19	20	
Lead	406.404	1.0	125.000	345.386	48.8	35 - 129	4.18	20	
Molybdenum	91.9658	1.0	125.000	ND	73.6	57 - 108	3.97	20	
Nickel	118.560	1.0	125.000	32.0863	69.2	44 - 122	1.16	20	
Selenium	90.0422	1.0	125.000	2.03997	70.4	54 - 104	5.13	20	
Silver	96.2403	1.0	125.000	ND	77.0	60 - 112	2.08	20	
Thallium	90.5119	1.0	125.000	6.12574	67.5	50 - 103	1.56	20	
Vanadium	181.468	1.0	125.000	85.5700	76.7	54 - 123	2.90	20	
Zinc	168.352	1.0	125.000	93.4828	59.9	29 - 132	0.788	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0179 - EPA 7471_S									
Blank (B5G0179-BLK1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	ND	0.10			NR				
LCS (B5G0179-BS1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.826522	0.10	0.833333		99.2	80 - 120			
Matrix Spike (B5G0179-MS1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	1.09799	0.10	0.833333	0.169821	111	70 - 130			
Matrix Spike Dup (B5G0179-MSD1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.956224	0.10	0.819672	0.169821	95.9	70 - 130	13.8	20	
Post Spike (B5G0179-PS1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.008078		5.00000E-3	0.002038	121	85 - 115			M1
Batch B5G0180 - EPA 7471_S									
Blank (B5G0180-BLK1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	ND	0.10			NR				
LCS (B5G0180-BS1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.840524	0.10	0.833333		101	80 - 120			
Matrix Spike (B5G0180-MS1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	17.5185	5.0	0.833333	18.4914	-117	70 - 130			M1
Matrix Spike Dup (B5G0180-MSD1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	19.7357	5.0	0.833333	18.4914	149	70 - 130	11.9	20	M1
Post Spike (B5G0180-PS1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.450718		5.00000E-3	0.221897	4580	85 - 115			M1

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Notes and Definitions

M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED ATECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 3.2		
☐ Other:	4. SEALED	☐	☑	Blue ice		

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959
Tel: 530 265 6090 x 203
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: Kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote No:
PO #:
Special Instructions/Comments: Total Title 22 Metals incl Mercury. Please hold remaining sample for possible additional solubility analysis

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 7000(Title 22 Metals); TO-15

Encircle Sample Matrix: SOILS SEDIMENT / SLUDGE; SOLIDS / WIPE/ FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

TAT

Container: # 802 Glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn ((Ac)2; 6=NaOH; 7=NA2S2O3

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 7000(Title 22 Metals)	TO-15	SOILS SEDIMENT / SLUDGE	SOLIDS / WIPE/ FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	# 802 Glass	REMARKS
1	1502373-1	QM-1	7/7/15	10 am							X		X						X	
2	-2	QM-2		10 am							X									
3	-3	QM-3		10: am							X									
4	-4	QM-4		10: am							X									
5	-5	QM-5		10: am							X									
6	-6	QM-6		10: am							X									
7	-7	QM-7		11: am							X									
8	-8	WR-8		11: am							X									
9	-9	WR-9		11: am							X									
10	-10	WR-10		11: am							X									

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	7/8/15	11:00	Branch Manager	7/9/15	08:53
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport: ☐ Client ☐ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other: _____

Sample Conditions Upon Receipt

Condition	Y	N	Condition	Y	N
1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 3.2		
4. SEALED	☐	☑	Blue Ice		

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959
Tel: 530 265 6090 x 203
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: kleach@sgmail.com
Company: Sierra Streams Inst.
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote No:
PO #:
Special Instructions/Comments: see pg 1 Standard TAT

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE / FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

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ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 / 7000(Title 22 Metals)	TO-15	SOIL / SEDIMENT / SLUDGE	SOLIDS / WIPE / FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	#	REMARKS
1	1502373-11	WR-11	7/7/15	12pm							X		X						X	
2	-12	WR-12									X									
3	-13	SR-13									X									
4	-14	SR-14									X									
5	-15	SR-15									X									
6	-16	SR-16									X									
7	-17	SR-17									X									
8	-18	RF-18		1pm							X									
9	-19	RF-19									X									
10	-20	RF-20									X									

TERMS

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   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
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11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Kyle Leach — Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	7/8/15	11:00	ABSWEN FRANGIONI	7/9/15	08:53
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

November 06, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1503729
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on October 30, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR8-B	1503729-01	Soil	10/27/15 10:00	10/30/15 9:00
WR21	1503729-02	Soil	10/27/15 10:10	10/30/15 9:00
WR21-1'	1503729-03	Soil	10/27/15 10:16	10/30/15 9:00
WR9-.75	1503729-04	Soil	10/27/15 10:24	10/30/15 9:00
WR13-B	1503729-05	Soil	10/27/15 10:30	10/30/15 9:00
WR9-1.5'	1503729-06	Soil	10/27/15 10:08	10/30/15 9:00
SR22	1503729-07	Soil	10/27/15 10:00	10/30/15 9:00
WR23	1503729-08	Soil	10/27/15 10:44	10/30/15 9:00
WR24	1503729-09	Soil	10/27/15 10:50	10/30/15 9:00
WR25	1503729-10	Soil	10/27/15 10:56	10/30/15 9:00
US26	1503729-11	Soil	10/27/15 11:00	10/30/15 9:00
US27	1503729-12	Soil	10/27/15 11:10	10/30/15 9:00
US28	1503729-13	Soil	10/27/15 11:20	10/30/15 9:00
US29	1503729-14	Soil	10/27/15 11:30	10/30/15 9:00

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR8-B
Lab ID: 1503729-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Arsenic	**57**	2.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Barium	**100**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Cadmium	**6.9**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Chromium	**39**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Cobalt	**21**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Copper	**510**	2.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Lead	**1400**	2.0	2	B5K0014	11/02/2015	11/02/15 17:10	D6
Molybdenum	**17**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Nickel	**29**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Selenium	**3.6**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Silver	**8.1**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Thallium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Vanadium	**72**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Zinc	**480**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**100**	10	100	B5K0015	11/02/2015	11/03/15 11:16	

STLC Mercury by AA (Cold Vapor) EPA 7470A

Analyst: SB

Analyte	Result (ug/L)	PQL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**5.4**	1.0	1	B5K0178	11/06/2015	11/06/15 13:06	

TCLP Mercury by AA (Cold Vapor) by EPA 7470A

Analyst: SB

Analyte	Result (ug/L)	PQL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.20	1	B5K0162	11/05/2015	11/06/15 12:48	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR21
Lab ID: 1503729-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	40	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Arsenic	**250**	20	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Barium	**51**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Cadmium	**5.5**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Chromium	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Cobalt	**4.4**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Copper	**340**	2.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Lead	**20000**	20	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Molybdenum	**14**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Nickel	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Selenium	**3.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Silver	**73**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Thallium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Vanadium	**23**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Zinc	**630**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	

TCLP Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**230**	1.0	20	B5K0138	11/05/2015	11/06/15 09:38	D6

STLC Metals by ICP-AES by EPA 6010B

Analyst: RR

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Arsenic	**1.0**	1.0	20	B5K0176	11/06/2015	11/06/15 10:18	
Copper	**2.4**	1.0	20	B5K0176	11/06/2015	11/06/15 10:18	
Lead	**560**	2.5	50	B5K0176	11/06/2015	11/06/15 10:30	D6

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR21

Lab ID: 1503729-02

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**11**	5.0	50	B5K0015	11/02/2015	11/03/15 11:18	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Client Sample ID WR21-1'
Lab ID: 1503729-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	40	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Arsenic	**210**	20	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Barium	**44**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Cadmium	**6.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Chromium	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Cobalt	**7.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Copper	**380**	2.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Lead	**19000**	20	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Molybdenum	**16**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Nickel	**14**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Selenium	**2.1**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Silver	**57**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Thallium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Vanadium	**23**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Zinc	**780**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**19**	5.0	50	B5K0015	11/02/2015	11/03/15 11:20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR9-.75

Lab ID: 1503729-04

Title 22 Metals by ICP-AES EPA 6010B **Analyst: RR**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	10	5	B5K0014	11/02/2015	11/02/15 17:29	D6
Arsenic	**53**	5.0	5	B5K0014	11/02/2015	11/02/15 17:29	D6
Barium	**97**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Beryllium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Cadmium	**13**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Chromium	**22**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Cobalt	**14**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Copper	**210**	10	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Lead	**1500**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Molybdenum	**18**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Nickel	**22**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Selenium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Silver	**26**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Thallium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Vanadium	**47**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Zinc	**460**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**26**	5.0	50	B5K0015	11/02/2015	11/03/15 11:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR13-B
Lab ID: 1503729-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Arsenic	**36**	2.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Barium	**130**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Beryllium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Cadmium	**19**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Chromium	**37**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Cobalt	**24**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Copper	**220**	4.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Lead	**970**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Molybdenum	**9.2**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Nickel	**47**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Selenium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Silver	**3.9**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Thallium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Vanadium	**75**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Zinc	**720**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**14**	5.0	50	B5K0015	11/02/2015	11/03/15 11:24	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR9-1.5'
Lab ID: 1503729-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	**3.3**	2.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Arsenic	**52**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Barium	**90**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Cadmium	**10**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Chromium	**23**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Cobalt	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Copper	**240**	2.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Lead	**1400**	5.0	5	B5K0052	11/03/2015	11/04/15 11:41	D6
Molybdenum	**20**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Nickel	**23**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Selenium	**2.3**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Silver	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Vanadium	**50**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Zinc	**390**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**26**	5.0	50	B5K0055	11/03/2015	11/04/15 11:41	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID SR22
Lab ID: 1503729-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Arsenic	**68**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Barium	**74**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Cadmium	**11**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Chromium	**25**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Cobalt	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Copper	**190**	2.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Lead	**740**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Molybdenum	**21**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Nickel	**27**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Selenium	**5.1**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Silver	**22**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Vanadium	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Zinc	**310**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**4.5**	2.0	20	B5K0055	11/03/2015	11/04/15 11:43	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR23
Lab ID: 1503729-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Arsenic	**40**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Barium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Cadmium	**5.5**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Chromium	**21**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Cobalt	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Copper	**230**	2.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Lead	**790**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Molybdenum	**5.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Nickel	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Selenium	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Silver	**6.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Vanadium	**56**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Zinc	**220**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**9.7**	2.0	20	B5K0055	11/03/2015	11/04/15 11:45	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR24
Lab ID: 1503729-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Arsenic	**43**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Barium	**89**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Cadmium	**8.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Chromium	**36**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Cobalt	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Copper	**170**	2.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Lead	**930**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Molybdenum	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Nickel	**30**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Selenium	**3.2**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Silver	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Vanadium	**61**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Zinc	**390**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**19**	5.0	50	B5K0055	11/03/2015	11/04/15 11:47	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR25
Lab ID: 1503729-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Arsenic	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Barium	**140**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Cadmium	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Chromium	**39**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Cobalt	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Copper	**120**	2.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Lead	**150**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Molybdenum	**6.5**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Nickel	**25**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Selenium	**2.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Silver	**1.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Vanadium	**80**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Zinc	**100**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.7**	0.10	1	B5K0055	11/03/2015	11/04/15 10:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US26
Lab ID: 1503729-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Arsenic	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Barium	**180**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Cadmium	**1.1**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Chromium	**80**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Cobalt	**19**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Copper	**68**	2.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Lead	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Molybdenum	**2.3**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Nickel	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Selenium	**2.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Vanadium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Zinc	**51**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:14	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US27
Lab ID: 1503729-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Arsenic	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Barium	**130**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Chromium	**75**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Cobalt	**19**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Copper	**72**	2.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Lead	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Molybdenum	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Nickel	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Selenium	**4.1**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Vanadium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Zinc	**43**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US28
Lab ID: 1503729-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Arsenic	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Barium	**100**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Chromium	**55**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Cobalt	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Copper	**75**	2.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Lead	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Molybdenum	**2.6**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Nickel	**36**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Selenium	**2.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Vanadium	**97**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Zinc	**38**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:18	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US29
Lab ID: 1503729-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Arsenic	**7.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Barium	**210**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Chromium	**63**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Cobalt	**17**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Copper	**39**	2.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Lead	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Molybdenum	**1.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Nickel	**40**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Selenium	**2.2**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Vanadium	**92**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Zinc	**46**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0014 - EPA 3050B_S									
Blank (B5K0014-BLK1)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
Blank (B5K0014-BLK2)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
LCS (B5K0014-BS1)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	50.7756	1.0	50.0000		102	80 - 120			
Beryllium	48.1478	1.0	50.0000		96.3	80 - 120			
Cadmium	48.6105	1.0	50.0000		97.2	80 - 120			
Chromium	51.6108	1.0	50.0000		103	80 - 120			
Cobalt	49.0124	1.0	50.0000		98.0	80 - 120			
Copper	49.1727	2.0	50.0000		98.3	80 - 120			
Lead	48.0093	1.0	50.0000		96.0	80 - 120			
Molybdenum	50.3312	1.0	50.0000		101	80 - 120			
Nickel	48.3439	1.0	50.0000		96.7	80 - 120			
Selenium	44.4272	1.0	50.0000		88.9	80 - 120			
Silver	48.3074	1.0	50.0000		96.6	80 - 120			
Thallium	50.5248	1.0	50.0000		101	80 - 120			
Vanadium	49.2443	1.0	50.0000		98.5	80 - 120			
Zinc	45.9146	1.0	50.0000		91.8	80 - 120			
LCS (B5K0014-BS2)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	48.6075	2.0	50.0000		97.2	80 - 120			
Arsenic	48.8113	1.0	50.0000		97.6	80 - 120			
Matrix Spike (B5K0014-MS1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0014 - EPA 3050B_S (continued)									
Matrix Spike (B5K0014-MS1) - Continued		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	190.215	1.0	125.000	95.3322	75.9	18 - 159			
Beryllium	99.3511	1.0	125.000	0.383649	79.2	61 - 107			
Cadmium	98.3036	1.0	125.000	1.37893	77.5	53 - 104			
Chromium	131.041	1.0	125.000	27.6064	82.7	53 - 121			
Cobalt	104.878	1.0	125.000	8.73980	76.9	55 - 109			
Copper	130.870	2.0	125.000	20.6394	88.2	58 - 124			
Lead	98.8968	1.0	125.000	3.91384	76.0	35 - 129			
Molybdenum	98.6790	1.0	125.000	2.34100	77.1	57 - 108			
Nickel	119.545	1.0	125.000	22.8191	77.4	44 - 122			
Selenium	95.2810	1.0	125.000	ND	76.2	54 - 104			
Silver	102.144	1.0	125.000	ND	81.7	60 - 112			
Thallium	97.5902	1.0	125.000	2.00708	76.5	50 - 103			
Vanadium	147.832	1.0	125.000	49.6292	78.6	54 - 123			
Zinc	138.239	1.0	125.000	46.0876	73.7	29 - 132			
Matrix Spike (B5K0014-MS2)		**Source: 1503684-01RE1**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	77.4334	2.0	125.000	ND	61.9	28 - 106			
Arsenic	128.988	1.0	125.000	27.5562	81.1	57 - 109			
Matrix Spike Dup (B5K0014-MSD1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	190.106	1.0	125.000	95.3322	75.8	18 - 159	0.0573	20	
Beryllium	100.044	1.0	125.000	0.383649	79.7	61 - 107	0.695	20	
Cadmium	99.3634	1.0	125.000	1.37893	78.4	53 - 104	1.07	20	
Chromium	129.937	1.0	125.000	27.6064	81.9	53 - 121	0.846	20	
Cobalt	106.426	1.0	125.000	8.73980	78.1	55 - 109	1.47	20	
Copper	130.726	2.0	125.000	20.6394	88.1	58 - 124	0.110	20	
Lead	104.286	1.0	125.000	3.91384	80.3	35 - 129	5.30	20	
Molybdenum	100.865	1.0	125.000	2.34100	78.8	57 - 108	2.19	20	
Nickel	119.763	1.0	125.000	22.8191	77.6	44 - 122	0.182	20	
Selenium	98.4744	1.0	125.000	ND	78.8	54 - 104	3.30	20	
Silver	103.390	1.0	125.000	ND	82.7	60 - 112	1.21	20	
Thallium	96.7735	1.0	125.000	2.00708	75.8	50 - 103	0.840	20	
Vanadium	149.933	1.0	125.000	49.6292	80.2	54 - 123	1.41	20	
Zinc	139.314	1.0	125.000	46.0876	74.6	29 - 132	0.775	20	
Matrix Spike Dup (B5K0014-MSD2)		**Source: 1503684-01RE1**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	81.0953	2.0	125.000	ND	64.9	28 - 106	4.62	20	
Arsenic	130.602	1.0	125.000	27.5562	82.4	57 - 109	1.24	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0052 - EPA 3050B_S									
Blank (B5K0052-BLK1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5K0052-BS1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	48.4280	2.0	50.0000		96.9	80 - 120			
Arsenic	46.5596	1.0	50.0000		93.1	80 - 120			
Barium	50.6490	1.0	50.0000		101	80 - 120			
Beryllium	47.9524	1.0	50.0000		95.9	80 - 120			
Cadmium	48.2329	1.0	50.0000		96.5	80 - 120			
Chromium	50.9384	1.0	50.0000		102	80 - 120			
Cobalt	49.0270	1.0	50.0000		98.1	80 - 120			
Copper	48.4809	2.0	50.0000		97.0	80 - 120			
Lead	48.1681	1.0	50.0000		96.3	80 - 120			
Molybdenum	49.5391	1.0	50.0000		99.1	80 - 120			
Nickel	48.1495	1.0	50.0000		96.3	80 - 120			
Selenium	44.2294	1.0	50.0000		88.5	80 - 120			
Silver	49.3429	1.0	50.0000		98.7	80 - 120			
Thallium	49.6844	1.0	50.0000		99.4	80 - 120			
Vanadium	49.1347	1.0	50.0000		98.3	80 - 120			
Zinc	51.3014	1.0	50.0000		103	80 - 120			
Matrix Spike (B5K0052-MS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	98.5828	2.0	125.000	0.859013	78.2	28 - 106			
Arsenic	112.234	1.0	125.000	2.08859	88.1	57 - 109			
Barium	150.099	1.0	125.000	45.2340	83.9	18 - 159			
Beryllium	112.308	1.0	125.000	0.377467	89.5	61 - 107			
Cadmium	105.149	1.0	125.000	ND	84.1	53 - 104			
Chromium	207.452	1.0	125.000	105.795	81.3	53 - 121			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0052 - EPA 3050B_S (continued)									
Matrix Spike (B5K0052-MS1) - Continued		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Cobalt	113.217	1.0	125.000	4.95417	86.6	55 - 109			
Copper	136.921	2.0	125.000	18.0394	95.1	58 - 124			
Lead	110.873	1.0	125.000	3.30797	86.1	35 - 129			
Molybdenum	120.681	1.0	125.000	8.45354	89.8	57 - 108			
Nickel	115.348	1.0	125.000	7.96403	85.9	44 - 122			
Selenium	107.259	1.0	125.000	0.509803	85.4	54 - 104			
Silver	111.107	1.0	125.000	ND	88.9	60 - 112			
Thallium	108.816	1.0	125.000	ND	87.1	50 - 103			
Vanadium	134.490	1.0	125.000	24.3424	88.1	54 - 123			
Zinc	131.083	1.0	125.000	29.2925	81.4	29 - 132			
Matrix Spike Dup (B5K0052-MSD1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	100.129	2.0	125.000	0.859013	79.4	28 - 106	1.56	20	
Arsenic	115.262	1.0	125.000	2.08859	90.5	57 - 109	2.66	20	
Barium	154.592	1.0	125.000	45.2340	87.5	18 - 159	2.95	20	
Beryllium	113.519	1.0	125.000	0.377467	90.5	61 - 107	1.07	20	
Cadmium	106.172	1.0	125.000	ND	84.9	53 - 104	0.968	20	
Chromium	214.955	1.0	125.000	105.795	87.3	53 - 121	3.55	20	
Cobalt	114.382	1.0	125.000	4.95417	87.5	55 - 109	1.02	20	
Copper	140.067	2.0	125.000	18.0394	97.6	58 - 124	2.27	20	
Lead	111.278	1.0	125.000	3.30797	86.4	35 - 129	0.365	20	
Molybdenum	119.839	1.0	125.000	8.45354	89.1	57 - 108	0.700	20	
Nickel	116.597	1.0	125.000	7.96403	86.9	44 - 122	1.08	20	
Selenium	106.543	1.0	125.000	0.509803	84.8	54 - 104	0.670	20	
Silver	112.538	1.0	125.000	ND	90.0	60 - 112	1.28	20	
Thallium	108.107	1.0	125.000	ND	86.5	50 - 103	0.654	20	
Vanadium	136.994	1.0	125.000	24.3424	90.1	54 - 123	1.84	20	
Zinc	135.536	1.0	125.000	29.2925	85.0	29 - 132	3.34	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

TCLP Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0138 - EPA 3010A_S									
Blank (B5K0138-BLK1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	ND	0.050			NR				
LCS (B5K0138-BS1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	0.942737	0.050	1.00000		94.3	80 - 120			
Matrix Spike (B5K0138-MS1)		**Source: 1503729-02**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	231.459	1.0	2.50000	225.889	223	77 - 121			D6, M1
Matrix Spike Dup (B5K0138-MSD1)		**Source: 1503729-02**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	227.992	1.0	2.50000	225.889	84.2	77 - 121	1.51	20	D6

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

STLC Metals by ICP-AES by EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0176 - STLC_S Extraction									
Blank (B5K0176-BLK1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	ND	1.0			NR				
Copper	ND	1.0			NR				
Lead	ND	1.0			NR				
LCS (B5K0176-BS1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	1.86205		2.00000		93.1	80 - 120			
Copper	2.08158		2.00000		104	80 - 120			
Lead	1.98020		2.00000		99.0	80 - 120			
Duplicate (B5K0176-DUP1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	ND	1.0		ND	NR			20	
Copper	0.236780	1.0		0.239484	NR		1.14	20	
Lead	0.226691	1.0		0.227873	NR		0.520	20	
Matrix Spike (B5K0176-MS1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	2.68246		2.50000	0.159260	101	90 - 110			
Copper	2.76153		2.50000	0.239484	101	62 - 129			
Lead	2.58336		2.50000	0.227873	94.2	44 - 130			
Matrix Spike Dup (B5K0176-MSD1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	2.57406		2.50000	0.159260	96.6	90 - 110	4.12	20	
Copper	2.68186		2.50000	0.239484	97.7	62 - 129	2.93	20	
Lead	2.56495		2.50000	0.227873	93.5	44 - 130	0.715	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0015 - EPA 7471_S									
Blank (B5K0015-BLK1)				Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	ND	0.10			NR				
LCS (B5K0015-BS1)				Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.791380	0.10	0.833333		95.0	80 - 120			
Matrix Spike (B5K0015-MS1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.880681	0.10	0.833333	0.021069	103	70 - 130			
Matrix Spike Dup (B5K0015-MSD1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.865426	0.10	0.833333	0.021069	101	70 - 130	1.75	20	
Post Spike (B5K0015-PS1)		**Source: 1503700-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.005692		5.00000E-3	0.000542	103	85 - 115			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0055 - EPA 7471_S									
Blank (B5K0055-BLK1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	ND	0.10			NR				
LCS (B5K0055-BS1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.771171	0.10	0.833333		92.5	80 - 120			
Matrix Spike (B5K0055-MS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.976980	0.10	0.833333	0.178078	95.9	70 - 130			
Matrix Spike Dup (B5K0055-MSD1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.945413	0.10	0.833333	0.178078	92.1	70 - 130	3.28	20	
Post Spike (B5K0055-PS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.007262		5.00000E-3	0.002137	103	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

STLC Mercury by AA (Cold Vapor) EPA 7470A - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0178 - EPA 245.1/7470_S									
Blank (B5K0178-BLK1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	ND	0.20			NR				
LCS (B5K0178-BS1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	10.1760	0.20	10.0000		102	80 - 120			
Matrix Spike (B5K0178-MS1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	56.8608	1.0	50.0000	5.43035	103	70 - 130			
Matrix Spike Dup (B5K0178-MSD1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	57.7780	1.0	50.0000	5.43035	105	70 - 130	1.60	20	
Post Spike (B5K0178-PS1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	6.40506		5.00000	1.08607	106	85 - 115			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

TCLP Mercury by AA (Cold Vapor) by EPA 7470A - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0162 - EPA 245.1/7470_S									
Blank (B5K0162-BLK1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	ND	0.20			NR				
LCS (B5K0162-BS1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.1488	0.20	10.0000		101	80 - 120			
Matrix Spike (B5K0162-MS1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.1860	0.20	10.0000	ND	102	70 - 130			
Matrix Spike Dup (B5K0162-MSD1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.3801	0.20	10.0000	ND	104	70 - 130	1.89	20	
Post Spike (B5K0162-PS1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	5.34538		5.00000	0.023284	106	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Notes and Definitions

M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only					ATLCOC Ver:20130715
Method of Transport	Sample Conditions Upon Receipt				
	Condition	Y	N	Condition	Y N
Client / ATL	1. CHILLED	YES		5. # OF SAMPLES MATCH COC	
FedEx / OnTrac	2. HEADSPACE (VOA)			6. PRESERVED	
GSO	3. CONTAINER INTACT			7. COOLER TEMP, deg C: 6.0	
Other:	4. SEALED				

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street
City: Nevada City
State: CA
Zip: 95959
Tel: (530) 256-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: (SSI) Sierra Streams Institute
Address: 431 Uren St
City: Nevada City
State: CA
Zip: 95959

SEND INVOICE TO: same as SEND REPORT TO
Attn: same
Email:
Company:
Address:
City:
State:
Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #:
PO #:

Special Instructions/Comments: Please 72 hr Rush initial Title 22 metals on 5 samples this COC then run WET Metals and TCLP on sample with highest total lead and mercury results

Encircle or Write Requested Analysis: Select Analysis; Select Analysis; 6010 / 7000 (Title 22 Metals); Select Analysis; Select Analysis; Select Analysis; Select Analysis; Select Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis

Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix

Container: # 8oz glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NAS2O3

QA/QC: Routine / Caltrans / Legal / RWQCB / Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	6010 / 7000 (Title 22 Metals)	TAT	# 8oz glass	REMARKS
1	1507779 - 1	WR8-B	10/27/15	10:00 am	X	3	X	
2	2	WR21	10/27/15	10:10 am	X	3	X	
3	3	WR21-1'	10/27/15	10:16 am	X	3	X	
4	4	WR9-.75	10/27/15	10:24 am	X	3	X	
5	5	SR13-B	10/27/15	10:30 am	X	3	X	
6								
7								
8								
9								
10								

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	10/28/15	8 am		10/30/15	9am
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only					ATLCOC Ver:20130715
Method of Transport	Sample Conditions Upon Receipt				
	Condition	Y	N	Condition	Y	N
Client ✓ / FedEx / GSO / Other: / ATL / OnTrac	1. CHILLED	yes		5. # OF SAMPLES MATCH COC	
	2. HEADSPACE (VOA)			6. PRESERVED	
	3. CONTAINER INTACT			7. COOLER TEMP, deg C: 6.0	
	4. SEALED				

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street
City: Nevada City State: CA Zip: 95959
Tel: (530) 256-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: kleach08@gmail.com
Company: SSI
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: same as SEND REPORT TO
Attn: same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #:
PO #:
Special Instructions/Comments: Standard TAT these 9 samples for Title 22 metals

QA/QC: Routine, Caltrans, Legal, RWQCB Level IV

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	Select Analysis	Select Analysis	6010 / 7000 (Title 22 Metals)	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Select Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Enter Custom Analysis	Select Soil Matrix	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	Enter Custom Matrix	TAT	Container: # 4oz glass	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NaOSO3	REMARKS
1	1503729 - 6	WR9-1.5'	10/27/15	10:08 am			X																						5	82				
2	7	SR22	10/27/15	10:00 am			X																						5	X				
3	8	WR23	10/27/15	10:44 am			X																						5	X				
4	9	WR24	10/27/15	10:50 am			X																						5	X				
5	10	WR25	10/27/15	10:56 am			X																						5	X				
6	11	US26	10/27/15	11:00 am			X																						5	X				
7	12	US27	10/27/15	11:10 am			X																						5	X				
8	13	US28	10/27/15	11:20 am			X																						5	X				
9	14	US29	10/27/15	11:30 am			X																						5	X				
10																																		

TERMS

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   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
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   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
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   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	10/28/15	8 am	[illegible]	10/28/15	9:00

Diane Galvan

From: Kyle [kleach08@gmail.com]
Sent: Tuesday, November 03, 2015 6:37 PM
To: Diane Galvan
Subject: Re: Partial/Draft Results - SNC Environs (1503729-01/05)

Hi Diane
Please also add soluble arsenic and copper for sample WR21
Thanks
Kyle

Sent from my iPhone

November 16, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502373
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on July 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR-10	1502373-10	Soil	7/07/15 11:00	7/09/15 11:18
WR-12	1502373-12	Soil	7/07/15 12:00	7/09/15 11:18

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Client Sample ID WR-10

Lab ID: 1502373-10

STLC DI Metals by ICP-AES by EPA 6010B **Analyst: RR**

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.50	10	B5K0399	11/13/2015	11/13/15 13:53	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Client Sample ID WR-12
Lab ID: 1502373-12

STLC DI Metals by ICP-AES by EPA 6010B **Analyst: RR**

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.50	10	B5K0399	11/13/2015	11/13/15 14:05	

QUALITY CONTROL SECTION

STLC DI Metals by ICP-AES by EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0399 - STLC DI_S Extraction									
Blank (B5K0399-BLK1)				Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	ND	0.50			NR				
LCS (B5K0399-BS1)				Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.02350		2.00000		101	80 - 120			
Matrix Spike (B5K0399-MS1)		**Source: 1502373-10**		Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.54619		2.50000	0.035656	100	70 - 130			
Matrix Spike Dup (B5K0399-MSD1)		**Source: 1502373-10**		Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.56023		2.50000	0.035656	101	70 - 130	0.550	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

From: Kyle [kleach08@gmail.com]
Sent: Monday, November 09, 2015 6:00 PM
To: Diane Galvan
Subject: Re: Phone Message

Thank you
Yes please run the WET DI analysis for soluble lead on samples WR-10 WR 12 and WR-24 Standard turn around time
Thanks
Kyle

Sent from my iPhone

On Nov 9, 2015, at 3:53 PM, Diane Galvan <Diane@atlglobal.com> wrote:

Hi Kyle,

I've received your voice message and have been informed by our Sample Receiving we do have enough of samples WR10 (1502373-10), WR12 (1502373-12) and WR24 (1503729-09) remaining for WET-DI analysis. You may request the additional analysis via email correspondence or on a Chain of Custody, whichever you prefer.

Thanks,

Diane Galvan
Project Manager

<image001.jpg>**Advanced Technology Laboratories**
www.atlglobal.com
Tel: (562) 989-4045 ext. 238
Fax: (562) 989-4040

Advanced Technology Laboratories is a full-service environmental lab providing organic and inorganic analyses of soil, water, wastewater, storm water and hazardous waste samples. ATL is accredited by the State of California, NELAP and State of Oregon (Air) and holds various SBE, DBE and MBE certificates and a USDA soil permit. ATL takes pride in providing our customers with quick turnaround time, excellent customer service and defensible data while offering very competitive rates. *Advanced Technology Labs - Your Partner for Quality Environmental Testing*

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ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

April 22, 2015

Report to:
Kyle Leach
Sierra Streams Institute
431 Uren Street
Nevada City, CA 95959

cc: Justin Wood

Bill to:
Kyle Leach
Sierra Streams Institute
431 Uren Street
Nevada City, CA 95959

Project ID:
ACZ Project ID: L23651

Kyle Leach:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on April 06, 2015. This project has been assigned to ACZ's project number, L23651. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L23651. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after May 22, 2015. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.

Max Janicek has reviewed and approved this report.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Sierra Streams Institute
Project ID:
Sample ID: PROV-DRAIN

ACZ Sample ID: ***L23651-01***
Date Sampled: *03/31/15 11:00*
Date Received: *04/06/15*
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation								04/13/15 11:55	mss2
Cyanide, WAD	SM4500-CN I- distillation								04/13/15 14:36	mss2
Total Hot Plate Digestion	M200.2 ICP-MS								04/09/15 11:24	scp
Total Hot Plate Digestion	M200.2 ICP								04/09/15 16:28	aeb
Total Recoverable Digestion	M200.2 ICP-MS								04/10/15 11:00	scp

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Sierra Streams Institute
Project ID:
Sample ID: PROV-DRAIN

ACZ Sample ID: ***L23651-01***
Date Sampled: *03/31/15 11:00*
Date Received: *04/06/15*
Sample Matrix: *Surface Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	04/09/15 10:05	aeb
Aluminum, total	M200.7 ICP	1		U		mg/L	0.03	0.2	04/10/15 11:18	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	04/09/15 17:44	msh
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	04/10/15 1:00	pmc
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	04/09/15 17:44	msh
Arsenic, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0002	0.001	04/10/15 1:00	pmc
Barium, dissolved	M200.8 ICP-MS	1	0.0237			mg/L	0.0005	0.003	04/09/15 17:44	msh
Barium, total	M200.8 ICP-MS	1	0.0249			mg/L	0.0005	0.003	04/10/15 1:00	pmc
Beryllium, total recoverable	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	04/10/15 21:58	pmc
Cadmium, dissolved	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0001	0.0005	04/09/15 17:44	msh
Cadmium, total	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0001	0.0005	04/10/15 1:00	pmc
Calcium, dissolved	M200.7 ICP	1	12.9			mg/L	0.1	0.5	04/09/15 10:05	aeb
Chromium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0005	0.002	04/09/15 17:44	msh
Chromium, total	M200.8 ICP-MS	1		U		mg/L	0.0005	0.002	04/10/15 1:00	pmc
Cobalt, dissolved	M200.8 ICP-MS	1	0.00011	B		mg/L	0.00005	0.0003	04/09/15 17:44	msh
Cobalt, total	M200.8 ICP-MS	1	0.00014	B		mg/L	0.00005	0.0003	04/10/15 1:00	pmc
Copper, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0005	0.003	04/09/15 17:44	msh
Copper, total	M200.8 ICP-MS	1	0.0011	B		mg/L	0.0005	0.003	04/10/15 1:00	pmc
Iron, dissolved	M200.7 ICP	1	0.06			mg/L	0.02	0.05	04/09/15 10:05	aeb
Iron, total	M200.7 ICP	1	0.62		*	mg/L	0.02	0.05	04/10/15 11:18	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/09/15 17:44	msh
Lead, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	04/10/15 1:00	pmc
Magnesium, dissolved	M200.7 ICP	1	3.3			mg/L	0.2	1	04/09/15 10:05	aeb
Manganese, dissolved	M200.8 ICP-MS	2	0.224			mg/L	0.001	0.005	04/10/15 19:53	msh
Manganese, total	M200.8 ICP-MS	2	0.260		*	mg/L	0.001	0.005	04/10/15 20:23	pmc
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	04/13/15 15:17	mfm
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	04/13/15 13:09	mfm
Nickel, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0006	0.003	04/09/15 17:44	msh
Nickel, total	M200.8 ICP-MS	1		U		mg/L	0.0006	0.003	04/10/15 1:00	pmc
Potassium, dissolved	M200.7 ICP	1	1.2			mg/L	0.2	1	04/09/15 10:05	aeb
Selenium, total recoverable	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	04/10/15 21:58	pmc
Silica, dissolved	M200.7 ICP	1	26			mg/L	0.2	1	04/09/15 10:05	aeb
Silver, dissolved	M200.8 ICP-MS	2		U	*	mg/L	0.0001	0.0005	04/10/15 19:53	msh
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	04/10/15 1:00	pmc
Sodium, dissolved	M200.7 ICP	1	5.6			mg/L	0.2	1	04/09/15 14:36	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/09/15 17:44	msh
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/10/15 1:00	pmc
Vanadium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	04/09/15 17:44	msh
Vanadium, total	M200.8 ICP-MS	1	0.0004	B		mg/L	0.0002	0.001	04/10/15 1:00	pmc
Zinc, dissolved	M200.8 ICP-MS	1	0.012			mg/L	0.002	0.005	04/09/15 17:44	msh
Zinc, total	M200.8 ICP-MS	1	0.010			mg/L	0.002	0.005	04/10/15 1:00	pmc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Sierra Streams Institute
Project ID:
Sample ID: PROV-DRAIN

ACZ Sample ID: ***L23651-01***
Date Sampled: *03/31/15 11:00*
Date Received: *04/06/15*
Sample Matrix: *Surface Water*

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	56.2		*	mg/L	2	20	04/10/15 0:00	enb
Carbonate as CaCO3		1		U	*	mg/L	2	20	04/10/15 0:00	enb
Hydroxide as CaCO3		1		U	*	mg/L	2	20	04/10/15 0:00	enb
Total Alkalinity		1	56.2		*	mg/L	2	20	04/10/15 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			-11.1			%			04/22/15 12:27	calc
Sum of Anions			1.5			meq/L			04/22/15 12:27	calc
Sum of Cations			1.2			meq/L			04/22/15 12:27	calc
Chloride	M300.0 - Ion Chromatography	1	1.52	B	*	mg/L	0.5	2.5	04/20/15 19:06	tcd
Conductivity @25C	SM2510B	1	138		*	umhos/cm	1	10	04/10/15 12:33	enb
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/13/15 15:41	thf
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/13/15 17:36	thf
Dissolved Chromium, Hexavalent	SM3500Cr-B	1		UH	*	mg/L	0.005	0.02	04/06/15 12:05	id
Hardness as CaCO3	SM2340B - Calculation		46			mg/L	0.8	4	04/22/15 12:27	calc
Lab Filtration (0.45um filter)	SOPWC050	1							04/14/15 2:48	tms
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							04/07/15 13:10	jjc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1	0.05	B	*	mg/L	0.02	0.1	04/17/15 0:58	pjb
Nitrogen, ammonia	M350.1 - Automated Phenate	1		U	*	mg/L	0.05	0.2	04/14/15 16:47	thf
pH (lab)	SM4500H+ B									
pH		1	7.7	H	*	units	0.1	0.1	04/10/15 0:00	enb
pH measured at		1	22.4		*	C	0.1	0.1	04/10/15 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	1	86		*	mg/L	10	20	04/06/15 14:05	enb
Residue, Non-Filterable (TSS) @105C	SM2540D	1		U	*	mg/L	5	20	04/07/15 15:17	enb
Sulfate	M300.0 - Ion Chromatography	1	14.1		*	mg/L	0.5	2.5	04/20/15 19:06	tcd
TDS (calculated)	Calculation		106			mg/L			04/22/15 12:27	calc
TDS (ratio - measured/calculated)	Calculation		0.81						04/22/15 12:27	calc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Sierra Streams Institute
Project ID:
Sample ID: ADIT-PIPE

ACZ Sample ID: ***L23651-02***
Date Sampled: *03/31/15 12:30*
Date Received: *04/06/15*
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Cyanide, total	M335.4 - Manual Distillation		-		*				04/13/15 12:09	mss2
Cyanide, WAD	SM4500-CN I- distillation				*				04/13/15 15:00	mss2
Total Hot Plate Digestion	M200.2 ICP-MS								04/09/15 11:36	scp
Total Hot Plate Digestion	M200.2 ICP								04/09/15 16:39	aeb
Total Recoverable Digestion	M200.2 ICP-MS								04/10/15 11:30	scp

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Sierra Streams Institute
Project ID:
Sample ID: ADIT-PIPE

ACZ Sample ID: ***L23651-02***
Date Sampled: *03/31/15 12:30*
Date Received: *04/06/15*
Sample Matrix: *Surface Water*

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Aluminum, dissolved	M200.7 ICP	1		U		mg/L	0.03	0.2	04/09/15 10:08	aeb
Aluminum, total	M200.7 ICP	1		U		mg/L	0.03	0.2	04/10/15 11:21	aeb
Antimony, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	04/09/15 17:47	msh
Antimony, total	M200.8 ICP-MS	1		U		mg/L	0.0004	0.002	04/10/15 1:04	pmc
Arsenic, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	04/09/15 17:47	msh
Arsenic, total	M200.8 ICP-MS	1	0.0008	B		mg/L	0.0002	0.001	04/10/15 1:04	pmc
Barium, dissolved	M200.8 ICP-MS	1	0.0171			mg/L	0.0005	0.003	04/09/15 17:47	msh
Barium, total	M200.8 ICP-MS	1	0.0186			mg/L	0.0005	0.003	04/10/15 1:04	pmc
Beryllium, total recoverable	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	04/10/15 22:01	pmc
Cadmium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/09/15 17:47	msh
Cadmium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0001	0.0005	04/10/15 1:04	pmc
Calcium, dissolved	M200.7 ICP	1	14.4			mg/L	0.1	0.5	04/09/15 10:08	aeb
Chromium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0005	0.002	04/09/15 17:47	msh
Chromium, total	M200.8 ICP-MS	1		U		mg/L	0.0005	0.002	04/10/15 1:04	pmc
Cobalt, dissolved	M200.8 ICP-MS	1	0.00047			mg/L	0.00005	0.0003	04/09/15 17:47	msh
Cobalt, total	M200.8 ICP-MS	1	0.00067			mg/L	0.00005	0.0003	04/10/15 1:04	pmc
Copper, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0005	0.003	04/09/15 17:47	msh
Copper, total	M200.8 ICP-MS	1	0.0016	B		mg/L	0.0005	0.003	04/10/15 1:04	pmc
Iron, dissolved	M200.7 ICP	1	5.82			mg/L	0.02	0.05	04/09/15 10:08	aeb
Iron, total	M200.7 ICP	1	15.90		*	mg/L	0.02	0.05	04/10/15 11:21	aeb
Lead, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/09/15 17:47	msh
Lead, total	M200.8 ICP-MS	1	0.0008			mg/L	0.0001	0.0005	04/10/15 1:04	pmc
Magnesium, dissolved	M200.7 ICP	1	3.5			mg/L	0.2	1	04/09/15 10:08	aeb
Manganese, dissolved	M200.8 ICP-MS	2	0.251			mg/L	0.001	0.005	04/10/15 20:00	msh
Manganese, total	M200.8 ICP-MS	2	0.275		*	mg/L	0.001	0.005	04/10/15 20:25	pmc
Mercury, dissolved	M245.1 CVAA	1		U		mg/L	0.0002	0.001	04/13/15 15:28	mfm
Mercury, total	M245.1 CVAA	1		U		mg/L	0.0002	0.001	04/13/15 13:11	mfm
Nickel, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0006	0.003	04/09/15 17:47	msh
Nickel, total	M200.8 ICP-MS	1	0.0007	B		mg/L	0.0006	0.003	04/10/15 1:04	pmc
Potassium, dissolved	M200.7 ICP	1	1.2			mg/L	0.2	1	04/09/15 10:08	aeb
Selenium, total recoverable	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0003	04/10/15 22:01	pmc
Silica, dissolved	M200.7 ICP	1	27.2			mg/L	0.2	1	04/09/15 10:08	aeb
Silver, dissolved	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	04/15/15 23:54	pmc
Silver, total	M200.8 ICP-MS	1		U		mg/L	0.00005	0.0003	04/10/15 1:04	pmc
Sodium, dissolved	M200.7 ICP	1	5.4			mg/L	0.2	1	04/09/15 14:39	aeb
Thallium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/09/15 17:47	msh
Thallium, total	M200.8 ICP-MS	1		U		mg/L	0.0001	0.0005	04/10/15 1:04	pmc
Vanadium, dissolved	M200.8 ICP-MS	1		U		mg/L	0.0002	0.001	04/09/15 17:47	msh
Vanadium, total	M200.8 ICP-MS	1	0.0002	B		mg/L	0.0002	0.001	04/10/15 1:04	pmc
Zinc, dissolved	M200.8 ICP-MS	1	0.008			mg/L	0.002	0.005	04/09/15 17:47	msh
Zinc, total	M200.8 ICP-MS	1	0.012			mg/L	0.002	0.005	04/10/15 1:04	pmc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Sierra Streams Institute
Project ID:
Sample ID: ADIT-PIPE

ACZ Sample ID: ***L23651-02***
Date Sampled: *03/31/15 12:30*
Date Received: *04/06/15*
Sample Matrix: *Surface Water*

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	54.8		*	mg/L	2	20	04/10/15 0:00	enb
Carbonate as CaCO3		1		U	*	mg/L	2	20	04/10/15 0:00	enb
Hydroxide as CaCO3		1		U	*	mg/L	2	20	04/10/15 0:00	enb
Total Alkalinity		1	54.8		*	mg/L	2	20	04/10/15 0:00	enb
Cation-Anion Balance	Calculation									
Cation-Anion Balance			6.7			%			04/22/15 12:27	calc
Sum of Anions			1.4			meq/L			04/22/15 12:27	calc
Sum of Cations			1.6			meq/L			04/22/15 12:27	calc
Chloride	M300.0 - Ion Chromatography	1	1.49	B	*	mg/L	0.5	2.5	04/20/15 19:42	tcd
Conductivity @25C	SM2510B	1	143		*	umhos/cm	1	10	04/10/15 12:41	enb
Cyanide, total	M335.4 - Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/13/15 15:43	thf
Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	0.5		U	*	mg/L	0.003	0.01	04/13/15 17:39	thf
Dissolved Chromium, Hexavalent	SM3500Cr-B	1		UH	*	mg/L	0.005	0.02	04/06/15 12:07	id
Hardness as CaCO3	SM2340B - Calculation		50			mg/L	0.8	4	04/22/15 12:27	calc
Lab Filtration (0.45um filter)	SOPWC050	1							04/14/15 2:52	tms
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A	1							04/07/15 13:10	jjc
Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	1		U	*	mg/L	0.02	0.1	04/17/15 0:59	pjb
Nitrogen, ammonia	M350.1 - Automated Phenate	1	0.15	B	*	mg/L	0.05	0.2	04/14/15 16:27	thf
pH (lab)	SM4500H+ B									
pH		1	7.5	H	*	units	0.1	0.1	04/10/15 0:00	enb
pH measured at		1	21.9		*	C	0.1	0.1	04/10/15 0:00	enb
Residue, Filterable (TDS) @180C	SM2540C	1	98		*	mg/L	10	20	04/06/15 14:07	enb
Residue, Non-Filterable (TSS) @105C	SM2540D	1	21.0		*	mg/L	5	20	04/07/15 15:18	enb
Sulfate	M300.0 - Ion Chromatography	1	11.1		*	mg/L	0.5	2.5	04/20/15 19:42	tcd
TDS (calculated)	Calculation		111			mg/L			04/22/15 12:27	calc
TDS (ratio - measured/calculated)	Calculation		0.88						04/22/15 12:27	calc

** Please refer to Qualifier Reports for details.*

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	*LCSWD*	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	*LFB*	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	*LFM*	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	*LFMD*	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	*LRB*	Laboratory Reagent Blank
ICB	Initial Calibration Blank	*MS*	Matrix Spike
ICV	Initial Calibration Verification standard	*MSD*	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	*PBS*	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	*PBW*	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	*PQV*	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	*SDL*	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(4) EPA SW-846. Test Methods for Evaluating Solid Waste.
(5) Standard Methods for the Examination of Water and Wastewater.

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
(5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Sierra Streams Institute

ACZ Project ID: ***L23651***

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381769													
WG381769PBW	PBW	04/10/15 11:26				U	mg/L		-20	20			
WG381769LCSW3	LCSW	04/10/15 11:43	WC150318-8	820		876	mg/L	107	90	110			
L23718-01DUP	DUP	04/10/15 13:15			204	204	mg/L				0	20	
WG381769LCSW6	LCSW	04/10/15 13:32	WC150409-1	820.0001		826	mg/L	101	90	110			

Aluminum, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381692													
WG381692ICV	ICV	04/09/15 9:21	II150318-3	2		2	mg/L	100	95	105			
WG381692ICB	ICB	04/09/15 9:27				U	mg/L		-0.09	0.09			
WG381692LFB	LFB	04/09/15 9:40	II150325-4	1.0015		1.056	mg/L	105	85	115			
L22741-10AS	AS	04/09/15 9:52	II150325-4	1.0015	.07	1.08	mg/L	101	85	115			
L22741-10ASD	ASD	04/09/15 9:55	II150325-4	1.0015	.07	1.066	mg/L	99	85	115	1	20	

Aluminum, total M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381773													
WG381773ICV	ICV	04/10/15 10:44	II150407-3	2		1.988	mg/L	99	95	105			
WG381773ICB	ICB	04/10/15 10:50				U	mg/L		-0.09	0.09			
WG381734LRB	LRB	04/10/15 11:02				U	mg/L		-0.066	0.066			
WG381734LFB	LFB	04/10/15 11:06	II150325-4	1.0015		1.069	mg/L	107	85	115			
L23657-01LFM	LFM	04/10/15 11:27	II150325-4	1.0015	U	1.038	mg/L	104	70	130			
L23657-01LFMD	LFMD	04/10/15 11:30	II150325-4	1.0015	U	1.083	mg/L	108	70	130	4	20	

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.02		.021	mg/L	105	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0012	0.0012			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.01001		.00963	mg/L	96	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.02002	U	.02015	mg/L	101	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.02002	U	.02392	mg/L	119	70	130	17	20	

Antimony, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.02		.0213	mg/L	107	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0012	0.0012			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00088	0.00088			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.01001		.00996	mg/L	100	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.01001	U	.00874	mg/L	87	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.01001	U	.00856	mg/L	86	70	130	2	20	

Sierra Streams Institute

ACZ Project ID: ***L23651***

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.04993	mg/L	100	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0006	0.0006			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.0501		.04759	mg/L	95	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1002	.0179	.11863	mg/L	101	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1002	.0179	.13228	mg/L	114	70	130	11	20	

Arsenic, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.05075	mg/L	102	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0006	0.0006			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00044	0.00044			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.0501		.04955	mg/L	99	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.0501	.0024	.0491	mg/L	93	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.0501	.0024	.0483	mg/L	92	70	130	2	20	

Barium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.0507	mg/L	101	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0015	0.0015			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.04919	mg/L	98	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	.032	.1334	mg/L	101	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	.032	.1424	mg/L	110	70	130	7	20	

Barium, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.05034	mg/L	101	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0015	0.0015			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.0011	0.0011			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.04631	mg/L	93	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.0814	.1296	mg/L	96	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.0814	.1261	mg/L	89	70	130	3	20	

Beryllium, total recoverable M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381822													
WG381822ICV	ICV	04/10/15 21:45	MS150312-3	.05		.0491	mg/L	98	90	110			
WG381822ICB	ICB	04/10/15 21:48				U	mg/L		-0.00015	0.00015			
WG381781LRB	LRB	04/10/15 21:52				U	mg/L		-0.00011	0.00011			
WG381781LFB	LFB	04/10/15 21:55	MS150407-2	.05005		.04845	mg/L	97	85	115			
L23708-01LFM	LFM	04/10/15 22:20	MS150407-2	.05005	U	.04978	mg/L	99	70	130			
L23708-01LFMD	LFMD	04/10/15 22:29	MS150407-2	.05005	U	.05079	mg/L	101	70	130	2	20	

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ACZ Project ID: ***L23651***

Cadmium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.05059	mg/L	101	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0003	0.0003			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.04897	mg/L	98	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	U	.10198	mg/L	102	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	U	.11854	mg/L	118	70	130	15	20	

Cadmium, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.05083	mg/L	102	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0003	0.0003			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00022	0.00022			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.04737	mg/L	95	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.0001	.04786	mg/L	95	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.0001	.04653	mg/L	93	70	130	3	20	

Calcium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381692													
WG381692ICV	ICV	04/09/15 9:21	II150318-3	100		100.49	mg/L	100	95	105			
WG381692ICB	ICB	04/09/15 9:27				U	mg/L		-0.3	0.3			
WG381692LFB	LFB	04/09/15 9:40	II150325-4	67.98862		69.88	mg/L	103	85	115			
L22741-10AS	AS	04/09/15 9:52	II150325-4	67.98862	10	77.78	mg/L	100	85	115			
L22741-10ASD	ASD	04/09/15 9:55	II150325-4	67.98862	10	77.12	mg/L	99	85	115	1	20	

Chloride M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG382180													
WG382180ICV	ICV	04/20/15 17:16	WI150331-4	20		19.8	mg/L	99	90	110			
WG382180ICB	ICB	04/20/15 17:34				U	mg/L		-1.5	1.5			
WG382180LFB1	LFB	04/20/15 18:13	WI150409-2	30		29.7	mg/L	99	90	110			
L23648-01DUP	DUP	04/20/15 18:49			3.22	3.21	mg/L				0	20	RA
L23651-01AS	AS	04/20/15 19:24	WI150409-2	30	1.52	31.1	mg/L	99	90	110			
WG382180LFB2	LFB	04/21/15 3:10	WI150409-2	30		29.4	mg/L	98	90	110			

Chromium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.04793	mg/L	96	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0015	0.0015			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.04854	mg/L	97	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	U	.0983	mg/L	98	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	U	.1145	mg/L	114	70	130	15	20	

Sierra Streams Institute

ACZ Project ID: ***L23651***

Chromium, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.04952	mg/L	99	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0015	0.0015			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.0011	0.0011			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.04632	mg/L	93	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.0041	.05028	mg/L	92	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.0041	.05003	mg/L	92	70	130	0	20	

Cobalt, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.0506	mg/L	101	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.00015	0.00015			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.048863	mg/L	98	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	.0008	.10283	mg/L	102	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	.0008	.11757	mg/L	117	70	130	13	20	

Cobalt, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.0517	mg/L	103	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.00015	0.00015			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00011	0.00011			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.04507	mg/L	90	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.00141	.04769	mg/L	92	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.00141	.04717	mg/L	91	70	130	1	20	

Conductivity @25C SM2510B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381769													
WG381769LCSW2	LCSW	04/10/15 11:31	PCN46666	1409		1470	umhos/cm	104	90	110			
L23718-01DUP	DUP	04/10/15 13:15			1680	1680	umhos/cm				0	20	
WG381769LCSW5	LCSW	04/10/15 13:19	PCN46666	1409		1460	umhos/cm	104	90	110			

Copper, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.04848	mg/L	97	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0015	0.0015			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05		.04797	mg/L	96	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1	U	.094	mg/L	94	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1	U	.1105	mg/L	111	70	130	16	20	

Sierra Streams Institute

ACZ Project ID: ***L23651***

Copper, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.04767	mg/L	95	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0015	0.0015			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.0011	0.0011			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05		.04478	mg/L	90	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05	.0028	.04592	mg/L	86	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05	.0028	.04553	mg/L	85	70	130	1	20	

Cyanide, total M335.4 - Colorimetric w/ distillation

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381877													
WG381877ICV	ICV	04/13/15 15:24	WI150408-7	.3003		.3249	mg/L	108	90	110			
WG381877ICB	ICB	04/13/15 15:24				U	mg/L		-0.003	0.003			
WG381849LRB	LRB	04/13/15 15:25				U	mg/L		-0.003	0.003			
WG381849LFB	LFB	04/13/15 15:26	WI150408-4	.2		.2134	mg/L	107	90	110			
L23627-04DUP	DUP	04/13/15 15:40			U	U	mg/L				0	20	RA
L23651-01LFM	LFM	04/13/15 15:42	WI150408-4	.2	U	.2291	mg/L	115	90	110			M1

Cyanide, WAD SM4500-CN I,E-Colorimetric w/ distillation

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381877													
WG381877ICV	ICV	04/13/15 15:24	WI150408-7	.3003		.3249	mg/L	108	90	110			
WG381877ICB	ICB	04/13/15 15:24				U	mg/L		-0.003	0.003			
WG381886													
WG381886ICV	ICV	04/13/15 17:27	WI150408-7	.3003		.3257	mg/L	108	90	110			
WG381886ICB	ICB	04/13/15 17:28				U	mg/L		-0.003	0.003			
WG381850LRB	LRB	04/13/15 17:29				U	mg/L		-0.003	0.003			
WG381850LFB	LFB	04/13/15 17:29	WI150408-6	.2002		.2206	mg/L	110	90	110			
L23626-01DUP	DUP	04/13/15 17:31			U	U	mg/L				0	20	RA
L23627-01LFM	LFM	04/13/15 17:33	WI150408-6	.2002	U	.2218	mg/L	111	90	110			M1

Dissolved Chromium, Hexavalent SM3500Cr-B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381521													
WG381521ICV	ICV	04/06/15 12:00	WC141203-5	.05		.0536	mg/L	107	90	110			
WG381521ICB	ICB	04/06/15 12:01				U	mg/L		-0.015	0.015			
WG381521LFB	LFB	04/06/15 12:03	WC141203-7	.05		.055	mg/L	110	90	110			
L23651-02AS	AS	04/06/15 12:09	WC141203-7	.05	U	.0558	mg/L	112	90	110			M1
L23651-02DUP	DUP	04/06/15 12:11			U	U	mg/L				0	20	RA

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381692													
WG381692ICV	ICV	04/09/15 9:21	II150318-3	2		2.018	mg/L	101	95	105			
WG381692ICB	ICB	04/09/15 9:27				U	mg/L		-0.06	0.06			
WG381692LFB	LFB	04/09/15 9:40	II150325-4	1.0001		1.04	mg/L	104	85	115			
L22741-10AS	AS	04/09/15 9:52	II150325-4	1.0001	U	1.023	mg/L	102	85	115			
L22741-10ASD	ASD	04/09/15 9:55	II150325-4	1.0001	U	1.013	mg/L	101	85	115	1	20	

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ACZ Project ID: ***L23651***

Iron, total M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381773													
WG381773ICV	ICV	04/10/15 10:44	II150407-3	2		1.969	mg/L	98	95	105			
WG381773ICB	ICB	04/10/15 10:50				U	mg/L		-0.06	0.06			
WG381734LRB	LRB	04/10/15 11:02				.023	mg/L		-0.044	0.044			
WG381734LFB	LFB	04/10/15 11:06	II150325-4	1.0001		1.041	mg/L	104	85	115			
L23657-01LFM	LFM	04/10/15 11:27	II150325-4	1.0001	7.58	8.092	mg/L	51	70	130			M3
L23657-01LFMD	LFMD	04/10/15 11:30	II150325-4	1.0001	7.58	9.546	mg/L	197	70	130	16	20	M3

Lead, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.0498	mg/L	100	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0003	0.0003			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.04832	mg/L	97	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	U	.09847	mg/L	98	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	U	.11477	mg/L	115	70	130	15	20	

Lead, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.04872	mg/L	97	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0003	0.0003			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00022	0.00022			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.04445	mg/L	89	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.0023	.048	mg/L	91	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.0023	.04762	mg/L	91	70	130	1	20	

Magnesium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381692													
WG381692ICV	ICV	04/09/15 9:21	II150318-3	100		101.28	mg/L	101	95	105			
WG381692ICB	ICB	04/09/15 9:27				U	mg/L		-0.6	0.6			
WG381692LFB	LFB	04/09/15 9:40	II150325-4	50.00339		49.76	mg/L	100	85	115			
L22741-10AS	AS	04/09/15 9:52	II150325-4	50.00339	1.3	49.48	mg/L	96	85	115			
L22741-10ASD	ASD	04/09/15 9:55	II150325-4	50.00339	1.3	49.12	mg/L	96	85	115	1	20	

Manganese, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381780													
WG381780ICV	ICV	04/10/15 19:20	MS150312-3	.05		.05067	mg/L	101	90	110			
WG381780ICB	ICB	04/10/15 19:22				U	mg/L		-0.0015	0.0015			
WG381780LFB	LFB	04/10/15 19:45	MS150407-2	.0501		.04571	mg/L	91	85	115			
L23658-01AS	AS	04/10/15 20:10	MS150407-2	.0501	.2307	.27416	mg/L	87	70	130			
L23658-01ASD	ASD	04/10/15 20:13	MS150407-2	.0501	.2307	.27279	mg/L	84	70	130	1	20	

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ACZ Project ID: ***L23651***

Manganese, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381818													
WG381818ICV	ICV	04/10/15 20:10	MS150312-3	.05		.05294	mg/L	106	90	110			
WG381818ICB	ICB	04/10/15 20:12				U	mg/L		-0.0015	0.0015			
WG381704LRB	LRB	04/10/15 20:13				U	mg/L		-0.0011	0.0011			
WG381704LFB	LFB	04/10/15 20:15	MS150407-2	.0501		.04619	mg/L	92	85	115			
L23640-01LFM	LFM	04/10/15 20:19	MS150407-2	.0501	.166	.2386	mg/L	145	70	130			M1
L23640-01LFMD	LFMD	04/10/15 20:21	MS150407-2	.0501	.166	.2344	mg/L	137	70	130	2	20	M1

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381798													
WG381798ICV	ICV	04/13/15 11:32	II150406-2	.005005		.00512	mg/L	102	90	110			
WG381798ICB	ICB	04/13/15 11:34				U	mg/L		-0.0006	0.0006			
WG381859													
WG381859LRB	LRB	04/13/15 14:38				U	mg/L		-0.00044	0.00044			
WG381859LFB	LFB	04/13/15 14:40	II150325-6	.002002		.00187	mg/L	93	85	115			
L23651-01LFM	LFM	04/13/15 15:19	II150325-6	.002002	U	.00197	mg/L	98	85	115			
L23651-01LFMD	LFMD	04/13/15 15:21	II150325-6	.002002	U	.00183	mg/L	91	85	115	7	20	

Mercury, total M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381798													
WG381798ICV	ICV	04/13/15 11:32	II150406-2	.005005		.00512	mg/L	102	90	110			
WG381798ICB	ICB	04/13/15 11:34				U	mg/L		-0.0006	0.0006			
WG381847													
WG381847LRB	LRB	04/13/15 13:02				U	mg/L		-0.00044	0.00044			
WG381847LFB	LFB	04/13/15 13:05	II150325-6	.002002		.00176	mg/L	88	85	115			
L23657-01LFM	LFM	04/13/15 13:15	II150325-6	.002002	U	.00183	mg/L	91	85	115			
L23657-01LFMD	LFMD	04/13/15 13:18	II150325-6	.002002	U	.00183	mg/L	91	85	115	0	20	

Nickel, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.04886	mg/L	98	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0018	0.0018			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.04849	mg/L	97	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	U	.096	mg/L	96	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	U	.1118	mg/L	112	70	130	15	20	

Nickel, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.05026	mg/L	101	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0018	0.0018			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00132	0.00132			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.04625	mg/L	92	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.0034	.04842	mg/L	90	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.0034	.04785	mg/L	89	70	130	1	20	

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ACZ Project ID: ***L23651***

Nitrate/Nitrite as N M353.2 - H2SO4 preserved

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG382077													
WG382077ICV	ICV	04/16/15 20:44	WI150120-5	2.416		2.355	mg/L	97	90	110			
WG382077ICB	ICB	04/16/15 20:45				U	mg/L		-0.06	0.06			
WG382080													
WG382080LFB	LFB	04/17/15 0:50	WI141226-3	2		2.035	mg/L	102	90	110			
L23563-01AS	AS	04/17/15 1:29	WI141226-3	30	20.2	50.33	mg/L	100	90	110			
L23563-02DUP	DUP	04/17/15 1:32			13.7	13.61	mg/L				1	20	

Nitrogen, ammonia M350.1 - Automated Phenate

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381894													
WG381894ICV	ICV	04/14/15 13:19	WI141103-10	.999		1.033	mg/L	103	90	110			
WG381894ICB	ICB	04/14/15 13:20				U	mg/L		-0.15	0.15			
WG381894ICV1	ICV	04/14/15 15:07	WI141103-10	.999		1.038	mg/L	104	90	110			
WG381894ICB1	ICB	04/14/15 15:08				U	mg/L		-0.15	0.15			
WG381927													
WG381927LFB1	LFB	04/14/15 15:57	WI150204-10	1		.989	mg/L	99	90	110			
L23627-01AS	AS	04/14/15 16:17	WI150204-10	1	U	.99	mg/L	99	90	110			
L23627-02DUP	DUP	04/14/15 16:19			U	U	mg/L				0	20	RA
WG381927LFB2	LFB	04/14/15 16:29	WI150204-10	1		.985	mg/L	99	90	110			

pH (lab) SM4500H+ B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381769													
WG381769LCSW1	LCSW	04/10/15 11:29	PCN46943	6.01		6	units	100	5.9	6.1			
L23718-01DUP	DUP	04/10/15 13:15			8.1	8.1	units				0	20	
WG381769LCSW4	LCSW	04/10/15 13:18	PCN46943	6.01		6	units	100	5.9	6.1			

Potassium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381692													
WG381692ICV	ICV	04/09/15 9:21	II150318-3	20		19.5	mg/L	98	95	105			
WG381692ICB	ICB	04/09/15 9:27				U	mg/L		-0.6	0.6			
WG381692LFB	LFB	04/09/15 9:40	II150325-4	99.93386		95.53	mg/L	96	85	115			
L22741-10AS	AS	04/09/15 9:52	II150325-4	99.93386	2.6	95.72	mg/L	93	85	115			
L22741-10ASD	ASD	04/09/15 9:55	II150325-4	99.93386	2.6	94.82	mg/L	92	85	115	1	20	

Residue, Filterable (TDS) @180C SM2540C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381526													
WG381526PBW	PBW	04/06/15 13:30				U	mg/L		-20	20			
WG381526LCSW	LCSW	04/06/15 13:31	PCN48322	260		246	mg/L	95	80	120			
L23658-03DUP	DUP	04/06/15 14:14			734	728	mg/L				1	10	

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ACZ Project ID: ***L23651***

Residue, Non-Filterable (TSS) @105C SM2540D

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381587													
WG381587PBW	PBW	04/07/15 14:50				U	mg/L		-15	15			
WG381587LCSW	LCSW	04/07/15 14:51	PCN48322	160		139	mg/L	87	80	120			
L23651-02DUP	DUP	04/07/15 15:19			21	21	mg/L				0	10	RA

Selenium, total recoverable M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381822													
WG381822ICV	ICV	04/10/15 21:45	MS150312-3	.05		.05161	mg/L	103	90	110			
WG381822ICB	ICB	04/10/15 21:48				U	mg/L		-0.0003	0.0003			
WG381781LRB	LRB	04/10/15 21:52				U	mg/L		-0.00022	0.00022			
WG381781LFB	LFB	04/10/15 21:55	MS150407-2	.05015		.05117	mg/L	102	85	115			
L23708-01LFM	LFM	04/10/15 22:20	MS150407-2	.05015	.0004	.05136	mg/L	102	70	130			
L23708-01LFMD	LFMD	04/10/15 22:29	MS150407-2	.05015	.0004	.05077	mg/L	100	70	130	1	20	

Silica, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381692													
WG381692ICV	ICV	04/09/15 9:21	II150318-3	42.8		43.04	mg/L	101	95	105			
WG381692ICB	ICB	04/09/15 9:27				U	mg/L		-0.6	0.6			
WG381692LFB	LFB	04/09/15 9:40	II150325-4	21.428		22.07	mg/L	103	85	115			
L22741-10AS	AS	04/09/15 9:52	II150325-4	21.428	1.5	23.58	mg/L	103	85	115			
L22741-10ASD	ASD	04/09/15 9:55	II150325-4	21.428	1.5	23.44	mg/L	102	85	115	1	20	

Silver, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381780													
WG381780ICV	ICV	04/10/15 19:20	MS150312-3	.02		.01991	mg/L	100	90	110			
WG381780ICB	ICB	04/10/15 19:22				U	mg/L		-0.00015	0.00015			
WG381780LFB	LFB	04/10/15 19:45	MS150407-2	.01002		.00875	mg/L	87	85	115			
L23658-01AS	AS	04/10/15 20:10	MS150407-2	.01002	U	.005774	mg/L	58	70	130			M2 ZA
L23658-01ASD	ASD	04/10/15 20:13	MS150407-2	.01002	U	.006897	mg/L	69	70	130	18	20	M2 ZA
WG382011													
WG382011ICV	ICV	04/15/15 23:44	MS150312-3	.02		.01976	mg/L	99	90	110			
WG382011ICB	ICB	04/15/15 23:48				U	mg/L		-0.00015	0.00015			
WG382011LFB	LFB	04/15/15 23:51	MS150407-2	.01002		.01004	mg/L	100	85	115			
L23658-02AS	AS	04/16/15 0:07	MS150407-2	.01002	U	.007992	mg/L	80	70	130			
L23658-02ASD	ASD	04/16/15 0:10	MS150407-2	.01002	U	.007056	mg/L	70	70	130	12	20	

Silver, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.02		.02006	mg/L	100	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.00015	0.00015			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00011	0.00011			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.01002		.009357	mg/L	93	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.01002	U	.009209	mg/L	92	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.01002	U	.009045	mg/L	90	70	130	2	20	

Sierra Streams Institute

ACZ Project ID: ***L23651***

Sodium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381717													
WG381717ICV	ICV	04/09/15 13:58	II150318-3	100		96.7	mg/L	97	95	105			
WG381717ICB	ICB	04/09/15 14:04				U	mg/L		-0.6	0.6			
WG381717LFB	LFB	04/09/15 14:17	II150325-4	100.0188		96.34	mg/L	96	85	115			
L22741-10AS	AS	04/09/15 14:30	II150325-4	100.0188	.5	96.05	mg/L	96	85	115			
L22741-10ASD	ASD	04/09/15 14:33	II150325-4	100.0188	.5	98.05	mg/L	98	85	115	2	20	

Sulfate M300.0 - Ion Chromatography

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG382180													
WG382180ICV	ICV	04/20/15 17:16	WI150331-4	50.05		50.8	mg/L	101	90	110			
WG382180ICB	ICB	04/20/15 17:34				U	mg/L		-1.5	1.5			
WG382180LFB1	LFB	04/20/15 18:13	WI150409-2	30		29.6	mg/L	99	90	110			
L23648-01DUP	DUP	04/20/15 18:49			35.6	35.7	mg/L				0	20	
L23651-01AS	AS	04/20/15 19:24	WI150409-2	30	14.1	43.4	mg/L	98	90	110			
WG382180LFB2	LFB	04/21/15 3:10	WI150409-2	30		29	mg/L	97	90	110			

Thallium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.05074	mg/L	101	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0003	0.0003			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.0502		.04912	mg/L	98	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1004	U	.10016	mg/L	100	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1004	U	.11638	mg/L	116	70	130	15	20	

Thallium, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.05318	mg/L	106	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0003	0.0003			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00022	0.00022			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.0502		.04324	mg/L	86	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.0502	U	.04772	mg/L	95	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.0502	U	.04779	mg/L	95	70	130	0	20	

Vanadium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.04787	mg/L	96	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.0006	0.0006			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05005		.04972	mg/L	99	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.1001	U	.10382	mg/L	104	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.1001	U	.12006	mg/L	120	70	130	15	20	

Sierra Streams Institute

ACZ Project ID: ***L23651***

Vanadium, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.04949	mg/L	99	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.0006	0.0006			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.00044	0.00044			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05005		.0478	mg/L	96	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05005	.0054	.05338	mg/L	96	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05005	.0054	.05281	mg/L	95	70	130	1	20	

Zinc, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381741													
WG381741ICV	ICV	04/09/15 17:02	MS150312-3	.05		.046	mg/L	92	90	110			
WG381741ICB	ICB	04/09/15 17:04				U	mg/L		-0.006	0.006			
WG381741LFB	LFB	04/09/15 17:07	MS150407-2	.05008		.0559	mg/L	112	85	115			
L23657-01AS	AS	04/09/15 17:52	MS150407-2	.10016	.006	.1051	mg/L	99	70	130			
L23657-01ASD	ASD	04/09/15 17:55	MS150407-2	.10016	.006	.1208	mg/L	115	70	130	14	20	

Zinc, total M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG381754													
WG381754ICV	ICV	04/10/15 0:32	MS150312-3	.05		.0452	mg/L	90	90	110			
WG381754ICB	ICB	04/10/15 0:35				U	mg/L		-0.006	0.006			
WG381704LRB	LRB	04/10/15 0:38				U	mg/L		-0.0044	0.0044			
WG381704LFB	LFB	04/10/15 0:42	MS150407-2	.05008		.0499	mg/L	100	85	115			
L23640-01LFM	LFM	04/10/15 0:54	MS150407-2	.05008	.015	.0577	mg/L	85	70	130			
L23640-01LFMD	LFMD	04/10/15 0:57	MS150407-2	.05008	.015	.0568	mg/L	83	70	130	2	20	

Sierra Streams Institute ACZ Project ID: ***L23651***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L23651-01	WG381773	Iron, total	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381818	Manganese, total	M200.8 ICP-MS	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381780	Silver, dissolved	M200.8 ICP-MS	M2	Matrix spike recovery was low, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M200.8 ICP-MS	ZA	Poor recovery for Silver quality control is accepted due to low Silver solubility in samples, digestates, or extracts that do not contain sufficient Hydrochloric acid.
	WG381769	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG382180	Chloride	M300.0 - Ion Chromatography	Q6	Sample was received above recommended temperature.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381769	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG381877	Cyanide, total	M335.4 - Colorimetric w/ distillation	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381886	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381521	Dissolved Chromium, Hexavalent	SM3500Cr-B	H3	Sample was received and analyzed past holding time.
			SM3500Cr-B	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM3500Cr-B	Q6	Sample was received above recommended temperature.
			SM3500Cr-B	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381769	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG382080	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG381927	Nitrogen, ammonia	M350.1 - Automated Phenate	Q6	Sample was received above recommended temperature.
			M350.1 - Automated Phenate	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381769	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG381526	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG381587	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG382180	Sulfate	M300.0 - Ion Chromatography	Q6	Sample was received above recommended temperature.
	WG381769	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

Sierra Streams Institute ACZ Project ID: ***L23651***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L23651-02	WG381849	Cyanide, total	M335.4 - Manual Distillation	Q3	Sample received with improper or inadequate chemical preservation.
	WG381850	Cyanide, WAD	SM4500-CN I- distillation	Q3	Sample received with improper or inadequate chemical preservation.
	WG381773	Iron, total	M200.7 ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381818	Manganese, total	M200.8 ICP-MS	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
	WG381769	Bicarbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
		Carbonate as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG382180	Chloride	M300.0 - Ion Chromatography	Q6	Sample was received above recommended temperature.
			M300.0 - Ion Chromatography	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381769	Conductivity @25C	SM2510B	Q6	Sample was received above recommended temperature.
	WG381877	Cyanide, total	M335.4 - Colorimetric w/ distillation	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			M335.4 - Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			M335.4 - Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381886	Cyanide, WAD	SM4500-CN I,E-Colorimetric w/ distillation	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM4500-CN I,E-Colorimetric w/ distillation	Q6	Sample was received above recommended temperature.
			SM4500-CN I,E-Colorimetric w/ distillation	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381521	Dissolved Chromium, Hexavalent	SM3500Cr-B	H3	Sample was received and analyzed past holding time.
			SM3500Cr-B	M1	Matrix spike recovery was high, the recovery of the associated control sample (LCS or LFB) was acceptable.
			SM3500Cr-B	Q6	Sample was received above recommended temperature.
			SM3500Cr-B	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381769	Hydroxide as CaCO3	SM2320B - Titration	Q6	Sample was received above recommended temperature.
	WG382080	Nitrate/Nitrite as N	M353.2 - H2SO4 preserved	Q6	Sample was received above recommended temperature.
	WG381927	Nitrogen, ammonia	M350.1 - Automated Phenate	Q6	Sample was received above recommended temperature.
			M350.1 - Automated Phenate	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG381769	pH	SM4500H+ B	Q6	Sample was received above recommended temperature.
		pH measured at	SM4500H+ B	Q6	Sample was received above recommended temperature.
	WG381526	Residue, Filterable (TDS) @180C	SM2540C	Q6	Sample was received above recommended temperature.
	WG381587	Residue, Non-Filterable (TSS) @105C	SM2540D	Q6	Sample was received above recommended temperature.
			SM2540D	RA	Relative Percent Difference (RPD) was not used for data validation because the sample concentration is too low for accurate evaluation (< 10x MDL).
	WG382180	Sulfate	M300.0 - Ion Chromatography	Q6	Sample was received above recommended temperature.
	WG381769	Total Alkalinity	SM2320B - Titration	Q6	Sample was received above recommended temperature.

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Sierra Streams Institute

ACZ Project ID:	L23651
Date Received:	04/06/2015 10:09
Received By:	ddp
Date Printed:	4/6/2015

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?			X
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody complete and accurate?	X		
7) Were any changes made to the Chain of Custody prior to ACZ receiving the samples?	X		

A change was made in the Report to: section prior to ACZ custody.

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits?	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?		X	

Some parameters were received past hold time.

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/Hr)	Custody Seal Intact?
4450	8.2	16	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s) but was thawed by receipt at ACZ.

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Sierra Streams Institute

ACZ Project ID:	L23651
Date Received:	04/06/2015 10:09
Received By:	ddp
Date Printed:	4/6/2015

ACZ Laboratories, Inc. L23651

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Kyle Leach
Company: Sierra Streams Institute
E-mail: kleach08@gmail.com
Address: 431 Uren St
Nevada City CA 95959
Telephone: 530 265-6090 x203

Copy of Report to:

Name: Justin Wood
Company: Sierra Streams Inst.
E-mail: justin@sierrastreamsinstitute.org
Telephone: 530 265-6090 x204

Invoice to:

Name: Kyle Leach
Company: Sierra Streams Institute
E-mail: kleach08@gmail.com
Address: 431 Uren St
Nevada City CA 95959
Telephone: 530 265 6090 x203

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes [ ] No [X]

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: Kyle Leach **Sampler's Site Information** **State** CA **Zip code** 95959 **Time Zone** Pac

***Sampler's Signature:** [signature]

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION

Quote #: ENVIRONS-MINING
PO#:
Reporting state for compliance testing: CA
Check box if samples include NRC licensed material? [ ]

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE	TIME	Matrix	# of Containers	Inorganic Prep	Metals total/dis	Wet chemistry					
Prov-Drain	3/31/15	11:00a	H_2O		X	X	X					
Adit-Pipe	3/31/15	12:30p	H_2O		X	X	X					
			SW									
			SW									

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

please see parameters Methods and Detection Limits included in quote
filtered samples filtered in field w/ in line filter .45um

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
[signature]	3/31/15 530p	[signature]	4/6/15 1000

EXCELCHEM
Environmental Labs

1135 W Sunset Boulevard
Suite A
Rocklin, CA 95765
Phone# 916-543-4445
Fax# 916-543-4449

ELAP Certificate No. : 2119

18 October 2016

Kyle Leach

Sierra Streams Institute

431 Uren St., Suite C

Nevada City, CA 95959

RE: Providence Quartz Mill

Work order number:1609127

Enclosed are the results of analyses for samples received by the laboratory on 09/27/16 14:39. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

John Somers, Lab Director

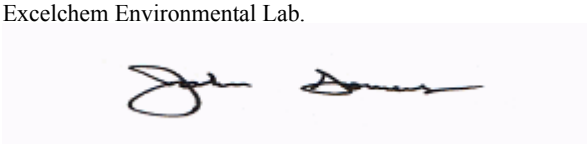
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-1B	1609127-01	Soil	09/22/16 12:00	09/27/16 14:39
WR-12B	1609127-02	Soil	09/22/16 12:15	09/27/16 14:39

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

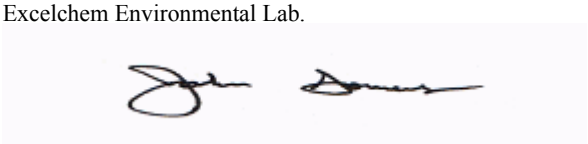
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

QM-1B

1609127-01 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
WET-DI Analysis								
Lead	**14.8**	10.0	ug/l	AZJ0110	10/12/16	10/14/16	EPA 6010B	
Mercury	**0.487**	0.200	"	AZJ0139	10/12/16	10/17/16	EPA 7471	

Excelchem Environmental Lab.



Laboratory Representative

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Excelchem Environmental Labs

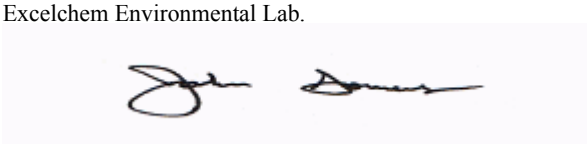
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

WR-12B

1609127-02 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
WET-DI Analysis								
Lead	ND	10.0	ug/l	AZJ0110	10/12/16	10/14/16	EPA 6010B	
Mercury	**2.79**	0.200	"	AZJ0139	10/12/16	10/17/16	EPA 7471	

Excelchem Environmental Lab.



Laboratory Representative

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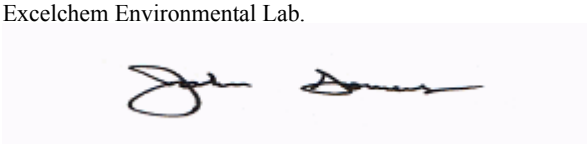
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

WET-DI Analysis - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AZJ0110 - EPA 6010B										
Blank (AZJ0110-BLK1)				Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	ND	10.0	ug/l							
LCS (AZJ0110-BS1)				Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	996	10.0	ug/l	1000		99.6	80-120			
LCS Dup (AZJ0110-BSD1)				Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	994	10.0	ug/l	1000		99.4	80-120	0.271	25	
Matrix Spike (AZJ0110-MS1)		**Source: 1609127-02**		Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	972	10.0	ug/l	1000	ND	97.2	75-125			
Matrix Spike Dup (AZJ0110-MSD1)		**Source: 1609127-02**		Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	980	10.0	ug/l	1000	ND	98.0	75-125	0.871	25	
Batch AZJ0139 - EPA 7471										
Blank (AZJ0139-BLK1)				Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	ND	0.200	ug/l							
LCS (AZJ0139-BS1)				Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	6.69	0.200	ug/l	6.67		100	80-120			
LCS Dup (AZJ0139-BSD1)				Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	6.75	0.200	ug/l	6.67		101	80-120	0.794	20	
Matrix Spike (AZJ0139-MS1)		**Source: 1609127-01**		Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	6.79	0.200	ug/l	6.67	0.487	94.5	75-125			

Excelchem Environmental Lab.



Laboratory Representative

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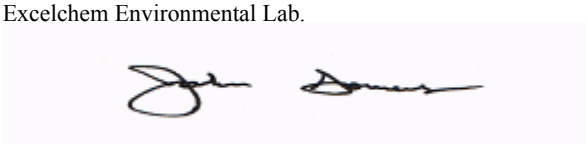
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

WET-DI Analysis - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AZJ0139 - EPA 7471										
Matrix Spike Dup (AZJ0139-MSD1)		**Source: 1609127-01**		Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	7.84	0.200	ug/l	6.67	0.487	110	75-125	14.4	20	

Excelchem Environmental Lab.



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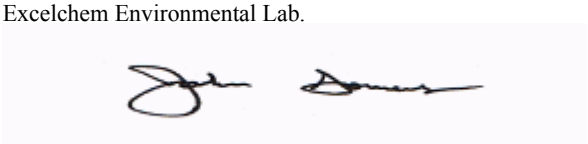
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

Notes and Definitions

ND	Analyte not detected at reporting limit.
NR	Not reported

Excelchem Environmental Lab.



Laboratory Representative

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Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

Excelchem Environmental Labs

CHAIN OF CUSTODY

1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765
Ph: 916-543-4445 Fx: 916-543-4449

Project Manager: Kyle Leach
Email Address for Reporting: 431 Uren St Suite C kleach@sierrastreams.com
Email Address for Reporting:
Company Name & Address: 431 Uren St Suite C Nevada City CA 95959
Billing Address: "
Phone #: 530 265 6090
Cell #: 530 575 5605
Fax #:
P.O# / Project Name: Providence Quartz Mill
Project Location: Nevada City
Sampler Name: Kyle Leach
Sampler Signature:

REPORTING REQUIREMENTS BELOW:

PDF / Standard Format
Geotracker / EDF / Provide Global ID ___
EDD / Equis / Data Table
MDL Format
Data to be reported to State's Database ? Yes___ No___
EDT / CDPH - Provide Source Codes / PWS ID: ___

page _ of _

Matrix Table:
S = Soil / Sludge / Solid (circle one)
A = Air
DW = Drinking Water
MW = Monitoring Wells
GW = Groundwater
TW = Treated Water
WW = Waste Water

SAMPLE ID:	Source Codes	SAMPLING DATE	SAMPLING TIME	Matrix (See Matrix Table)	Summa #	Preserved ? (Mark yes and no if both available) Yes	No	Metals Stic	Metals Total	Lead DIWET	Mercury DIWET
QM-1B		9/22/16	12:00	S						X	X
WR-12B		9/22/16	12:15	S						X	X

ANALYSIS REQUST

Relinquished by: Kyle Leach DATE 9/27/16 TIME 2:38
Relinquished by: DATE 9/27/16 TIME 2:43
Received by:
Received by Laboratory:

Remarks: Need lowest possible reporting limits <10 ug/L Arsenic Lead <0.002 ug/L Hg or DI WET

LAB USE: 1609127
BIN 68

Excelchem Environmental Lab.

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.

Laboratory Representative

Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

Sample Integrity

WORK ORDER : 1609127

Date Received: 09/27/2016

Section 1 – Sample Arrival Info.

Sample Transport: **Walk-In** Transported In: **Hand**

Describe type of packing materials: **None**

Has chilling process begun? **No** Samples Received: **Ambient**

Temperature of Samples (ºC): **24** Ice Chest Temperature(s) (ºC): **N/A**

Section 2 – Bottle/Analysis Info.

	Yes	No	N/A	Comments
Did all bottles arrive unbroken and intact?	X			-
Did all bottle labels agree with COC?	X			-
Were correct containers used for the tests requested?	X			-
Were correct preservations used for the tests requested?	X			-
Was a sufficient amount of sample sent for tests indicated?	X			-
Were bubbles present in VOA Vials?: **(Volatile Methods Only)**			X	-

Section 3 – Summa/Flow regulator Info.

Used Summa#:	N/A
Unused Summa#:	
Cleaning Summa#:	
Regulator#:	
Was there any visual damage to summa canisters **or** flow regulators? **Explain.**	

Section 4 – COC Info.

	Completed Yes	Completed No	Info From Container		Completed Yes	Completed No	Comments
Was COC Received	X		-	Analysis Requested	X		-
Date Sampled	X		-	Samples arrived within holding time	X		-
Time Sampled	X		-	Any hold times less than 72 hrs		X	-
Sample ID	X		-	Client Name	X		-
Rush TAT		X	-	Address/Telephone #	X		-

Section 5 – Comments / Discrepancies

Was Client notified of discrepancies: N/A Notified by: N/A

Explanations / Comments: -

-

-

-

Samples Labeled by:	**JLM**
Bin #s:	**68**
COC Scanned/Attached by:	**JLM**
Sample labels reviewed by:	**JLM**

Filled out by:	*Jennifer Michaud*	**Date:** 9/27/16
		Time: 14:44

Excelchem Environmental Lab.

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.

Laboratory Representative

EXCELCHEM
Environmental Labs

1135 W Sunset Boulevard
Suite A
Rocklin, CA 95765
Phone# 916-543-4445
Fax# 916-543-4449

ELAP Certificate No. : 2119

18 October 2016

Kyle Leach

Sierra Streams Institute

431 Uren St., Suite C

Nevada City, CA 95959

RE: Providence Quartz Mill

Work order number:1609127

Enclosed are the results of analyses for samples received by the laboratory on 09/27/16 14:39. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

John Somers, Lab Director

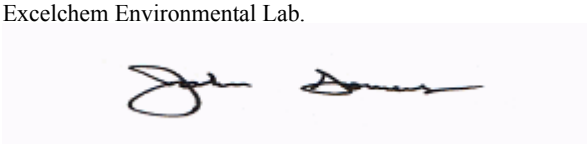
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-1B	1609127-01	Soil	09/22/16 12:00	09/27/16 14:39
WR-12B	1609127-02	Soil	09/22/16 12:15	09/27/16 14:39

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

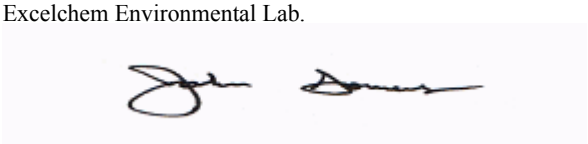
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

QM-1B

1609127-01 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
WET-DI Analysis								
Lead	**14.8**	10.0	ug/l	AZJ0110	10/12/16	10/14/16	EPA 6010B	
Mercury	**0.487**	0.200	"	AZJ0139	10/12/16	10/17/16	EPA 7471	

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

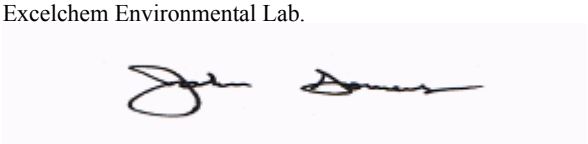
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

WR-12B

1609127-02 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
WET-DI Analysis								
Lead	ND	10.0	ug/l	AZJ0110	10/12/16	10/14/16	EPA 6010B	
Mercury	**2.79**	0.200	"	AZJ0139	10/12/16	10/17/16	EPA 7471	

Excelchem Environmental Lab.



Laboratory Representative

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.

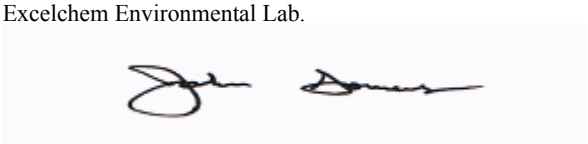
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

WET-DI Analysis - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AZJ0110 - EPA 6010B										
Blank (AZJ0110-BLK1)				Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	ND	10.0	ug/l							
LCS (AZJ0110-BS1)				Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	996	10.0	ug/l	1000		99.6	80-120			
LCS Dup (AZJ0110-BSD1)				Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	994	10.0	ug/l	1000		99.4	80-120	0.271	25	
Matrix Spike (AZJ0110-MS1)		**Source: 1609127-02**		Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	972	10.0	ug/l	1000	ND	97.2	75-125			
Matrix Spike Dup (AZJ0110-MSD1)		**Source: 1609127-02**		Prepared: 10/12/16 Analyzed: 10/14/16						
Lead	980	10.0	ug/l	1000	ND	98.0	75-125	0.871	25	
Batch AZJ0139 - EPA 7471										
Blank (AZJ0139-BLK1)				Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	ND	0.200	ug/l							
LCS (AZJ0139-BS1)				Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	6.69	0.200	ug/l	6.67		100	80-120			
LCS Dup (AZJ0139-BSD1)				Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	6.75	0.200	ug/l	6.67		101	80-120	0.794	20	
Matrix Spike (AZJ0139-MS1)		**Source: 1609127-01**		Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	6.79	0.200	ug/l	6.67	0.487	94.5	75-125			

Excelchem Environmental Lab.



Laboratory Representative

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.

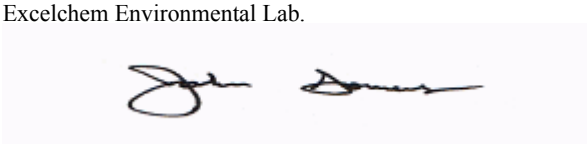
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

WET-DI Analysis - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch AZJ0139 - EPA 7471										
Matrix Spike Dup (AZJ0139-MSD1)		**Source: 1609127-01**		Prepared: 10/12/16 Analyzed: 10/17/16						
Mercury	7.84	0.200	ug/l	6.67	0.487	110	75-125	14.4	20	

Excelchem Environmental Lab.



Laboratory Representative

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.

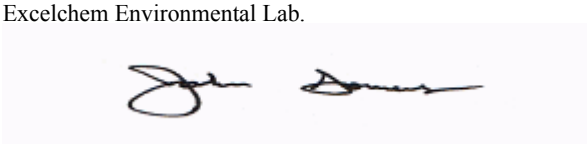
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

Notes and Definitions

ND	Analyte not detected at reporting limit.
NR	Not reported

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

Excelchem Environmental Labs

CHAIN OF CUSTODY

1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765
Ph: 916-543-4445 Fx: 916-543-4449

Project Manager: Kyle Leach
Email Address for Reporting: 431 Uren St Suite C kleach@sierrastreams.com
Email Address for Reporting:
Company Name & Address: 431 Uren St Suite C Nevada City CA 95959
Billing Address: "
Phone #: 530 265 6090
Cell #: 530 575 5605
Fax #:
P.O# / Project Name: Providence Quartz Mill
Project Location: Nevada City
Sampler Name: Kyle Leach
Sampler Signature:

REPORTING REQUIREMENTS BELOW:

PDF / Standard Format
Geotracker / EDF / Provide Global ID ___
EDD / Equis / Data Table
MDL Format
Data to be reported to State's Database ? Yes___ No___
EDT / CDPH - Provide Source Codes / PWS ID: ___

page _ of _

Matrix Table:
S = Soil / Sludge / Solid (circle one)
A = Air
DW = Drinking Water
MW = Monitoring Wells
GW = Groundwater
TW = Treated Water
WW = Waste Water

SAMPLE ID:	Source Codes	SAMPLING DATE	SAMPLING TIME	Matrix (See Matrix Table)	Summa #	Preserved ? (Mark yes and no if both available) Yes	No	Metals Stic	Metals Total	Lead DIWET	Mercury DIWET
QM-1B		9/22/16	12:00	S						X	X
WR-12B		9/22/16	12:15	S						X	X

ANALYSIS REQUST

Relinquished by: Kyle Leach DATE 9/27/16 TIME 2:38
Relinquished by: DATE 9/27/16 TIME 2:43
Received by:
Received by Laboratory:

Remarks: Need lowest possible reporting limits <10 ug/L Arsenic Lead <0.002 ug/L Hg or DI WET

LAB USE: 1609127
BIN 68

Excelchem Environmental Lab.

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.

Laboratory Representative

Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	10/18/16 11:12

Sample Integrity

WORK ORDER : 1609127

Date Received: 09/27/2016

Section 1 – Sample Arrival Info.

Sample Transport: **Walk-In** Transported In: **Hand**

Describe type of packing materials: **None**

Has chilling process begun? **No** Samples Received: **Ambient**

Temperature of Samples (ºC): **24** Ice Chest Temperature(s) (ºC): **N/A**

Section 2 – Bottle/Analysis Info.

	Yes	No	N/A	Comments
Did all bottles arrive unbroken and intact?	X			-
Did all bottle labels agree with COC?	X			-
Were correct containers used for the tests requested?	X			-
Were correct preservations used for the tests requested?	X			-
Was a sufficient amount of sample sent for tests indicated?	X			-
Were bubbles present in VOA Vials?: **(Volatile Methods Only)**			X	-

Section 3 – Summa/Flow regulator Info.

Used Summa#:	N/A
Unused Summa#:	
Cleaning Summa#:	
Regulator#:	
Was there any visual damage to summa canisters **or** flow regulators? **Explain.**	

Section 4 – COC Info.

	Completed Yes	Completed No	Info From Container		Completed Yes	Completed No	Comments
Was COC Received	X		-	Analysis Requested	X		-
Date Sampled	X		-	Samples arrived within holding time	X		-
Time Sampled	X		-	Any hold times less than 72 hrs		X	-
Sample ID	X		-	Client Name	X		-
Rush TAT		X	-	Address/Telephone #	X		-

Section 5 – Comments / Discrepancies

Was Client notified of discrepancies: N/A Notified by: N/A

Explanations / Comments: -

-

-

-

Samples Labeled by:	**JLM**
Bin #s:	**68**
COC Scanned/Attached by:	**JLM**
Sample labels reviewed by:	**JLM**

Filled out by:	*Jennifer Michaud*	**Date:** 9/27/16
		Time: 14:44

Excelchem Environmental Lab.

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.

Laboratory Representative

EXCELCHEM
Environmental Labs

1135 W Sunset Boulevard
Suite A
Rocklin, CA 95765
Phone# 916-543-4445
Fax# 916-543-4449

ELAP Certificate No. : 2119

15 February 2017

Kyle Leach

Sierra Streams Institute

431 Uren St., Suite C

Nevada City, CA 95959

RE: Providence Quartz Mill

Work order number:1702017

Enclosed are the results of analyses for samples received by the laboratory on 02/02/17 11:30. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

John Somers, Lab Director

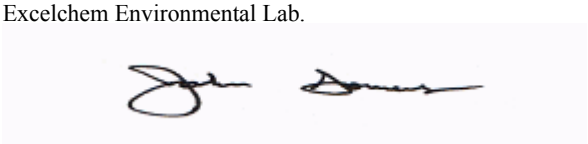
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-5b	1702017-01	Soil	01/31/17 00:00	02/02/17 11:30
RF-18b	1702017-02	Soil	01/31/17 00:00	02/02/17 11:30
WR-12b	1702017-03	Soil	01/31/17 00:00	02/02/17 11:30
WR-11b	1702017-04	Soil	01/31/17 00:00	02/02/17 11:30
WR-21b	1702017-05	Soil	01/31/17 00:00	02/02/17 11:30

Excelchem Environmental Lab.



Laboratory Representative

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.

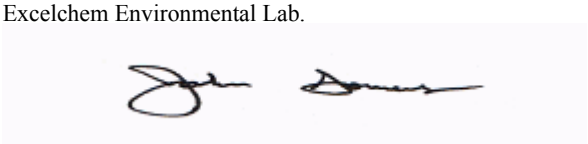
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

QM-5b
1702017-01 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**9.8**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**2.2**	2.0	"	"	"	"	"	
Lead	**42.8**	2.0	"	"	"	"	"	
Mercury	**0.669**	0.160	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

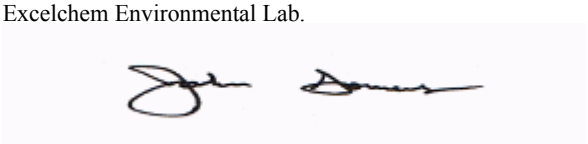
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

RF-18b

1702017-02 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**17.8**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	ND	2.0	"	"	"	"	"	
Lead	**233**	2.0	"	"	"	"	"	
Mercury	**7.34**	0.320	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

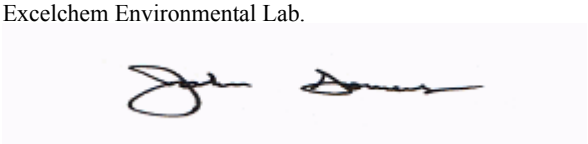
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

WR-12b

1702017-03 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**30.5**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**6.1**	2.0	"	"	"	"	"	
Lead	**557**	2.0	"	"	"	"	"	
Mercury	**14.6**	1.60	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



Laboratory Representative

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.

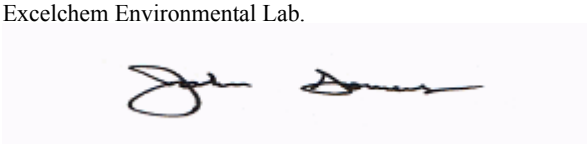
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

WR-11b
1702017-04 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**25.3**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**5.1**	2.0	"	"	"	"	"	
Lead	**370**	2.0	"	"	"	"	"	
Mercury	**6.06**	0.320	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



Laboratory Representative

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.

Excelchem Environmental Labs

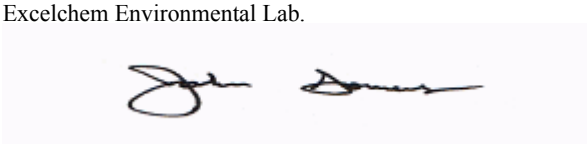
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

WR-21b

1702017-05 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**223**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**13.1**	2.0	"	"	"	"	"	
Lead	**8460**	2.0	"	"	"	"	"	
Mercury	**17.4**	1.60	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



Laboratory Representative

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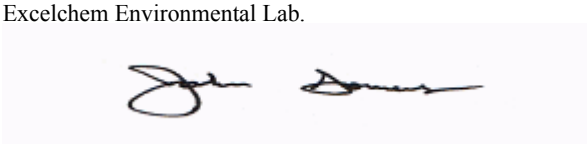
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

Total Recoverable Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0084 - EPA 7471A										
Blank (A[B0084-BLK1)				Prepared & Analyzed: 02/09/17						
Mercury	ND	0.016	mg/kg							
LCS (A[B0084-BS1)				Prepared & Analyzed: 02/09/17						
Mercury	0.491	0.016	mg/kg	0.400		123	75-125			
LCS Dup (A[B0084-BSD1)				Prepared & Analyzed: 02/09/17						
Mercury	0.479	0.016	mg/kg	0.400		120	75-125	2.47	20	
Matrix Spike (A[B0084-MS1)		**Source: 1702017-01**		Prepared & Analyzed: 02/09/17						
Mercury	1.14	0.080	mg/kg	0.400	0.669	119	75-125			
Matrix Spike Dup (A[B0084-MSD1)		**Source: 1702017-01**		Prepared & Analyzed: 02/09/17						
Mercury	1.25	0.080	mg/kg	0.400	0.669	145	75-125	8.70	20	QL-01
Batch A[B0097 - EPA 6010B										
Blank (A[B0097-BLK1)				Prepared & Analyzed: 02/10/17						
Arsenic	ND	1.0	mg/kg							
Cadmium	ND	1.0	"							
Lead	ND	1.0	"							
LCS (A[B0097-BS1)				Prepared & Analyzed: 02/10/17						
Arsenic	91.6	1.0	mg/kg	100		91.6	80-120			
Cadmium	92.2	1.0	"	100		92.2	80-120			
Lead	94.4	1.0	"	100		94.4	80-120			
LCS Dup (A[B0097-BSD1)				Prepared & Analyzed: 02/10/17						
Arsenic	95.1	1.0	mg/kg	100		95.1	80-120	3.72	25	
Cadmium	95.4	1.0	"	100		95.4	80-120	3.40	25	
Lead	97.9	1.0	"	100		97.9	80-120	3.63	25	

Excelchem Environmental Lab.



Laboratory Representative

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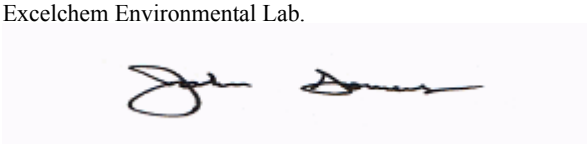
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

Total Recoverable Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0097 - EPA 6010B										
Matrix Spike (A[B0097-MS1)		**Source: 1702008-02**		Prepared & Analyzed: 02/10/17						
Arsenic	114	1.0	mg/kg	100	26.4	87.0	75-125			
Cadmium	92.3	1.0	"	100	0.169	92.1	75-125			
Lead	84.2	1.0	"	100	2.74	81.5	75-125			
Matrix Spike Dup (A[B0097-MSD1)		**Source: 1702008-02**		Prepared & Analyzed: 02/10/17						
Arsenic	113	1.0	mg/kg	100	26.4	86.6	75-125	0.353	25	
Cadmium	93.9	1.0	"	100	0.169	93.7	75-125	1.72	25	
Lead	86.6	1.0	"	100	2.74	83.9	75-125	2.74	25	

Excelchem Environmental Lab.



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Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

Notes and Definitions

QL-01 Sample results for the QC batch were accepted based on LCS/LCSD percent recoveries and RPD values.

ND Analyte not detected at reporting limit.

NR Not reported

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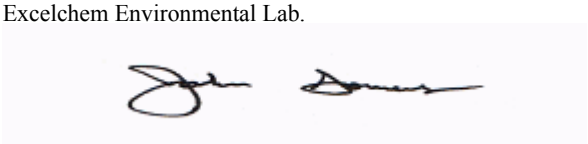

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Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

CHAIN OF CUSTODY

Excelchem Environmental Labs

1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765
Ph: 916-543-4445 Fx: 916-543-4449

REPORTING REQUIREMENTS BELOW:

- PDF / Standard Format
- Geotracker / EDF / Provide Global ID
- EDD / Equis / Data Table
- MDL Format
- Data to be reported to State's Database ? Yes ___ No ✓
- EDT / CDPH - Provide Source Codes / PWS ID: ___

Project Manager: Kyle Leach
Phone #: 530 265 6080x243
Email Address for Reporting: kleach08@gmail.com
Cell #: 530 575 5605
Email Address for Reporting:
Fax #:
Company Name & Address: Sierra Streams Institute, 431 Uren St Suite C, Nevada City CA 95959
P.O# / Project Name: SNC Environs
Project Location: Providence Quartz Mill
Billing Address: same
Sampler Name: Kyle Leach
Sampler Signature: [signature]

page 1 of 1

LAB USE: Bin #: BIN 525
Microbiology
Work Order: 1702017

ANALYSIS REQUST

Matrix Table:
S = Soil / Sludge / Solid (circle one)
A = Air
DW = Drinking Water
MW = Monitoring Wells
GW = Groundwater
TW = Treated Water
WW = Waste Water

SAMPLE ID:	Source Codes	SAMPLING DATE	SAMPLING TIME	Matrix (See Matrix Table)	Preserved ? (Mark yes and no if both available) Yes	No	Summa #	Tedlar / Summa	Coliform Tube	250ml plastic	500ml plastic	1000ml plastic	1 Gallon plastic	1 Liter Amber	40ml Voa - Clear	40ml Voa - Amber	250ml Amber	500ml Amber	Soil Jar	Metals Stic	Metals Total	Arsenic, lead, mercury, cadmium
GM-5b		1/31/17		S			1												X			X
RF-18b		"		S															X			X
WR-12b		"		S															X			X
WR-11b		"		S															X			X
WR-21b		"		S															X			X

Relinquished by: [signature] DATE 2/3/17 TIME 1130 Received by: [signature]

Relinquished by: [signature] DATE 2/3/17 TIME 1130 Received by Laboratory: [signature]

Remarks: Please hold remaining sample for possible DI WET analysis after Total results received. ★ Need final invoice befor Feb 28, 2017

Excelchem Environmental Lab.

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Laboratory Representative

Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	02/15/17 15:25

Sample Integrity

WORK ORDER : 1702017

Date Received: 02/02/2017

Section 1 – Sample Arrival Info.

Sample Transport: **Walk-In** Transported In: **Box**

Describe type of packing materials: **None**

Has chilling process begun? **No** Samples Received: **Ambient**

Temperature of Samples (ºC): **17** Ice Chest Temperature(s) (ºC): **N/A**

Section 2 – Bottle/Analysis Info.

	Yes	No	N/A	Comments
Did all bottles arrive unbroken and intact?	X			-
Did all bottle labels agree with COC?	X			-
Were correct containers used for the tests requested?	X			-
Were correct preservations used for the tests requested?	X			-
Was a sufficient amount of sample sent for tests indicated?	X			-
Were bubbles present in VOA Vials?: **(Volatile Methods Only)**			X	-

Section 3 – Summa/Flow regulator Info.

N/A

Used Summa#:
Unused Summa#:
Cleaning Summa#:
Regulator#:
Was there any visual damage to summa canisters **or** flow regulators? **Explain.**

Section 4 – COC Info.

	Completed Yes	Completed No	Info From Container		Completed Yes	Completed No	Comments
Was COC Received	X		-	Analysis Requested	X		-
Date Sampled	X		-	Samples arrived within holding time	X		-
Time Sampled		X	-	Any hold times less than 72 hrs		X	-
Sample ID	X		-	Client Name	X		-
Rush TAT		X	-	Address/Telephone #	X		-

Section 5 – Comments / Discrepancies

Was Client notified of discrepancies: N/A Notified by: N/A

Explanations / Comments: -

- Sample time not present on COC or sample containers

-

Samples Labeled by:	JL
Bin #s:	S2B
COC Scanned/Attached by:	JL
Sample labels reviewed by:	JL

Filled out by: James Lane	**Date:** 2/3/17
	Time: 08:12

Excelchem Environmental Lab.

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Laboratory Representative

EXCELCHEM
Environmental Labs

1135 W Sunset Boulevard
Suite A
Rocklin, CA 95765
Phone# 916-543-4445
Fax# 916-543-4449

ELAP Certificate No. : 2119

06 March 2017

Kyle Leach

Sierra Streams Institute

431 Uren St., Suite C

Nevada City, CA 95959

RE: Providence Quartz Mill

Work order number:1702017

Enclosed are the results of analyses for samples received by the laboratory on 02/02/17 11:30. All Quality Control results are within acceptable limits except where noted as a case narrative. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

John Somers, Lab Director

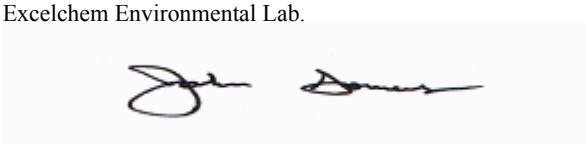
Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-5b	1702017-01	Soil	01/31/17 00:00	02/02/17 11:30
RF-18b	1702017-02	Soil	01/31/17 00:00	02/02/17 11:30
WR-12b	1702017-03	Soil	01/31/17 00:00	02/02/17 11:30
WR-11b	1702017-04	Soil	01/31/17 00:00	02/02/17 11:30
WR-21b	1702017-05	Soil	01/31/17 00:00	02/02/17 11:30

Excelchem Environmental Lab.



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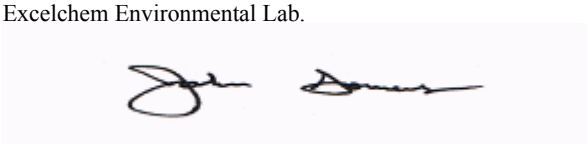
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

QM-5b
1702017-01 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**9.8**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**2.2**	2.0	"	"	"	"	"	
Lead	**42.8**	2.0	"	"	"	"	"	
Mercury	**0.669**	0.160	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



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Excelchem Environmental Labs

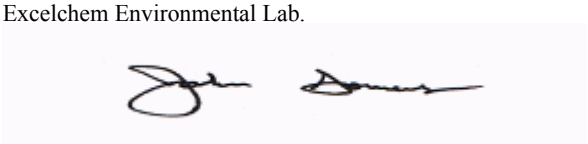
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

RF-18b

1702017-02 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**17.8**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	ND	2.0	"	"	"	"	"	
Lead	**233**	2.0	"	"	"	"	"	
Mercury	**7.34**	0.320	"	A[B0084	02/09/17	02/09/17	EPA 7471A	
WET-DI Analysis								
Arsenic	ND	10.0	ug/l	A[B0202	02/22/17	02/22/17	EPA 6010B	
Cadmium	ND	10.0	"	"	"	"	"	
Lead	ND	10.0	"	"	"	"	"	
Mercury	ND	0.200	"	A[B0199	"	02/22/17	EPA 7471	

Excelchem Environmental Lab.



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Excelchem Environmental Labs

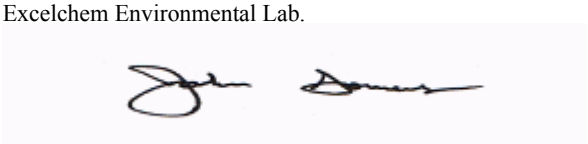
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

WR-12b

1702017-03 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**30.5**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**6.1**	2.0	"	"	"	"	"	
Lead	**557**	2.0	"	"	"	"	"	
Mercury	**14.6**	1.60	"	A[B0084	02/09/17	02/09/17	EPA 7471A	
WET-DI Analysis								
Arsenic	ND	10.0	ug/l	A[B0202	02/22/17	02/22/17	EPA 6010B	
Cadmium	ND	10.0	"	"	"	"	"	
Lead	**16.4**	10.0	"	"	"	"	"	
Mercury	**0.251**	0.200	"	A[B0199	"	02/22/17	EPA 7471	

Excelchem Environmental Lab.



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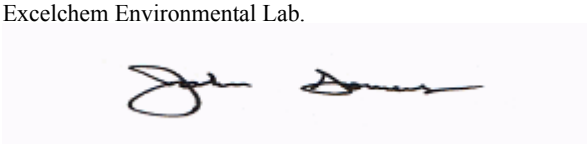
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

WR-11b

1702017-04 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Ion Chromatography								
Hexavalent Chromium	**2.10**	0.200	mg/kg	A[B0245	02/23/17	02/23/17	EPA 7196	
Total Recoverable Metals								
Arsenic	**25.3**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**5.1**	2.0	"	"	"	"	"	
Lead	**370**	2.0	"	"	"	"	"	
Mercury	**6.06**	0.320	"	A[B0084	02/09/17	02/09/17	EPA 7471A	
WET-DI Analysis								
Arsenic	ND	10.0	ug/l	A[B0202	02/22/17	02/22/17	EPA 6010B	
Cadmium	ND	10.0	"	"	"	"	"	
Lead	ND	10.0	"	"	"	"	"	
Mercury	ND	0.200	"	A[B0199	"	02/22/17	EPA 7471	

Excelchem Environmental Lab.



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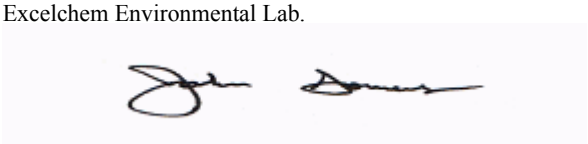
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

WR-21b

1702017-05 (Soil)

Analyte	Result	Reporting Limit	Units	Batch	Date Prepared	Date Analyzed	Method	Notes
Total Recoverable Metals								
Arsenic	**223**	2.0	mg/kg	A[B0097	02/10/17	02/10/17	EPA 6010B	
Cadmium	**13.1**	2.0	"	"	"	"	"	
Lead	**8460**	2.0	"	"	"	"	"	
Mercury	**17.4**	1.60	"	A[B0084	02/09/17	02/09/17	EPA 7471A	

Excelchem Environmental Lab.



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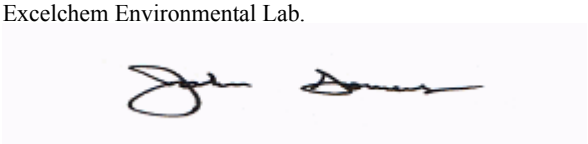
Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

Ion Chromatography - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0245 - EPA 7196										
Blank (A[B0245-BLK1)				Prepared & Analyzed: 02/23/17						
Hexavalent Chromium	ND	0.020	mg/kg							
LCS (A[B0245-BS1)				Prepared & Analyzed: 02/23/17						
Hexavalent Chromium	0.270	0.020	mg/kg	0.300		90.0	80-120			
LCS Dup (A[B0245-BSD1)				Prepared & Analyzed: 02/23/17						
Hexavalent Chromium	0.280	0.020	mg/kg	0.300		93.3	80-120	3.64	20	
Duplicate (A[B0245-DUP1)		**Source: 1702017-02**		Prepared & Analyzed: 02/23/17						
Hexavalent Chromium	0.800	0.200	mg/kg		0.700			13.3	20	
Matrix Spike (A[B0245-MS1)		**Source: 1702017-02**		Prepared & Analyzed: 02/23/17						
Hexavalent Chromium	3.40	0.200	mg/kg	3.00	0.700	90.0	75-125			
Matrix Spike Dup (A[B0245-MSD1)		**Source: 1702017-02**		Prepared & Analyzed: 02/23/17						
Hexavalent Chromium	3.50	0.200	mg/kg	3.00	0.700	93.3	75-125	2.90	20	

Excelchem Environmental Lab.



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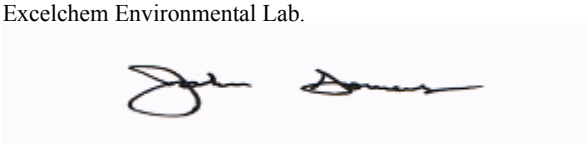
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

Total Recoverable Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0084 - EPA 7471A										
Blank (A[B0084-BLK1)				Prepared & Analyzed: 02/09/17						
Mercury	ND	0.016	mg/kg							
LCS (A[B0084-BS1)				Prepared & Analyzed: 02/09/17						
Mercury	0.491	0.016	mg/kg	0.400		123	75-125			
LCS Dup (A[B0084-BSD1)				Prepared & Analyzed: 02/09/17						
Mercury	0.479	0.016	mg/kg	0.400		120	75-125	2.47	20	
Matrix Spike (A[B0084-MS1)		**Source: 1702017-01**		Prepared & Analyzed: 02/09/17						
Mercury	1.14	0.080	mg/kg	0.400	0.669	119	75-125			
Matrix Spike Dup (A[B0084-MSD1)		**Source: 1702017-01**		Prepared & Analyzed: 02/09/17						
Mercury	1.25	0.080	mg/kg	0.400	0.669	145	75-125	8.70	20	QL-01
Batch A[B0097 - EPA 6010B										
Blank (A[B0097-BLK1)				Prepared & Analyzed: 02/10/17						
Arsenic	ND	1.0	mg/kg							
Cadmium	ND	1.0	"							
Lead	ND	1.0	"							
LCS (A[B0097-BS1)				Prepared & Analyzed: 02/10/17						
Arsenic	91.6	1.0	mg/kg	100		91.6	80-120			
Cadmium	92.2	1.0	"	100		92.2	80-120			
Lead	94.4	1.0	"	100		94.4	80-120			
LCS Dup (A[B0097-BSD1)				Prepared & Analyzed: 02/10/17						
Arsenic	95.1	1.0	mg/kg	100		95.1	80-120	3.72	25	
Cadmium	95.4	1.0	"	100		95.4	80-120	3.40	25	
Lead	97.9	1.0	"	100		97.9	80-120	3.63	25	

Excelchem Environmental Lab.



Laboratory Representative

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Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

Total Recoverable Metals - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0097 - EPA 6010B										
Matrix Spike (A[B0097-MS1)		**Source: 1702008-02**		Prepared & Analyzed: 02/10/17						
Arsenic	114	1.0	mg/kg	100	26.4	87.0	75-125			
Cadmium	92.3	1.0	"	100	0.169	92.1	75-125			
Lead	84.2	1.0	"	100	2.74	81.5	75-125			
Matrix Spike Dup (A[B0097-MSD1)		**Source: 1702008-02**		Prepared & Analyzed: 02/10/17						
Arsenic	113	1.0	mg/kg	100	26.4	86.6	75-125	0.353	25	
Cadmium	93.9	1.0	"	100	0.169	93.7	75-125	1.72	25	
Lead	86.6	1.0	"	100	2.74	83.9	75-125	2.74	25	

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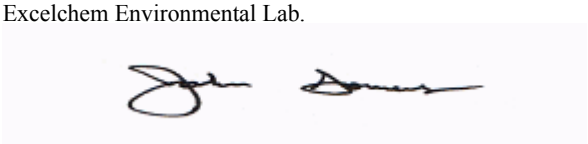

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Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

WET-DI Analysis - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0199 - EPA 7471										
Blank (A[B0199-BLK1)				Prepared & Analyzed: 02/22/17						
Mercury	ND	0.200	ug/l							
LCS (A[B0199-BS1)				Prepared & Analyzed: 02/22/17						
Mercury	6.20	0.200	ug/l	6.67		93.0	80-120			
LCS Dup (A[B0199-BSD1)				Prepared & Analyzed: 02/22/17						
Mercury	6.35	0.200	ug/l	6.67		95.2	80-120	2.34	20	
Matrix Spike (A[B0199-MS1)		**Source: 1702017-02**		Prepared & Analyzed: 02/22/17						
Mercury	5.57	0.200	ug/l	6.67	ND	83.6	75-125			
Matrix Spike Dup (A[B0199-MSD1)		**Source: 1702017-02**		Prepared & Analyzed: 02/22/17						
Mercury	5.56	0.200	ug/l	6.67	ND	83.4	75-125	0.240	20	
Batch A[B0202 - EPA 6010B										
Blank (A[B0202-BLK1)				Prepared & Analyzed: 02/22/17						
Arsenic	ND	10.0	ug/l							
Cadmium	ND	10.0	"							
Lead	ND	10.0	"							
LCS (A[B0202-BS1)				Prepared & Analyzed: 02/22/17						
Arsenic	976	10.0	ug/l	1000		97.6	80-120			
Cadmium	962	10.0	"	1000		96.2	80-120			
Lead	998	10.0	"	1000		99.8	80-120			
LCS Dup (A[B0202-BSD1)				Prepared & Analyzed: 02/22/17						
Arsenic	974	10.0	ug/l	1000		97.4	80-120	0.226	25	
Cadmium	962	10.0	"	1000		96.2	80-120	0.0104	25	
Lead	994	10.0	"	1000		99.4	80-120	0.432	25	

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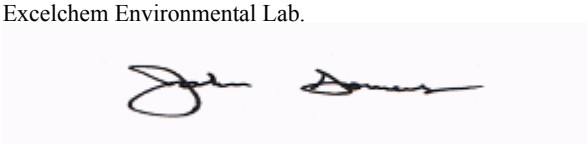

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431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

WET-DI Analysis - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch A[B0202 - EPA 6010B										
Matrix Spike (A[B0202-MS1)		**Source: 1702017-02**		Prepared & Analyzed: 02/22/17						
Arsenic	978	10.0	ug/l	1000	ND	97.8	0-200			
Cadmium	966	10.0	"	1000	0.200	96.6	80-120			
Lead	1000	10.0	"	1000	2.10	100	75-125			
Matrix Spike Dup (A[B0202-MSD1)		**Source: 1702017-02**		Prepared & Analyzed: 02/22/17						
Arsenic	972	10.0	ug/l	1000	ND	97.2	0-200	0.657	200	
Cadmium	958	10.0	"	1000	0.200	95.7	80-120	0.863	25	
Lead	996	10.0	"	1000	2.10	99.4	75-125	0.820	25	

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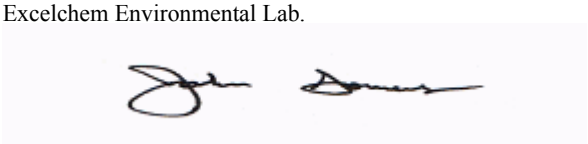

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431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

Notes and Definitions

QL-01 Sample results for the QC batch were accepted based on LCS/LCSD percent recoveries and RPD values.

ND Analyte not detected at reporting limit.

NR Not reported

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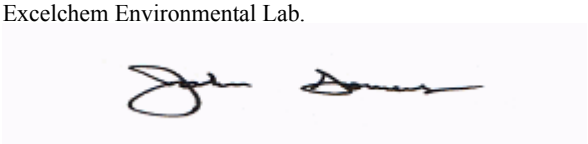

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Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

CHAIN OF CUSTODY

Excelchem Environmental Labs

1135 W. Sunset Blvd. Suite A
Rocklin, CA 95765
Ph: 916-543-4445 Fx: 916-543-4449

REPORTING REQUIREMENTS BELOW:

- PDF / Standard Format
- Geotracker / EDF / Provide Global ID
- EDD / Equis / Data Table
- MDL Format
- Data to be reported to State's Database ? Yes ___ No ✓
- EDT / CDPH - Provide Source Codes / PWS ID: ___

Project Manager: Kyle Leach
Phone #: 530 265 6080x243
Email Address for Reporting: kleach08@gmail.com
Cell #: 530 575 5605
Email Address for Reporting:
Fax #:
Company Name & Address: Sierra Streams Institute, 431 Uren St Suite C, Nevada City CA 95959
P.O# / Project Name: SNC Environs
Billing Address: same
Project Location: Providence Quartz Mill
Sampler Name: Kyle Leach
Sampler Signature: [signature]

page 1 of 1

LAB USE: Bin #: ___ Microbiology: ___ Work Order: ___

BIN 5215

1702017

ANALYSIS REQUST

Matrix Table:
S = Soil / Sludge / Solid (circle one)
A = Air
DW = Drinking Water
MW = Monitoring Wells
GW = Groundwater
TW = Treated Water
WW = Waste Water

Preserved ? (Mark yes and no if both available)

SAMPLE ID:	Source Codes	SAMPLING DATE	SAMPLING TIME	Matrix (See Matrix Table)	Summa #	Yes	No	Tedlar / Summa	Coliform Tube	250ml plastic	500ml plastic	1000ml plastic	1 Gallon plastic	1 Liter Amber	40ml Voa - Clear	40ml Voa - Amber	250ml Amber	500ml Amber	Soil Jar	Metals Stic	Metals Total	Arsenic, lead, mercury, cadmium
GM-5b		1/31/17		S	1		X												X		X	X
RF-18b		"		S															X		X	X
WR-12b		"		S															X		X	X
WR-11b		"		S															X		X	X
WR-21b		"		S															X		X	X

Relinquished by: [signature] DATE 2/2/17 TIME 1130 Received by: [signature]

Relinquished by: [signature] DATE 2/2/17 TIME 1130 Received by Laboratory: [signature]

Remarks: Please hold remaining sample for possible DI WET analysis after Total results reviewed. ★ Need final invoice befor Feb 28, 2017

Excelchem Environmental Lab.

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Laboratory Representative

Excelchem Environmental Labs

Sierra Streams Institute	Project:	Providence Quartz Mill	
431 Uren St., Suite C	Project Number:	[none]	Date Reported:
Nevada City, CA 95959	Project Manager:	Kyle Leach	03/06/17 10:07

Sample Integrity

WORK ORDER : 1702017

Date Received: 02/02/2017

Section 1 – Sample Arrival Info.

Sample Transport: **Walk-In** Transported In: **Box**

Describe type of packing materials: **None**

Has chilling process begun? **No** Samples Received: **Ambient**

Temperature of Samples (ºC): **17** Ice Chest Temperature(s) (ºC): **N/A**

Section 2 – Bottle/Analysis Info.

	Yes	No	N/A	Comments
Did all bottles arrive unbroken and intact?	X			-
Did all bottle labels agree with COC?	X			-
Were correct containers used for the tests requested?	X			-
Were correct preservations used for the tests requested?	X			-
Was a sufficient amount of sample sent for tests indicated?	X			-
Were bubbles present in VOA Vials?: **(Volatile Methods Only)**			X	-

Section 3 – Summa/Flow regulator Info.

N/A

Used Summa#:
Unused Summa#:
Cleaning Summa#:
Regulator#:
Was there any visual damage to summa canisters **or** flow regulators? **Explain.**

Section 4 – COC Info.

	Completed Yes	Completed No	Info From Container		Completed Yes	Completed No	Comments
Was COC Received	X		-	Analysis Requested	X		-
Date Sampled	X		-	Samples arrived within holding time	X		-
Time Sampled		X	-	Any hold times less than 72 hrs		X	-
Sample ID	X		-	Client Name	X		-
Rush TAT		X	-	Address/Telephone #	X		-

Section 5 – Comments / Discrepancies

Was Client notified of discrepancies: N/A Notified by: N/A

Explanations / Comments: -

- Sample time not present on COC or sample containers

-

Samples Labeled by:	JL
Bin #s:	S2B
COC Scanned/Attached by:	JL
Sample labels reviewed by:	JL

Filled out by: James Lane	**Date:** 2/3/17
	Time: 08:12

Excelchem Environmental Lab.

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Laboratory Representative

HUMAN HEALTH RISK ASSESSMENT

FOR

PROVIDENCE QUARTZ MILL SITE
NEVADA CITY, CALIFORNIA

OCTOBER 2016

PREPARED ON BEHALF OF

SIERRA STREAMS INSTITUTE
431 UREN STREET, SUITE C
NEVADA CITY, CA 95959

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

792 Searls Avenue
Nevada City, California 95959

HOLDREGE & KULL
CONSULTING ENGINEERS • GEOLOGISTS

Project No. 3991-03
October 26, 2016

Sierra Streams Institute
431 Uren Street, Suite C
Nevada City, CA 95959

Attention: Kyle Leach, PG

Reference: ***Providence Quartz Mill Site***
Nevada City Environs Property
APN 05-100-87
Nevada City, California

Subject: ***Human Health Risk Assessment***

Dear Mr. Leach:

Holdrege & Kull (H&K) prepared this report to summarize the findings of a screening level human health risk assessment for the Providence Quartz Mill Site located in Nevada City, California. This risk assessment is based on site characterization data provided to H&K by Sierra Streams Institute. Findings of this risk assessment are intended to support an engineering evaluation and cost analysis of alternative non-time-critical remedial actions for mine waste identified at the Providence Quartz Mill Site.

Please contact the undersigned if you have any questions regarding H&K's assessment or the findings presented in this report.

Sincerely,

HOLDREGE & KULL

REGISTERED PROFESSIONAL ENGINEER
JASON W. MUIR
No. 60167
Exp. 06/18
CIVIL
STATE OF CALIFORNIA

Jason W. Muir, C.E. 60167
Principal Engineer

copies: 3 to SSI /Attn: Kyle Leach
PDF to SSI /Attn: Kyle Leach

F:\1 Projects\3991\3991-03 \01 Report\3991-03 HHRA Report, Providence Quartz Mill Site.docx

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ACRONYMS AND ABBREVIATIONS

AOC	area of concern
APN	assessor's parcel number
BLM	United States Bureau of Land Management
BTV	background threshold value
Cal/EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response Compensation and Liability Act of 1980 (Superfund)
COC	constituent of concern
DTSC	California Department of Toxic Substances Control
DTSC-SL	DTSC Screening Level
EMSHP	Empire Mine State Historical Park
EPC	exposure point concentration
EWR	Environs Waste Rock
IRIS	Integrated Risk Information System
H&K	Holdrege & Kull
HERO	Human and Ecological Risk Office
HHRA	Human Health Risk Assessment
HI	Hazard Index
HSC	California Health and Safety Code
HQ	Hazard Quotient
mg/kg	milligrams per kilogram
m3/day	cubic meters per day
m3/kg	cubic meters per kilogram
na	not analyzed/ not available
OEHHA	Office of Environmental Health Hazard Assessment
PEA	Preliminary Endangerment Assessment
PEF	Particulate Emissions Factor
PQM	Providence Quartz Mill
RL	reporting limit
RME	reasonable maximum exposure
RSL	USEPA Regional Screening Level
SSI	Sierra Streams Institute
TTLC	Total Threshold Limit Concentration
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency

µg/dL	micrograms per deciliter
µg/m3	micrograms per cubic meter
%	percent

1 INTRODUCTION

Holdrege & Kull (H&K) prepared this report to summarize the findings of a screening level human health risk assessment for the Providence Quartz Mill Site (the Site) located in Nevada City, California. This risk assessment is based on site characterization data provided to H&K by Sierra Streams Institute (SSI). Findings of this risk assessment are intended to support an engineering evaluation and cost analysis of alternative non-time-critical remedial actions for mine waste identified at the Site.

1.1 PURPOSE AND SCOPE

The present risk assessment addresses inorganic constituents (metals) detected in mine waste at the former Providence Quartz Mill Site and two nearby mine waste piles. The human health risk assessment includes:

- Evaluation of soil metals data obtained from the Site by SSI;
- Identification of potential human health hazards associated with the detected soil metals concentrations;
- Exposure characterization based on standard (residential) exposure parameters and other exposure scenarios previously developed in consultation with the United States Environmental Protection Agency (USEPA); and
- Toxicity and risk characterization using standard toxicity parameters as set forth by USEPA and the California Department of Toxic Substances Control (DTSC).

H&K understands that this risk assessment will be reviewed by USEPA and/or DTSC for consistency with risk assessment guidance and with exposure parameters that were previously developed specifically for the adjacent Providence Mine Site (H&K, 2013). H&K's understanding of the Site is based on information provided by SSI. H&K did not confirm the location or condition of mine features at the site, nor did we delineate the property boundaries or sample locations.

1.2 PREVIOUS INVESTIGATION

H&K reviewed the following documents pertaining to previous investigation of the Site and the adjacent Providence Mine Site:

- *Soil Investigation Report for Environs Mining Legacy Project, Nevada City Environs Property, APN 05-100-87, Nevada City, California* (SSI; December 9, 2015); and
- *Human Health Risk Assessment for Providence Mine Site, APN 05-100-87, Nevada City, California* (H&K; June 17, 2013).

SSI's Soil Investigation Report (2015) presents the Site investigation results used for the present risk assessment. Maps and laboratory reports from SSI (2015) are presented in Appendix A. H&K's previous risk assessment (H&K, 2013) was related to the adjacent Providence Mine Site. H&K understands that SSI has since performed remedial action at the Providence Mine Site under USEPA and DTSC oversight.

1.3 LIMITATIONS OF THIS ASSESSMENT

The recommendations and conclusions in this report are preliminary in nature based on existing Site conditions; the interpretation of Site history and Site usage information provided by SSI; and the results of the investigation, sample screening, and laboratory analyses provided by SSI. The assessment focuses on a portion of the subject property, and does not consider the property in its entirety. The concentrations detected in the samples obtained from the Site and used in this assessment may not be representative of conditions between the locations sampled. Other forms of contamination may be present within the Site that the investigation did not detect.

The purpose of the assessment was not to guarantee or certify a clean Site, but to assess Site conditions in accordance with DTSC and USEPA protocol. H&K and USEPA used judgment and experience to develop the exposure parameters. Therefore, the risk assessment findings are not to be considered scientific certainties. The findings presented herein are contingent upon H&K's review of future sampling results or any other pertinent information that becomes available, as well as the review and approval by USEPA, DTSC and other appropriate regulatory agencies.

Changes in the conditions of the property can occur with the passage of time. The changes may be due to natural processes or to the works of man, on the project site or adjacent properties. Changes in regulations, interpretations, and/or enforcement policies may occur at any time. Such changes may affect the outcome of future risk assessment, and may affect the extent of remediation required.

H&K prepared and issued this report for the exclusive use of SSI. The information and findings presented herein apply only to the subject property. H&K is not responsible for any other party's interpretations of the reported information.

H&K performed this assessment in general accordance with present, regional, generally accepted standards of care. This report does not represent a legal opinion. No warranty, expressed or implied, including any implied warranty of merchantability or fitness for the purpose is made or intended in connection with the work.

2 BACKGROUND

2.1 SITE DESCRIPTION

The Site is located in Nevada City, California, within the historic Nevada City Mining District. Referencing the Mount Diablo geodetic datum, the Site is located in the southwestern quarter of Section 12, Township 16 North, Range 8 East. The center of the Site is located at latitude 39.259 degrees, longitude -121.038 degrees. A location map is presented as Figure 1, and a vicinity map is presented as Figure 2.

The Site is located in the northwestern portion of the approximately 37.99-acre Environs Property, which comprises Nevada County Assessor's Parcel Number (APN) 05-100-87. The Site is located in an undeveloped, forested area below Deer Creek, approximately one mile downstream (west) of downtown Nevada City.

In general, the Site is sparsely vegetated. A partially-paved road is located on the eastern boundary of the Site, and a previous assessment site (the Providence Mine Site) is located east of the road. A site map is presented as Figure 3.

The Providence Mine was operated circa 1860 to circa 1920. Hardrock (lode) gold mining waste (mill tailings and processed waste) has impacted soil at the Site, and waste rock (unprocessed overburden) was identified in two piles located to the northwest of the Site. Much of the mine waste and waste rock originally generated by the mining operation was previously washed downstream by the creek over the past 100 years, and waste rock was reportedly removed from the Site for offsite road construction in the mid-1900s.

Historical maps, such as the 1912 Sanborn map of the Providence Mine obtained from Searls Historical Library, depict a hoisting works, mine shaft and waste dump on the previously investigated site east of the paved road. A 40-stamp mill and sulphuret reduction works (chlorination works) is depicted on the subject Site west

of the paved road. The former mill site and chemical processing location are the subject of the current assessment. An excerpt of the historical map is presented as Figure 4.

2.2 LAND USE

The Site is currently undeveloped, except for the abandoned mining features, the road and nearby trails. Potential land uses include recreational trail use and the possibility of periodic camping by local transients. The immediate vicinity of the Site includes Deer Creek to the north and open space in other directions. Seven Hills School is located approximately 2,000 feet southeast of the Site, and the Nevada City Tech Center is located approximately 700 feet southeast of the Site.

2.3 APPARENT PROBLEM

Hardrock gold mining typically involves the removal of gold-bearing ore from mineralized hydrothermal vein systems. The ore and associated rock often contain naturally elevated concentrations of heavy metals such as lead and arsenic. In addition, chemicals such as mercury were often imported to mill sites to facilitate the extraction of gold from the ore materials. Because the mining process brings mineralized materials to the ground surface, and because the milling process tends to liberate naturally-occurring metals and introduce other chemicals, these processes tend to increase the chance of exposure to elevated metals concentrations.

SSI has identified mill tailings, waste rock and affected soil at the Site that contain lead, arsenic, mercury and other metals at concentrations exceeding background soil metals concentrations and/or regulatory benchmark concentrations for human health. Elevated soil metals concentrations present a potential human health risk resulting from potential exposure pathways including incidental soil ingestion, inhalation of soil dust, and dermal contact. These potential exposure pathways are depicted on the conceptual site model diagram presented as Figure 5.

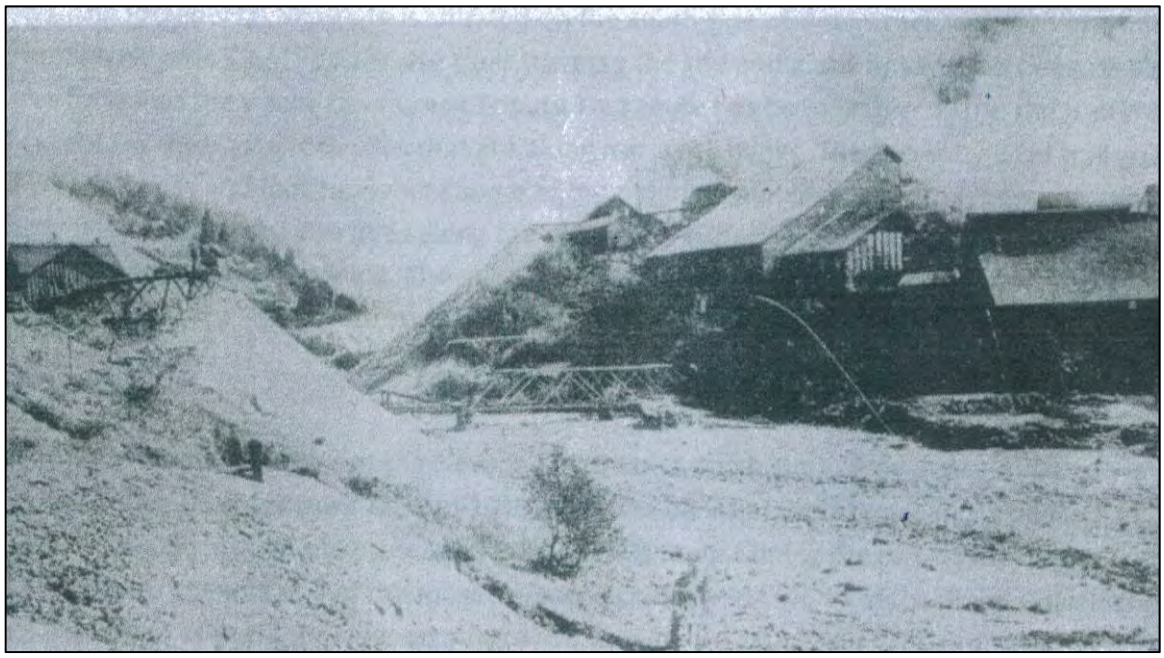
2.4 AREAS OF CONCERN

Elevated metals concentrations have been identified in waste rock and soil within the Site. SSI identified two areas of concern (AOCs), which are described below.

1. Providence Quartz Mill Site, and
2. Environs Waste Rock Piles.

Providence Quartz Mill Site (PQM)

The features depicted on the 1912 Sanborn fire insurance map (Figure 4) at the Providence Quartz Mill Site include a 40-stamp quartz mill (inactive in 1912), a sulphuret room, and a roasting furnace. A historical photograph of the mine and mill site, as viewed from the west across Deer Creek, is presented below.



Deer Creek and Providence Mine, undated (from SSI).

The former structures are no longer present at the Site. According to SSI (2015), current conditions at the former mill site consist of hummocky, sloped terrain in its eastern portion, and a graded area along the paved road in its northern portion. The former sulphuret area is a relatively level, benched area containing crushed quartz ore and fine-grained purple soil (typical of sulphuret process waste) on the ground surface. Mine waste rock and mill tailings are located north and west of the former sulphuret area. The former roasting furnace location is an elongated, level area which was apparently cut into native soil and rock along the western Site boundary.

Environs Waste Rock (EWR)

Two waste rock piles (WR1 and WR2) are located near Deer Creek to the northeast of the Providence Quartz Mill Site. The piles contain angular waste rock and finer materials that were apparently excavated from the underground workings of the Providence Mine. The waste rock piles are separated from the Environs

recreational trail by a steep slope. Because the waste rock piles are not easily accessible, SSI anticipates that routine visitation of the waste rock plies would not be likely.

3 DATA PRESENTATION

3.1 TOTAL METALS IN SOIL AND MINE WASTE

SSI obtained samples of soil and fine-grained mine waste (sand size and smaller) for analysis of total concentrations of Title 22 (CAM 17) metals by USEPA Methods 6010B and 7471A. Results are summarized in Table 1, and laboratory reports are presented in Appendix A. H&K did not validate the quality of the soil metals data and had no control over the field and laboratory methods and quality control procedures associated with the SSI (2015) investigation. H&K understands that SSI has evaluated the field acquisition procedures and laboratory quality control reports, and has determined that the data quality is acceptable for site characterization and risk assessment purposes.

3.2 LOCAL BACKGROUND SOIL ARSENIC DATA

In the Nevada City and Grass Valley area, arsenic is known to occur in soil at concentrations exceeding typical regulatory benchmarks for arsenic in residential and commercial soil. Therefore, a discussion of regional background soil arsenic concentrations is informative with respect to risk management decisions involving arsenic in soil.

H&K compiled background soil arsenic data for eight local assessments performed under the DTSC's Voluntary Cleanup Program, including Spring Hill, North Star, Kenny Ranch, Winds Aloft, Osborne Hill, Loma Rica, La Barr Meadows and Bear River Mill. Background soil arsenic data are presented in Appendix B. DTSC has reviewed and approved the investigation reports for which the background data were obtained.

The 208 local background arsenic concentrations, listed in Table 1 of Appendix B, range from non-detect to 48 milligrams per kilogram (mg/kg). The mean is 5.3 mg/kg, the standard deviation is 6.9 mg/kg and the coefficient of variation is 1.3. Descriptive statistics for the non-transformed and base 10 log-transformed data are presented in Appendix B.

The DTSC (1997, 2007) provides a framework in which risk assessors may identify background arsenic concentrations. Based on these guidance documents, visual

and statistical evaluation of the regional background arsenic data were performed as described below.

Microsoft Excel Analyze-it™ version 1.73 was used to prepare normality plots of the non-transformed and log-transformed data. The plots are presented in Appendix B, and descriptive statistics are summarized in Tables 2 and 3 of Appendix B. The non-transformed data are clearly not normal, as is often the case with trace metals. Although the log-transformed data generally display a linear distribution, the log-transformed data are not normally distributed based on the Shapiro-Wilk normality test. The coefficient of variation, as well as gaps and inflections observed in the log-transformed data, attest to the fact that the data were obtained from different sites and different geologic units.

With the exception of the Winds Aloft site, the eight background data locations share similar geology. Published geologic descriptions generally indicate that the sites are underlain by quartz diorite, diabase and/or ultramafic rock, as plotted on the QAP diagram presented as Figure 1 in Appendix B. The QAP in Figure 1 is a simplified depiction of the compositional ratio of quartz (Q), alkali feldspar (A), and plagioclase feldspar (P) in igneous plutonic rocks mapped at seven of the eight locations. Specific geologic descriptions are presented in Table 4 of Appendix B.

Outlying data were evaluated using the fourth spread procedure described by DTSC (2007). The fourth spread, f_s, is defined as the measure of spread in a data set that is resistant to outliers and is calculated according to the following equation: $f_s = Q_3 - Q_1$ (third quartile - first quartile). By definition, any observation farther than $1.5f_s$ from the closest fourth is considered an outlier. For the log-transformed data set, $1.5f_s$ is equal to 1.25, and any observation below $Q_1 - 1.5f_s$ or above $Q_3 + 1.5f_s$ would be considered an outlier. By this method, none of the data were determined to be outliers.

The 95th percentile value for the local background arsenic data set is 17 mg/kg. This value may be considered a background threshold value representing regional background soil arsenic concentrations.

4 CONCEPTUAL MODEL

A site conceptual model (SCM) diagram is presented as Figure 5. The diagram depicts:

- Primary source media and release mechanisms;
- Secondary source media and transport mechanisms;

- Potential points of exposure (exposure media) and exposure routes; and
- Potential receptors.

The model components are described below.

4.1 PRIMARY SOURCE MEDIA

Primary source media include:

1. Naturally mineralized gold-bearing ore materials, waste materials, and processed mining waste, which commonly contain elevated concentrations of heavy metals and metalloids (e.g., lead and arsenic). Although no natural mineralization has been identified in near-surface native soil and rock at the Site, geologic maps depict numerous hydrothermally-emplaced, mineralized, gold-bearing quartz veins underlying the Site vicinity. These naturally mineralized materials were brought to the surface as a result of underground mining operations.
2. Mercury, which commonly was imported during the early days of gold mining as elemental mercury (quicksilver) for use in recovery of gold from ore materials.

A sulphuret process was historically operated at the Providence Quartz Mill Site. The sulphuret process was used to extract gold from "refractory" ore, in which fine gold particles are bound to sulfide minerals that occlude the gold particles, making them difficult to extract. According to Bean (1867), the sulphuret process typically involved crushing, roasting and chlorination of the refractory ore. Chlorine gas was commonly generated from manganese peroxide and sulfuric acid. Byproducts of the sulphuret process typically included air pollution, purple or dark red soil coloration, and processing waste with elevated concentrations of total and soluble metals, which occur naturally in the ore and are liberated during processing.

4.2 PRIMARY RELEASE MECHANISMS

The following primary release mechanisms are numbered in correspondence with the source media listed above.

1. The deep, mineralized ore deposits underlying the local area were transported to the ground surface as a result of historical hardrock gold mining operations, and heavy metals and metalloids (e.g., arsenic and lead) were liberated from the ore deposits as a result of crushing and chemical processing.
2. Mercury imported for use in nearby gold amalgamation processes tended to be released in liquid or vapor form.

a. Elemental mercury in liquid form tended to be introduced to the environment as a result of mercury loss during the amalgamation process.

b. Mercury in vapor form tended to be released if there was incomplete recovery of mercury after heating of gold-mercury amalgam (e.g., in a distillation retort).

The mine waste was subject to precipitation, surface water infiltration and runoff, and erosion due to wind and mechanical disturbance.

4.3 SECONDARY SOURCE MEDIA

The secondary source media are Site soil and the remnant mine waste, which have elevated concentrations of metals and metalloids. Surface water in Deer Creek and groundwater underlying the Site are potential secondary source media.

4.4 TRANSPORT MECHANISMS

Transport mechanisms are depicted on Figure 5 and described below.

Surface Water Erosion

Seasonal overland surface water flow during storm events may transport contaminated soil and mine waste via sediment in suspended form.

Leaching

Precipitation and percolation may leach heavy metals from contaminated soil and mine waste and transport them in dissolved form.

Erosion

Erosion of contaminated soil and mine waste by wind or mechanical disturbance may transport suspended particulates.

Volatilization

The constituents of potential concern (metals and metalloids) are not volatile, with the exception of mercury. Volatilization is generally not considered a significant transport mechanism for the Site; however, cleanup goals are established based on the findings of human health risk assessment that consider mercury volatilization for the air exposure pathway.

Biological Uptake

Heavy metals and metalloids may be incorporated in plant tissue as a result of biological uptake for plants growing in contaminated soil or mine waste. Heavy metals and metalloids may be incorporated in animal tissue through the food chain or as a result of direct contact (ingestion, dermal contact, inhalation of soil dust) with contaminated soil.

4.5 EXPOSURE MEDIA AND EXPOSURE ROUTES

Exposure media for the Site are soil and air, which may contain both suspended particulates (dust) and vapor (volatile mercury). Exposure routes are incidental ingestion and dermal contact with contaminated soil and mine waste, and inhalation of particulates or vapors originating from the contaminated soil and mine waste.

The mine waste and contaminated soil are subject to seasonal precipitation and runoff that may transport solid or dissolved constituents towards Deer Creek, which is located approximately 150 feet down slope (north-northeast) of the Site. Surface water monitoring in Deer Creek has been performed as part of past studies of the watershed, but is not addressed by SSI (2015) and is not evaluated as part of this risk assessment.

As described above, volatilization is evaluated only for mercury, and cleanup goals are established based on the findings of human health risk assessment that consider mercury volatilization for the air exposure pathway.

Ingestion of plant and animal tissue is a potential exposure pathway in the case of future vegetable garden cultivation, hunting or fishing. Food chain exposure pathways are not evaluated as part of this risk assessment; however, methylation and biomagnification of mercury, as described below by Alpers, et al. (2005), is an ongoing topic of study in the Deer Creek watershed.

> Mercury occurs in several different geochemical forms, including elemental mercury [Hg(0)], ionic (or oxidized) mercury [Hg(II)], and a suite of organic forms, the most important of which is MeHg (CH_3Hg^+) [methylmercury]. MeHg is the form most readily incorporated into biological tissues and most toxic to humans. The transformation from elemental mercury to methylmercury is a complex biogeochemical process that requires at least two steps, (1) oxidation of Hg(0) to Hg(II), followed by (2) transformation from Hg(II) to MeHg. Step 2 is referred to as methylation. Mercury methylation is controlled by sulfate-reducing bacteria and other microbes

that tend to thrive in conditions of low dissolved oxygen, such as near the sediment-water interface or in algal mats. Numerous environmental factors influence the rates of mercury methylation and the reverse reaction known as demethylation. These factors include temperature, dissolved organic carbon, salinity, acidity (pH), oxidation-reduction conditions, and the form and concentration of sulfur in water and sediments.

The concentration of MeHg generally increases by a factor of ten or less with each step up the food chain, a process known as biomagnification. Therefore, even though the concentrations of Hg(0), Hg(II), and MeHg in water may be very low and deemed safe for human consumption in drinking water, MeHg concentration levels in fish, especially predatory species such as bass and catfish, may reach levels that are considered potentially harmful.

Pursuant to the USGS (2000) mercury assessment, Scotts Flat Reservoir and Little Deer Creek were listed on California's 303 (d) list under the Clean Water Act as having impaired beneficial uses due to mercury contamination. An Interim Public Health Notification was issued by the County of Nevada for these waterbodies, and a draft fish consumption advisory was issued by the California Office of Environmental Health Hazard Assessment (OEHHA).

4.6 POTENTIAL RECEPTORS

The Site is currently open space. Although no specific development plans are available, future development may include a parking area and trail that would subject to pedestrian, equestrian and cyclist use. Potential receptors include construction workers and recreational visitors.

5 BACKGROUND SOIL METALS EVALUATION

For the purposes of risk assessment, it is useful to distinguish between background metals concentrations occurring naturally in soil and elevated metals concentrations resulting from past waste disposal activities and releases of hazardous material to the environment. According to the DTSC Office of Human and Ecological Risk (HERO) Human Health Risk Assessment (HHRA) Note No. 3 (DTSC, 2016), "HERO strongly recommends consideration of site-specific background concentrations of inorganic constituents."

DTSC (1997) provides a framework in which risk assessors may identify background metals concentrations. Pursuant to DTSC guidance (accessed in 2016

at http://www.dtsc.ca.gov/AssessingRisk/backgrnd.cfm), “risk assessments should eliminate from consideration those whose range of concentrations fall within the range of local ambient conditions.” To do this, the local ambient data set may be defined by pooling all Site data and determining ambient conditions in the presence of possible contamination. DTSC (1997) describes two methods of comparison:

1. Comparison of all detected Site concentrations for a given metal to a single value representative of the upper range of local ambient conditions; and
2. Comparison of mean Site concentrations for a given metal to mean ambient values using the Wilcoxon Rank Sum test, a simple non-parametric statistical technique.

The two methods may be used to compare both high-end values and mean values to determine whether contamination is present.

Site CAM 17 metals data are presented in Table 1. ProUCL Version 5.0 (USEPA, 2013) was used to perform outlier tests and to prepare box plots and normality plots (Q-Q Plots), which are presented in Appendix C. Based on the outlier test results and visual interpretation of the plots, multiple populations were detected for most CAM 17 metals in Site soil (antimony, arsenic, cadmium, cobalt, copper, lead, mercury, molybdenum, selenium, silver, thallium and zinc). Linear Q-Q Plots, indicative of a single (background) population, were identified for barium, beryllium, chromium and vanadium. Antimony was not detected in samples obtained from the Environs Waste Rock Piles.

6 HUMAN HEALTH RISK ASSESSMENT

A human health screening evaluation was performed in general accordance with guidelines set forth in DTSC’s Human Health Risk Assessment (HHRA) guidance (available online at http://www.dtsc.ca.gov/assessingrisk/humanrisk2.cfm). HHRA methodology and results are summarized below.

6.1 EXPOSURE PATHWAYS AND MEDIA OF CONCERN

A conceptual model is presented in Section 4. Exposure media for the site are soil and air. Exposure pathways are incidental ingestion and dermal contact with the affected soil, and inhalation of particulates and volatile mercury originating from the affected soil.

Groundwater and surface water pathways are not considered in the risk assessment. Although portions of the waste rock piles on the banks of Deer Creek may be subject to seasonal inundation, H&K understands that the remedial action

is focused on the protection of human health, and no water quality data are available for the Site.

6.2 EXPOSURE POINT CONCENTRATIONS AND CHEMICAL GROUPS

The Site is impacted by inorganics (metals and metalloids) associated with mine waste. No other constituents of potential concern were identified.

Exposure point concentrations (EPCs) and general statistics are summarized in Tables 2a and 2b. EPCs are generally represented by a reasonable maximum exposure (RME) concentration, using the 95% upper confidence limit (95% UCL) on the arithmetic mean constituent concentration, as determined using the latest version of ProUCL (Version 5.0; USEPA, 2013). Statistical calculations are summarized in Appendix C. When UCL calculations are not possible based on a limited number of detections, the maximum detected concentration is used as the EPC.

H&K understands that an authoritative rather than random soil sampling approach was employed for the site investigation. Thus, the data have limited use for statistical analysis.

6.3 CONSTITUENTS OF CONCERN

Constituents of concern (COCs) are identified in Tables 3a and 3b. Metals are considered COCs if the EPC exceeds the Site background range, or for arsenic, if the EPC exceeds the local BTV, as described in Section 3.2. The following metals are identified as COCs and are included in the risk characterization.

- Providence Quartz Mill (PQM): antimony, arsenic, cadmium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium and zinc.
- Environs Waste Rock (EWR): cadmium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium and zinc.

6.4 EXPOSURE PARAMETERS

Residential (unrestricted) land use is considered, as are other potential exposure scenarios including recreational trail use, routine visitation from neighboring residences, unauthorized transient camping, and construction worker.

6.4.1 Residential Land Use

Exposure parameters for residential land use are adopted from the PEA Guidance Manual (DTSC, 2015c) as updated by HERO HHRA Note No. 1 (DTSC, 2014),

pursuant to guidance presented in *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (RAGS Part E, Supplemental Guidance for Dermal Risk Assessment; US EPA, OSWER 9285.7-02EP, July 2004) and *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (US EPA, OSWER 9355.4-24, December 2002).

- Child exposure is considered. Cadmium hazard is evaluated pursuant to guidelines set forth in HERO HHRA Note No. 3 (DTSC, 2016) considering 26-year adult exposure.
- Exposure frequency is 350 days per year.
- Body weight is 15 kilograms (kg) for child and 80 kg for adult.
- The incidental soil ingestion rate is 200 milligrams per day (mg/day) for child and 100 mg/day for adult. Pica is not considered.
- The inhalation rate is 10 cubic meters per day (m^3/day) for child and 20 m^3/day for adult.
- Averaging time is 70 years for carcinogenic effects.
- Exposure duration for adults is 20 years. Averaging time for non-carcinogenic effects is equal to the exposure duration.
- Exposed skin surface area is 2,900 square centimeters (cm^2) for children and 6,032 cm^2 for adults.
- Dermal adherence factor is 0.2 milligrams per square centimeter (mg/cm^2) for children and 0.07 mg/cm^2 for adults.
- Particulate emission factor (PEF) is 1.36×10^9 cubic meters per kilogram (m^3/kg).

6.4.2 Recreational Trail Use

Exposure parameters for a “recreational runner” scenario were set forth by the DTSC’s Office of Human and Ecological Risk (formerly known as the Human and Ecological Risk Division) in the memorandum *Remediation Goals for the Recreational Runner on Trails, Empire Mine State Historical Park (EMSHP), Grass Valley* (September 29, 2006). The memorandum presented in Appendix D sets forth the exposure scenario.

In 2006, DTSC observed recreational use patterns on trails within the EMSHP and determined that the runner who routinely uses the trails would likely have the highest chronic exposure to contaminants in the soil, based on the extent of heavy physical activity involved in running compared to the other observed uses of the

trails. Because the subject site is smaller than the EMSHP, and potential future trail segments through the Site would be shorter than those at the EMSHP, this appears to be a conservative exposure scenario with respect to use of the subject Site by recreational runners.

DTSC (2006) calculated a remedial goal for arsenic in soil on trails at the EMSHP of 270 mg/kg, determining that the consideration of arsenic as a threshold toxicant, rather than as a carcinogen, is appropriate and health protective of the recreational runner due to the short time duration of trail use. The remedial goal corresponded to a hazard quotient of one and a risk within the range of one-per million and one-per-ten-thousand, considering that complete exposure pathways exist for inhalation, ingestion and dermal contact.

Based on the current toxicological parameters listed in Table 4, and considering the recreational runner exposure parameters discussed above, a soil arsenic concentration of 46 mg/kg yields a hazard quotient of 1.0 and a risk within the range of one-per-million and one-per-ten-thousand.

6.4.3 Routine Visitation from Neighboring Residences

Based on the distance between neighboring residences to the Site, routine visitation is not considered likely. A relatively conservative scenario was previously developed by DTSC for routine child visitation at other Nevada County cleanup sites, as outlined below.

- The visitor is a child age 6 to 16 years.
- The exposure duration is 10 years, 2 hours per day.
- The exposure frequency is 7 days per week, 50 weeks per year.
- The exposure frequency for soil dermal contact is one event per day.
- Incidental soil ingestion is 200 mg/day. Pica is not considered.
- Averaging time is 10 years for non-carcinogenic and 70 years for carcinogenic.
- Average body weight for boys and girls, 6 to 16 years old is 41.5 kg (verified with *Exposure Factors Handbook*, EPA, 1997, p. 7-10 and Table 7-3).
- Exposed skin surface area is 2800 square centimeters (cm^2) for children, per *Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil* (OEHHA, November 2004, revised January 2005).

- Dermal adherence factor is 0.2 mg/cm^2 per *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual* (RAGS Part E, Supplemental Guidance for Dermal Risk Assessment,U.S. EPA, OSWER 9285.7-02EP, July 2004).
- Particulate emission factor is 1.36 x 109 m^3/kg, per *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (U.S. EPA, OSWER 9355.4-24, December 2002).
- Inhalation rate is 2.4 m^3/day for a child during the 2-hour site visitation.

6.4.4 Unauthorized Transient Camping

H&K understands that SSI has not observed evidence of transient campers at the Site. This relatively conservative exposure scenario assumes that the Site may be visited by adult transient campers at an exposure frequency of 100 days per year. Exposure parameters set forth by the Bureau of Land Management (BLM) for a camper scenario result in a screening level for soil arsenic of 46 mg/kg (Karl Ford, *Risk Management Criteria for Metals at BLM Mining Sites*, Technical Note 390, October 2004). Exposure parameters for the transient camper scenario considered in this assessment are outlined below.

- The transient camper is an adult (over 16 years).
- The exposure duration (central tendency) is 9 years.
- The exposure frequency is 100 days per year.
- The exposure frequency for soil dermal contact is one event per day.
- Incidental soil ingestion rates are not available specifically for campers. This assessment considers a central tendency ingestion rate for adult campers (50 mg/day) based on EPA's Exposure Factor Handbook (1997) value for resident adults.
- Averaging time is equal to exposure duration for non-carcinogenic effects, and is 70 years for carcinogenic effects.
- Average body weight is 70 kg.
- Exposed skin surface area for adult campers assumes short sleeve shirts, long pants, and shoes, with head, hands, and forearms available for contact. A value of 3,300 cm^2 is the average of the 50th percentile for males and females greater than 18 years of age.
- The dermal adherence factor is 0.2 milligrams per square centimeter as set forth in *Risk Assessment Guidance for Superfund, Volume I: Human Health*

Evaluation Manual (RAGS Part E, Supplemental Guidance for Dermal Risk Assessment, U.S. EPA, OSWER 9285.7-02EP, July 2004).

- The particulate emission factor is 1.36×10^9 cubic meters per kilogram (m3/kg), per *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (U.S. EPA, OSWER 9355.4-24, December 2002).
- The inhalation rate is 20 m^3/day for the adult camper, which is equal to the adult resident inhalation rate.

6.4.5 Construction Worker

Exposure parameters for the construction worker are adopted from HERO HHRA Note No. 1 (DTSC, 2014). Considering the expected duration of the cleanup (approximately one month), the default exposure duration (one year) used in this scenario is conservative.

- Adult exposure is considered.
- Exposure duration is one year.
- Exposure frequency is 250 days per year.
- Body weight is 80 kg.
- Incidental soil ingestion rate is 330 mg/day.
- Inhalation rate is 20 m^3/day for the eight-hour workday.
- Averaging time is 70 years for carcinogenic effects.
- Averaging time for non-carcinogenic effects is equal to the exposure duration.
- Exposed skin surface area is 6,032 cm^2.
- Dermal adherence factor is 0.08 mg/cm^2.
- PEF is 1.0×10^6 m^3/kg.

6.5 TOXICITY VALUES

Toxicity values and references are listed in Table 4.

6.6 RISK CHARACTERIZATION

Risk and hazard calculations are performed using the following equations for non-volatile constituents. For residential land use, hazard is evaluated for child exposure except for cadmium (DTSC, 2016). Calculations are summarized in Tables 5a through 9b, and results are summarized in Table 10.

$Risk_{soil}$ = SF_o x C_s x [(($IR_{s,child}$ x EF x ED_{child} x 10^{-6} kg/mg) / (BW_{child} x AT x 365 days/yr)) + ((SA_{child} x AF x ABS x EF_{child} x ED_{child} x 10^{-6} kg/mg) / (BW_{child} x AT x 365 days/yr)) + (($IR_{s,adult}$ x EF x ED_{adult} x 10^{-6} kg/mg) / (BW_{adult} x AT x 365 days/yr)) + ((SA_{adult} x AF x ABS x EF_{adult} x ED_{adult} x 10^{-6} kg/mg) / (BW_{adult} x AT x 365 days/yr))]

$Hazard_{soil}$ = (C_s / RfD_o) x [((IR_s x EF x ED x 10^{-6} kg/mg) / (BW x AT x 356 days/yr)) + ((SA x AF x ABS x EF x ED x 10^{-6} kg/mg) / (BW x AT x 365 days/yr))]

$Risk_{air}$ = SF_i x C_a x [((IR_{child} x EF x ED_{child}) / (BW_{child} x AT x 365 days/yr)) + ((IR_{adult} x EF x ED_{adult}) / (BW_{adult} x AT x 365 days/yr))]

$Hazard_{air}$ = (C_a / RfD_i) x (IR x EF x ED) / (BW x AT x 365 days/yr)

Where:

ABS = absorption fraction of chemical from soil

AT = averaging time, years

AF = soil to skin adherence factor, mg/cm^2

BW = body weight, kg

C_a = concentration in air, mg/m^3 (C_a = C_s / PEF)

C_s = concentration in soil, mg/kg

ED = exposure duration, years

EF = exposure frequency

PEF = particulate emission factor, m^3/kg

$Hazard_{air}$ = non-cancer chronic health hazard for air pathways

$Hazard_{soil}$ = non-cancer chronic health hazard for soil pathways

IR_a = inhalation rate, m^3/day

IR_s = incidental soil ingestion rate, mg/day

SA = exposed skin surface area, cm^2

SF_i = inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$

SF_o = oral cancer slope factor, $(mg/kg\text{-}day)^{-1}$

RfD_i = inhalation reference dose, mg/kg-day

RfD_o = oral reference dose, mg/kg-day

$Risk_{air}$ = lifetime excess cancer risk for air pathways

$Risk_{soil}$ = lifetime excess cancer risk for soil pathways

For volatile constituents (i.e., mercury) in soil, the following methodology is used to assess chronic health hazard related to air pathways pursuant to HERO HHRA Note No. 3 (DTSC, 2016).

$Hazard_{air} = (C_a / RfC_i) \times (EF_i \times ED \times ET) / (AT_{nc} \times 24\ hr/day \times 365\ day/yr)$

Where:

RfC_i = reference concentration for inhalation exposure, mg/m^3 (mercury RfCi = 3.0E-05 mg/m^3 as established by OEHHA and as listed in Table 4)

AT_{nc} = averaging time for non-carcinogenic effects, years

C_a = concentration in air, mg/m^3 ($C_a = C_s / VF$)

VF = volatilization factor for soil, m^3/kg, as established by DTSC (2016) Table A-5 ($VF_{resident}$ = 3.52E+04 m^3/kg; VF_{worker} = 3.52E+04 m^3/kg)

C_s = concentration in soil, mg/kg

EF_i = exposure frequency for inhalation pathway, days/yr

ED = exposure duration, years

ET = exposure time, hr/day (24 hr/day for resident and 8 hr/day for worker)

6.6.1 Residential Land Use

<u>Constituents of Concern</u>

Human health risk and hazard under a residential exposure scenario are characterized in Tables 5a for Providence Quartz Mill (PQM) and in Table 5b for Environs Waste Rock (EWR).

- For PQM, the chronic health hazard index (hazard, or HI) exceeds unity, and the lifetime excess cancer risk (risk) exceeds one-per million. Arsenic is the primary contributor to hazard and risk (Hazard Quotient [HQ] = 350, Risk = 1.3E-03). Mercury is a significant contributor to hazard (HQ = 20). Hazard quotients for cadmium and thallium also exceed unity.
- For EWR, hazard exceeds unity and risk is less than one-per million. Hazard is driven by thallium (HQ = 2), with contributions from cadmium, cobalt and mercury. Arsenic does not exceed the BTV, and therefore hazard and risk are not quantified for arsenic.

<u>All Detected Chemicals, Including Ambient Range</u>

Tables 5c and 5d summarize hazard and risk for PQM and EWR, respectively, considering all detected constituents including ambient metals concentrations.

Pursuant to guidelines set forth in HERO HHRA Note No. 4 (DTSC, 2014), hazard and risk are calculated considering the hazard and risk associated with exposure to all detected chemicals (including those that are determined to be consistent with site-specific background or ambient concentrations). This information is intended to be useful for risk management decisions and to foster public transparency.

- For PQM, hazard exceeds unity and risk exceeds one-per million. As described above, arsenic is the primary contributor to hazard and risk (HQ = 350, Risk = 1.3E-03), mercury is a significant contributor to hazard, and HQs for cadmium and thallium also exceed unity.
- For EWR, hazard exceeds unity and risk exceeds one-per million. Hazard and risk are driven by arsenic (HQ = 60, Risk = 2.2E-04), although it occurs within the local background range. Thallium, cadmium, cobalt, mercury and vanadium also contribute to hazard.

6.6.2 Recreational Trail Use

Human health risk and hazard under a recreational trail use scenario are characterized for PQM and EWR in Tables 6a and 6b, respectively.

- For PQM, hazard (3) exceeds unity and risk (4.1E-05) exceeds one-per million. Arsenic is the primary contributor to hazard and risk, and cadmium, cobalt and mercury are contributors.
- For EWR, hazard (0.5) is less than unity and risk (6.4E-06) exceeds one-per million. Risk is driven by cobalt (Risk = 5.8E-06; 95% UCL = 12.4 mg/kg), whereas the RSL for cobalt in residential soil is 23 mg/kg.

6.6.3 Routine Visitation from Neighboring Residences

Human health risk and hazard under routine child visitation scenario are characterized for PQM and EWR in Tables 7a and 7b, respectively.

- For PQM, hazard (130) exceeds unity and risk (6.0E-04) exceeds one-per million. Arsenic is the primary contributor to hazard and risk. Cadmium, mercury and thallium also contribute to hazard.
- For EWR, hazard (3) exceeds unity and risk (2.8E-09) is less than one-per million. Cadmium and thallium are the primary contributors to hazard.

6.6.4 Unauthorized Transient Camping

Human health risk and hazard under an adult periodic camping scenario are characterized for PQM and EWR in Tables 8a and 8b, respectively.

- For PQM, hazard (7) exceeds unity and risk (3.0E-05) exceeds one-per million. Arsenic is the primary contributor to hazard and risk.
- For EWR, hazard (0.1) is less than unity and risk (3.6E-09) is less than one-per million.

6.6.5 Construction Worker

Human health risk and hazard under a construction worker exposure scenario are characterized for PQM and EWR in Tables 9a and 9b, respectively.

- For PQM, hazard (110) exceeds unity and risk (5.3E-05) exceeds one-per million. Arsenic is the primary contributor to hazard and risk. Mercury, nickel and thallium are also contributors.
- For EWR, hazard (5) exceeds unity and risk (1.2E-06) exceeds one-per million. Risk is driven by cobalt. Cadmium, cobalt and nickel are primary contributors to hazard.

6.7 LEAD HAZARD ASSESSMENT

Lead hazards were assessed using the *Lead Risk Assessment Spreadsheet Version 8* (LeadSpread 8; DTSC, 2011) for child exposure, and the Modified USEPA Adult Lead Model (Modified ALM; DTSC, 2011) for adult exposure. Calculations were performed using standard exposure parameters and the EPC values (95% UCL values) listed in Tables 3a and 3b. Results are summarized in Table 11. LeadSpread output is presented in Appendix E.

The California Environmental Protection Agency (CalEPA) Office of Environmental Health Hazard Assessment (OEHHA) modified the toxicity evaluation of lead in 2007, replacing the 10 µg/dL threshold blood concentration with a source-specific “benchmark change” of 1.0 µg/dL. This change is addressed in the OEHHA publication *Child-Specific Benchmark Change in Blood Lead Concentration for School Site Risk Assessment* (OEHHA, April 2007; http://oehha.ca.gov/risk-assessment/crnr/final-report-chrc-lead).

As summarized in Table 11, soil lead values associated with both assessment areas (Providence Quartz Mill and Environs Waste Rock) are not suitable for residential development.

A modified exposure frequency (two days per week) was previously used by H&K (2013) for child lead exposure in consultation with USEPA for the adjacent Providence Mine Site. Considering this modified exposure frequency for child lead exposure, the benchmark 90th percentile blood lead level (1.0 µg/dL) for non-pica child corresponds to a soil lead concentration 270 mg/kg. The modified child lead model is presented in Appendix E.

6.8 UNCERTAINTY ANALYSIS

Per OEHHA (2004), "systematic, logical and informed approaches to decision making about carcinogens in the environment call for quantitative assessments, because the absence of clearly definable thresholds does not permit identification of 'safe' levels of exposure. Unfortunately, due to the frequent lack of sufficient data, assumptions have to be made in order to complete quantitative assessments of cancer risk."

There are uncertainties associated with metals content of waste and affected soil; the amount of exposure to waste and soil; the biological uptake of metals from waste and soil; and the toxicological effects of biologically available metals. Such uncertainty must be discussed so that the assessment does not result in a "higher degree of implied certainty in the overall assessment than is warranted" (OEHHA, 2004).

As a result of the uncertainties described below, confidence in the exposure assessment is considered low to moderate. Confidence in toxicity values range from low to high based on the data available for specific metals. This assessment conservatively assumes that soil arsenic is entirely bioavailable, which is typically not the case based on previous assessment of other local sites.

<u>Sampling Uncertainty</u>

Sampling uncertainty related to contaminant concentration in soil, as well as sampling uncertainty related to the literature-derived exposure and toxicity parameters, contribute to the overall uncertainty of the assessment. Statistical analysis is performed as part of the assessment to develop a reasonable maximum exposure level. Confidence in a population mean and variance increases as the number of samples taken from the population increases. H&K did not oversee the site investigation. Based on the moderate sample population (54) and the authoritative sampling approach, confidence in sampling is considered moderate to low.

Model Uncertainty

The literature-derived exposure factors and toxicity factors used in the assessment were obtained with the goal of reducing uncertainty; however, limitations of existing data pertaining to activity patterns for future site occupants, as well as health effects from metals exposure, result in model uncertainty.

Bioavailability

The assessment assumes that arsenic in soil is completely available for biological uptake. Unpublished studies of other abandoned mine lands in Nevada County indicate that the actual bioavailability of arsenic may be lower than 100 percent. The assumption of 100 percent bioavailability likely overestimates the health effects presented by waste and affected soil.

Laboratory Methods and Detection Limits

The soil metals concentrations generally exceed the corresponding laboratory detection limits. Therefore, detection limits are not expected to be a significant source of uncertainty.

Toxicity Values

The California slope factor for oral arsenic exposure (9.5 per mg/kg-day, OEHHA) was used for the risk assessment presented herein. For comparison, the USEPA slope factor is 1.5 per mg/kg-day. The slope factors imply a linear (no threshold) dose-response relationship; however, others have postulated a non-linear relationship, and the mechanisms for arsenic carcinogenicity are not known (OEHHA, 2004). If the dose-response relationship is non-linear, the assumption of linearity would tend to overestimate risks.

6.9 SUMMARY OF RISK ASSESSMENT FINDINGS

Results of the human health risk assessment are summarized in Table 10 and are discussed below.

In general, soil arsenic concentrations govern the calculated chronic human health hazard and excess lifetime cancer risk. Arsenic was detected in the Environs Waste Rock samples only at concentrations below the BTV; therefore, arsenic is not considered a COC for Environs Waste Rock.

Cadmium, cobalt, mercury, thallium and other metals contribute to the chronic human health hazard, although the critical health effects vary from metal to metal.

For example, the USEPA Integrated Risk Information System (IRIS; http://www.epa.gov/IRIS/) and the Agency for Toxic Substances and Disease Registry (ATSDR; http://www.atsdr.cdc.gov/toxprofiles/index.asp) cite the following critical chronic health effects from oral exposure:

- Arsenic: hyperpigmentation (darkening of an area of skin or nails caused by increased melanin), keratosis (growth of keratin (fibrous structural proteins)) on the skin, and possible vascular complications.
- Cadmium: proteinuria
- Mercury: Hand tremor, memory loss, autonomic dysfunction
- Thallium: Respiratory and cardiovascular effects, liver, kidney, hair loss

This screening evaluation does not differentiate chronic health hazards by critical health effect, but instead conservatively considers the aggregate hazard index irrespective of critical health effect.

6.9.1 Providence Quartz Mill

Baseline conditions at the Providence Quartz Mill (PQM) assessment area are not suitable for residential land use, and are not considered protective under the other exposure scenarios considered in this assessment (adult recreational trail use, routine child visitation, adult unauthorized camping, and construction worker). In addition, results of lead hazard assessment demonstrate that soil lead concentrations at the Providence Quartz Mill are not suitable for unrestricted land use.

6.9.2 Environs Waste Rock

Although the Environs Waste Rock assessment area may be acceptable for recreational trail use and periodic visitation, soil metals concentrations are not acceptable for unrestricted use.

Because of the steep slopes between the Environs Trail and the Environs Waste Rock piles, routine visitation of the piles is considered unlikely. The risk assessment findings summarized below indicate that removal action for Environs Waste Rock may not be justified from a human health standpoint based on the limited access.

Arsenic concentrations detected in Environs Waste Rock (maximum 40 mg/kg; 95% UCL = 15.2 mg/kg) are within the range of local background soil arsenic

concentrations described in Section 3.2. Therefore, arsenic is excluded from the risk assessment for Environs Waste Rock.

Soil lead (95% UCL = 249 mg/kg), cadmium (95% UCL = 2.3 mg/kg), cobalt (95% UCL = 12.4 mg/kg), nickel (95% UCL = 23.8 mg/kg) and thallium (95% UCL = 1.9 mg/kg) drive the hazard index under some of the exposure scenarios summarized below.

Residential (Unrestricted)

The Environs Waste Rock is not suitable for residential land use. Hazard is driven by thallium (HQ = 2), with contributions from cadmium, cobalt and mercury. Arsenic does not exceed the BTV, and therefore hazard and risk are not quantified for arsenic.

The 95% UCL (249 mg/kg) on the mean soil lead concentration results in a 90th percentile blood lead level for non-pica child of 3.2 micrograms per deciliter (µg/dL), which exceeds the benchmark concentration of 1.0 µg/dL. The 90th percentile blood lead level for adult worker is 0.4 µg/dL.

Adult Recreational Trail Use

Considering adult recreational trail use, the chronic health hazard index is 0.5 and risk is 6.4E-06, which meets the general criteria for this exposure scenario as described above in Section 6.4.2: HI less than one, risk less than one-per-ten-thousand. Risk is driven by cobalt (Risk = 5.8E-06; 95% UCL = 12.4 mg/kg), whereas the RSL for cobalt in residential soil is 23 mg/kg.

Routine Child Visitation

Considering routine child visitation, the chronic health hazard index is 2.8 and risk is 2.8E-09. However, hazard is driven by cadmium (HQ = 2), and the 95% UCL (2.31 mg/kg) for cadmium in Environs Waste Rock (2.3 mg/kg) is less than the DTSC-SL for cadmium in residential soil (5.2 mg/kg). The second highest hazard quotient is associated with thallium (HQ = 0.9; 95% UCL = 1.9 mg/kg). Considering the steep slopes and limited access to the waste rock piles, child exposure at the modeled frequency is considered unlikely.

A modified exposure frequency (two days per week) was previously used by H&K (2013) for child lead exposure in consultation with USEPA for the adjacent Providence Mine Site. Considering this modified exposure frequency for child lead exposure, the 95% UCL (249 mg/kg) on the mean soil lead concentration results in

a 90th percentile blood lead level for non-pica child of 0.9 µg/dL, which is less than the benchmark blood lead concentration of 1.0 µg/dL.

Unauthorized Transient Camping

For the adult unauthorized camping scenario, hazard (0.1) is less than one and risk (3.6E-09) is less than one-per-million. Because of the steep slopes between the Environs Trail and the Environs Waste Rock piles, routine transient camping is considered unlikely.

Construction Worker

For the construction worker exposure scenario, the chronic health hazard index (5) exceeds unity and risk (1.2E-06) exceeds one-per million. Cadmium (95 % UCL = 2.3 mg/kg), cobalt (95% UCL = 12.4 mg/kg) and nickel (95% UCL = 23.8 mg/kg) are primary contributors to hazard. Risk is driven by cobalt. None of these metals exceed their respective DTSC-SLs or RSLs for residential soil, and the exposure duration (1 year) is conservative for the small assessment area. The waste rock piles are not accessible to construction equipment, but dust control would be appropriate if the piles were subject to disturbance.

6.10 ASSESSMENT RELATED TO FUTURE REMOVAL ACTION

H&K understands that SSI plans to conduct remedial action at the Providence Quartz Mill. The purpose of the proposed remedial action is:

- To remove mine waste and affected soil; and
- To place clean cover over contaminated areas that remain in place and that may be subject to future use.

At the request of SSI, H&K performed statistical evaluation and risk assessment to simulate two possible removal actions:

1. Removal of soil with metals (lead and mercury) concentrations exceeding the corresponding TTLCs (1,000 mg/kg and 20 mg/kg, respectively).
2. Removal of soil with lead concentrations exceeding a cleanup goal (270 mg/kg) previously used for the adjacent Providence Quartz Mine site.

The assessment is summarized in Tables 12a through 19, and findings are discussed below.

6.10.1 Removal of Soil Exceeding TTLCs

Only lead and mercury were detected at concentrations exceeding the corresponding TTLCs:

- Lead concentrations in samples WR-8, WR-8B, WR-9, WR9-.75, WR9-1.5, SR-13, WR21 and WR21-1 exceed the TTLC for lead (1,000 mg/kg).
- Mercury concentrations in samples WR-8, WR-8B and SR-13 exceed the TTLC for lead (20 mg/kg). Lead also exceeds the TTLC in these samples.

The locations of the eight samples listed above are depicted in Figure 6. The samples were obtained from the vicinity of the historical location of the sulphuret room, on the southwest side of the historical location of the quartz mill. This area comprises approximately 300 square feet, as shown on Figure 6.

The PQM data set was culled by removing all metals data for the eight soil samples listed above, and the resulting 95% UCL values are listed in Table 12a. Based on the results summarized below for each exposure scenario, the PQM assessment area would not be acceptable for unrestricted land use after removal of soil with metals exceeding the TTLC, nor would it be acceptable under the other exposure scenarios considered. Soil cover would be required to limit recreational exposure, and engineering controls would be required for dust mitigation during construction or other soil disturbing activities. Results are summarized in Tables 18 and 19, and exposure scenarios are discussed below.

<u>Residential (Unrestricted)</u>

The Providence Quartz Mill assessment area, after removal of soil with lead and mercury concentrations exceeding the TTLC, would not be suitable for residential land use. Hazard is driven by arsenic, with contributions from cadmium, mercury and thallium.

After removal of soil with lead and mercury concentrations exceeding the TTLC, the resulting 95% UCL (544 mg/kg) on the mean soil lead concentration results in a 90th percentile blood lead level for non-pica child of 7.1 µg/dL, which exceeds the benchmark concentration of 1.0 µg/dL. The 90th percentile blood lead level for adult worker is 0.9 µg/dL.

<u>Adult Recreational Trail Use</u>

Considering adult recreational trail use, the chronic health hazard index is 2 and risk is 1.9E-05. Arsenic (95% UCL = 28.5 mg/kg), cobalt (95% UCL = 16.1 mg/kg),

mercury (95% UCL = 8.9 mg/kg) and nickel (95% UCL = 32.4 mg/kg) contribute the largest hazard quotients. The cobalt EPC is below the corresponding RSLs for cobalt (23 mg/kg) in residential soil, and the nickel EPC is below the corresponding DTSC-SL for nickel (490 mg/kg) in residential soil.

Routine Child Visitation

Considering routine child visitation, the chronic health hazard index is 48 and risk is 1.9E-09. Hazard and risk are driven by arsenic, with significant hazard quotients related to cadmium and thallium.

Unauthorized Transient Camping

For the adult unauthorized camping scenario, hazard (0.3) and risk (9.5E-06) are driven by arsenic.

Construction Worker

For the construction worker exposure scenario, hazard (43) and risk (1.8E-05) are driven by arsenic, with significant hazard quotients related to cadmium, cobalt, nickel and thallium. As mentioned above, the EPCs for cobalt and nickel do not exceed the corresponding screening levels for residential soil.

6.10.2 Removal of Soil With Lead Exceeding 270 mg/kg

Removal of soil from the Providence Quartz Mill assessment area with lead concentrations exceeding 270 mg/kg would result in soil removal from most of the assessment area. Only 12 of the 30 samples obtained from the assessment area have lead concentrations less than or equal to 270 mg/kg.

To evaluate possible post-removal conditions, the PQM data set was culled by removing all metals data except for the 12 samples where lead is less than or equal to 270 mg/kg, and the resulting 95% UCL values are listed in Table 12b. Based on the results summarized below for each exposure scenario, the PQM assessment area would not be acceptable for unrestricted land use or routine child visitation after removal of soil with lead exceeding 270 mg/kg, but it may be acceptable for some forms of trail use. Soil cover would likely be required.

The resulting 95% UCL for arsenic in soil (17.1 mg/kg) is similar to the BTV (17 mg/kg) for local soil, as described in Section 3.2. Hazard and risk are evaluated below for each exposure scenario, both with and without contributions from arsenic. Results are summarized in Tables 18 and 19.

Residential (Unrestricted)

The Providence Quartz Mill assessment area, after removal of soil with lead concentrations exceeding 270 mg/kg, would not be suitable for residential land use. Hazard is driven by arsenic, with significant contributions from mercury and thallium.

After removal of soil with lead concentrations exceeding 270 mg/kg, the resulting 95% UCL (180 mg/kg) on the mean soil lead concentration results in a 90th percentile blood lead level for non-pica child of 2.3 µg/dL, which exceeds the benchmark concentration of 1.0 µg/dL. The 90th percentile blood lead level for adult worker is 0.3 µg/dL.

Adult Recreational Trail Use

Considering adult recreational trail use, the chronic health hazard index is 1.1 and risk is 1.4E-05. Arsenic (95% UCL = 17.1 mg/kg) drives hazard and risk (HQ = 0.7, risk = 7.0E-06). Excluding arsenic (BTV = 17 mg/kg), the hazard index is 0.7 and risk is 8.0E-06.

Routine Child Visitation

Considering routine child visitation, the chronic health hazard index is 28 and risk is 1.2E-04. Hazard and risk are driven by arsenic, with cadmium and thallium also resulting in hazard quotients larger than one.

Unauthorized Transient Camping

For the adult unauthorized camping scenario, hazard (1.3) and risk (6.0E-06) are driven by arsenic. Excluding arsenic (BTV = 17), hazard is less than one and risk is less than one-per-million.

Construction Worker

For the construction worker exposure scenario, hazard (27) and risk (1.0E-05) are driven by arsenic, with cadmium, cobalt, nickel and thallium also resulting in hazard quotients greater than one. As mentioned above, the EPCs for cobalt and nickel do not exceed the corresponding screening levels for residential soil.

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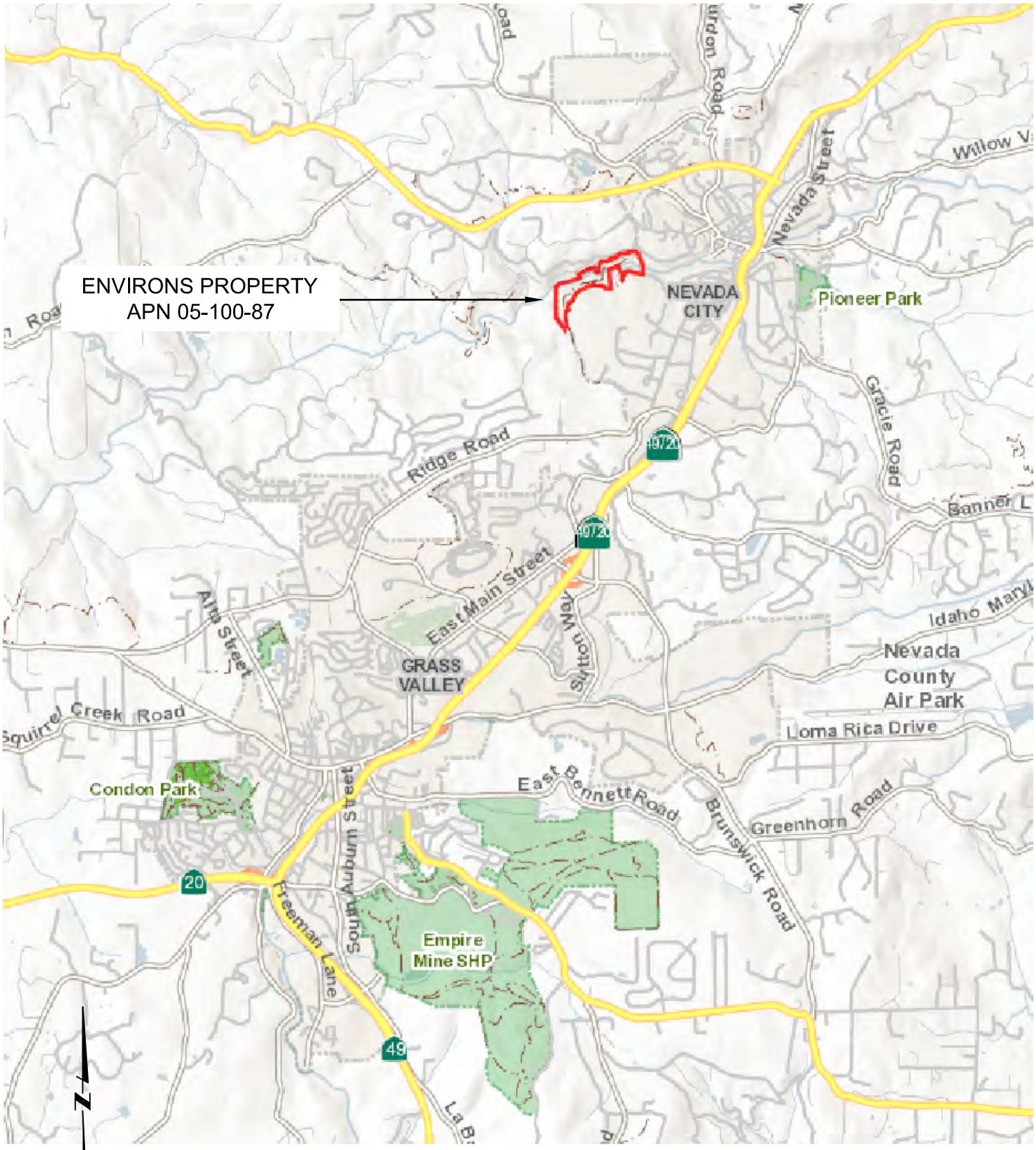
FIGURES

Figure 1	Location Map
Figure 2	Vicinity Map
Figure 3	Site Map
Figure 4	Historical Map
Figure 5	Conceptual Site Model Diagram
Figure 6	Sample Location Map



NOT TO SCALE

BASE MAP FROM NEVADA COUNTY GIS (GIS.NEVCOUNTY.NET/MYNEIGHBORHOOD/); AUGUST 2016

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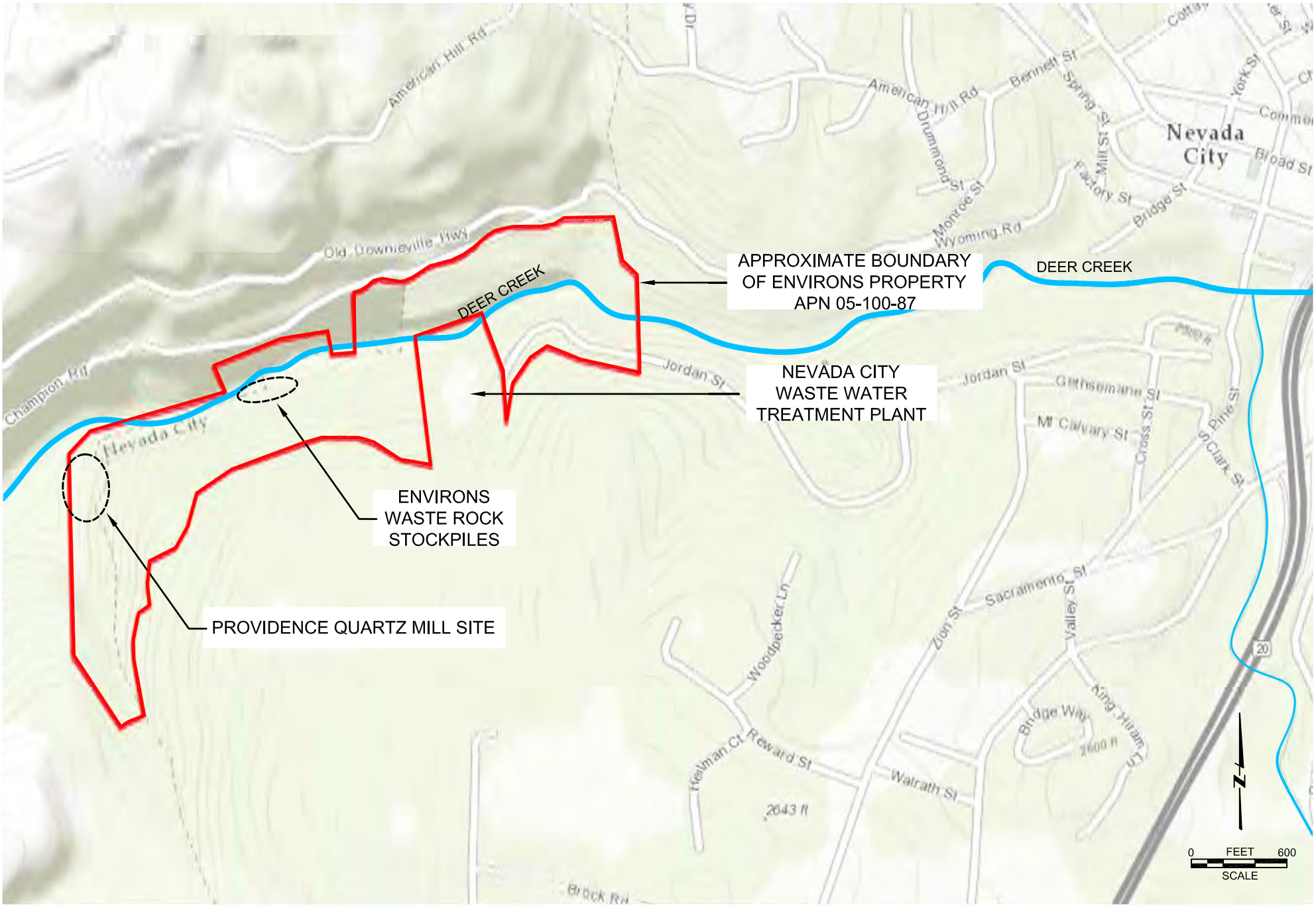
LOCATION MAP

PROVIDENCE QUARTZ MILL SITE

NEVADA CITY, CALIFORNIA

DRAWN BY:	DODGE
CHECKED BY:	MUIR
H&K PROJECT:	3991-03
DATE:	OCTOBER 2016

FIGURE 1



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VICINITY MAP

PROVIDENCE QUARTZ MILL SITE

NEVADA CITY, CALIFORNIA

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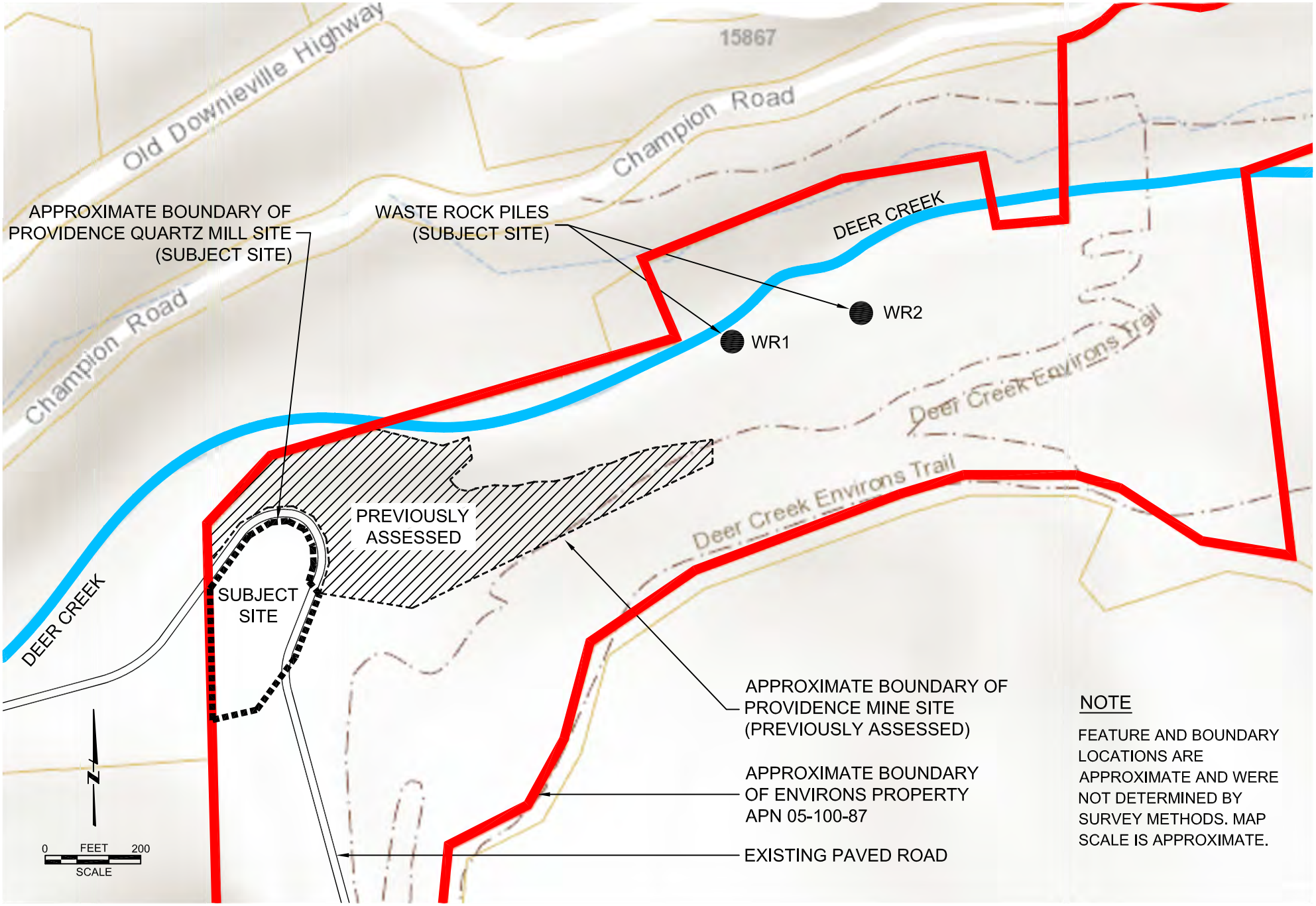
H&K PROJECT:	3991-03
DATE:	OCTOBER 2016

FIGURE 2



NOTE

FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY METHODS. MAP SCALE IS APPROXIMATE.

BASE MAP FROM NEVADA COUNTY GIS (GIS.NEVCOUNTY.NET/MYNEIGHBORHOOD/); AUGUST 2016

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SITE MAP

PROVIDENCE QUARTZ MILL SITE

NEVADA CITY, CALIFORNIA

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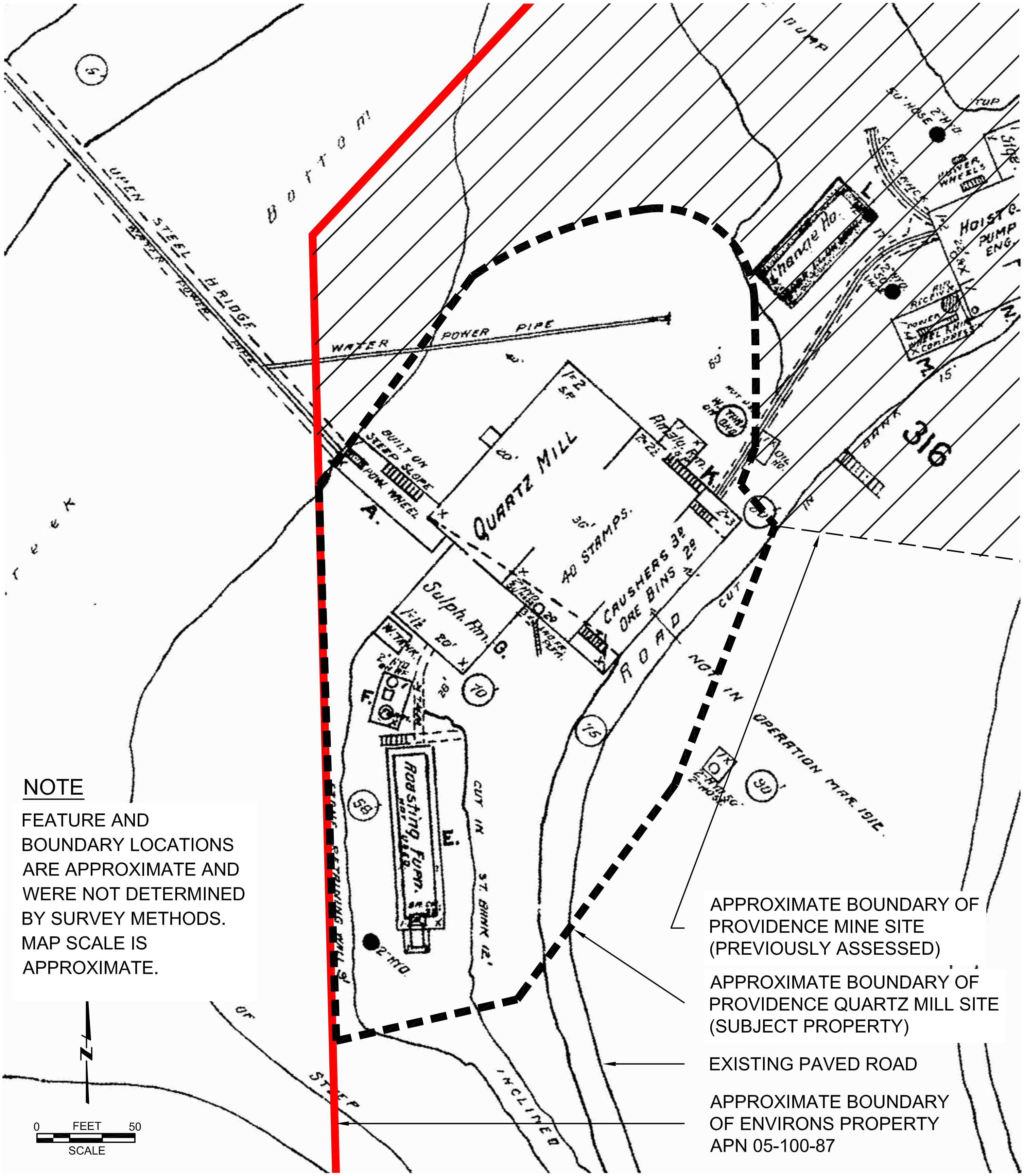
H&K PROJECT:	3991-03
DATE:	OCTOBER 2016

FIGURE 3



BASE MAP FROM SANDBORN INSURANCE MAP OF NEVADA CITY, MARCH 1912, SHEET 13

HOLDREGE & KULL CONSULTING ENGINEERS • GEOLOGISTS	HISTORICAL MAP PROVIDENCE QUARTZ MILL SITE NEVADA CITY, CALIFORNIA	DRAWN BY: DODGE CHECKED BY: MUIR H&K PROJECT: 3991-03 DATE: OCTOBER 2016	FIGURE 4

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TYPICAL TRANSPORT MECHANISMS AND EXPOSURE MEDIA FOR HUMAN AND ECOLOGICAL RECEPTORS

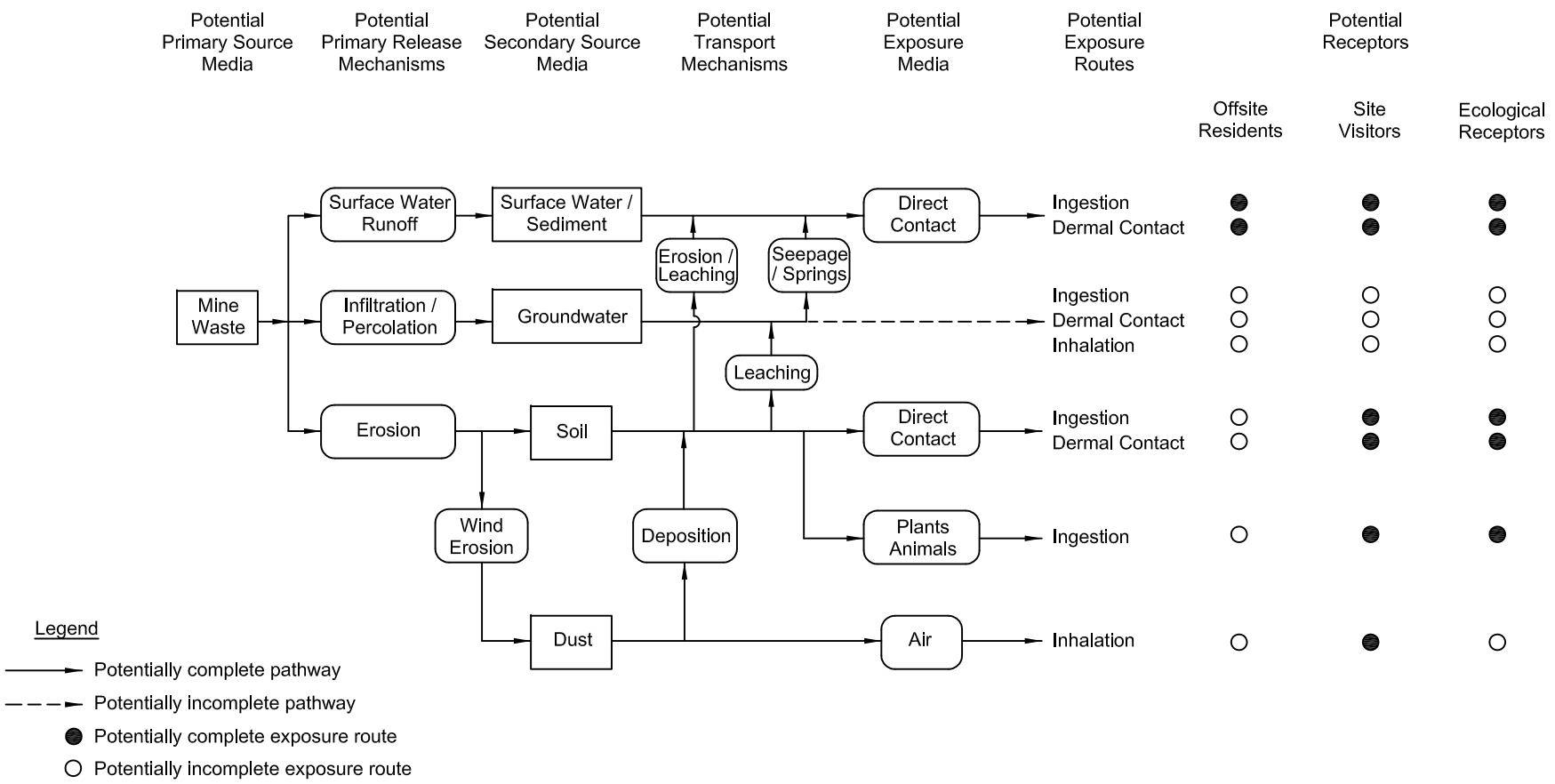

Figure adapted from "Risk Management Criteria for Metals at BLM Mining Sites", Technical Note 390, October 2004, BLM/RS/ST-97/001+1703, Figure 1.

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SITE CONCEPTUAL MODEL DIAGRAM

PROVIDENCE QUARTZ MILL SITE

NEVADA CITY, CALIFORNIA

DRAWN BY:	DODGE
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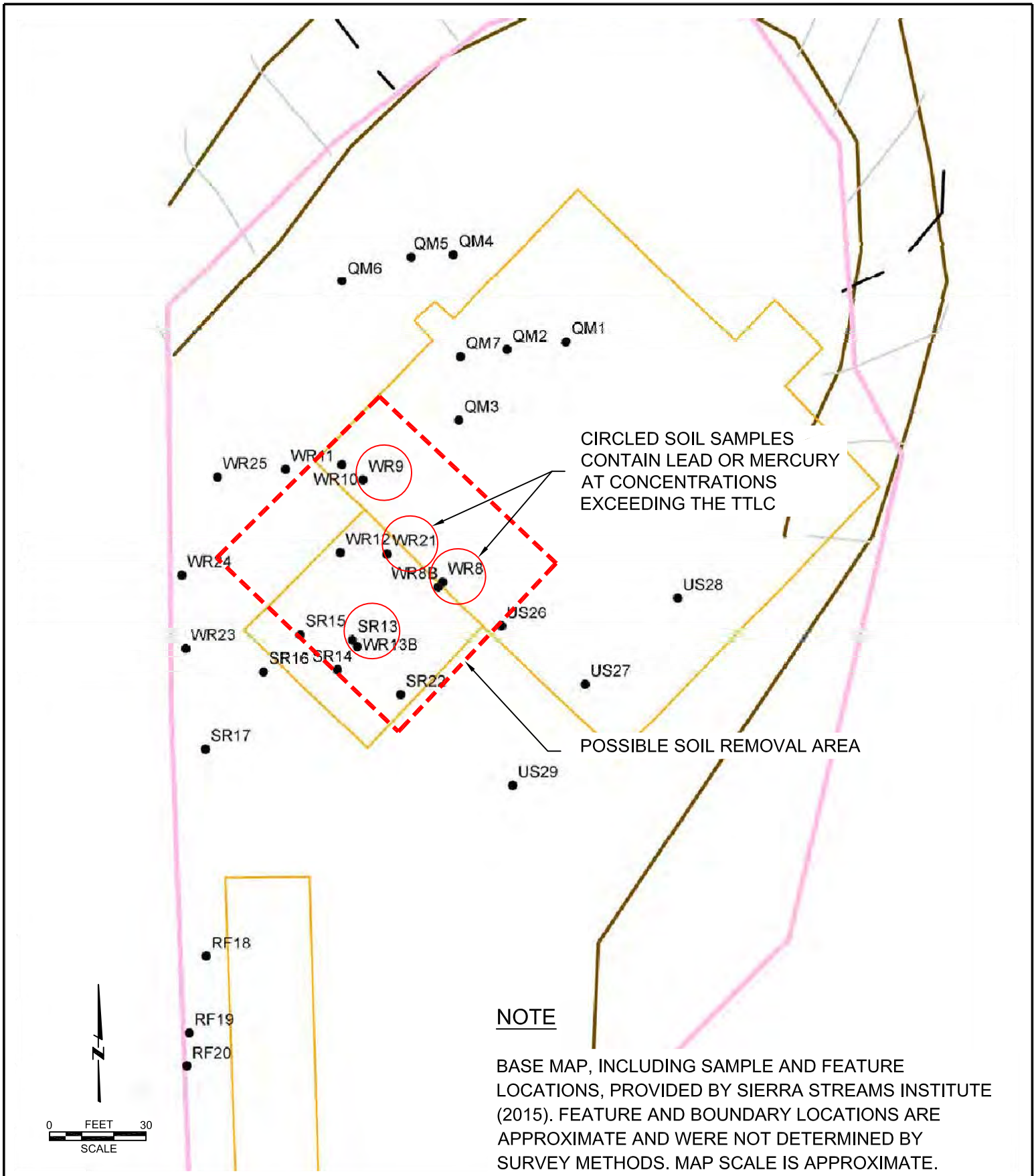
DATE:	OCTOBER 2016

FIGURE 5



NOTE

BASE MAP, INCLUDING SAMPLE AND FEATURE LOCATIONS, PROVIDED BY SIERRA STREAMS INSTITUTE (2015). FEATURE AND BOUNDARY LOCATIONS ARE APPROXIMATE AND WERE NOT DETERMINED BY SURVEY METHODS. MAP SCALE IS APPROXIMATE.

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SAMPLE LOCATION MAP

PROVIDENCE QUARTZ MILL SITE

NEVADA CITY, CALIFORNIA

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DATE:	OCTOBER 2016

FIGURE 6

TABLES

Table 1 Total Metals in Soil Samples

Table 2a Summary of Statistical Evaluation and Exposure Point Concentrations, Providence Quartz Mill

Table 2b Summary of Statistical Evaluation and Exposure Point Concentrations, Environs Waste Rock

Table 3a Constituents of Concern, Providence Quartz Mill

Table 3b Constituents of Concern, Environs Waste Rock

Table 4 Toxicity Values

Table 5a Summary of Risk/Hazard Calculations for Standard Exposure Scenario, Providence Quartz Mill

Table 5b Summary of Risk/Hazard Calculations for Standard Exposure Scenario, Environs Waste Rock

Table 5c Summary of Risk/Hazard Calculations for Standard Exposure Scenario, All Detected Constituents, Providence Quartz Mill

Table 5d Summary of Risk/Hazard Calculations for Standard Exposure Scenario, All Detected Constituents, Environs Waste Rock

Table 6a Summary of Risk/Hazard Calculations for Adult Recreational Trail Use Exposure Scenario, Providence Quartz Mill

Table 6b Summary of Risk/Hazard Calculations for Adult Recreational Trail Use Exposure Scenario, Environs Waste Rock

Table 7a Summary of Risk/Hazard Calculations for Routine Child Visitation Scenario, Providence Quartz Mill

Table 7b Summary of Risk/Hazard Calculations for Routine Child Visitation Scenario, Environs Waste Rock

Table 8a Summary of Risk/Hazard Calculations for Adult Unauthorized Transient Camping Exposure Scenario, Providence Quartz Mill

Table 8b Summary of Risk/Hazard Calculations for Adult Unauthorized Transient Camping Exposure Scenario, Environs Waste Rock

Table 9a Summary of Risk/Hazard Calculations for Construction Scenario, Providence Quartz Mill

Table 9b Summary of Risk/Hazard Calculations for Construction Scenario, Environs Waste Rock

Table 10 Summary of Human Health Risk Assessment

Table 11 Summary of Lead Hazard Assessment

Table 12a Summary of Statistical Evaluation and EPCs, PQM, Removal of Soil Exceeding TTLCs

Table 12b Summary of Statistical Evaluation and EPCs, PQM, Removal of Soil with Lead Exceeding 270 mg/kg

Table 13a Summary of Risk/Hazard Calculations for Standard Exposure Scenario, PQM, Removal of Soil Exceeding TTLCs
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Table 16b Summary of Risk/Hazard Calculations for Adult Unauthorized Camping, PQM, Removal of Soil with Lead Exceeding 270 mg/kg
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Table 17b Summary of Risk/Hazard Calculations for Construction Worker, PQM, Removal of Soil with Lead Exceeding 270 mg/kg
Table 18 Summary of Human Health Risk Assessment, PQM, Proposed Soil Removal
Table 19 Summary of Lead Hazard Assessment, PQM, Proposed Soil Removal

Table 1 - Total Metals in Soil Samples
Providence Quartz Mill Site
Nevada City, California

				Results																
Sample ID	**Sample Date**	**Unit**	**AOC**	**Antimony, metallic**	**Arsenic, inorganic**	**Barium**	**Beryllium and compounds**	**Cadmium**	**Chromium, total (1)**	**Cobalt**	**Copper**	**Lead and compounds**	**Mercury, elemental**	**Molybdenum**	**Nickel, soluble salts**	**Selenium**	**Silver**	**Thallium, soluble salts**	**Vanadium and compounds**	**Zinc and compounds**
USEPA Method				*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*7471A*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*
CAS No.				*7440-36-0*	*7440-38-2*	*7440-39-3*	*7440-41-7*	*7440-43-9*	*16065-83-1*	*7440-48-4*	*7440-50-8*	*7439-92-1*	*7439-97-6*	*7439-98-7*	*7440-02-0*	*7782-49-2*	*7440-22-4*	*7440-28-0*	*7440-62-2*	*7440-66-6*
Method Detection Limit				*0.21*	*0.55*	*0.04*	*0.05*	*0.06*	*0.19*	*0.11*	*0.12*	*0.16*	*0.009*	*0.04*	*0.10*	*0.32*	*0.12*	*0.36*	*0.20*	*0.49*
Reporting Limit				*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.10*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
Screening Levels	*Residential Soil*			*31*	*0.067*	*15,000*	*15*	*5.2*	*36,000*	*23*	*3,100*	*80*	*1.0*	*390*	*490*	*390*	*390*	*0.78*	*390*	*23,000*
	Commercial Soil			*470*	*0.25*	*2.2E+05*	*210*	*7.3*	*2.7E+05*	*350*	*47,000*	*320*	*4.5*	*5,800*	*3,100*	*5,800*	*1,500*	*12*	*1,000*	*3.5E+05*
	Basis for Screening Level			*RSL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*RSL*	*RSL*	*RSL*	*DTSC-SL*	*RSL*
	TTLC			*500*	*500*	*10,000*	*10,000*	*100*	*2,500*	*2,500*	*18,000*	*1,000*	*20*	*3,500*	*2,000*	*100*	*500*	*700*	*2,400*	*5,000*
QM-1	07/07/15	mg/kg	PQM	ND	20	150	ND	2.8	43	13	97	430	14	14	26	ND	ND	4.1	87	120
QM-2	07/07/15	mg/kg	PQM	ND	13	190	1.2	ND	56	14	62	98	1.5	ND	34	ND	ND	5.6	110	60
QM-3	07/07/15	mg/kg	PQM	ND	13	170	ND	1.4	41	12	68	190	3.8	ND	27	ND	ND	3.9	93	80
QM-4	07/07/15	mg/kg	PQM	ND	13	120	ND	1.8	43	13	63	89	0.74	1.5	25	ND	ND	3.1	77	74
QM-5	07/07/15	mg/kg	PQM	ND	15	100	ND	2.7	38	14	77	89	0.86	1.8	24	ND	ND	2.8	69	88
QM-6	07/07/15	mg/kg	PQM	ND	17	130	ND	3.3	47	13	78	140	3.5	2.8	29	ND	ND	2.5	84	110
QM-7	07/07/15	mg/kg	PQM	ND	11	120	1.3	2.1	35	20	88	74	1.4	ND	26	ND	ND	3.5	100	89
WR-8	07/07/15	mg/kg	PQM	ND	91	72	ND	5.8	36	14	430	1800	44	17	28	ND	2.0	ND	76	750
WR8-B	10/27/15	mg/kg	PQM	ND	57	100	ND	6.9	39	21	510	1400	100	17	29	3.6	8.1	ND	72	480
WR-9	07/07/15	mg/kg	PQM	ND	56	69	ND	11	18	14	310	1000	15	15	21	2	28	ND	32	340
WR9-.75	10/27/15	mg/kg	PQM	ND	53	97	ND	13	22	14	210	1500	26	18	22	ND	26	ND	47	460
WR9-1.5'	10/27/15	mg/kg	PQM	3.3	52	90	ND	10	23	13	240	1400	26	20	23	2.3	13	ND	50	390
WR-10	07/07/15	mg/kg	PQM	ND	21	140	ND	6.1	29	15	110	340	7.5	5.5	21	ND	ND	1.4	68	270
WR-11	07/07/15	mg/kg	PQM	ND	38	120	ND	8.1	40	15	160	750	11	6.9	28	ND	ND	2.0	77	310
WR-12	07/07/15	mg/kg	PQM	ND	21	100	ND	8.9	25	16	120	580	9.7	4.4	22	ND	ND	1.7	60	2000
SR-13	07/07/15	mg/kg	PQM	ND	40	110	ND	19	32	21	250	1000	23	8	38	ND	ND	1.2	71	710
WR13-B	10/27/15	mg/kg	PQM	ND	36	130	ND	19	37	24	220	970	14	9.2	47	ND	3.9	ND	75	720
SR-14	07/07/15	mg/kg	PQM	ND	19	120	1.1	ND	47	14	120	150	2.2	4.2	35	1.9	ND	ND	120	130
SR-15	07/07/15	mg/kg	PQM	ND	18	83	ND	11	35	23	230	800	6.1	5.7	44	ND	ND	1.4	86	420
SR-16	07/07/15	mg/kg	PQM	ND	15	130	1.1	1	49	12	120	180	3.2	1.8	33	ND	ND	2.3	120	110
SR-17	07/07/15	mg/kg	PQM	ND	11	120	1.1	ND	46	16	130	93	1.1	ND	37	ND	ND	4.5	110	72
RF-18	07/07/15	mg/kg	PQM	ND	22	72	1	ND	80	8.3	140	270	6.4	ND	39	3.2	ND	4.4	93	83
RF-19	07/07/15	mg/kg	PQM	ND	19	74	ND	ND	51	7.8	150	240	10	ND	27	2.3	ND	3.9	92	77
RF-20	07/07/15	mg/kg	PQM	ND	22	94	ND	1.4	42	11	140	350	18	ND	32	2	ND	6.1	86	93
WR21	10/27/15	mg/kg	PQM	ND	250	51	ND	5.5	11	4.4	340	20000	11	14	11	3	73	ND	23	630
WR21-1'	10/27/15	mg/kg	PQM	ND	210	44	ND	6	11	7	380	19000	19.00	16	14	2.1	57	ND	23	780
SR22	10/27/15	mg/kg	PQM	ND	68	74	ND	11	25	14	190	740	4.50	21	27	5.1	22	ND	49	310
WR23	10/27/15	mg/kg	PQM	ND	40	110	ND	5.5	21	12	230	790	9.70	5.8	15	2.7	6.7	ND	56	220
WR24	10/27/15	mg/kg	PQM	ND	43	89	ND	8.4	36	16	170	930	19.00	15	30	3.2	13	ND	61	390
WR25	10/27/15	mg/kg	PQM	ND	16	140	ND	2.7	39	14	120	150	1.7	6.5	25	2.4	1.4	ND	80	100
WR1-S1	06/02/15	mg/kg	EWR	ND	40	120	ND	3.5	3.5	18	140	530	0.52	9.6	4.6	ND	ND	ND	54	81
WR1-S2	06/02/15	mg/kg	EWR	ND	11	140	ND	3	3.4	15	120	400	0.43	13	4.2	ND	ND	ND	48	82
WR1-S3	06/02/15	mg/kg	EWR	ND	17	97	ND	2.1	3.5	14	120	410	1.4	7.6	3.7	ND	1.8	ND	53	62

Table 1 - Total Metals in Soil Samples
Providence Quartz Mill Site
Nevada City, California

Sample ID	Sample Date	Unit	AOC	Antimony, metallic	Arsenic, inorganic	Barium	Beryllium and compounds	Cadmium	Chromium, total (1)	Cobalt	Copper	Lead and compounds	Mercury, elemental	Molybdenum	Nickel, soluble salts	Selenium	Silver	Thallium, soluble salts	Vanadium and compounds	Zinc and compounds
				Results																
USEPA Method				*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*7471A*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*	*6010B*
CAS No.				*7440-36-0*	*7440-38-2*	*7440-39-3*	*7440-41-7*	*7440-43-9*	*16065-83-1*	*7440-48-4*	*7440-50-8*	*7439-92-1*	*7439-97-6*	*7439-98-7*	*7440-02-0*	*7782-49-2*	*7440-22-4*	*7440-28-0*	*7440-62-2*	*7440-66-6*
Method Detection Limit				*0.21*	*0.55*	*0.04*	*0.05*	*0.06*	*0.19*	*0.11*	*0.12*	*0.16*	*0.009*	*0.04*	*0.10*	*0.32*	*0.12*	*0.36*	*0.20*	*0.49*
Reporting Limit				*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*0.10*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
Screening Levels	*Residential Soil*			*31*	*0.067*	*15,000*	*15*	*5.2*	*36,000*	*23*	*3,100*	*80*	*1.0*	*390*	*490*	*390*	*390*	*0.78*	*390*	*23,000*
	Commercial Soil			*470*	*0.25*	*2.2E+05*	*210*	*7.3*	*2.7E+05*	*350*	*47,000*	*320*	*4.5*	*5,800*	*3,100*	*5,800*	*1,500*	*12*	*1,000*	*3.5E+05*
	Basis for Screening Level			*RSL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*RSL*	*DTSC-SL*	*DTSC-SL*	*RSL*	*DTSC-SL*	*RSL*	*RSL*	*RSL*	*DTSC-SL*	*RSL*
	TTLC			*500*	*500*	*10,000*	*10,000*	*100*	*2,500*	*2,500*	*18,000*	*1,000*	*20*	*3,500*	*2,000*	*100*	*500*	*700*	*2,400*	*5,000*
WR2-S1	06/02/15	mg/kg	EWR	ND	ND	70	ND	6.6	1.3	4.1	23	23	ND	12	1.9	ND	ND	5.6	19	75
WR2-S2	06/02/15	mg/kg	EWR	ND	11	87	ND	1.6	4.1	9	54	59	0.3	6.1	4.8	ND	ND	ND	34	46
WR2-S3	06/02/15	mg/kg	EWR	ND	23	46	ND	1.8	1.8	3.4	96	170	0	ND	2.3	ND	3.0	1.1	14	43
WR2-S4	06/02/15	mg/kg	EWR	ND	4.9	130	ND	1.8	5.3	11	75	64	1	44	5.9	ND	3.3	ND	38	40
WR2-S5	06/02/15	mg/kg	EWR	ND	20	88	ND	2.8	5.5	8.5	150	330	0.57	11	11	ND	4.7	2.7	29	53
WR2-S6	06/02/15	mg/kg	EWR	ND	16	73	ND	3	2.7	4.6	90	170	0.47	19	2.9	ND	4.8	1.1	19	50
WR2-S7	06/02/15	mg/kg	EWR	ND	24	44	ND	3.3	2.5	10	140	330	0.3	8.7	3.2	ND	8.0	3.3	22	71
WR2-S8	06/02/15	mg/kg	EWR	ND	3.7	58	ND	1.3	3.9	13	62	53	0.2	6	5.2	ND	ND	ND	48	36
WR2-S9	06/02/15	mg/kg	EWR	ND	ND	240	ND	ND	4.6	8.4	16	7.3	ND	ND	5.1	ND	ND	ND	48	34
WR2-S10	06/02/15	mg/kg	EWR	ND	ND	200	ND	ND	4.2	9.1	18	12	ND	ND	5.1	ND	ND	ND	42	34
WR2-S11	06/02/15	mg/kg	EWR	ND	ND	220	ND	ND	6	9.6	31	15	0.13	ND	5.6	ND	ND	ND	54	34
WR2-S12	06/02/15	mg/kg	EWR	ND	4.4	130	ND	2.1	5.1	9.7	41	52	0.2	9.7	5.8	ND	ND	ND	38	58
WR2-S13	06/02/15	mg/kg	EWR	ND	ND	160	ND	ND	3.7	16	62	30	ND	3.1	5	ND	ND	ND	47	40
WR2-TS14	06/02/15	mg/kg	EWR	ND	ND	90	ND	ND	8.9	6.9	23	13	0.12	ND	5.8	ND	ND	ND	61	29
WR2-TS15	06/02/15	mg/kg	EWR	ND	ND	230	ND	ND	4	9.5	16	7.5	ND	ND	4.9	ND	ND	ND	48	55
WR2-TS16	06/02/15	mg/kg	EWR	ND	24	73	ND	ND	9.1	5.5	23	21	0.43	ND	5.5	ND	ND	ND	41	32
WR2-S17	06/02/15	mg/kg	EWR	ND	15	58	ND	1.5	2	5.7	45	64	0.41	27.00	2.2	ND	5.2	3.2	35	33
WR2-S18	06/02/15	mg/kg	EWR	ND	24	53	ND	ND	9.2	4.7	17	16	0.61	ND	4.5	ND	ND	ND	41	22
US26	10/27/15	mg/kg	EWR	ND	14	180	ND	1.1	80	19	68	15	ND	2.3	49	2.4	ND	ND	110	51
US27	10/27/15	mg/kg	EWR	ND	12	130	ND	ND	75	19	72	12	ND	2.7	49	4.1	ND	ND	110	43
US28	10/27/15	mg/kg	EWR	ND	12	100	ND	ND	55	16	75	15	ND	2.6	36	2.8	ND	ND	97	38
US29	10/27/15	mg/kg	EWR	ND	7.8	210	ND	ND	63	17	39	14	ND	1.7	40	2.2	ND	ND	92	46

Notes:
1 Total chromium (CAS No. 7440-47-3) results compared to RSLs for Chromium III (CAS No. 16065-83-1)
AOC = area of concern
CAS = Chemical Abstracts Service registry number
DTSC-SL = California Department of Toxic Substances Control (DTSC) Screening Level (SL), as set forth in Human Health Risk Assessment (HHRA) Note 3 (DTSC; July 2015)
mg/kg = milligrams per kilogram
ND = not detected above listed RL
RSL = USEPA Region 9 Regional Screening Level
TTLC = Total Threshold Limit Concentration

Areas of Concern
PQM = Providence Quartz Mill
EWR = Environs Waste Rock

Table 2a - Summary of Statistical Evaluation and Exposure Point Concentrations, Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Constituent	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
Population	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Detections	1	30	30	6	25	30	30	30	30	30	23	30	13	12	17	30	30
Minimum[1]	<2	11	44	<1	<1	11	4.4	62.0	74	0.74	<1	11	<1	<1	<1	23	60
Maximum[1]	3.3	250	190	1.3	19.00	80	24	510	20,000	100	21	47	5.1	73.00	6.1	120	2,000
Mean Detect	NA	44	107	1.1	7.0	36.6	14.2	185	1,851	9.7	10.1	28.0	2.75	21.2	3.2	74.9	349
Outlier Values[3]	**3.3**	multiple	none	none	multiple	none		510	multiple	multiple	multiple	multiple	5.1	multiple	multiple	none	multiple
Distribution[2]	NA	non-parametric	Normal	Normal	Approx. Normal	Normal	Approx. Normal	Approx. Normal	Approx. Normal	Gamma	Approx. Normal	Normal	Approx. Normal	Approx. Normal	Normal	Normal	non-parametric
UCL method[2]	NA	95% Chebyshev (Mean, Sd)	95% Student's-t	95% KM (t)	95% KM (t)	95% Student's-t	95% Student's-t	95% Student's-t	95% Chebyshev (Mean, Sd)	95% Adjusted Gamma	95% KM (t)	95% Student's-t	95% KM (t)	95% KM (t)	95% KM (t)	95% Student's-t	95% Chebyshev (Mean, Sd)
UCL value[2]	NA	**87.4**	**117**	**1.05**	**7.58**	**40.9**	**15.6**	**220**	**5,690**	**20.3**	**10.1**	**30.5**	**2.09**	**14.5**	**2.74**	**82.8**	**659**

Table 2b - Summary of Statistical Evaluation and Exposure Point Concentrations, Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Constituent	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
Population	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Detections	0	18	25	0	14	25	25	25	25	16	17	25	4	7	6	25	25
Minimum[1]	<2	<1	44	<1	<1	1.3	3.4	16.0	7.3	<0.1	<1	1.9	<1	<1	<1	14	22.0
Maximum[1]	**<2**	40	240	**<1**	6.6	80	19	150	530	1.4	44, 27	49	4.1	8.0	5.6	110	82
Mean Detect	NA	15.8	121	NA	2.5	14.7	10.7	64.6	113.3	0.44	11.0	10.9	2.88	4.4	2.83	47.0	47.5
Outlier Values[3]	NA	none	none	NA	6.6	none	none	none	multiple	1.4	44	none	none	none	none	none	none
Distribution[2]	NA	Normal	Approx. Normal	NA	Approx. Normal	non-parametric	Normal	Approx. Normal	Approx. Lognormal	Approx. Lognormal	Gamma	non-parametric	Normal	Normal	Normal	Gamma	Normal
UCL method[2]	NA	95% KM (t)	95% Student's-t	NA	95% KM (t)	95% Chebyshev (Mean, Sd)	95% Student's-t	95% Student's-t	95% Chebyshev (Mean, Sd)	95% KM (t)	95% Adj. Gamma KM	95% Chebyshev (Mean, Sd)	95% KM (t)	95% KM (t)	95% KM (t)	95% Adj. Gamma	95% Student's-t
UCL value[2]	NA	**15.2**	**142.2**	NA	**2.31**	**35.9**	**12.4**	**79.3**	**249**	**0.42**	**12.84**	**23.8**	**1.60**	**2.62**	**1.85**	**60.5**	**53.1**

Notes:
1 Soil concentrations are shown in milligrams per kilograms (mg/kg)
2 Distribution, UCL/BTV method and UCL/BTV calculations by ProUCL 5.0 (USEPA, 2013)
3 At five percent signifcance level based on Rosner's Outlier Test
< = constituent not detected at concentration greater than or equal to the listed laboratory detection limit
BTV = background threshold value
EPC = exposure point concentration
KM = Kaplan Meier
NA = not applicable or not available
Values in **bold** font are used as EPCs/BTVs.

Table 3a - Constituents of Concern, Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Constituent	CAS No.	Unit	Max Detect	EPC[1]	EPC Source	Does the EPC exceed the Site background range?	Does the EPC exceed the local background range?	Is the constituent considered a COPC?
Antimony	7440-36-0	mg/kg	3.3	3.3	max detect	yes	NA	**yes**
Arsenic	7440-38-2	mg/kg	250	87.4	UCL	yes	yes	**yes**
Barium	7440-39-3	mg/kg	190	117	UCL	no	NA	no
Beryllium	7440-41-7	mg/kg	1.3	1.05	UCL	no	NA	no
Cadmium	7440-43-9	mg/kg	19.00	7.58	UCL	yes	NA	**yes**
Chromium	16065-83-1	mg/kg	80	40.9	UCL	no	NA	no
Cobalt	7440-48-4	mg/kg	24	15.6	UCL	yes	NA	**yes**
Copper	7440-50-8	mg/kg	510	220	UCL	yes	NA	**yes**
Lead	7439-92-1	mg/kg	20,000	5,690	UCL	yes	NA	**yes**
Mercury	7439-97-6	mg/kg	100	20.3	UCL	yes	NA	**yes**
Molybdenum	7439-98-7	mg/kg	21	10.1	UCL	yes	NA	**yes**
Nickel	7440-02-0	mg/kg	47	30.5	UCL	yes	NA	**yes**
Selenium	7782-49-2	mg/kg	5.1	2.09	UCL	yes	NA	**yes**
Silver	7440-22-4	mg/kg	73.00	14.5	UCL	yes	NA	**yes**
Thallium	7440-28-0	mg/kg	6.1	2.74	UCL	yes	NA	**yes**
Vanadium	7440-62-2	mg/kg	120	82.8	UCL	no	NA	no
Zinc	7440-66-6	mg/kg	2,000	659	UCL	yes	NA	**yes**

Notes:
1 Statistical evaluation performed using ProUCL 5.0 (USEPA, 2013). ProUCL output presented in Appendix C.
2 See Section 3.2 for local soil arsenic BTV derivation.
BTV = background threshold value
COC = constituent of potential concern
EPC = exposure point concentration
mg/kg = milligrams per kilogram soil
NA = not applicable
UCL = 95% upper confidence limit on arithmetic mean value. See Table E1.

Table 3b - Constituents of Concern, Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Constituent	CAS No.	Unit	Max Detect	EPC[1]	EPC Source	Does the EPC exceed the Site background range?	Does the EPC exceed the local background range?	Is the constituent considered a COPC?
Antimony	7440-36-0	mg/kg	not detected	NA	NA	no	NA	no
Arsenic	7440-38-2	mg/kg	40	15.2	UCL	no	no	no
Barium	7440-39-3	mg/kg	240	142.2	UCL	no	NA	no
Beryllium	7440-41-7	mg/kg	<1	NA	UCL	no	NA	no
Cadmium	7440-43-9	mg/kg	6.6	2.31	UCL	yes	NA	**yes**
Chromium	16065-83-1	mg/kg	80	35.9	UCL	no	NA	no
Cobalt	7440-48-4	mg/kg	19	12.4	UCL	yes	NA	**yes**
Copper	7440-50-8	mg/kg	150	79.3	UCL	yes	NA	**yes**
Lead	7439-92-1	mg/kg	530	249	UCL	yes	NA	**yes**
Mercury	7439-97-6	mg/kg	1.4	0.42	UCL	yes	NA	**yes**
Molybdenum	7439-98-7	mg/kg	44, 27	12.84	UCL	yes	NA	**yes**
Nickel	7440-02-0	mg/kg	49	23.8	UCL	yes	NA	**yes**
Selenium	7782-49-2	mg/kg	4.1	1.60	UCL	yes	NA	**yes**
Silver	7440-22-4	mg/kg	8.0	2.62	UCL	yes	NA	**yes**
Thallium	7440-28-0	mg/kg	5.6	1.85	UCL	yes	NA	**yes**
Vanadium	7440-62-2	mg/kg	110	60.5	UCL	no	NA	no
Zinc	7440-66-6	mg/kg	82	53.1	UCL	yes	NA	**yes**

Notes:
1 Statistical evaluation performed using ProUCL 5.0 (USEPA, 2013). ProUCL output presented in Appendix C.
2 See Section 3.2 for local soil arsenic BTV derivation.
BTV = background threshold value
COC = constituent of potential concern
EPC = exposure point concentration
mg/kg = milligrams per kilogram soil
NA = not applicable
UCL = 95% upper confidence limit on arithmetic mean value. See Table E1.

Table 4 - Toxicity Values
Providence Quartz Mill Site
Nevada City, California

Analyte	CAS No.	**RfDo** (mg/kg-day)		**RfDi** (mg/kg-day)			**SFo** $(mg/kg\text{-}day)^{-1}$		**SFi** $(mg/kg\text{-}day)^{-1}$			ABS
		value	source	RfCi (mg/m^3)	source	value	value	source	IUR $(ug/m^3)^{-1}$	source	value	
Antimony, metallic	7440-36-0	4.0.E-04	IRIS	--	--	--	--	--	--	--	--	0.01
Arsenic, inorganic	7440-38-2	3.5E-06	OEHHA	1.5E-05	OEHHA	3.8E-06	9.5E+00	OEHHA PHG	3.3E-03	OEHHA	1.3E+01	0.03
Barium	7440-39-3	2.0E-01	IRIS	5.0E-04	HEAST	1.3E-04	--	--	--	--	--	0.01
Beryllium and compounds	7440-41-7	2.0E-04	OEHHA PHG	7.0E-06	OEHHA	1.8E-06	--	--	2.4E-03	IRIS	9.6E+00	0.01
Cadmium, diet	7440-43-9	6.3E-06	OEHHA PHG	1.0E-05	ATSDR	2.5E-06	--	--	1.8E-03	IRIS	7.2E+00	0.001
Chromium (III), insoluble salts	16065-83-1	1.5E+00	IRIS	--	--	--	--	--	--	--	--	0.01
Cobalt	7440-48-4	3.0E-04	PPRTV	6.0E-06	PPRTV	1.5E-06	--	--	9.0E-03	PPRTV	3.6E+01	0.01
Copper	7440-50-8	4.0E-02	HEAST	--	--	--	--	--	--	--	--	0.01
Lead and compounds	7439-92-1	Lead is evaluated using the LeadSpread 8 model (DTSC, 2011)										
Mercury, elemental	7439-97-6	1.6E-04	OEHHA	3.0E-05	OEHHA	7.5E-06	--	--	--	--	--	0.01
Molybdenum	7439-98-7	5.0E-03	IRIS	--	--	--	--	--	--	--	--	0.01
Nickel, soluble salts	7440-02-0	1.1E-02	OEHHA	1.4E-05	OEHHA	3.5E-06	--	--	2.6E-04	OEHHA	1.0E+00	0.01
Selenium	7782-49-2	5.0E-03	IRIS	2.0E-02	CalEPA	5.0E-03	--	--	--	--	--	0.01
Silver	7440-22-4	5.0E-03	IRIS	--	--	--	--	--	--	--	--	0.01
Thallium, soluble salts	7440-28-0	1.0E-05	PPRTV*	--	--	--	--	--	--	--	--	0.01
Vanadium and compounds	7440-62-2	5.0E-03	RSL	1.0E-04	ATSDR	2.5E-05	--	--	--	--	--	0.01
Zinc and compounds	7440-66-6	3.0E-01	IRIS	--	--	--	--	--	--	--	--	0.01

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
ATSDR = Agency for Toxic Substances and Disease Registry
Conversions per Supplemental Guidance to RAGS: Region 4 Bulletins Human Health Risk Assessment (US EPA, November 1995), with updated body weight (DTSC, 2014)
HEAST = US EPA Office of Research and Development, Health Effects Assessment Summary Tables
IRIS = US EPA Integrated Risk Information System (http://www.epa.gov/iris/)
IUR = inhalation unit risk
OEHHA = CalEPA Office of Environmental Health Hazard Assessment
PPRTV = Provisional Peer Reviewed Toxicity Values, US EPA OSWER Office of Superfund Remediation Technology Inovation (OSRTI)
RfCi = reference concentraton for inhalation exposure
RfDi = reference dose for chronic inhalation exposure: RfDi [mg/kg-day] = RfCi $[mg/m^3]$ * (20 m^3/day) * $(80\ kg)^{-1}$
RfDo = reference dose for chronic oral exposure
RSL = USEPA Region IX RSL user guide Section 5: Value is based on IRIS oral RfD for Vanadium Pentoxide, factoring out the molecular weight (MW) of the oxide ion.
SFi = cancer slope factor for inhalation exposure: SFi $[(mg/kg\text{-}day)^{-1}]$ = IUR $[(ug/m^3)^{-1}]$ * (10^3ug/mg) * (80 kg) * $(20m^3/day)^{-1}$.
SFo = cancer slope factor for oral exposure
* Appendix PPRTV Screen (see USEPA FAQ #27, http://www.epa.gov/region9/superfund/prg/)

Table 5a - Summary of Risk/Hazard Calculations for Standard Exposure Scenario (Unrestricted Land Use), Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	3.3	2.43E-09	1.09E-01		1.09E-01			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	87.4	6.43E-08	3.47E+02	1.10E-02	3.47E+02	1.28E-03	1.05E-07	1.28E-03
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.58	5.57E-09	1.44E+00	5.34E-04	1.44E+00		4.95E-09	4.95E-09
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	15.6	1.15E-08	6.84E-01	4.89E-03	6.89E-01		5.09E-08	5.09E-08
Copper	95% UCL	4.0E-02	--	--	--	0.01	220	1.62E-07	7.24E-02		7.24E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	20.3	1.49E-08	1.67E+00	1.84E+01	2.01E+01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	10.1	7.43E-09	2.66E-02		2.66E-02			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	30.5	2.24E-08	3.65E-02	4.10E-03	4.06E-02		2.88E-09	2.88E-09
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	5.50E-03	1.96E-07	5.50E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	14.5	1.07E-08	3.82E-02		3.82E-02			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	2.74	2.01E-09	3.60E+00		3.60E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	2.89E-02		2.89E-02			0.00E+00
TOTAL									3.55E+02	1.85E+01	**3.7E+02**	1.28E-03	1.63E-07	**1.3E-03**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 2.6E+01 Risk excluding Arsenic: 5.9E-08
Arsenic Hazard Quotient: 3.5.E+02 Arsenic Risk: 1.3E-03

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-carcinogen	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ingestion)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014); 26 yr adult exposure used for cadmium per HHRA Note 3 (DTSC, 2016)
ET, exposure time	24	24	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	200	100	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	10	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	15	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface area	2,900	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	0.2	0.07	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission factor	1.360E+09	1.360E+09	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.

Table 5b - Summary of Risk/Hazard Calculations for Standard Exposure Scenario (Unrestricted Land Use), Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.31	1.70E-09	4.40E-01	1.63E-04	4.40E-01		1.51E-09	1.51E-09
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	12.4	9.12E-09	5.44E-01	3.89E-03	5.48E-01		4.05E-08	4.05E-08
Copper	95% UCL	4.0E-02	--	--	--	0.01	79.3	5.83E-08	2.61E-02		2.61E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	0.42	3.09E-10	3.45E-02	3.81E-01	4.16E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	12.84	9.44E-09	3.38E-02		3.38E-02			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	23.8	1.75E-08	2.85E-02	3.20E-03	3.17E-02		2.24E-09	2.24E-09
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.60	1.18E-09	4.21E-03	1.50E-07	4.21E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	2.62	1.93E-09	6.89E-03		6.89E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	1.85	1.36E-09	2.43E+00		2.43E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	53.1	3.90E-08	2.33E-03		2.33E-03			0.00E+00
TOTAL									3.55E+00	3.89E-01	**3.9E+00**	0.00E+00	4.42E-08	**4.4E-08**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-carcinogen	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ingestion)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	24	24	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	200	100	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	10	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	15	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface area	2,900	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	0.2	0.07	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission factor	1.360E+09	1.360E+09	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.

Table 5c - Summary of Risk/Hazard Calculations for Standard Exposure Scenario (Unrestricted Land Use), Providence Quartz Mill (PQM), All Detected Constituents
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	3.3	2.43E-09	1.09E-01		1.09E-01			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	87.4	6.43E-08	3.47E+02	1.10E-02	3.47E+02	1.28E-03	1.05E-07	1.28E-03
Barium	95% UCL	2.0E-01	1.3E-04	--	--	0.01	117	8.60E-08	7.70E-03	4.40E-04	8.14E-03			0.00E+00
Beryllium	95% UCL	2.0E-04	1.8E-06	--	9.6E+00	0.01	1.05	7.72E-10	6.91E-02	2.82E-04	6.94E-02		9.14E-10	9.14E-10
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.58	5.57E-09	1.44E+00	5.34E-04	1.44E+00		4.95E-09	4.95E-09
Chromium	95% UCL	1.5E+00	--	--	--	0.01	40.9	3.01E-08	3.59E-04		3.59E-04			0.00E+00
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	15.6	1.15E-08	6.84E-01	4.89E-03	6.89E-01		5.09E-08	5.09E-08
Copper	95% UCL	4.0E-02	--	--	--	0.01	220	1.62E-07	7.24E-02		7.24E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	20.3	1.49E-08	1.67E+00	1.84E+01	2.01E+01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	10.1	7.43E-09	2.66E-02		2.66E-02			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	30.5	2.24E-08	3.65E-02	4.10E-03	4.06E-02		2.88E-09	2.88E-09
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	5.50E-03	1.96E-07	5.50E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	14.5	1.07E-08	3.82E-02		3.82E-02			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	2.74	2.01E-09	3.60E+00		3.60E+00			0.00E+00
Vanadium	95% UCL	5.0E-03	2.5E-05	--	--	0.01	82.8	6.09E-08	2.18E-01	1.56E-03	2.19E-01			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	2.89E-02		2.89E-02			0.00E+00
TOTAL									3.55E+02	1.85E+01	**3.7E+02**	1.28E-03	1.64E-07	**1.3E-03**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 2.6E+01
Arsenic Hazard Quotient: 3.5.E+02
Risk excluding Arsenic: 6.0E-08
Arsenic Risk: 1.3E-03

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-carcinogen	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ingestion)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	24	24	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	200	100	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	10	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	15	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface area	2,900	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	0.2	0.07	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission factor	1.360E+09	1.360E+09	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.

Table 5d - Summary of Risk/Hazard Calculations for Standard Exposure Scenario (Unrestricted Land Use), Environs Waste Rock (EWR), All Detected Constituents
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	not detected	4.0E-04	--	--	--	0.01	ND	ND	ND		ND			ND
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	15.2	1.12E-08	6.04E+01	1.91E-03	6.04E+01	2.23E-04	1.82E-08	2.23E-04
Barium	95% UCL	2.0E-01	1.3E-04	--	--	0.01	142	1.05E-07	9.35E-03	5.35E-04	9.89E-03			0.00E+00
Beryllium	not detected	2.0E-04	1.8E-06	--	9.6E+00	0.01	ND	ND	ND	ND	ND		ND	ND
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.31	1.70E-09	4.40E-01	1.63E-04	4.40E-01		1.51E-09	1.51E-09
Chromium	95% UCL	1.5E+00	--	--	--	0.01	35.9	2.64E-08	3.15E-04		3.15E-04			0.00E+00
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	12.4	9.12E-09	5.44E-01	3.89E-03	5.48E-01		4.05E-08	4.05E-08
Copper	95% UCL	4.0E-02	--	--	--	0.01	79.3	5.83E-08	2.61E-02		2.61E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	0.42	3.09E-10	3.45E-02	3.81E-01	4.16E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	12.84	9.44E-09	3.38E-02		3.38E-02			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	23.8	1.75E-08	2.85E-02	3.20E-03	3.17E-02		2.24E-09	2.24E-09
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.60	1.18E-09	4.21E-03	1.50E-07	4.21E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	2.62	1.93E-09	6.89E-03		6.89E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	1.85	1.36E-09	2.43E+00		2.43E+00			0.00E+00
Vanadium	95% UCL	5.0E-03	2.5E-05	--	--	0.01	60.5	4.45E-08	1.59E-01	1.14E-03	1.60E-01			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	53.1	3.90E-08	2.33E-03		2.33E-03			0.00E+00
TOTAL									6.41E+01	3.92E-01	**6.4E+01**	2.23E-04	6.24E-08	**2.2E-04**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 4.1E+00
Arsenic Hazard Quotient: 6.0.E+01
Risk excluding Arsenic: 4.4E-08
Arsenic Risk: 2.2E-04

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-carcinogen	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ingestion)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	24	24	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	200	100	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	10	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	15	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface area	2,900	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	0.2	0.07	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission factor	1.360E+09	1.360E+09	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.

Table 6a - Summary of Risk/Hazard Calculations for Adult Recreational Trail Use Exposure Scenario, Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	3.3	3.30E-06	2.67E-04		2.67E-04			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	87.4	8.74E-05	1.25E+00	7.12E-01	1.97E+00	1.79E-05	1.51E-05	3.30E-05
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.58	7.58E-06	2.93E-02	9.26E-02	1.22E-01		7.14E-07	7.14E-07
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	15.6	1.56E-05	1.69E-03	3.17E-01	3.19E-01		7.35E-06	7.35E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	220	2.20E-04	1.78E-04		1.78E-04			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	20.3	2.03E-05	4.11E-03	4.39E-01	4.43E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	10.1	1.01E-05	6.55E-05		6.55E-05			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	30.5	3.05E-05	8.99E-05	2.66E-01	2.66E-01		4.15E-07	4.15E-07
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	2.09E-06	1.35E-05	1.28E-05	2.63E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	14.5	1.45E-05	9.40E-05		9.40E-05			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	2.74	2.74E-06	8.88E-03		8.88E-03			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	6.59E-04	7.12E-05		7.12E-05			0.00E+00
TOTAL									1.30E+00	1.83E+00	**3.1E+00**	1.79E-05	2.36E-05	**4.1E-05**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
na= not applicable
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 1.2E+00
Arsenic Hazard Quotient: 2.0.E+00
Risk excluding Arsenic: 8.5E-06
Arsenic Risk: 3.3E-05

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	na	70	yr	DTSC, 2006
ATnc, averaging time (non-carcinogen	na	30	yr	DTSC, 2006
EFs, exposure frequency (ingestion)	na	200	days/yr	DTSC, 2006
EFd, exposure frequency (dermal)	na	200	days/yr	DTSC, 2006
EFi, exposure frequency (inhalation)	na	200	days/yr	DTSC, 2006
ED, exposure duration	na	30	yr	DTSC, 2006
ET, exposure time	na	1	hr/day	DTSC, 2006
IRs, soil ingestion rate	na	3	mg/day	DTSC, 2006 (100 x default (0.03 mg/hr) = 3 mg/hr; 3 mg/hr x 1 hr/day = 3 mg/day)
IRa, inhalation rate	na	3.9	m^3/day	DTSC, 2006 (from USEPA EFH 1997; 3.9 m^3/hr x 1 hr/day = 3 m^3/day)
BW, body weight	na	70	kg	DTSC, 2006 (more conservative than HERO HHRA Note No. 1 [DTSC, 2014])
SA, exposed skin surface area	na	5,700	cm^2	DTSC, 2006 (corresponding to runner BW from DTSC, 2006)
AF, adherance factor	na	0.2	mg/cm^2	DTSC, 2006
PEF, particulate emission factor	na	1.0E+06	m^3/kg	DTSC, 2006
Absorption correction factor	na	0.1	unitless	DTSC, 2006 (default is 24 hr/day; 0.1 x 24 hr/day = 2.4 hr/day

DTSC = California Department of Toxic Substances Control
HERO = Office of Human and Ecological Risk (formerly Human and Ecological Risk Division [HERD])
DTSC, 2006 = HERD Memorandum titled Remediation Goals for the Recreational Runner on Trails, Empire Mine State Historical Park, Grass Valley (September 29, 2006)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 2014.
HERO Human Health Risk Assessment Note No. 3, Recommended methodology for use of U.S. EPA Regional Screening Levels (RSLs) in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities, January 2016.

Table 6b - Summary of Risk/Hazard Calculations for Adult Recreational Trail Use Exposure Scenario, Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.31	2.31E-06	8.94E-03	2.82E-02	3.71E-02		2.18E-07	2.18E-07
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	12.4	1.24E-05	1.34E-03	2.52E-01	2.54E-01		5.84E-06	5.84E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	79.3	7.93E-05	6.42E-05		6.42E-05			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	0.42	4.20E-07	8.51E-05	9.08E-03	9.17E-03			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	12.84	1.28E-05	8.32E-05		8.32E-05			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	23.8	2.38E-05	7.01E-05	2.08E-01	2.08E-01		3.24E-07	3.24E-07
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.60	1.60E-06	1.04E-05	9.77E-06	2.01E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	2.62	2.62E-06	1.70E-05		1.70E-05			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	1.85	1.85E-06	6.00E-03		6.00E-03			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	53.1	5.31E-05	5.74E-06		5.74E-06			0.00E+00
TOTAL									1.66E-02	4.97E-01	**5.1E-01**	0.00E+00	6.38E-06	**6.4E-06**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
na= not applicable
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	na	70	yr	DTSC, 2006
ATnc, averaging time (non-carcinogen	na	30	yr	DTSC, 2006
EFs, exposure frequency (ingestion)	na	200	days/yr	DTSC, 2006
EFd, exposure frequency (dermal)	na	200	days/yr	DTSC, 2006
EFi, exposure frequency (inhalation)	na	200	days/yr	DTSC, 2006
ED, exposure duration	na	30	yr	DTSC, 2006
ET, exposure time	na	1	hr/day	DTSC, 2006
IRs, soil ingestion rate	na	3	mg/day	DTSC, 2006 (100 x default (0.03 mg/hr) = 3 mg/hr; 3 mg/hr x 1 hr/day = 3 mg/day)
IRa, inhalation rate	na	3.9	m^3/day	DTSC, 2006 (from USEPA EFH 1997; 3.9 m^3/hr x 1 hr/day = 3 m^3/day)
BW, body weight	na	70	kg	DTSC, 2006 (more conservative than HERO HHRA Note No. 1 [DTSC, 2014])
SA, exposed skin surface area	na	5,700	cm^2	DTSC, 2006 (corresponding to runner BW from DTSC, 2006)
AF, adherance factor	na	0.2	mg/cm^2	DTSC, 2006
PEF, particulate emission factor	na	1.0E+06	m^3/kg	DTSC, 2006
Absorption correction factor	na	0.1	unitless	DTSC, 2006 (default is 24 hr/day; 0.1 x 24 hr/day = 2.4 hr/day

DTSC = California Department of Toxic Substances Control
HERO = Office of Human and Ecological Risk (formerly Human and Ecological Risk Division [HERD])
DTSC, 2006 = HERD Memorandum titled Remediation Goals for the Recreational Runner on Trails, Empire Mine State Historical Park, Grass Valley (September 29, 2006)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 2014.
HERO Human Health Risk Assessment Note No. 3, Recommended methodology for use of U.S. EPA Regional Screening Levels (RSLs) in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities, January 2016.

Table 7a - Summary of Risk/Hazard Calculations for Routine Child Visitation Scenario, Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo $(mg/kg\text{-}day)^{-1}$	Sfi $(mg/kg\text{-}day)^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	3.3	2.43E-09	3.92E-02		3.92E-02			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	87.4	6.43E-08	1.25E+02	9.50E-04	1.25E+02	5.96E-04	6.72E-09	5.96E-04
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.58	5.57E-09	5.58E+00	1.24E-04	5.58E+00		3.18E-10	3.18E-10
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	15.6	1.15E-08	2.47E-01	4.24E-04	2.48E-01		3.27E-09	3.27E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	220	1.62E-07	2.62E-02		2.62E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	20.3	1.49E-08	6.03E-01	1.10E-04	6.03E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	10.1	7.43E-09	9.61E-03		9.61E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	30.5	2.24E-08	1.32E-02	3.55E-04	1.35E-02		1.85E-10	1.85E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	1.99E-03	1.70E-08	1.99E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	14.5	1.07E-08	1.38E-02		1.38E-02			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	2.74	2.01E-09	1.30E+00		1.30E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	1.04E-02		1.04E-02			0.00E+00
TOTAL									1.33E+02	1.96E-03	**1.3E+02**	5.96E-04	1.05E-08	**6.0E-04**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca $[mg/m^3]$ = air concentration = Cs [mg/kg] * $(PEF\ [m^3/kg])^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding Arsenic:	7.8.E+00	Risk excluding Arsenic: 3.8E-09
Arsenic Hazard Quotient:	1.3.E+02	Arsenic Risk: 6.0E-04

Parameter	Value, child	Units	Reference
ATc, averaging time (carcinogen)	70	yr	DTSC HERD, 2006
ATnc, averaging time (non-carcinogen)	10	yr	DTSC HERD, 2006
EFs, exposure frequency (ingestion)	350	days/yr	DTSC HERD, 2006
EFd, exposure frequency (dermal)	350	days/yr	DTSC HERD, 2006
EFi, exposure frequency (inhalation)	350	days/yr	DTSC HERD, 2006
ED, exposure duration	10	yr	DTSC HERD, 2006
ET, exposure time	2	hr/day	DTSC HERD, 2006
IRs, soil ingestion rate	200	mg/day	DTSC HERD, 2006
IRa, inhalation rate	2.4	m^3/day	DTSC HERD, 2006
BW, body weight	41.5	kg	DTSC HERD, 2006
SA, exposed skin surface area	2,900	cm^2	DTSC HERD, 2006
AF, adherance factor	0.2	mg/cm^2	DTSC HERD, 2006
PEF, particulate emission factor	1.36E+09	m^3/kg	DTSC HERD, 2006

Table 7b - Summary of Risk/Hazard Calculations for Routine Child Visitation Scenario, Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo $(mg/kg\text{-}day)^{-1}$	Sfi $(mg/kg\text{-}day)^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	**Hazard**, soil + air	$Risk_{soil}$	$Risk_{air}$	**Risk**, soil + air
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.31	1.70E-09	1.70E+00	3.77E-05	1.70E+00		9.69E-11	9.69E-11
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	12.4	9.12E-09	1.97E-01	3.37E-04	1.97E-01		2.60E-09	2.60E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	79.3	5.83E-08	9.43E-03		9.43E-03			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	0.42	3.09E-10	1.25E-02	2.28E-06	1.25E-02			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	12.84	9.44E-09	1.22E-02		1.22E-02			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	23.8	1.75E-08	1.03E-02	2.77E-04	1.06E-02		1.44E-10	1.44E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.60	1.18E-09	1.52E-03	1.30E-08	1.52E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	2.62	1.93E-09	2.49E-03		2.49E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	1.85	1.36E-09	8.80E-01		8.80E-01			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	53.1	3.90E-08	8.42E-04		8.42E-04			0.00E+00
TOTAL									2.82E+00	6.54E-04	**2.8E+00**	0.00E+00	2.84E-09	**2.8E-09**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca $[mg/m^3]$ = air concentration = Cs [mg/kg] * $(PEF\ [m^3/kg])^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Units	Reference
ATc, averaging time (carcinogen)	70	yr	DTSC HERD, 2006
ATnc, averaging time (non-carcinogen)	10	yr	DTSC HERD, 2006
EFs, exposure frequency (ingestion)	350	days/yr	DTSC HERD, 2006
EFd, exposure frequency (dermal)	350	days/yr	DTSC HERD, 2006
EFi, exposure frequency (inhalation)	350	days/yr	DTSC HERD, 2006
ED, exposure duration	10	yr	DTSC HERD, 2006
ET, exposure time	2	hr/day	DTSC HERD, 2006
IRs, soil ingestion rate	200	mg/day	DTSC HERD, 2006
IRa, inhalation rate	2.4	m^3/day	DTSC HERD, 2006
BW, body weight	41.5	kg	DTSC HERD, 2006
SA, exposed skin surface area	2,900	cm^2	DTSC HERD, 2006
AF, adherance factor	0.2	mg/cm^2	DTSC HERD, 2006
PEF, particulate emission factor	1.36E+09	m^3/kg	DTSC HERD, 2006

Table 8a - Summary of Risk/Hazard Calculations for Adult Unauthorized Transient Camping Exposure Scenario, Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	3.3	2.43E-09	1.83E-03		1.83E-03			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	87.4	6.43E-08	6.82E+00	1.34E-03	6.82E+00	2.92E-05	8.54E-09	2.92E-05
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.58	5.57E-09	2.39E-01	1.75E-04	2.39E-01		4.04E-10	4.04E-10
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	15.6	1.15E-08	1.15E-02	5.99E-04	1.21E-02		4.16E-09	4.16E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	220	1.62E-07	1.22E-03		1.22E-03			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	20.3	1.49E-08	2.81E-02	1.56E-04	2.83E-02			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	10.1	7.43E-09	4.47E-04		4.47E-04			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	30.5	2.24E-08	6.14E-04	5.02E-04	1.12E-03		2.35E-10	2.35E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	9.26E-05	2.41E-08	9.26E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	14.5	1.07E-08	6.42E-04		6.42E-04			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	2.74	2.01E-09	6.07E-02		6.07E-02			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	4.87E-04		4.87E-04			0.00E+00
TOTAL									7.17E+00	2.77E-03	**7.E+00**	2.92E-05	1.33E-08	**3.E-05**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 3.5E-01
Arsenic Hazard Quotient: 6.82E+00
Risk excluding Arsenic: 4.8E-09
Arsenic Risk: 2.9E-05

Parameter	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	yr	BLM, 2004
ATnc, averaging time (non-carcinogen)	9	yr	BLM, 2004
EFs, exposure frequency (ingestion)	100	days/yr	BLM, 2004
EFd, exposure frequency (dermal)	100	days/yr	BLM, 2004
EFi, exposure frequency (inhalation)	100	days/yr	BLM, 2004
ED, exposure duration	9	yr	BLM, 2004
IRs, soil ingestion rate	50	mg/day	BLM, 2004
IRa, inhalation rate	20	m^3/day	BLM, 2004
BW, body weight	70	kg	BLM, 2004
SA, exposed skin surface area	3,300	cm^2	BLM, 2004
AF, adherance factor	0.2	mg/cm^2	BLM, 2004
PEF, particulate emission factor	1.36E+09	m^3/kg	BLM, 2004

BLM 2004 = Karl Ford, Risk Management Criteria for Metals at BLM Mining Sites, Technical Note 390, United States Bureau of Land Management , October 2004

Table 8b - Summary of Risk/Hazard Calculations for Adult Unauthorized Transient Camping Exposure Scenario, Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.31	1.70E-09	7.27E-02	5.32E-05	7.28E-02		1.23E-10	1.23E-10
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	12.4	9.12E-09	9.16E-03	4.76E-04	9.63E-03		3.30E-09	3.30E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	79.3	5.83E-08	4.39E-04		4.39E-04			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	0.42	3.09E-10	5.82E-04	3.22E-06	5.85E-04			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	12.84	9.44E-09	5.69E-04		5.69E-04			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	23.8	1.75E-08	4.79E-04	3.91E-04	8.71E-04		1.83E-10	1.83E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.60	1.18E-09	7.09E-05	1.84E-08	7.09E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	2.62	1.93E-09	1.16E-04		1.16E-04			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	1.85	1.36E-09	4.10E-02		4.10E-02			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	53.1	3.90E-08	3.92E-05		3.92E-05			0.00E+00
TOTAL									1.25E-01	9.24E-04	**1.3.E-01**	0.00E+00	3.61E-09	**3.6.E-09**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	yr	BLM, 2004
ATnc, averaging time (non-carcinogen)	9	yr	BLM, 2004
EFs, exposure frequency (ingestion)	100	days/yr	BLM, 2004
EFd, exposure frequency (dermal)	100	days/yr	BLM, 2004
EFi, exposure frequency (inhalation)	100	days/yr	BLM, 2004
ED, exposure duration	9	yr	BLM, 2004
IRs, soil ingestion rate	50	mg/day	BLM, 2004
IRa, inhalation rate	20	m^3/day	BLM, 2004
BW, body weight	70	kg	BLM, 2004
SA, exposed skin surface area	3,300	cm^2	BLM, 2004
AF, adherance factor	0.2	mg/cm^2	BLM, 2004
PEF, particulate emission factor	1.36E+09	m^3/kg	BLM, 2004

BLM 2004 = Karl Ford, Risk Management Criteria for Metals at BLM Mining Sites, Technical Note 390, United States Bureau of Land Management , October 2004

Table 9a - Summary of Risk/Hazard Calculations for Construction Scenario, Providence Quartz Mill (PQM)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	3.3	3.30E-06	2.67E-02		2.67E-02			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	87.4	8.74E-05	1.02E+02	3.99E+00	1.05E+02	4.82E-05	2.82E-06	5.10E-05
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.58	7.58E-06	3.45E+00	5.19E-01	3.97E+00		1.34E-07	1.34E-07
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	15.6	1.56E-05	1.68E-01	1.78E+00	1.95E+00		1.37E-06	1.37E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	220	2.20E-04	1.78E-02		1.78E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	20.3	2.03E-05	4.11E-01	4.63E-01	8.74E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	10.1	1.01E-05	6.54E-03		6.54E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	30.5	3.05E-05	8.98E-03	1.49E+00	1.50E+00		7.76E-08	7.76E-08
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	2.09E-06	1.35E-03	7.16E-05	1.43E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	14.5	1.45E-05	9.39E-03		9.39E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	2.74	2.74E-06	8.87E-01		8.87E-01			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	6.59E-04	7.11E-03		7.11E-03			0.00E+00
TOTAL									1.06E+02	8.25E+00	**1.1E+02**	4.82E-05	4.41E-06	**5.3E-05**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding Arsenic: 9.2.E+00
Arsenic Hazard Quotient: 1.1.E+02
Risk excluding Arsenic: 1.6E-06
Arsenic Risk: 5.1E-05

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinog	--	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-ca	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ing	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (der	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFi, exposure frequency (inha	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	--	8	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	--	330	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	--	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	--	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface are	--	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	--	0.8	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission fact	--	1.0E+06	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.
PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, October 2015)

Table 9b - Summary of Risk/Hazard Calculations for Construction Scenario, Environs Waste Rock (EWR)
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.31	2.31E-06	1.05E+00	1.58E-01	1.21E+00		4.07E-08	4.07E-08
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	12.4	1.24E-05	1.34E-01	1.42E+00	1.55E+00		1.09E-06	1.09E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	79.3	7.93E-05	6.42E-03		6.42E-03			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	0.42	4.20E-07	8.50E-03	9.59E-03	1.81E-02			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	12.84	1.28E-05	8.32E-03		8.32E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	23.8	2.38E-05	7.01E-03	1.16E+00	1.17E+00		6.05E-08	6.05E-08
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.60	1.60E-06	1.04E-03	5.48E-05	1.09E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	2.62	2.62E-06	1.70E-03		1.70E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	1.85	1.85E-06	5.99E-01		5.99E-01			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	53.1	5.31E-05	5.73E-04		5.73E-04			0.00E+00
TOTAL									1.82E+00	2.75E+00	**4.6E+00**	0.00E+00	1.19E-06	**1.2E-06**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinog	--	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-ca	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ing	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (der	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFi, exposure frequency (inha	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	--	8	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	--	330	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	--	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	--	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface are	--	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	--	0.8	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission fact	--	1.0E+06	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.
PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, October 2015)

Table 10 - Summary of Human Health Risk Assessment
Providence Quartz Mill Site
Nevada City, California

Assessment Area	Constituents	Exposure Scenario									
		Residential (Unrestricted)		Adult Recreational Trail Use (Runner)		Routine Child Visitation		Adult Unauthorized Transient Camping		Construction Worker	
		Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
Providince Quartz Mill (PQM)	All Detected Constituents[1]	**4.E+02**	**1.E-03**	na	na	na	na	na	na	na	na
	Constituents of Concern (COCs)	**4.E+02**	**1.E-03**	**3.E+00**	**4.E-05**	**1.E+02**	**6.E-04**	**7.E+00**	**3.E-05**	**1.E+02**	**5.E-05**
	COCs Excluding Arsenic	**3.E+01**	6.E-08	1.E+00	**8.E-06**	**8.E+00**	4.E-09	3.E-01	5.E-09	**9.E+00**	**2.E-06**
	Arsenic	**3.E+02**	**1.E-03**	**2.E+00**	**3.E-05**	**1.E+02**	**6.E-04**	**7.E+00**	**3.E-05**	**1.E+02**	**5.E-05**
Environs Waste Rock (EWR)	All Detected Constituents[1]	**6.E+01**	**2.E-04**	na	na	na	na	na	na	na	na
	Constituents of Concern (COCs)	**4.E+00**	4.E-08	5.E-01	6.E-06	**3.E+00**	3.E-09	1.E-01	4.E-09	**5.E+00**	1.E-06
	COCs Excluding Arsenic[2]	na	na	na	na	na	na	na	na	na	na
	Arsenic[2]	na	na	na	na	na	na	na	na	na	na

Notes:

1 Pursuant to guidelines set forth in HERO HHRA Note 4 (DTSC, 2014), hazard and risk are calculated considering the hazard and risk associated with exposure to all detected chemicals (including those that are determined to be consistent with background or ambient concentrations). This information is intended to be useful for risk management decisions and to foster public transparency.

2 Arsenic is not considered a COC for Environs Waste Rock. Arsenic hazard and risk are assessed as part of "All Detected Constituents".

na = not assessed
COC = Constituent of Concern
Hazard = chronic health hazard index
Risk = excess lifetime cancer risk

Table 11 - Summary of Lead Hazard Assessment
Providence Quartz Mill Site
Nevada City, California

Assessment Area	Reasonable Maximum Exposure				Maximum Detection		
	EPC (mg/kg)	EPC Source	90th Percentile Estimate of Blood Lead (ug/dl)		Maximum Detected Concentration (mg/kg)	90th Percentile Estimate of Blood Lead (ug/dl)	
			Non-Pica Child	Adult Worker		Non-Pica Child	Adult Worker
Providence Quartz Mill (PQM)	5,690	95% UCL	**74**	**9.4**	20,000	**259**	**33**
Environs Waste Rock (EWR)	249	95% UCL	**3.2**	0.4	530	**6.9**	0.9

Notes:
EPC = exposure point concentration
UCL = upper confidence limit on the arithmetic mean
Lead hazards were assessed using the Lead Risk Assessment Spreadsheet Version 8 (LeadSpread 8; DTSC, 2011) for child exposure, and the Modified USEPA Adult Lead Model (Modified ALM; DTSC, 2011) for adult exposure.

Table 12a - Summary of Statistical Evaluation and Exposure Point Concentrations (EPCs), Providence Quartz Mill (PQM), Proposed Removal of Soil with Pb > TTLC and Hg > TTLC

Providence Quartz Mill Site

Nevada City, California

Constituent	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
Population	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Detections	0	22	22	6	17	22	22	22	22	22	15	22	8	5	16	22	22
Minimum[1]	<2	11	72	<1	<1	21	7.8	62	74	0.74	<1	15	<1	<1	<1	49	60
Maximum[1]	<2	68	190	1.3	19	80	24	230	970	19	21	47	5.1	22	6.1	120	2,000
Mean Detect	NA	23.2	117	1.1	5.7	41.1	14.4	131	384	6.81	7.1	29.7	2.85	9.4	3.3	84.2	269
Distribution[2]	NA	non-parametric	Normal	Normal	Gamma	Normal	Gamma	Normal	Gamma	Approx. Normal	Gamma	Normal	Normal	Normal	Normal	Normal	non-parametric
UCL method[2]	NA	95% Modified-t	95% Student's-t	95% KM (t)	95% Adjusted Gamma	95% Student's-t	95% Adjusted Gamma	95% Student's-t	95% Adjusted Gamma	95% Student's-t	95% Adjusted Gamma	95% Student's-t	95% KM (t)	95% KM (t)	95% KM (t)	95% Student's-t	95% Chebyshev (Mean, Sd)
UCL value[2]	NA	**28.5**	**128**	**1.07**	**7.02**	**45.7**	**16.1**	**150**	**544**	**8.89**	**7.92**	**32.4**	**2.09**	**4.95**	**3.83**	**91.5**	**659**

Table 12b - Summary of Statistical Evaluation and Exposure Point Concentrations (EPCs), Providence Quartz Mill Site (PQM), Proposed Removal of Soil with Pb > 270 mg/kg

Providence Quartz Mill Site

Nevada City, California

Constituent	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
Population	12	12	12	12	12	1	12	12	12	12	12	12	12	12	12	12	12
Detections	0	12	12	6	7	12	12	12	12	12	6	12	4	1	10	12	12
Minimum[1]	<2	11	72	<1	<1	35	7.8	62	74	0.74	<1	24	<1	<1	<1	69	60
Maximum[1]	<2	22	190	1.3	3.3	80	20	150	270	10	6.5	39	3.2	**1.4**	5.6	120	130
Mean Detect	NA	15.3	123	1.1	2.1	47.7	13.2	101	147	1.95	3.1	28	2.45	NA	3.65	95.7	89.4
Distribution[2]	NA	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Gamma	Approx. Normal	Normal	Normal	Normal	NA	Normal	Normal	Normal
UCL method[2]	NA	95% Student's-t	95% Student's-t	95% KM (t)	95% KM (t)	95% Student's-t	95% Student's-t	95% Student's-t	95% Student's-t	95% Student's-t	95% KM (t)	95% Student's-t	95% KM (t)	NA	95% KM (t)	95% Student's-t	95% Student's-t
UCL value[2]	NA	**17.1**	**141**	**1.12**	**2.12**	**53.8**	**14.8**	**118**	**180**	**4.45**	**2.98**	**32.8**	**1.92**	**NA**	**3.93**	**104.3**	**99.7**

Notes:

1 Soil concentrations are shown in milligrams per kilograms (mg/kg)

2 Distribution, UCL method and UCL calculations by ProUCL 5.0 (USEPA, 2013)

< = constituent not detected at concentration greater than or equal to the listed laboratory detection limit

EPC = exposure point concentration

KM = Kaplan Meier

NA = not applicable or not available

Values in **bold** font are used as EPCs.

Table 13a - Summary of Risk/Hazard Calculations for Standard Exposure Scenario (Unrestricted Land Use), Providence Quartz Mill (PQM), Removal of Soil > TTLCs
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	ND	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	28.5	2.10E-08	1.13E+02	3.57E-03	1.13E+02	4.19E-04	3.41E-08	4.19E-04
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.02	5.16E-09	1.34E+00	4.95E-04	1.34E+00		4.58E-09	4.58E-09
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	16.1	1.18E-08	7.06E-01	5.05E-03	7.11E-01		5.25E-08	5.25E-08
Copper	95% UCL	4.0E-02	--	--	--	0.01	150	1.10E-07	4.93E-02		4.93E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	8.9	6.54E-09	7.31E-01	8.07E+00	8.80E+00			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	7.9	5.82E-09	2.08E-02		2.08E-02			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.4	2.39E-08	3.88E-02	4.36E-03	4.32E-02		3.06E-09	3.06E-09
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	5.51E-03	1.97E-07	5.51E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	5.0	3.64E-09	1.30E-02		1.30E-02			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.83	2.82E-09	5.04E+00		5.04E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	2.89E-02		2.89E-02			0.00E+00
TOTAL									1.21E+02	8.09E+00	**1.3E+02**	4.19E-04	9.43E-08	**4.2E-04**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 1.6E+01 Risk excluding Arsenic: 6.0E-08
Arsenic Hazard Quotient: 1.1.E+02 Arsenic Risk: 4.2E-04

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-carcinogen	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ingestion)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014); 26 yr adult exposure used for cadmium per HHRA Note 3 (DTSC, 2016)
ET, exposure time	24	24	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	200	100	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	10	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	15	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface area	2,900	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	0.2	0.07	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission factor	1.360E+09	1.360E+09	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.

Table 13b - Summary of Risk/Hazard Calculations for Standard Exposure Scenario (Unrestricted Land Use), Providence Quartz Mill (PQM), Removal of Soil with Pb >270 mg/kg
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	ND	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	17.1	1.26E-08	6.79E+01	2.14E-03	6.79E+01	2.51E-04	2.05E-08	2.51E-04
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.12	1.56E-09	4.04E-01	1.49E-04	4.04E-01		1.38E-09	1.38E-09
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	14.8	1.09E-08	6.49E-01	4.64E-03	6.54E-01		4.83E-08	4.83E-08
Copper	95% UCL	4.0E-02	--	--	--	0.01	118	8.68E-08	3.88E-02		3.88E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	4.5	3.27E-09	3.66E-01	4.04E+00	4.41E+00			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	3.0	2.19E-09	7.84E-03		7.84E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.8	2.41E-08	3.92E-02	4.41E-03	4.36E-02		3.09E-09	3.09E-09
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.92	1.41E-09	5.05E-03	1.80E-07	5.05E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	1.4	1.03E-09	3.68E-03		3.68E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.93	2.89E-09	5.17E+00		5.17E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	100	7.33E-08	4.37E-03		4.37E-03			0.00E+00
TOTAL									7.46E+01	4.05E+00	**7.9E+01**	2.51E-04	7.32E-08	**2.5E-04**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 1.1E+01 Risk excluding Arsenic: 5.3E-08
Arsenic Hazard Quotient: 6.8.E+01 Arsenic Risk: 2.5E-04

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-carcinogen	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ingestion)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (dermal)	350	100	days/yr	PEA Guidance Manual
EFi, exposure frequency (inhalation)	350	350	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	6	20	yr	HERO HHRA Note No. 1 (DTSC, 2014); 26 yr adult exposure used for cadmium per HHRA Note 3 (DTSC, 2016)
ET, exposure time	24	24	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	200	100	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	10	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	15	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface area	2,900	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	0.2	0.07	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission factor	1.360E+09	1.360E+09	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, June 1999)
Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil (OEHHA, November 2004, revised January 2005)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.

Table 14a - Summary of Risk/Hazard Calculations for Adult Recreational Trail Use Exposure Scenario, Providence Quartz Mill (PQM), Removal of Soil > TTLCs
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	28.5	2.85E-05	4.09E-01	2.32E-01	6.41E-01	5.83E-06	4.92E-06	1.08E-05
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.02	7.02E-06	2.72E-02	8.57E-02	1.13E-01		6.61E-07	6.61E-07
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	16.1	1.61E-05	1.74E-03	3.28E-01	3.29E-01		7.58E-06	7.58E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	150	1.50E-04	1.22E-04		1.22E-04			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	8.9	8.89E-06	1.80E-03	1.92E-01	1.94E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	7.9	7.92E-06	5.13E-05		5.13E-05			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.4	3.24E-05	9.56E-05	2.83E-01	2.83E-01		4.41E-07	4.41E-07
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	2.09E-06	1.36E-05	1.28E-05	2.64E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	5.0	4.95E-06	3.21E-05		3.21E-05			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.83	3.83E-06	1.24E-02		1.24E-02			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	6.59E-04	7.12E-05		7.12E-05			0.00E+00
TOTAL									4.53E-01	1.12E+00	**1.6E+00**	5.83E-06	1.36E-05	**1.9E-05**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
na= not applicable
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 9.3E-01
Arsenic Hazard Quotient: 6.4.E-01
Risk excluding Arsenic: 8.7E-06
Arsenic Risk: 1.1E-05

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	na	70	yr	DTSC, 2006
ATnc, averaging time (non-carcinogen	na	30	yr	DTSC, 2006
EFs, exposure frequency (ingestion)	na	200	days/yr	DTSC, 2006
EFd, exposure frequency (dermal)	na	200	days/yr	DTSC, 2006
EFi, exposure frequency (inhalation)	na	200	days/yr	DTSC, 2006
ED, exposure duration	na	30	yr	DTSC, 2006
ET, exposure time	na	1	hr/day	DTSC, 2006
IRs, soil ingestion rate	na	3	mg/day	DTSC, 2006 (100 x default (0.03 mg/hr) = 3 mg/hr; 3 mg/hr x 1 hr/day = 3 mg/day)
IRa, inhalation rate	na	3.9	m^3/day	DTSC, 2006 (from USEPA EFH 1997; 3.9 m^3/hr x 1 hr/day = 3 m^3/day)
BW, body weight	na	70	kg	DTSC, 2006 (more conservative than HERO HHRA Note No. 1 [DTSC, 2014])
SA, exposed skin surface area	na	5,700	cm^2	DTSC, 2006 (corresponding to runner BW from DTSC, 2006)
AF, adherance factor	na	0.2	mg/cm^2	DTSC, 2006
PEF, particulate emission factor	na	1.0E+06	m^3/kg	DTSC, 2006
Absorption correction factor	na	0.1	unitless	DTSC, 2006 (default is 24 hr/day; 0.1 x 24 hr/day = 2.4 hr/day

DTSC = California Department of Toxic Substances Control
HERO = Office of Human and Ecological Risk (formerly Human and Ecological Risk Division [HERD])
DTSC, 2006 = HERD Memorandum titled Remediation Goals for the Recreational Runner on Trails, Empire Mine State Historical Park, Grass Valley (September 29, 2006)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 2014.
HERO Human Health Risk Assessment Note No. 3, Recommended methodology for use of U.S. EPA Regional Screening Levels (RSLs) in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities, January 2016.

Table 14b - Summary of Risk/Hazard Calculations for Adult Recreational Trail Use Exposure Scenario, Providence Quartz Mill (PQM), Removal of Soil with Pb > 270 mg/kg
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	17.1	1.71E-05	2.46E-01	1.39E-01	3.85E-01	3.50E-06	2.95E-06	6.45E-06
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.12	2.12E-06	8.20E-03	2.59E-02	3.41E-02		2.00E-07	2.00E-07
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	14.8	1.48E-05	1.60E-03	3.01E-01	3.03E-01		6.97E-06	6.97E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	118	1.18E-04	9.56E-05		9.56E-05			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	4.5	4.45E-06	9.01E-04	9.62E-02	9.71E-02			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	3.0	2.98E-06	1.93E-05		1.93E-05			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.8	3.28E-05	9.66E-05	2.86E-01	2.86E-01		4.46E-07	4.46E-07
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.92	1.92E-06	1.24E-05	1.17E-05	2.42E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	1.4	1.40E-06	9.07E-06		9.07E-06			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.93	3.93E-06	1.27E-02		1.27E-02			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	100	9.97E-05	1.08E-05		1.08E-05			0.00E+00
TOTAL									2.69E-01	8.49E-01	**1.1E+00**	3.50E-06	1.06E-05	**1.4E-05**

Notes:
1 Cadmium hazard evaluated per HHRA Note 3 (DTSC, 2016) considering 26-year adult exposure
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
na= not applicable
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 7.3E-01 Risk excluding Arsenic: 7.6E-06
Arsenic Hazard Quotient: 3.8.E-01 Arsenic Risk: 6.5E-06

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	na	70	yr	DTSC, 2006
ATnc, averaging time (non-carcinogen	na	30	yr	DTSC, 2006
EFs, exposure frequency (ingestion)	na	200	days/yr	DTSC, 2006
EFd, exposure frequency (dermal)	na	200	days/yr	DTSC, 2006
EFi, exposure frequency (inhalation)	na	200	days/yr	DTSC, 2006
ED, exposure duration	na	30	yr	DTSC, 2006
ET, exposure time	na	1	hr/day	DTSC, 2006
IRs, soil ingestion rate	na	3	mg/day	DTSC, 2006 (100 x default (0.03 mg/hr) = 3 mg/hr; 3 mg/hr x 1 hr/day = 3 mg/day)
IRa, inhalation rate	na	3.9	m^3/day	DTSC, 2006 (from USEPA EFH 1997; 3.9 m^3/hr x 1 hr/day = 3 m^3/day)
BW, body weight	na	70	kg	DTSC, 2006 (more conservative than HERO HHRA Note No. 1 [DTSC, 2014])
SA, exposed skin surface area	na	5,700	cm^2	DTSC, 2006 (corresponding to runner BW from DTSC, 2006)
AF, adherance factor	na	0.2	mg/cm^2	DTSC, 2006
PEF, particulate emission factor	na	1.0E+06	m^3/kg	DTSC, 2006
Absorption correction factor	na	0.1	unitless	DTSC, 2006 (default is 24 hr/day; 0.1 x 24 hr/day = 2.4 hr/day

DTSC = California Department of Toxic Substances Control
HERO = Office of Human and Ecological Risk (formerly Human and Ecological Risk Division [HERD])
DTSC, 2006 = HERD Memorandum titled Remediation Goals for the Recreational Runner on Trails, Empire Mine State Historical Park, Grass Valley (September 29, 2006)
HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 2014.
HERO Human Health Risk Assessment Note No. 3, Recommended methodology for use of U.S. EPA Regional Screening Levels (RSLs) in the Human Health Risk Assessment process at hazardous waste sites and permitted facilities, January 2016.

Table 15a - Summary of Risk/Hazard Calculations for Routine Child Visitation Scenario, Providence Quartz Mill (PQM), Removal of Soil > TTLCs
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo $(mg/kg\text{-}day)^{-1}$	Sfi $(mg/kg\text{-}day)^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	28.5	2.10E-08	4.09E+01	3.10E-04	4.09E+01	1.94E-04	2.19E-09	1.94E-04
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.02	5.16E-09	5.16E+00	1.14E-04	5.16E+00		2.94E-10	2.94E-10
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	16.1	1.18E-08	2.55E-01	4.38E-04	2.56E-01		3.38E-09	3.38E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	150	1.10E-07	1.78E-02		1.78E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	8.9	6.54E-09	2.64E-01	4.83E-05	2.64E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	7.9	5.82E-09	7.53E-03		7.53E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.4	2.39E-08	1.40E-02	3.78E-04	1.44E-02		1.97E-10	1.97E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	1.99E-03	1.71E-08	1.99E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	5.0	3.64E-09	4.71E-03		4.71E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.83	2.82E-09	1.82E+00		1.82E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	1.04E-02		1.04E-02			0.00E+00
TOTAL									4.85E+01	1.29E-03	**4.8E+01**	1.94E-04	6.06E-09	**1.9E-04**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca $[mg/m^3]$ = air concentration = Cs [mg/kg] * $(PEF\ [m^3/kg])^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding Arsenic:	7.6.E+00	Risk excluding Arsenic: 3.9E-09
Arsenic Hazard Quotient:	4.1.E+01	Arsenic Risk: 1.9E-04

Parameter	Value, child	Units	Reference
ATc, averaging time (carcinogen)	70	yr	DTSC HERD, 2006
ATnc, averaging time (non-carcinogen)	10	yr	DTSC HERD, 2006
EFs, exposure frequency (ingestion)	350	days/yr	DTSC HERD, 2006
EFd, exposure frequency (dermal)	350	days/yr	DTSC HERD, 2006
EFi, exposure frequency (inhalation)	350	days/yr	DTSC HERD, 2006
ED, exposure duration	10	yr	DTSC HERD, 2006
ET, exposure time	2	hr/day	DTSC HERD, 2006
IRs, soil ingestion rate	200	mg/day	DTSC HERD, 2006
IRa, inhalation rate	2.4	m^3/day	DTSC HERD, 2006
BW, body weight	41.5	kg	DTSC HERD, 2006
SA, exposed skin surface area	2,900	cm^2	DTSC HERD, 2006
AF, adherance factor	0.2	mg/cm^2	DTSC HERD, 2006
PEF, particulate emission factor	1.36E+09	m^3/kg	DTSC HERD, 2006

Table 15b - Summary of Risk/Hazard Calculations for Routine Child Visitation Scenario, Providence Quartz Mill (PQM), Removal of Soil with Pb > 270 mg/kg
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo $(mg/kg\text{-}day)^{-1}$	Sfi $(mg/kg\text{-}day)^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	17.1	1.26E-08	2.45E+01	1.86E-04	2.45E+01	1.17E-04	1.31E-09	1.17E-04
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.12	1.56E-09	1.56E+00	3.46E-05	1.56E+00		8.89E-11	8.89E-11
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	14.8	1.09E-08	2.35E-01	4.02E-04	2.35E-01		3.10E-09	3.10E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	118	8.68E-08	1.40E-02		1.40E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	4.5	3.27E-09	1.32E-01	2.42E-05	1.32E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	3.0	2.19E-09	2.83E-03		2.83E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.8	2.41E-08	1.42E-02	3.82E-04	1.46E-02		1.99E-10	1.99E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.92	1.41E-09	1.83E-03	1.57E-08	1.83E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	1.4	1.03E-09	1.33E-03		1.33E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.93	2.89E-09	1.87E+00		1.87E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	100	7.33E-08	1.58E-03		1.58E-03			0.00E+00
TOTAL									2.84E+01	1.03E-03	**2.8E+01**	1.17E-04	4.71E-09	**1.2E-04**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca $[mg/m^3]$ = air concentration = Cs [mg/kg] * $(PEF\ [m^3/kg])^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding Arsenic:	3.8.E+00	Risk excluding Arsenic: 3.4E-09
Arsenic Hazard Quotient:	2.5.E+01	Arsenic Risk: 1.2E-04

Parameter	Value, child	Units	Reference
ATc, averaging time (carcinogen)	70	yr	DTSC HERD, 2006
ATnc, averaging time (non-carcinogen)	10	yr	DTSC HERD, 2006
EFs, exposure frequency (ingestion)	350	days/yr	DTSC HERD, 2006
EFd, exposure frequency (dermal)	350	days/yr	DTSC HERD, 2006
EFi, exposure frequency (inhalation)	350	days/yr	DTSC HERD, 2006
ED, exposure duration	10	yr	DTSC HERD, 2006
ET, exposure time	2	hr/day	DTSC HERD, 2006
IRs, soil ingestion rate	200	mg/day	DTSC HERD, 2006
IRa, inhalation rate	2.4	m^3/day	DTSC HERD, 2006
BW, body weight	41.5	kg	DTSC HERD, 2006
SA, exposed skin surface area	2,900	cm^2	DTSC HERD, 2006
AF, adherance factor	0.2	mg/cm^2	DTSC HERD, 2006
PEF, particulate emission factor	1.36E+09	m^3/kg	DTSC HERD, 2006

Table 16a - Summary of Risk/Hazard Calculations for Adult Unauthorized Transient Camping Exposure Scenario, Providence Quartz Mill (PQM), Removal of Soil > TTLCs
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	28.5	2.10E-08	2.22E+00	4.37E-04	2.22E+00	9.51E-06	2.78E-09	9.51E-06
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.02	5.16E-09	2.21E-01	1.62E-04	2.21E-01		3.74E-10	3.74E-10
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	16.1	1.18E-08	1.19E-02	6.18E-04	1.25E-02		4.29E-09	4.29E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	150	1.10E-07	8.31E-04		8.31E-04			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	8.9	6.54E-09	1.23E-02	6.82E-05	1.24E-02			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	7.9	5.82E-09	3.51E-04		3.51E-04			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.4	2.39E-08	6.53E-04	5.33E-04	1.19E-03		2.50E-10	2.50E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	1.54E-09	9.28E-05	2.41E-08	9.28E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	5.0	3.64E-09	2.19E-04		2.19E-04			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.83	2.82E-09	8.48E-02		8.48E-02			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	4.85E-07	4.87E-04		4.87E-04			0.00E+00
TOTAL									2.56E+00	1.82E-03	**3.E+00**	9.51E-06	7.70E-09	**1.E-05**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic: 3.3E-01
Arsenic Hazard Quotient: 2.22E+00
Risk excluding Arsenic: 4.9E-09
Arsenic Risk: 9.5E-06

Parameter	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	yr	BLM, 2004
ATnc, averaging time (non-carcinogen)	9	yr	BLM, 2004
EFs, exposure frequency (ingestion)	100	days/yr	BLM, 2004
EFd, exposure frequency (dermal)	100	days/yr	BLM, 2004
EFi, exposure frequency (inhalation)	100	days/yr	BLM, 2004
ED, exposure duration	9	yr	BLM, 2004
IRs, soil ingestion rate	50	mg/day	BLM, 2004
IRa, inhalation rate	20	m^3/day	BLM, 2004
BW, body weight	70	kg	BLM, 2004
SA, exposed skin surface area	3,300	cm^2	BLM, 2004
AF, adherance factor	0.2	mg/cm^2	BLM, 2004
PEF, particulate emission factor	1.36E+09	m^3/kg	BLM, 2004

BLM 2004 = Karl Ford, Risk Management Criteria for Metals at BLM Mining Sites, Technical Note 390, United States Bureau of Land Management , October 2004

Table 16b - Summary of Risk/Hazard Calculations for Adult Unauthorized Transient Camping Exposure Scenario, Providence Quartz Mill (PQM), Removal of Soil with Pb > 270 mg/kg
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi[1] (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi[1] (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	17.1	1.26E-08	1.33E+00	2.62E-04	1.33E+00	5.71E-06	1.67E-09	5.71E-06
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.12	1.56E-09	6.67E-02	4.88E-05	6.68E-02		1.13E-10	1.13E-10
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	14.8	1.09E-08	1.09E-02	5.68E-04	1.15E-02		3.94E-09	3.94E-09
Copper	95% UCL	4.0E-02	--	--	--	0.01	118	8.68E-08	6.54E-04		6.54E-04			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	4.5	3.27E-09	6.16E-03	3.42E-05	6.20E-03			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	3.0	2.19E-09	1.32E-04		1.32E-04			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.8	2.41E-08	6.61E-04	5.39E-04	1.20E-03		2.52E-10	2.52E-10
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.92	1.41E-09	8.51E-05	2.21E-08	8.51E-05			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	1.4	1.03E-09	6.20E-05		6.20E-05			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.93	2.89E-09	8.71E-02		8.71E-02			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	100	7.33E-08	7.36E-05		7.36E-05			0.00E+00
TOTAL									1.51E+00	1.45E-03	**2.E+00**	5.71E-06	5.98E-09	**6.E-06**

Notes:
1 Per PEA Manual 2.5.1.5, use oral SF or RfD if inhalation SF or RfD is not available.
2 Chromium VI not considered an oral carcinogen per DTSC.
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
ND = not detected
NL = not listed in reviewed toxicological data sources
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding arsenic:	1.7E-01	Risk excluding Arsenic: 4.3E-09
Arsenic Hazard Quotient:	1.33E+00	Arsenic Risk: 5.7E-06

Parameter	Value, adult	Units	Reference
ATc, averaging time (carcinogen)	70	yr	BLM, 2004
ATnc, averaging time (non-carcinogen)	9	yr	BLM, 2004
EFs, exposure frequency (ingestion)	100	days/yr	BLM, 2004
EFd, exposure frequency (dermal)	100	days/yr	BLM, 2004
EFi, exposure frequency (inhalation)	100	days/yr	BLM, 2004
ED, exposure duration	9	yr	BLM, 2004
IRs, soil ingestion rate	50	mg/day	BLM, 2004
IRa, inhalation rate	20	m^3/day	BLM, 2004
BW, body weight	70	kg	BLM, 2004
SA, exposed skin surface area	3,300	cm^2	BLM, 2004
AF, adherance factor	0.2	mg/cm^2	BLM, 2004
PEF, particulate emission factor	1.36E+09	m^3/kg	BLM, 2004

BLM 2004 = Karl Ford, Risk Management Criteria for Metals at BLM Mining Sites, Technical Note 390, United States Bureau of Land Management , October 2004

Table 17a - Summary of Risk/Hazard Calculations for Construction Scenario, Providence Quartz Mill (PQM), Removal of Soil > TTLCs
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	$Hazard_{soil}$	$Hazard_{air}$	Hazard, soil + air	$Risk_{soil}$	$Risk_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	28.5	2.85E-05	3.31E+01	1.30E+00	3.44E+01	1.57E-05	9.20E-07	1.66E-05
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	7.02	7.02E-06	3.19E+00	4.81E-01	3.68E+00		1.24E-07	1.24E-07
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	16.1	1.61E-05	1.74E-01	1.84E+00	2.01E+00		1.42E-06	1.42E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	150	1.50E-04	1.21E-02		1.21E-02			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	8.9	8.89E-06	1.80E-01	2.03E-01	3.83E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	7.9	7.92E-06	5.13E-03		5.13E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.4	3.24E-05	9.55E-03	1.59E+00	1.60E+00		8.25E-08	8.25E-08
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	2.09	2.09E-06	1.36E-03	7.17E-05	1.43E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	5.0	4.95E-06	3.21E-03		3.21E-03			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.83	3.83E-06	1.24E+00		1.24E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	659	6.59E-04	7.11E-03		7.11E-03			0.00E+00
TOTAL									3.79E+01	5.41E+00	**4.3E+01**	1.57E-05	2.54E-06	**1.8E-05**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding Arsenic: 8.9.E+00 Risk excluding Arsenic: 1.6E-06
Arsenic Hazard Quotient: 3.4.E+01 Arsenic Risk: 1.7E-05

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinog	--	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-ca	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ing	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (der	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFi, exposure frequency (inha	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	--	8	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	--	330	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	--	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	--	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface are	--	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	--	0.8	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission fact	--	1.0E+06	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.
PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, October 2015)

Table 17b - Summary of Risk/Hazard Calculations for Construction Scenario, Providence Quartz Mill (PQM), Removal of Soil with Pb > 270 mg/kg
Providence Quartz Mill Site
Nevada City, California

Analyte	EPC Source	RfDo (mg/kg-day)	RfDi (mg/kg-day)	Sfo (mg/kg-day)$^{-1}$	Sfi (mg/kg-day)$^{-1}$	ABS	Cs (mg/kg)	Ca (mg/m^3)	Hazard$_{soil}$	Hazard$_{air}$	Hazard, soil + air	Risk$_{soil}$	Risk$_{air}$	Risk, soil + air
Antimony	max detect.	4.0E-04	--	--	--	0.01	ND	NA			0.00E+00			0.00E+00
Arsenic	95% UCL	3.5E-06	3.8E-06	9.5E+00	1.3E+01	0.03	17.1	1.71E-05	1.99E+01	7.81E-01	2.06E+01	9.43E-06	5.52E-07	9.99E-06
Cadmium	95% UCL	6.3E-06	2.5E-06	--	7.2E+00	0.00	2.12	2.12E-06	9.65E-01	1.45E-01	1.11E+00		3.73E-08	3.73E-08
Cobalt	95% UCL	3.0E-04	1.5E-06	--	3.6E+01	0.01	14.8	1.48E-05	1.60E-01	1.69E+00	1.85E+00		1.30E-06	1.30E-06
Copper	95% UCL	4.0E-02	--	--	--	0.01	118	1.18E-04	9.55E-03		9.55E-03			0.00E+00
Mercury	95% UCL	1.6E-04	7.5E-06	--	--	0.01	4.5	4.45E-06	9.01E-02	1.02E-01	1.92E-01			0.00E+00
Molybdenum	95% UCL	5.0E-03	--	--	--	0.01	3.0	2.98E-06	1.93E-03		1.93E-03			0.00E+00
Nickel	95% UCL	1.1E-02	3.5E-06	--	1.0E+00	0.01	32.8	3.28E-05	9.66E-03	1.60E+00	1.61E+00		8.34E-08	8.34E-08
Selenium	95% UCL	5.0E-03	5.0E-03	--	--	0.01	1.92	1.92E-06	1.24E-03	6.58E-05	1.31E-03			0.00E+00
Silver	95% UCL	5.0E-03	--	--	--	0.01	1.4	1.40E-06	9.07E-04		9.07E-04			0.00E+00
Thallium	95% UCL	1.0E-05	--	--	--	0.01	3.93	3.93E-06	1.27E+00		1.27E+00			0.00E+00
Zinc	95% UCL	3.0E-01	--	--	--	0.01	100	9.97E-05	1.08E-03		1.08E-03			0.00E+00
TOTAL									2.24E+01	4.32E+00	**2.7E+01**	9.43E-06	1.98E-06	**1.1E-05**

Notes:
ABS = dermal absorption fraction (PEA Guidance Manual, Appendix A, Table 2)
Ca [mg/m^3] = air concentration = Cs [mg/kg] * (PEF [m^3/kg])$^{-1}$
Cs [mg/kg] = soil concentration
RfDo = reference dose for chronic oral exposure
RfDi = reference dose for chronic inhalation exposure
Sfo = standard oral slope factor
Sfi = standard inhalation slope factor
UCL = upper confidence limit

Hazard Index excluding Arsenic: 6.1.E+00
Arsenic Hazard Quotient: 2.1.E+01
Risk excluding Arsenic: 1.4E-06
Arsenic Risk: 1.0E-05

Parameter	Value, child	Value, adult	Units	Reference
ATc, averaging time (carcinog	--	70	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ATnc, averaging time (non-ca	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFs, exposure frequency (ing	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFd, exposure frequency (der	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
EFi, exposure frequency (inha	--	250	days/yr	HERO HHRA Note No. 1 (DTSC, 2014)
ED, exposure duration	--	1	yr	HERO HHRA Note No. 1 (DTSC, 2014)
ET, exposure time	--	8	hr/day	HERO HHRA Note No. 3 (DTSC, 2016)
IRs, soil ingestion rate	--	330	mg/day	HERO HHRA Note No. 1 (DTSC, 2014)
IRa, inhalation rate	--	20	m^3/day	HERO HHRA Note No. 1 (DTSC, 2014)
BW, body weight	--	80	kg	HERO HHRA Note No. 1 (DTSC, 2014)
SA, exposed skin surface are	--	6,032	cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
AF, adherance factor	--	0.8	mg/cm^2	HERO HHRA Note No. 1 (DTSC, 2014)
PEF, particulate emission fact	--	1.0E+06	m^3/kg	HERO HHRA Note No. 1 (DTSC, 2014)

HERO Human Health Risk Assessment Note No. 1, Recommended DTSC Default Exposure Factors for Use in Risk Assessment, DTSC, September 30, 2014.
PEA Guidance Manual = Preliminary Endangermant Assessment Guidance Manual (DTSC, October 2015)

Table 18 - Summary of Human Health Risk Assessment, Providence Quartz Mill (PQM), Proposed Soil Removal
Providence Quartz Mill Site
Nevada City, California

Assessment Area	Constituents	Exposure Scenario									
		Residential (Unrestricted)		Adult Recreational Trail Use (Runner)		Routine Child Visitation		Adult Unauthorized Transient Camping		Construction Worker	
		Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk	Hazard	Risk
Providince Quartz Mill (PQM), Removal of Soil Pb > TTLC and Hg > TTLC	Constituents of Concern (COCs)	**1.E+02**	**4.E-04**	**2.E+00**	**2.E-05**	**5.E+01**	**2.E-04**	**3.E+00**	**2.E-05**	**4.E+01**	**2.E-05**
	COCs Excluding Arsenic	**2.E+01**	6.E-08	9.E-01	**9.E-06**	**8.E+00**	4.E-09	3.E-01	**2.E-06**	**9.E+00**	**2.E-06**
	Arsenic	**1.E+02**	**4.E-04**	6.E-01	**1.E-05**	**4.E+01**	**1.E-05**	**2.E+00**	**2.E-05**	**3.E+01**	**2.E-05**
Providince Quartz Mill (PQM), Removal of Soil with Pb > 270 mg/kg	Constituents of Concern (COCs)	**8.E+01**	**3.E-04**	1.E+00	**1.E-05**	**3.E+01**	**1.E-04**	**2.E+00**	**6.E-06**	**3.E+01**	**1.E-05**
	COCs Excluding Arsenic	**1.E+01**	5.E-08	7.E-01	**8.E-06**	**4.E+00**	3.E-09	2.E-01	4.E-09	**6.E+00**	1.E-06
	Arsenic	**7.E+01**	**3.E-04**	4.E-01	**6.E-06**	**2.E+01**	**1.E-04**	1.E+00	**6.E-06**	**2.E+01**	**1.E-05**

Notes:
na = not assessed
COC = Constituent of Concern
Hazard = chronic health hazard index
Risk = excess lifetime cancer risk

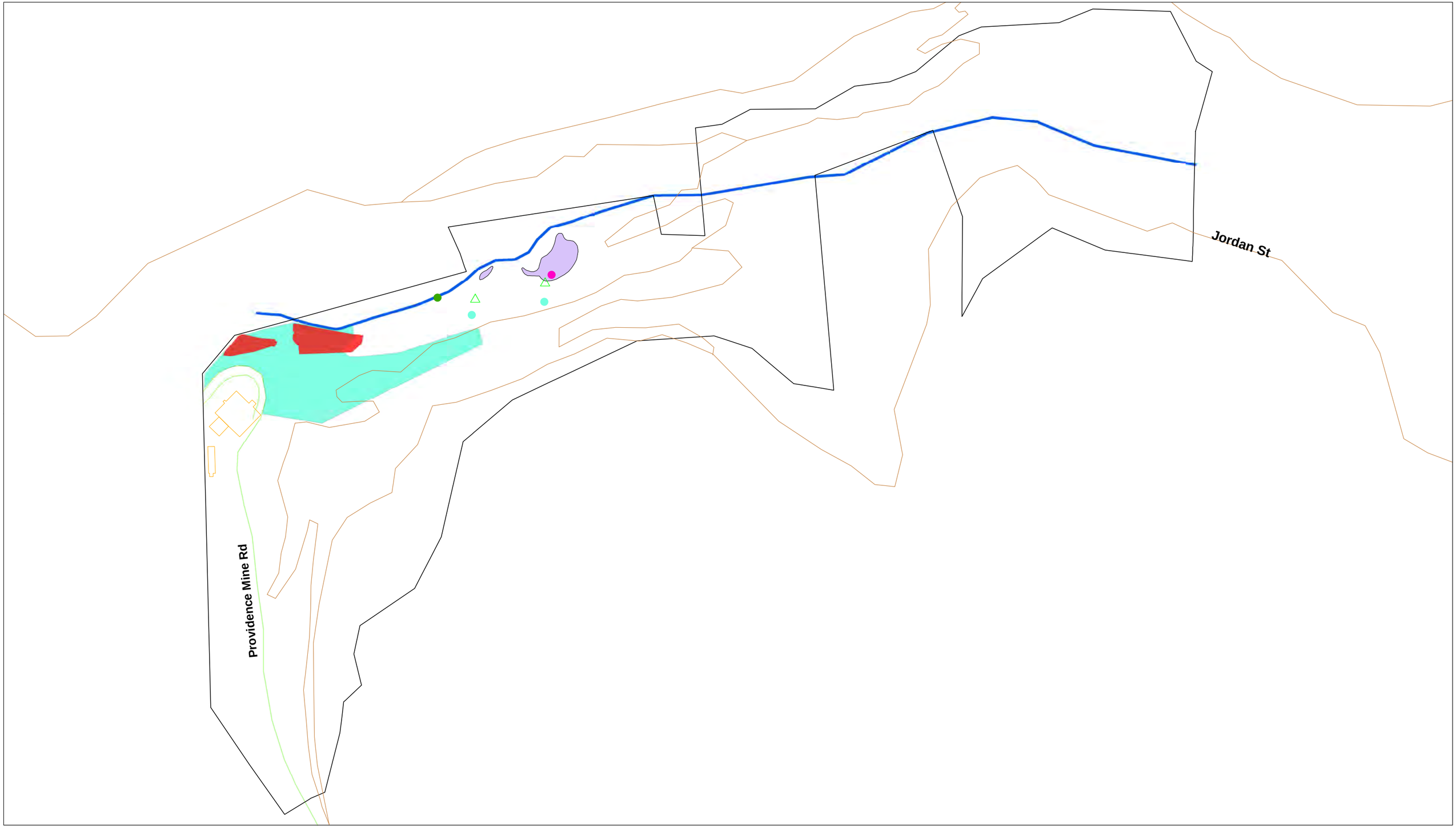
Table 19 - Summary of Lead Hazard Assessment, Providence Quartz Mill (PQM), Proposed Soil Removal
Providence Quartz Mill Site
Nevada City, California

Assessment Area	Reasonable Maximum Exposure				Maximum Detection		
	EPC (mg/kg)	EPC Source	90th Percentile Estimate of Blood Lead (ug/dl)		Maximum Detected Concentration (mg/kg)	90th Percentile Estimate of Blood Lead (ug/dl)	
			Non-Pica Child	Adult Worker		Non-Pica Child	Adult Worker
Providence Quartz Mill (PQM), Culled Data Set: Proposed Removal of Soil with Pb > TTLC and Hg > TTLC, Residential Exposure	544	95% UCL	**7.1**	0.9	970	**12.6**	**3.0**
Proposed Lead Cleanup Goal: Not-to-exceed 270 mg/kg Residential Exposure	180	95% UCL	**2.3**	0.3	270	**3.5**	0.4
Proposed Lead Cleanup Goal: Not-to-exceed 270 mg/kg Modified Exposure Frequency, 2 days per week	180	95% UCL	0.7	0.1	270	1.0	0.2

Notes:
EPC = exposure point concentration
UCL = upper confidence limit on the arithmetic mean
Lead hazards were assessed using the Lead Risk Assessment Spreadsheet Version 8 (LeadSpread 8; DTSC, 2011) for child exposure, and the Modified USEPA Adult Lead Model (Modified ALM; DTSC, 2011) for adult exposure.

APPENDIX A

Site Investigation Data



Legend

- Environs Parcel
- SNC Providence Project Boundary (775)
- Providence Mine Brownfield Site
- Providence Mine Road
- Deer Creek
- Deer Creek Tribute Trail
- Stamp Mill
- Mine Adit
- Adit Pipe
- Air Shaft
- Drain Tunnel
- Waste Rock Piles

Sierra Streams Institute
Sierra Nevada Conservancy - Environs Assessment

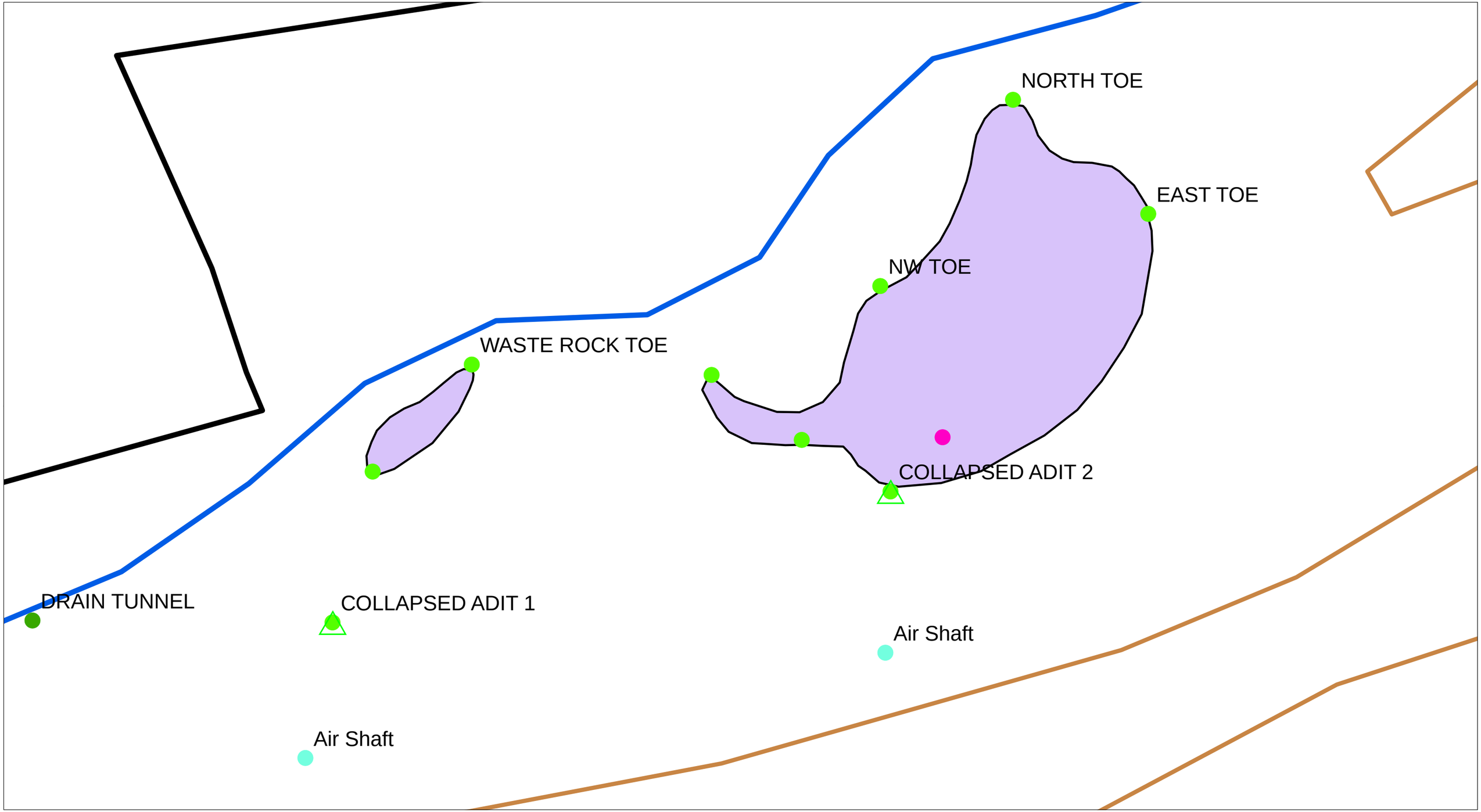
Figure 2 - Site Map

N

1 inch = 235 feet

0 0.025 0.05 0.1

Miles



Legend

- Environs Parcel
- Deer Creek
- Deer Creek Tribute Trail
- Waste Rock Piles
- Mine Features
- Adit Pipe
- Air Shaft
- Drain Tunnel
- Mine Adit

Sierra Streams Institute
Sierra Nevada Conservancy - Environs Assessment

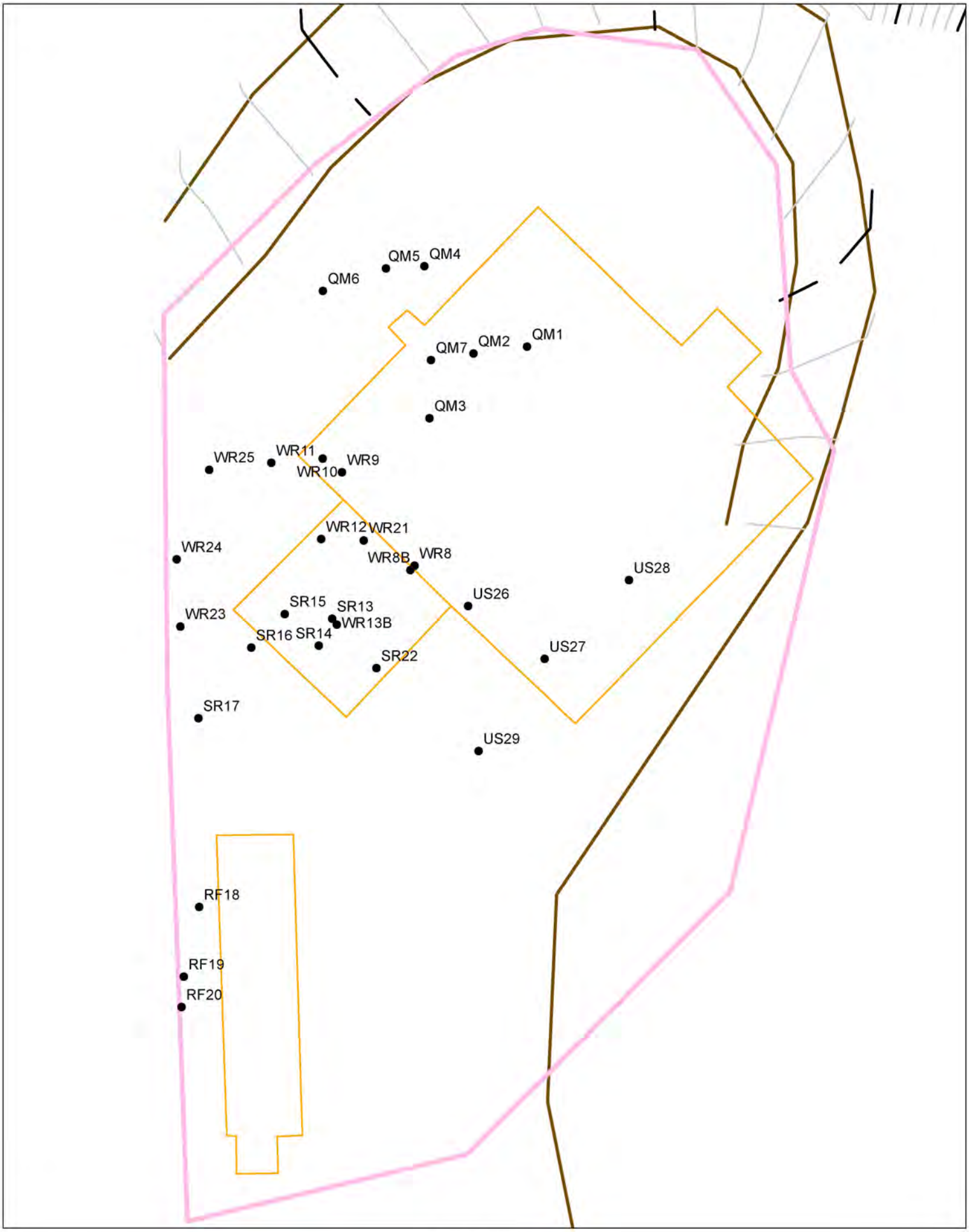
Figure 3: Sample Location Map Waste Rock Stockpiles

N

1 inch = 30 feet

0 0.0025 0.005 0.01

Miles



Legend

- Providence Quartz Mill Sample Points
- Quartz Mill Features
- Providence Quartz Mill Area
- Providence Mine Road

Sierra Streams Institute
Sierra Nevada Conservancy - Environs Assessment

Figure 4: Sample Location Map Quartz Mill Area

N

1 inch = 30 feet

0 0.0025 0.005

Miles

ADVANCED TECHNOLOGY LABORATORIES

June 17, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502024
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on June 10, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR1-S1	1502024-01	Soil	6/02/15 12:00	6/10/15 9:14
WR1-S2	1502024-02	Soil	6/02/15 12:00	6/10/15 9:14
WR1-S3	1502024-03	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S1	1502024-04	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S2	1502024-05	Soil	6/02/15 12:00	6/10/15 9:14
WR2-S3	1502024-06	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S4	1502024-07	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S5	1502024-08	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S6	1502024-09	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S7	1502024-10	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S8	1502024-11	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S9	1502024-12	Soil	6/02/15 13:00	6/10/15 9:14
WR2-S10	1502024-13	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S11	1502024-14	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S12	1502024-15	Soil	6/02/15 14:00	6/10/15 9:14
WR2-S13	1502024-16	Soil	6/02/15 14:00	6/10/15 9:14
WR2-TS14	1502024-17	Soil	6/02/15 14:00	6/10/15 9:14
WR2-TS15	1502024-18	Soil	6/02/15 15:00	6/10/15 9:14
WR2-TS16	1502024-19	Soil	6/02/15 15:00	6/10/15 9:14
WR2-S17	1502024-20	Soil	6/02/15 15:00	6/10/15 9:14
WR2-S18	1502024-21	Soil	6/02/15 15:00	6/10/15 9:14

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S1
Lab ID: 1502024-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Arsenic	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Barium	**120**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Cadmium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Chromium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Cobalt	**18**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Copper	**140**	2.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Lead	**530**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Molybdenum	**9.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Nickel	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Vanadium	**54**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	
Zinc	**81**	1.0	1	B5F0277	06/15/2015	06/15/15 15:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.52**	0.10	1	B5F0281	06/15/2015	06/15/15 14:34	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S2
Lab ID: 1502024-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Arsenic	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Barium	**140**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Cadmium	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Chromium	**3.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Cobalt	**15**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Copper	**120**	2.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Lead	**400**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Molybdenum	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Nickel	**4.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	
Zinc	**82**	1.0	1	B5F0277	06/15/2015	06/15/15 15:10	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.43**	0.10	1	B5F0281	06/15/2015	06/15/15 14:42	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR1-S3
Lab ID: 1502024-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Arsenic	**17**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Barium	**97**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Cadmium	**2.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Chromium	**3.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Cobalt	**14**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Copper	**120**	2.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Lead	**410**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Molybdenum	**7.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Nickel	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Silver	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Vanadium	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	
Zinc	**62**	1.0	1	B5F0277	06/15/2015	06/15/15 15:11	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.4**	0.10	1	B5F0281	06/15/2015	06/15/15 14:44	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S1
Lab ID: 1502024-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Barium	**70**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Cadmium	**6.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Chromium	**1.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Cobalt	**4.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Lead	**23**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Molybdenum	**12**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Nickel	**1.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Thallium	**5.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Vanadium	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	
Zinc	**75**	1.0	1	B5F0277	06/15/2015	06/15/15 15:13	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 14:46	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S2
Lab ID: 1502024-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Arsenic	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Barium	**87**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Cadmium	**1.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Chromium	**4.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Cobalt	**9.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Copper	**54**	2.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Lead	**59**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Molybdenum	**6.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Nickel	**4.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Vanadium	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	
Zinc	**46**	1.0	1	B5F0277	06/15/2015	06/15/15 15:15	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.29**	0.10	1	B5F0281	06/15/2015	06/15/15 14:48	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S3
Lab ID: 1502024-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Arsenic	**23**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Barium	**46**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Cadmium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Chromium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Cobalt	**3.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Copper	**96**	2.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Lead	**170**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Nickel	**2.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Silver	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Thallium	**1.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Vanadium	**14**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	
Zinc	**43**	1.0	1	B5F0277	06/15/2015	06/15/15 15:22	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.45**	0.10	1	B5F0281	06/15/2015	06/15/15 14:50	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S4
Lab ID: 1502024-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Arsenic	**4.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Barium	**130**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Cadmium	**1.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Chromium	**5.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Cobalt	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Copper	**75**	2.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Lead	**64**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Molybdenum	**44**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Nickel	**5.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Silver	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Vanadium	**38**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	
Zinc	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.51**	0.10	1	B5F0281	06/15/2015	06/15/15 14:52	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S5
Lab ID: 1502024-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Arsenic	**20**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Barium	**88**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Cadmium	**2.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Chromium	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Cobalt	**8.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Copper	**150**	2.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Lead	**330**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Molybdenum	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Nickel	**11**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Silver	**4.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Thallium	**2.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Vanadium	**29**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	
Zinc	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:25	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.57**	0.10	1	B5F0281	06/15/2015	06/15/15 14:58	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S6
Lab ID: 1502024-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Arsenic	**16**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Barium	**73**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Cadmium	**3.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Chromium	**2.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Cobalt	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Copper	**90**	2.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Lead	**170**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Molybdenum	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Nickel	**2.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Silver	**4.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Thallium	**1.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Vanadium	**19**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	
Zinc	**50**	1.0	1	B5F0277	06/15/2015	06/15/15 15:27	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.47**	0.10	1	B5F0281	06/15/2015	06/15/15 15:00	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S7
Lab ID: 1502024-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Arsenic	**24**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Barium	**44**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Cadmium	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Chromium	**2.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Cobalt	**10**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Copper	**140**	2.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Lead	**330**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Molybdenum	**8.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Nickel	**3.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Silver	**8.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Thallium	**3.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Vanadium	**22**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	
Zinc	**71**	1.0	1	B5F0277	06/15/2015	06/15/15 15:29	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.27**	0.10	1	B5F0281	06/15/2015	06/15/15 15:02	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S8
Lab ID: 1502024-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Arsenic	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Barium	**58**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Cadmium	**1.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Chromium	**3.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Cobalt	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Copper	**62**	2.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Lead	**53**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Molybdenum	**6.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Nickel	**5.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	
Zinc	**36**	1.0	1	B5F0277	06/15/2015	06/15/15 15:31	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.20**	0.10	1	B5F0281	06/15/2015	06/15/15 15:04	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Client Sample ID WR2-S9
Lab ID: 1502024-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Barium	**240**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Chromium	**4.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Cobalt	**8.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Copper	**16**	2.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Lead	**7.3**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Nickel	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:33	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:06	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S10
Lab ID: 1502024-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Barium	**200**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Chromium	**4.2**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Cobalt	**9.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Copper	**18**	2.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Lead	**12**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Nickel	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Vanadium	**42**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:35	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:08	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S11
Lab ID: 1502024-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Barium	**220**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Chromium	**6.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Cobalt	**9.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Copper	**31**	2.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Lead	**15**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Nickel	**5.6**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Vanadium	**54**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	
Zinc	**34**	1.0	1	B5F0277	06/15/2015	06/15/15 15:37	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.13**	0.10	1	B5F0281	06/15/2015	06/15/15 15:10	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S12
Lab ID: 1502024-15

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Arsenic	**4.4**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Barium	**130**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Cadmium	**2.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Chromium	**5.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Cobalt	**9.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Copper	**41**	2.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Lead	**52**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Molybdenum	**9.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Nickel	**5.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Vanadium	**38**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	
Zinc	**58**	1.0	1	B5F0277	06/15/2015	06/15/15 15:38	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.21**	0.10	1	B5F0281	06/15/2015	06/15/15 15:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S13
Lab ID: 1502024-16

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Barium	**160**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Chromium	**3.7**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Cobalt	**16**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Copper	**62**	2.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Lead	**30**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Molybdenum	**3.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Nickel	**5.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Vanadium	**47**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	
Zinc	**40**	1.0	1	B5F0277	06/15/2015	06/15/15 15:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:14	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Client Sample ID WR2-TS14
Lab ID: 1502024-17

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Barium	**90**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Chromium	**8.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Cobalt	**6.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Lead	**13**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Nickel	**5.8**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Vanadium	**61**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	
Zinc	**29**	1.0	1	B5F0277	06/15/2015	06/15/15 15:46	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.12**	0.10	1	B5F0281	06/15/2015	06/15/15 15:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-TS15
Lab ID: 1502024-18

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Arsenic	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Barium	**230**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Chromium	**4.0**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Cobalt	**9.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Copper	**16**	2.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Lead	**7.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Nickel	**4.9**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Vanadium	**48**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	
Zinc	**55**	1.0	1	B5F0277	06/15/2015	06/15/15 15:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5F0281	06/15/2015	06/15/15 15:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-TS16
Lab ID: 1502024-19

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Arsenic	**24**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Barium	**73**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Beryllium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Cadmium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Chromium	**9.1**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Cobalt	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Copper	**23**	2.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Lead	**21**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Molybdenum	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Nickel	**5.5**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Selenium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Silver	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Thallium	ND	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Vanadium	**41**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	
Zinc	**32**	1.0	1	B5F0277	06/15/2015	06/15/15 15:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.43**	0.10	1	B5F0281	06/15/2015	06/15/15 15:24	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S17
Lab ID: 1502024-20

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Arsenic	**15**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Barium	**58**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Beryllium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Cadmium	**1.5**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Chromium	**2.0**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Cobalt	**5.7**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Copper	**45**	2.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Lead	**64**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Molybdenum	**27**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Nickel	**2.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Selenium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Silver	**5.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Thallium	**3.2**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Vanadium	**35**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	
Zinc	**33**	1.0	1	B5F0279	06/15/2015	06/15/15 15:59	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.41**	0.10	1	B5F0282	06/15/2015	06/15/15 15:35	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Client Sample ID WR2-S18
Lab ID: 1502024-21

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Arsenic	**24**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Barium	**53**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Beryllium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Cadmium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Chromium	**9.2**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Cobalt	**4.7**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Copper	**17**	2.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Lead	**16**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Molybdenum	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Nickel	**4.5**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Selenium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Silver	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Thallium	ND	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Vanadium	**41**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	
Zinc	**22**	1.0	1	B5F0279	06/15/2015	06/15/15 16:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.61**	0.10	1	B5F0282	06/15/2015	06/15/15 15:43	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0277 - EPA 3050B_S									
Blank (B5F0277-BLK1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5F0277-BS1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	48.4485	2.0	50.0000		96.9	80 - 120			
Arsenic	45.8369	1.0	50.0000		91.7	80 - 120			
Barium	49.6778	1.0	50.0000		99.4	80 - 120			
Beryllium	46.6242	1.0	50.0000		93.2	80 - 120			
Cadmium	46.4546	1.0	50.0000		92.9	80 - 120			
Chromium	50.0640	1.0	50.0000		100	80 - 120			
Cobalt	47.7883	1.0	50.0000		95.6	80 - 120			
Copper	46.9236	2.0	50.0000		93.8	80 - 120			
Lead	47.9394	1.0	50.0000		95.9	80 - 120			
Molybdenum	46.2041	1.0	50.0000		92.4	80 - 120			
Nickel	47.3113	1.0	50.0000		94.6	80 - 120			
Selenium	44.1654	1.0	50.0000		88.3	80 - 120			
Silver	47.6280	1.0	50.0000		95.3	80 - 120			
Thallium	47.0126	1.0	50.0000		94.0	80 - 120			
Vanadium	49.5846	1.0	50.0000		99.2	80 - 120			
Zinc	44.7630	1.0	50.0000		89.5	80 - 120			
Matrix Spike (B5F0277-MS1)		**Source: 1502024-01**			Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	85.5230	2.0	125.000	ND	68.4	28 - 106			
Arsenic	138.232	1.0	125.000	40.2577	78.4	57 - 109			
Barium	211.635	1.0	125.000	116.800	75.9	18 - 159			
Beryllium	102.638	1.0	125.000	0.533714	81.7	61 - 107			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0277 - EPA 3050B_S (continued)									
Matrix Spike (B5F0277-MS1) - Continued		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Cadmium	98.5008	1.0	125.000	3.48955	76.0	53 - 104			
Chromium	106.517	1.0	125.000	3.51783	82.4	53 - 121			
Cobalt	118.493	1.0	125.000	18.2580	80.2	55 - 109			
Copper	275.054	2.0	125.000	144.685	104	58 - 124			
Lead	667.152	1.0	125.000	532.561	108	35 - 129			
Molybdenum	111.905	1.0	125.000	9.60249	81.8	57 - 108			
Nickel	102.227	1.0	125.000	4.64546	78.1	44 - 122			
Selenium	95.6250	1.0	125.000	ND	76.5	54 - 104			
Silver	108.933	1.0	125.000	0.225008	87.0	60 - 112			
Thallium	94.2168	1.0	125.000	ND	75.4	50 - 103			
Vanadium	158.554	1.0	125.000	54.1678	83.5	54 - 123			
Zinc	179.825	1.0	125.000	80.6545	79.3	29 - 132			
Matrix Spike Dup (B5F0277-MSD1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	89.1772	2.0	124.378	ND	71.7	28 - 106	4.18	20	
Arsenic	138.153	1.0	124.378	40.2577	78.7	57 - 109	0.0577	20	
Barium	209.009	1.0	124.378	116.800	74.1	18 - 159	1.25	20	
Beryllium	102.982	1.0	124.378	0.533714	82.4	61 - 107	0.334	20	
Cadmium	98.2728	1.0	124.378	3.48955	76.2	53 - 104	0.232	20	
Chromium	106.150	1.0	124.378	3.51783	82.5	53 - 121	0.345	20	
Cobalt	116.383	1.0	124.378	18.2580	78.9	55 - 109	1.80	20	
Copper	254.491	2.0	124.378	144.685	88.3	58 - 124	7.77	20	
Lead	604.438	1.0	124.378	532.561	57.8	35 - 129	9.86	20	
Molybdenum	113.255	1.0	124.378	9.60249	83.3	57 - 108	1.20	20	
Nickel	101.989	1.0	124.378	4.64546	78.3	44 - 122	0.233	20	
Selenium	96.8593	1.0	124.378	ND	77.9	54 - 104	1.28	20	
Silver	105.923	1.0	124.378	0.225008	85.0	60 - 112	2.80	20	
Thallium	96.3845	1.0	124.378	ND	77.5	50 - 103	2.27	20	
Vanadium	157.712	1.0	124.378	54.1678	83.2	54 - 123	0.532	20	
Zinc	173.073	1.0	124.378	80.6545	74.3	29 - 132	3.83	20	
Batch B5F0279 - EPA 3050B_S									
Blank (B5F0279-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0279 - EPA 3050B_S (continued)									
Blank (B5F0279-BLK1) - Continued					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5F0279-BS1)					Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	46.8539	2.0	50.0000		93.7	80 - 120			
Arsenic	44.2343	1.0	50.0000		88.5	80 - 120			
Barium	48.6384	1.0	50.0000		97.3	80 - 120			
Beryllium	45.3075	1.0	50.0000		90.6	80 - 120			
Cadmium	45.5631	1.0	50.0000		91.1	80 - 120			
Chromium	48.7582	1.0	50.0000		97.5	80 - 120			
Cobalt	46.8793	1.0	50.0000		93.8	80 - 120			
Copper	45.8039	2.0	50.0000		91.6	80 - 120			
Lead	46.3129	1.0	50.0000		92.6	80 - 120			
Molybdenum	45.1240	1.0	50.0000		90.2	80 - 120			
Nickel	46.2659	1.0	50.0000		92.5	80 - 120			
Selenium	42.8488	1.0	50.0000		85.7	80 - 120			
Silver	46.4464	1.0	50.0000		92.9	80 - 120			
Thallium	45.1826	1.0	50.0000		90.4	80 - 120			
Vanadium	48.4633	1.0	50.0000		96.9	80 - 120			
Zinc	43.9676	1.0	50.0000		87.9	80 - 120			
Matrix Spike (B5F0279-MS1)		**Source: 1502024-20**			Prepared: 6/15/2015 Analyzed: 6/15/2015				
Antimony	88.7211	2.0	125.000	ND	71.0	28 - 106			
Arsenic	119.745	1.0	125.000	15.1603	83.7	57 - 109			
Barium	154.876	1.0	125.000	57.8524	77.6	18 - 159			
Beryllium	104.683	1.0	125.000	0.305927	83.5	61 - 107			
Cadmium	98.7435	1.0	125.000	1.49918	77.8	53 - 104			
Chromium	106.890	1.0	125.000	2.00668	83.9	53 - 121			
Cobalt	109.240	1.0	125.000	5.68821	82.8	55 - 109			
Copper	159.956	2.0	125.000	44.6175	92.3	58 - 124			
Lead	165.647	1.0	125.000	63.7962	81.5	35 - 129			
Molybdenum	129.438	1.0	125.000	27.2136	81.8	57 - 108			
Nickel	102.442	1.0	125.000	2.21040	80.2	44 - 122			
Selenium	99.8170	1.0	125.000	ND	79.9	54 - 104			
Silver	112.964	1.0	125.000	5.18934	86.2	60 - 112			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	06/17/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0279 - EPA 3050B_S (continued)									
Matrix Spike (B5F0279-MS1) - Continued		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Thallium	103.149	1.0	125.000	3.15709	80.0	50 - 103			
Vanadium	140.083	1.0	125.000	35.1667	83.9	54 - 123			
Zinc	126.824	1.0	125.000	33.1858	74.9	29 - 132			
Matrix Spike Dup (B5F0279-MSD1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Antimony	87.9726	2.0	125.000	ND	70.4	28 - 106	0.847	20	
Arsenic	118.952	1.0	125.000	15.1603	83.0	57 - 109	0.665	20	
Barium	164.469	1.0	125.000	57.8524	85.3	18 - 159	6.01	20	
Beryllium	105.051	1.0	125.000	0.305927	83.8	61 - 107	0.351	20	
Cadmium	100.558	1.0	125.000	1.49918	79.2	53 - 104	1.82	20	
Chromium	109.622	1.0	125.000	2.00668	86.1	53 - 121	2.52	20	
Cobalt	108.416	1.0	125.000	5.68821	82.2	55 - 109	0.757	20	
Copper	153.968	2.0	125.000	44.6175	87.5	58 - 124	3.82	20	
Lead	157.646	1.0	125.000	63.7962	75.1	35 - 129	4.95	20	
Molybdenum	118.742	1.0	125.000	27.2136	73.2	57 - 108	8.62	20	
Nickel	102.898	1.0	125.000	2.21040	80.5	44 - 122	0.444	20	
Selenium	99.8719	1.0	125.000	ND	79.9	54 - 104	0.0550	20	
Silver	112.717	1.0	125.000	5.18934	86.0	60 - 112	0.219	20	
Thallium	102.505	1.0	125.000	3.15709	79.5	50 - 103	0.626	20	
Vanadium	139.361	1.0	125.000	35.1667	83.4	54 - 123	0.517	20	
Zinc	130.060	1.0	125.000	33.1858	77.5	29 - 132	2.52	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5F0281 - EPA 7471_S									
Blank (B5F0281-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	ND	0.10			NR				
LCS (B5F0281-BS1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.721222	0.10	0.833333		86.5	80 - 120			
Matrix Spike (B5F0281-MS1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.28987	0.10	0.833333	0.524734	91.8	70 - 130			
Matrix Spike Dup (B5F0281-MSD1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.28728	0.10	0.819672	0.524734	93.0	70 - 130	0.201	20	
Post Spike (B5F0281-PS1)		**Source: 1502024-01**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.010991		5.00000E-3	0.006297	93.9	85 - 115			
Batch B5F0282 - EPA 7471_S									
Blank (B5F0282-BLK1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	ND	0.10			NR				
LCS (B5F0282-BS1)				Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.686546	0.10	0.833333		82.4	80 - 120			
Matrix Spike (B5F0282-MS1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.11429	0.10	0.833333	0.411133	84.4	70 - 130			
Matrix Spike Dup (B5F0282-MSD1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	1.19327	0.10	0.833333	0.411133	93.9	70 - 130	6.84	20	
Post Spike (B5F0282-PS1)		**Source: 1502024-20**		Prepared: 6/15/2015 Analyzed: 6/15/2015					
Mercury	0.009943		5.00000E-3	4.9336E-3	100	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	06/17/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2015 715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☐	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 15.1		
☐ Other:	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Smith~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis — Encircle Sample Matrix — Container — QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	Select Analysis: Total 22 Metals	Select Soil Matrix	Select Solid Matrix	Select Water Matrix	Select Wastewater Matrix	Select Aqueous Matrix	TAT	Container #	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (AcO)2; 6=NaOH; 7=NA2S2O3	REMARKS
1	1502024-1	WR1-S1	6/2/15	12pm	X	X					X Standard	4 oz		1		
2	-2	WR1-S2		12 pm												
3	-3	WR1-S3		12 PM												
4	-4	WR2-S1		12 PM												
5	-5	WR2-S2		12 PM												
6	-6	WR2-S3		1pm												
7	-7	WR2-S4		1pm												
8	-8	WR2-S5		1pm												
9	-9	WR2-S6		1pm												
10	-10	WR2-S7		1pm												

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples, air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	1100		6/10/15	914

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2013 0715

Method of Transport	Sample Conditions Upon Receipt					
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:		
☐ Other:	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Selen~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis: Spiked 22 Metals; Select Analysis; Enter Custom Analysis
Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix
TAT; Container — Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Bedjar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NAS2O3
QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	Spiked 22 Metals	TAT	Type	Material	REMARKS
1	1502024-11	WR2-S8	6/2/15	1pm	X	X Standard	402	1	
2	-12	WR2-S9		1pm					
3	-13	WR2-S10		2pm					
4	-14	WR2-S11		2pm					
5	-15	WR2-S12		2pm					
6	-16	WR2-S13		2pm					
7	-17	WR2-TS14		2pm					
8	-18	WR2-TS15		3pm					
9	-19	WR2-TS16		3pm					
10	-20	WR2-S17		3pm					

TERMS

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   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
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8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
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   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	11:00	[illegible]	6/8/15	9:14

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 3 of 3

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver:2015715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL ☐ FedEx ☐ OnTrac ☐ GSO ☐ Other:	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☐	☐
	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C:		
	4. SEALED	☐	☑			

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959
Tel: (530) 265-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☑ same as SEND REPORT TO
Attn: ~~Jane Selen~~ Kyle Leach
Email:
Company: Sierra Streams Institute
Address: 431 Uren Street Suite C
City: Nevada City State: CA Zip: 95959

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #: Price Guide
PO #:
Special Instructions/Comments:

Encircle or Write Requested Analysis: Select Analysis / Enter Custom Analysis
Encircle Sample Matrix: Select Soil Matrix, Select Solid Matrix, Select Water Matrix, Select Wastewater Matrix, Select Aqueous Matrix, Enter Custom Matrix

ITEM	Lab No.	Sample Description: Sample ID / Location	Date	Time	Select Analysis: 17 Metals 2 Metals	Select Soil Matrix	TAT	Container #	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn ((Ac)2; 6=NaOH; 7=NA2S2O3	REMARKS
1	1502024-21	WR2-S18	6/2/15	3pm	X	X	Standard			1		
2												
3												
4												
5												
6												
7												
8												
9												
10												

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
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8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	6/8/15	11:00		6/10/15	9:14
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES

July 16, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502373
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on July 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
QM-1	1502373-01	Soil	7/07/15 10:00	7/09/15 11:18
QM-2	1502373-02	Soil	7/07/15 10:00	7/09/15 11:18
QM-3	1502373-03	Soil	7/07/15 10:00	7/09/15 11:18
QM-4	1502373-04	Soil	7/07/15 10:00	7/09/15 11:18
QM-5	1502373-05	Soil	7/07/15 10:00	7/09/15 11:18
QM-6	1502373-06	Soil	7/07/15 10:00	7/09/15 11:18
QM-7	1502373-07	Soil	7/07/15 11:00	7/09/15 11:18
WR-8	1502373-08	Soil	7/07/15 11:00	7/09/15 11:18
WR-9	1502373-09	Soil	7/07/15 11:00	7/09/15 11:18
WR-10	1502373-10	Soil	7/07/15 11:00	7/09/15 11:18
WR-11	1502373-11	Soil	7/07/15 12:00	7/09/15 11:18
WR-12	1502373-12	Soil	7/07/15 12:00	7/09/15 11:18
SR-13	1502373-13	Soil	7/07/15 12:00	7/09/15 11:18
SR-14	1502373-14	Soil	7/07/15 12:00	7/09/15 11:18
SR-15	1502373-15	Soil	7/07/15 12:00	7/09/15 11:18
SR-16	1502373-16	Soil	7/07/15 12:00	7/09/15 11:18
SR-17	1502373-17	Soil	7/07/15 12:00	7/09/15 11:18
RF-18	1502373-18	Soil	7/07/15 13:00	7/09/15 11:18
RF-19	1502373-19	Soil	7/07/15 13:00	7/09/15 11:18
RF-20	1502373-20	Soil	7/07/15 13:00	7/09/15 11:18

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-1
Lab ID: 1502373-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Arsenic	**20**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Barium	**150**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Cadmium	**2.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Chromium	**43**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Copper	**97**	2.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Lead	**430**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Molybdenum	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Nickel	**26**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 11:58	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Thallium	**4.1**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Vanadium	**87**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	
Zinc	**120**	1.0	1	B5G0177	07/13/2015	07/13/15 16:22	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**14**	2.0	20	B5G0179	07/12/2015	07/13/15 14:10	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-2
Lab ID: 1502373-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Barium	**190**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Beryllium	**1.2**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Chromium	**56**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Copper	**62**	2.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Lead	**98**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Nickel	**34**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Thallium	**5.6**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Vanadium	**110**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	
Zinc	**60**	1.0	1	B5G0177	07/13/2015	07/13/15 16:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.5**	0.10	1	B5G0179	07/12/2015	07/13/15 13:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-3
Lab ID: 1502373-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Barium	**170**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Cadmium	**1.4**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Chromium	**41**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Cobalt	**12**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Copper	**68**	2.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Lead	**190**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Nickel	**27**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Thallium	**3.9**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Vanadium	**93**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	
Zinc	**80**	1.0	1	B5G0177	07/13/2015	07/13/15 16:26	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.8**	1.0	10	B5G0179	07/12/2015	07/13/15 14:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-4
Lab ID: 1502373-04

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Arsenic	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Cadmium	**1.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Chromium	**43**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Copper	**63**	2.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Lead	**89**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Molybdenum	**1.5**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Nickel	**25**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Thallium	**3.1**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Vanadium	**77**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	
Zinc	**74**	1.0	1	B5G0177	07/13/2015	07/13/15 16:28	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.74**	0.10	1	B5G0179	07/12/2015	07/13/15 13:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-5
Lab ID: 1502373-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Arsenic	**15**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Barium	**100**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Cadmium	**2.7**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Chromium	**38**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Copper	**77**	2.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Lead	**89**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Molybdenum	**1.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Nickel	**24**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Thallium	**2.8**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Vanadium	**69**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	
Zinc	**88**	1.0	1	B5G0177	07/13/2015	07/13/15 16:30	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**0.86**	0.10	1	B5G0179	07/12/2015	07/13/15 13:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-6
Lab ID: 1502373-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Arsenic	**17**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Barium	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Cadmium	**3.3**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Chromium	**47**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Cobalt	**13**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Copper	**78**	2.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Lead	**140**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Molybdenum	**2.8**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Nickel	**29**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Thallium	**2.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Vanadium	**84**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	
Zinc	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 08:42	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.5**	1.0	10	B5G0179	07/12/2015	07/13/15 14:13	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID QM-7
Lab ID: 1502373-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Arsenic	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Beryllium	**1.3**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Cadmium	**2.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Chromium	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Cobalt	**20**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Copper	**88**	2.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Lead	**74**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Nickel	**26**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Thallium	**3.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Vanadium	**100**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	
Zinc	**89**	1.0	1	B5G0177	07/13/2015	07/14/15 08:44	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.4**	0.10	1	B5G0179	07/12/2015	07/13/15 13:26	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-8
Lab ID: 1502373-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Arsenic	**91**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Barium	**72**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Beryllium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Cadmium	**5.8**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Chromium	**36**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Cobalt	**14**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Copper	**430**	4.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Lead	**1800**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Molybdenum	**17**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Nickel	**28**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Selenium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Silver	**2.0**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Thallium	ND	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Vanadium	**76**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6
Zinc	**750**	2.0	2	B5G0177	07/13/2015	07/14/15 08:46	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**44**	5.0	50	B5G0179	07/12/2015	07/13/15 14:15	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-9
Lab ID: 1502373-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Arsenic	**56**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Barium	**69**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Cadmium	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Chromium	**18**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Copper	**310**	2.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Lead	**1000**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Molybdenum	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Nickel	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Selenium	**2.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Silver	**28**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Thallium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Vanadium	**32**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	
Zinc	**340**	1.0	1	B5G0177	07/13/2015	07/14/15 08:48	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**15**	5.0	50	B5G0179	07/12/2015	07/13/15 14:17	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Client Sample ID WR-10
Lab ID: 1502373-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Arsenic	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Barium	**140**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Cadmium	**6.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Chromium	**29**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Cobalt	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Copper	**110**	2.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Lead	**340**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Molybdenum	**5.5**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Nickel	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Thallium	**1.4**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Vanadium	**68**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	
Zinc	**270**	1.0	1	B5G0177	07/13/2015	07/14/15 08:49	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**7.5**	2.0	20	B5G0179	07/12/2015	07/13/15 14:19	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-11
Lab ID: 1502373-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Arsenic	**38**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Cadmium	**8.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Chromium	**40**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Cobalt	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Copper	**160**	2.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Lead	**750**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Molybdenum	**6.9**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Nickel	**28**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Thallium	**2.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Vanadium	**77**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	
Zinc	**310**	1.0	1	B5G0177	07/13/2015	07/14/15 08:51	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**11**	2.0	20	B5G0179	07/12/2015	07/13/15 14:21	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID WR-12
Lab ID: 1502373-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Arsenic	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Barium	**100**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Cadmium	**8.9**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Chromium	**25**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Cobalt	**16**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Lead	**580**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Molybdenum	**4.4**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Nickel	**22**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Thallium	**1.7**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Vanadium	**60**	1.0	1	B5G0177	07/13/2015	07/14/15 08:53	
Zinc	**2000**	2.0	2	B5G0177	07/13/2015	07/14/15 09:30	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**9.7**	2.0	20	B5G0179	07/12/2015	07/13/15 14:23	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-13
Lab ID: 1502373-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Arsenic	**40**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Barium	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Cadmium	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Chromium	**32**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Cobalt	**21**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Copper	**250**	2.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Lead	**1000**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Molybdenum	**8.0**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Nickel	**38**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 12:01	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Thallium	**1.2**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Vanadium	**71**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	
Zinc	**710**	1.0	1	B5G0177	07/13/2015	07/14/15 08:55	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**23**	5.0	50	B5G0179	07/12/2015	07/13/15 14:25	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-14
Lab ID: 1502373-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Arsenic	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Chromium	**47**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Cobalt	**14**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Lead	**150**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Molybdenum	**4.2**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Nickel	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Selenium	**1.9**	1.0	1	B5G0177	07/13/2015	07/14/15 12:03	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Thallium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Vanadium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	
Zinc	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 08:56	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**2.2**	0.20	2	B5G0179	07/12/2015	07/13/15 14:31	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-15
Lab ID: 1502373-15

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Arsenic	**18**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Barium	**83**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Cadmium	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Chromium	**35**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Cobalt	**23**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Copper	**230**	2.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Lead	**800**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Molybdenum	**5.7**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Nickel	**44**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Thallium	**1.4**	1.0	1	B5G0177	07/13/2015	07/14/15 12:05	
Vanadium	**86**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	
Zinc	**420**	1.0	1	B5G0177	07/13/2015	07/14/15 08:58	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**6.1**	2.0	20	B5G0179	07/12/2015	07/13/15 14:41	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-16
Lab ID: 1502373-16

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Arsenic	**15**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Barium	**130**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Cadmium	**1.0**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Chromium	**49**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Cobalt	**12**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Copper	**120**	2.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Lead	**180**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Molybdenum	**1.8**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Nickel	**33**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Thallium	**2.3**	1.0	1	B5G0177	07/13/2015	07/14/15 12:07	
Vanadium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	
Zinc	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 09:23	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**3.2**	1.0	10	B5G0179	07/12/2015	07/13/15 14:43	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID SR-17
Lab ID: 1502373-17

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Arsenic	**11**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Barium	**120**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Beryllium	**1.1**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Chromium	**46**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Cobalt	**16**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Copper	**130**	2.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Lead	**93**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Nickel	**37**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Selenium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Thallium	**4.5**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Vanadium	**110**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	
Zinc	**72**	1.0	1	B5G0177	07/13/2015	07/14/15 09:24	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.1**	0.10	1	B5G0179	07/12/2015	07/13/15 13:53	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-18
Lab ID: 1502373-18

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Arsenic	**22**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Barium	**72**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Beryllium	**1.0**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Chromium	**80**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Cobalt	**8.3**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Copper	**140**	2.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Lead	**270**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Nickel	**39**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Selenium	**3.2**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Thallium	**4.4**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Vanadium	**93**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	
Zinc	**83**	1.0	1	B5G0177	07/13/2015	07/14/15 09:26	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**6.4**	2.0	20	B5G0179	07/12/2015	07/13/15 14:45	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-19
Lab ID: 1502373-19

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Arsenic	**19**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Barium	**74**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Beryllium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Cadmium	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Chromium	**51**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Cobalt	**7.8**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Copper	**150**	2.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Lead	**240**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Molybdenum	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Nickel	**27**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Selenium	**2.3**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Silver	ND	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Thallium	**3.9**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Vanadium	**92**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	
Zinc	**77**	1.0	1	B5G0177	07/13/2015	07/14/15 09:28	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**10**	2.0	20	B5G0179	07/12/2015	07/13/15 14:47	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Client Sample ID RF-20
Lab ID: 1502373-20

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Arsenic	**22**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Barium	**94**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Beryllium	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Cadmium	**1.4**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Chromium	**42**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Cobalt	**11**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Copper	**140**	2.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Lead	**350**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Molybdenum	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Nickel	**32**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Selenium	**2.0**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Silver	ND	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Thallium	**6.1**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Vanadium	**86**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	
Zinc	**93**	1.0	1	B5G0178	07/13/2015	07/13/15 16:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**18**	5.0	50	B5G0180	07/12/2015	07/13/15 14:33	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0177 - EPA 3050B_S									
Blank (B5G0177-BLK1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5G0177-BS1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	45.8232	2.0	50.0000		91.6	80 - 120			
Arsenic	44.0781	1.0	50.0000		88.2	80 - 120			
Barium	47.2030	1.0	50.0000		94.4	80 - 120			
Beryllium	45.3593	1.0	50.0000		90.7	80 - 120			
Cadmium	44.7165	1.0	50.0000		89.4	80 - 120			
Chromium	47.9251	1.0	50.0000		95.9	80 - 120			
Cobalt	46.1278	1.0	50.0000		92.3	80 - 120			
Copper	48.9339	2.0	50.0000		97.9	80 - 120			
Lead	45.5758	1.0	50.0000		91.2	80 - 120			
Molybdenum	48.7444	1.0	50.0000		97.5	80 - 120			
Nickel	46.0806	1.0	50.0000		92.2	80 - 120			
Selenium	41.3485	1.0	50.0000		82.7	80 - 120			
Silver	45.8322	1.0	50.0000		91.7	80 - 120			
Thallium	44.9632	1.0	50.0000		89.9	80 - 120			
Vanadium	47.1206	1.0	50.0000		94.2	80 - 120			
Zinc	43.2900	1.0	50.0000		86.6	80 - 120			
Matrix Spike (B5G0177-MS1)		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	63.5129	2.0	125.000	ND	50.8	28 - 106			
Arsenic	83.5756	1.0	125.000	0.549600	66.4	57 - 109			
Barium	192.497	1.0	125.000	113.847	62.9	18 - 159			
Beryllium	84.5412	1.0	125.000	1.00294	66.8	61 - 107			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0177 - EPA 3050B_S (continued)									
Matrix Spike (B5G0177-MS1) - Continued		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Cadmium	75.2921	1.0	125.000	ND	60.2	53 - 104			
Chromium	100.916	1.0	125.000	16.6260	67.4	53 - 121			
Cobalt	87.7460	1.0	125.000	8.55013	63.4	55 - 109			
Copper	152.357	2.0	125.000	40.5713	89.4	58 - 124			
Lead	80.0530	1.0	125.000	3.89531	60.9	35 - 129			
Molybdenum	76.9315	1.0	125.000	ND	61.5	57 - 108			
Nickel	90.8793	1.0	125.000	12.0324	63.1	44 - 122			
Selenium	77.8190	1.0	125.000	ND	62.3	54 - 104			
Silver	86.0875	1.0	125.000	ND	68.9	60 - 112			
Thallium	80.9266	1.0	125.000	5.79196	60.1	50 - 103			
Vanadium	117.986	1.0	125.000	34.3448	66.9	54 - 123			
Zinc	130.107	1.0	125.000	55.8794	59.4	29 - 132			
Matrix Spike Dup (B5G0177-MSD1)		**Source: 1502370-01**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	62.6374	2.0	125.000	ND	50.1	28 - 106	1.39	20	
Arsenic	86.0482	1.0	125.000	0.549600	68.4	57 - 109	2.92	20	
Barium	204.716	1.0	125.000	113.847	72.7	18 - 159	6.15	20	
Beryllium	87.5206	1.0	125.000	1.00294	69.2	61 - 107	3.46	20	
Cadmium	77.0958	1.0	125.000	ND	61.7	53 - 104	2.37	20	
Chromium	103.658	1.0	125.000	16.6260	69.6	53 - 121	2.68	20	
Cobalt	90.1107	1.0	125.000	8.55013	65.2	55 - 109	2.66	20	
Copper	152.188	2.0	125.000	40.5713	89.3	58 - 124	0.111	20	
Lead	82.8500	1.0	125.000	3.89531	63.2	35 - 129	3.43	20	
Molybdenum	80.6236	1.0	125.000	ND	64.5	57 - 108	4.69	20	
Nickel	93.4194	1.0	125.000	12.0324	65.1	44 - 122	2.76	20	
Selenium	81.5087	1.0	125.000	ND	65.2	54 - 104	4.63	20	
Silver	88.0734	1.0	125.000	ND	70.5	60 - 112	2.28	20	
Thallium	83.3367	1.0	125.000	5.79196	62.0	50 - 103	2.93	20	
Vanadium	121.716	1.0	125.000	34.3448	69.9	54 - 123	3.11	20	
Zinc	130.523	1.0	125.000	55.8794	59.7	29 - 132	0.319	20	
Batch B5G0178 - EPA 3050B_S									
Blank (B5G0178-BLK1)				Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0178 - EPA 3050B_S (continued)									
Blank (B5G0178-BLK1) - Continued					Prepared: 7/13/2015 Analyzed: 7/13/2015				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5G0178-BS1)					Prepared: 7/13/2015 Analyzed: 7/13/2015				
Antimony	45.4378	2.0	50.0000		90.9	80 - 120			
Arsenic	43.9709	1.0	50.0000		87.9	80 - 120			
Barium	47.0538	1.0	50.0000		94.1	80 - 120			
Beryllium	45.2533	1.0	50.0000		90.5	80 - 120			
Cadmium	44.0508	1.0	50.0000		88.1	80 - 120			
Chromium	47.9214	1.0	50.0000		95.8	80 - 120			
Cobalt	46.2578	1.0	50.0000		92.5	80 - 120			
Copper	48.5846	2.0	50.0000		97.2	80 - 120			
Lead	45.0358	1.0	50.0000		90.1	80 - 120			
Molybdenum	48.3974	1.0	50.0000		96.8	80 - 120			
Nickel	45.7675	1.0	50.0000		91.5	80 - 120			
Selenium	40.9602	1.0	50.0000		81.9	80 - 120			
Silver	45.9142	1.0	50.0000		91.8	80 - 120			
Thallium	44.6304	1.0	50.0000		89.3	80 - 120			
Vanadium	47.3435	1.0	50.0000		94.7	80 - 120			
Zinc	42.7714	1.0	50.0000		85.5	80 - 120			
Matrix Spike (B5G0178-MS1)		**Source: 1502373-20**			Prepared: 7/13/2015 Analyzed: 7/13/2015				
Antimony	72.1714	2.0	125.000	ND	57.7	28 - 106			
Arsenic	113.238	1.0	125.000	21.9436	73.0	57 - 109			
Barium	178.637	1.0	125.000	94.0059	67.7	18 - 159			
Beryllium	93.3127	1.0	125.000	0.948675	73.9	61 - 107			
Cadmium	83.1470	1.0	125.000	1.42726	65.4	53 - 104			
Chromium	135.824	1.0	125.000	42.4811	74.7	53 - 121			
Cobalt	96.8476	1.0	125.000	10.7324	68.9	55 - 109			
Copper	244.496	2.0	125.000	140.035	83.6	58 - 124			
Lead	423.772	1.0	125.000	345.386	62.7	35 - 129			
Molybdenum	88.3895	1.0	125.000	ND	70.7	57 - 108			
Nickel	117.190	1.0	125.000	32.0863	68.1	44 - 122			
Selenium	85.5427	1.0	125.000	2.03997	66.8	54 - 104			
Silver	94.2580	1.0	125.000	ND	75.4	60 - 112			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0178 - EPA 3050B_S (continued)									
Matrix Spike (B5G0178-MS1) - Continued		**Source: 1502373-20**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Thallium	89.1145	1.0	125.000	6.12574	66.4	50 - 103			
Vanadium	176.281	1.0	125.000	85.5700	72.6	54 - 123			
Zinc	167.032	1.0	125.000	93.4828	58.8	29 - 132			
Matrix Spike Dup (B5G0178-MSD1)		**Source: 1502373-20**		Prepared: 7/13/2015 Analyzed: 7/13/2015					
Antimony	75.5937	2.0	125.000	ND	60.5	28 - 106	4.63	20	
Arsenic	115.220	1.0	125.000	21.9436	74.6	57 - 109	1.74	20	
Barium	181.407	1.0	125.000	94.0059	69.9	18 - 159	1.54	20	
Beryllium	96.5352	1.0	125.000	0.948675	76.5	61 - 107	3.39	20	
Cadmium	85.2366	1.0	125.000	1.42726	67.0	53 - 104	2.48	20	
Chromium	136.493	1.0	125.000	42.4811	75.2	53 - 121	0.491	20	
Cobalt	98.7126	1.0	125.000	10.7324	70.4	55 - 109	1.91	20	
Copper	249.898	2.0	125.000	140.035	87.9	58 - 124	2.19	20	
Lead	406.404	1.0	125.000	345.386	48.8	35 - 129	4.18	20	
Molybdenum	91.9658	1.0	125.000	ND	73.6	57 - 108	3.97	20	
Nickel	118.560	1.0	125.000	32.0863	69.2	44 - 122	1.16	20	
Selenium	90.0422	1.0	125.000	2.03997	70.4	54 - 104	5.13	20	
Silver	96.2403	1.0	125.000	ND	77.0	60 - 112	2.08	20	
Thallium	90.5119	1.0	125.000	6.12574	67.5	50 - 103	1.56	20	
Vanadium	181.468	1.0	125.000	85.5700	76.7	54 - 123	2.90	20	
Zinc	168.352	1.0	125.000	93.4828	59.9	29 - 132	0.788	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	07/16/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5G0179 - EPA 7471_S									
Blank (B5G0179-BLK1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	ND	0.10			NR				
LCS (B5G0179-BS1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.826522	0.10	0.833333		99.2	80 - 120			
Matrix Spike (B5G0179-MS1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	1.09799	0.10	0.833333	0.169821	111	70 - 130			
Matrix Spike Dup (B5G0179-MSD1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.956224	0.10	0.819672	0.169821	95.9	70 - 130	13.8	20	
Post Spike (B5G0179-PS1)		**Source: 1502370-01**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.008078		5.00000E-3	0.002038	121	85 - 115			M1
Batch B5G0180 - EPA 7471_S									
Blank (B5G0180-BLK1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	ND	0.10			NR				
LCS (B5G0180-BS1)				Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.840524	0.10	0.833333		101	80 - 120			
Matrix Spike (B5G0180-MS1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	17.5185	5.0	0.833333	18.4914	-117	70 - 130			M1
Matrix Spike Dup (B5G0180-MSD1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	19.7357	5.0	0.833333	18.4914	149	70 - 130	11.9	20	M1
Post Spike (B5G0180-PS1)		**Source: 1502373-20**		Prepared: 7/12/2015 Analyzed: 7/13/2015					
Mercury	0.450718		5.00000E-3	0.221897	4580	85 - 115			M1

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	07/16/2015

Notes and Definitions

M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED ATECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only				ATLCOC Ver: 20130715
Method of Transport	Sample Conditions Upon Receipt			
	Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☑ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 3.2		
☐ Other:	4. SEALED	☐	☑	Blue ice		

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959
Tel: 530 265 6090 x 203
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: Kleach08@gmail.com
Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote No:
PO #:
Special Instructions/Comments: Total Title 22 Metals incl Mercury. Please hold remaining sample for possible additional solubility analysis

Encircle or Write Requested Analysis; Encircle Sample Matrix; Container

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624 (Volatiles)	8015(GRO)	8015(DRO)	8270(Semi-volatiles)	8081(Organochlorine Pesticides)	8082(PCBs)	6010 7000(Title 22 Metals)	TO-15	SOILS/ SEDIMENT / SLUDGE	SOLIDS / WIPE/ FILTER	WATER - DRINKING / GROUND	WATER - STORM / WASTE	AQUEOUS / LAYERED - OIL	TAT	# 8oz Glass	Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister	Material: 1=Glass; 2=Plastic; 3=Metal	Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn (Ac)2; 6=NaOH; 7=NA2S2O3	REMARKS
1	1502373-1	QM-1	7/7/15	10 am							X		X						X				
2	-2	QM-2		10 am							X												
3	-3	QM-3		10:am							X												
4	-4	QM-4		10:am							X												
5	-5	QM-5		10:am							X												
6	-6	QM-6		10:am							X												
7	-7	QM-7		11:am							X												
8	-8	WR-8		11:am							X												
9	-9	WR-9		11:am							X												
10	-10	WR-10		11:am							X												

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples Submitted AFTER 3:00 PM, are considered received the following Business day at 8:00 AM.
3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-fi ve (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	7/8/15	11:00	Branch Manager	7/9/15	08:53
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only — ATLCOC Ver: 20130715

Method of Transport	Sample Conditions Upon Receipt: Condition	Y	N	Condition	Y	N
☐ Client ☐ ATL	1. CHILLED	☑	☐	5. # OF SAMPLES MATCH COC	☑	☐
☐ FedEx ☐ OnTrac	2. HEADSPACE (VOA)	☐	☐	6. PRESERVED	☐	☑
☐ GSO	3. CONTAINER INTACT	☑	☐	7. COOLER TEMP, deg C: 3.2		
☐ Other:	4. SEALED	☐	☑	Blue Ice		

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959
Tel: 530 265 6090 x 203
Fax:

SEND REPORT TO:
Attn: Kyle Leach Email: kleach@sgmail.com
Company: Sierra Streams Inst.
Address: 431 Uren St
City: Nevada City State: CA Zip: 95959

SEND INVOICE TO: ☐ same as SEND REPORT TO
Attn: Same Email:
Company:
Address:
City: State: Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote No:
PO #:
Special Instructions/Comments: see pg 1 Standard TAT

QA/QC: ☐ Routine ☐ Caltrans ☐ Legal ☐ RWQCB ☐ Level IV

Encircle or Write Requested Analysis: 8260 / 624 (Volatiles); 8015(GRO); 8015(DRO); 8270(Semi-volatiles); 8081(Organochlorine Pesticides); 8082(PCBs); 6010 / 7000(Title 22 Metals); TO-15

Encircle Sample Matrix: SOIL / SEDIMENT / SLUDGE; SOLIDS / WIPE / FILTER; WATER - DRINKING / GROUND; WATER - STORM / WASTE; AQUEOUS / LAYERED - OIL

Container: # 802 Glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7=Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4=4C; 5=Zn ((Ac)2; 6=NaOH; 7=NA2S2O3

ITEM	Lab No.	Sample ID / Location	Date	Time	8260 / 624	8015(GRO)	8015(DRO)	8270	8081	8082	6010 / 7000	TO-15	SOIL	SOLIDS	WATER - DRINKING	WATER - STORM	AQUEOUS	TAT	#	Type	Material	Preservative	REMARKS
1	1502373-11	WR-11	7/7/15	12pm							X		X						X				
2	-12	WR-12									X												
3	-13	SR-13									X												
4	-14	SR-14									X												
5	-15	SR-15									X												
6	-16	SR-16									X												
7	-17	SR-17									X												
8	-18	RF-18		1pm							X												
9	-19	RF-19									X												
10	-20	RF-20									X												

TERMS

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3. The following turnaround time conditions apply:
   TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work - ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
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7. Electronic records maintained for fi ve (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
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   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reforma? ed report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction on procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Kyle Leach — Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	7/8/15	11:00	ABSENT FRAN GRAHAM	7/9/15	08:53
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

November 06, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1503729
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on October 30, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR8-B	1503729-01	Soil	10/27/15 10:00	10/30/15 9:00
WR21	1503729-02	Soil	10/27/15 10:10	10/30/15 9:00
WR21-1'	1503729-03	Soil	10/27/15 10:16	10/30/15 9:00
WR9-.75	1503729-04	Soil	10/27/15 10:24	10/30/15 9:00
WR13-B	1503729-05	Soil	10/27/15 10:30	10/30/15 9:00
WR9-1.5'	1503729-06	Soil	10/27/15 10:08	10/30/15 9:00
SR22	1503729-07	Soil	10/27/15 10:00	10/30/15 9:00
WR23	1503729-08	Soil	10/27/15 10:44	10/30/15 9:00
WR24	1503729-09	Soil	10/27/15 10:50	10/30/15 9:00
WR25	1503729-10	Soil	10/27/15 10:56	10/30/15 9:00
US26	1503729-11	Soil	10/27/15 11:00	10/30/15 9:00
US27	1503729-12	Soil	10/27/15 11:10	10/30/15 9:00
US28	1503729-13	Soil	10/27/15 11:20	10/30/15 9:00
US29	1503729-14	Soil	10/27/15 11:30	10/30/15 9:00

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR8-B
Lab ID: 1503729-01

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Arsenic	**57**	2.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Barium	**100**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Cadmium	**6.9**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Chromium	**39**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Cobalt	**21**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Copper	**510**	2.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Lead	**1400**	2.0	2	B5K0014	11/02/2015	11/02/15 17:10	D6
Molybdenum	**17**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Nickel	**29**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Selenium	**3.6**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Silver	**8.1**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Thallium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 17:11	D6
Vanadium	**72**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	
Zinc	**480**	1.0	1	B5K0014	11/02/2015	11/02/15 15:43	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**100**	10	100	B5K0015	11/02/2015	11/03/15 11:16	

STLC Mercury by AA (Cold Vapor) EPA 7470A

Analyst: SB

Analyte	Result (ug/L)	PQL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**5.4**	1.0	1	B5K0178	11/06/2015	11/06/15 13:06	

TCLP Mercury by AA (Cold Vapor) by EPA 7470A

Analyst: SB

Analyte	Result (ug/L)	PQL (ug/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.20	1	B5K0162	11/05/2015	11/06/15 12:48	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR21
Lab ID: 1503729-02

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	40	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Arsenic	**250**	20	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Barium	**51**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Cadmium	**5.5**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Chromium	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Cobalt	**4.4**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Copper	**340**	2.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Lead	**20000**	20	20	B5K0014	11/02/2015	11/02/15 17:14	D6
Molybdenum	**14**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Nickel	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Selenium	**3.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Silver	**73**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Thallium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Vanadium	**23**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	
Zinc	**630**	1.0	1	B5K0014	11/02/2015	11/02/15 15:44	

TCLP Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	**230**	1.0	20	B5K0138	11/05/2015	11/06/15 09:38	D6

STLC Metals by ICP-AES by EPA 6010B

Analyst: RR

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Arsenic	**1.0**	1.0	20	B5K0176	11/06/2015	11/06/15 10:18	
Copper	**2.4**	1.0	20	B5K0176	11/06/2015	11/06/15 10:18	
Lead	**560**	2.5	50	B5K0176	11/06/2015	11/06/15 10:30	D6

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR21

Lab ID: 1503729-02

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**11**	5.0	50	B5K0015	11/02/2015	11/03/15 11:18	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Client Sample ID WR21-1'
Lab ID: 1503729-03

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	40	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Arsenic	**210**	20	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Barium	**44**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Beryllium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Cadmium	**6.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Chromium	**11**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Cobalt	**7.0**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Copper	**380**	2.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Lead	**19000**	20	20	B5K0014	11/02/2015	11/02/15 17:18	D6
Molybdenum	**16**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Nickel	**14**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Selenium	**2.1**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Silver	**57**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Thallium	ND	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Vanadium	**23**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	
Zinc	**780**	1.0	1	B5K0014	11/02/2015	11/02/15 15:46	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**19**	5.0	50	B5K0015	11/02/2015	11/03/15 11:20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR9-.75

Lab ID: 1503729-04

Title 22 Metals by ICP-AES EPA 6010B **Analyst: RR**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	10	5	B5K0014	11/02/2015	11/02/15 17:29	D6
Arsenic	**53**	5.0	5	B5K0014	11/02/2015	11/02/15 17:29	D6
Barium	**97**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Beryllium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Cadmium	**13**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Chromium	**22**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Cobalt	**14**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Copper	**210**	10	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Lead	**1500**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Molybdenum	**18**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Nickel	**22**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Selenium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Silver	**26**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Thallium	ND	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Vanadium	**47**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6
Zinc	**460**	5.0	5	B5K0014	11/02/2015	11/02/15 16:10	D6

Mercury by AA (Cold Vapor) EPA 7471A **Analyst: SB**

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**26**	5.0	50	B5K0015	11/02/2015	11/03/15 11:22	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR13-B
Lab ID: 1503729-05

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	4.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Arsenic	**36**	2.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Barium	**130**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Beryllium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Cadmium	**19**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Chromium	**37**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Cobalt	**24**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Copper	**220**	4.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Lead	**970**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Molybdenum	**9.2**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Nickel	**47**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Selenium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Silver	**3.9**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Thallium	ND	2.0	2	B5K0014	11/02/2015	11/02/15 17:32	D6
Vanadium	**75**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6
Zinc	**720**	2.0	2	B5K0014	11/02/2015	11/02/15 16:12	D6

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**14**	5.0	50	B5K0015	11/02/2015	11/03/15 11:24	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR9-1.5'
Lab ID: 1503729-06

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	**3.3**	2.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Arsenic	**52**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Barium	**90**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Cadmium	**10**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Chromium	**23**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Cobalt	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Copper	**240**	2.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Lead	**1400**	5.0	5	B5K0052	11/03/2015	11/04/15 11:41	D6
Molybdenum	**20**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Nickel	**23**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Selenium	**2.3**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Silver	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Vanadium	**50**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	
Zinc	**390**	1.0	1	B5K0052	11/03/2015	11/04/15 10:56	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**26**	5.0	50	B5K0055	11/03/2015	11/04/15 11:41	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID SR22
Lab ID: 1503729-07

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Arsenic	**68**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Barium	**74**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Cadmium	**11**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Chromium	**25**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Cobalt	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Copper	**190**	2.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Lead	**740**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Molybdenum	**21**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Nickel	**27**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Selenium	**5.1**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Silver	**22**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Vanadium	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	
Zinc	**310**	1.0	1	B5K0052	11/03/2015	11/04/15 10:58	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**4.5**	2.0	20	B5K0055	11/03/2015	11/04/15 11:43	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR23
Lab ID: 1503729-08

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Arsenic	**40**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Barium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Cadmium	**5.5**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Chromium	**21**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Cobalt	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Copper	**230**	2.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Lead	**790**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Molybdenum	**5.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Nickel	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Selenium	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Silver	**6.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Vanadium	**56**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	
Zinc	**220**	1.0	1	B5K0052	11/03/2015	11/04/15 11:03	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**9.7**	2.0	20	B5K0055	11/03/2015	11/04/15 11:45	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR24
Lab ID: 1503729-09

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Arsenic	**43**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Barium	**89**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Cadmium	**8.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Chromium	**36**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Cobalt	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Copper	**170**	2.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Lead	**930**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Molybdenum	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Nickel	**30**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Selenium	**3.2**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Silver	**13**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Vanadium	**61**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	
Zinc	**390**	1.0	1	B5K0052	11/03/2015	11/04/15 11:05	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**19**	5.0	50	B5K0055	11/03/2015	11/04/15 11:47	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID WR25
Lab ID: 1503729-10

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Arsenic	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Barium	**140**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Cadmium	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Chromium	**39**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Cobalt	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Copper	**120**	2.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Lead	**150**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Molybdenum	**6.5**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Nickel	**25**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Selenium	**2.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Silver	**1.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Vanadium	**80**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	
Zinc	**100**	1.0	1	B5K0052	11/03/2015	11/04/15 11:07	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	**1.7**	0.10	1	B5K0055	11/03/2015	11/04/15 10:12	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US26
Lab ID: 1503729-11

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Arsenic	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Barium	**180**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Cadmium	**1.1**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Chromium	**80**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Cobalt	**19**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Copper	**68**	2.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Lead	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Molybdenum	**2.3**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Nickel	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Selenium	**2.4**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Vanadium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	
Zinc	**51**	1.0	1	B5K0052	11/03/2015	11/04/15 11:09	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:14	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US27
Lab ID: 1503729-12

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Arsenic	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Barium	**130**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Chromium	**75**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Cobalt	**19**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Copper	**72**	2.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Lead	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Molybdenum	**2.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Nickel	**49**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Selenium	**4.1**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Vanadium	**110**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	
Zinc	**43**	1.0	1	B5K0052	11/03/2015	11/04/15 11:11	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:16	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US28
Lab ID: 1503729-13

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Arsenic	**12**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Barium	**100**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Chromium	**55**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Cobalt	**16**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Copper	**75**	2.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Lead	**15**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Molybdenum	**2.6**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Nickel	**36**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Selenium	**2.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Vanadium	**97**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	
Zinc	**38**	1.0	1	B5K0052	11/03/2015	11/04/15 11:13	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:18	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Client Sample ID US29
Lab ID: 1503729-14

Title 22 Metals by ICP-AES EPA 6010B

Analyst: RR

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Antimony	ND	2.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Arsenic	**7.8**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Barium	**210**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Beryllium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Cadmium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Chromium	**63**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Cobalt	**17**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Copper	**39**	2.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Lead	**14**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Molybdenum	**1.7**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Nickel	**40**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Selenium	**2.2**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Silver	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Thallium	ND	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Vanadium	**92**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	
Zinc	**46**	1.0	1	B5K0052	11/03/2015	11/04/15 11:15	

Mercury by AA (Cold Vapor) EPA 7471A

Analyst: SB

Analyte	Result (mg/kg)	PQL (mg/kg)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Mercury	ND	0.10	1	B5K0055	11/03/2015	11/04/15 10:20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

QUALITY CONTROL SECTION

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0014 - EPA 3050B_S									
Blank (B5K0014-BLK1)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
Blank (B5K0014-BLK2)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
LCS (B5K0014-BS1)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	50.7756	1.0	50.0000		102	80 - 120			
Beryllium	48.1478	1.0	50.0000		96.3	80 - 120			
Cadmium	48.6105	1.0	50.0000		97.2	80 - 120			
Chromium	51.6108	1.0	50.0000		103	80 - 120			
Cobalt	49.0124	1.0	50.0000		98.0	80 - 120			
Copper	49.1727	2.0	50.0000		98.3	80 - 120			
Lead	48.0093	1.0	50.0000		96.0	80 - 120			
Molybdenum	50.3312	1.0	50.0000		101	80 - 120			
Nickel	48.3439	1.0	50.0000		96.7	80 - 120			
Selenium	44.4272	1.0	50.0000		88.9	80 - 120			
Silver	48.3074	1.0	50.0000		96.6	80 - 120			
Thallium	50.5248	1.0	50.0000		101	80 - 120			
Vanadium	49.2443	1.0	50.0000		98.5	80 - 120			
Zinc	45.9146	1.0	50.0000		91.8	80 - 120			
LCS (B5K0014-BS2)				Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	48.6075	2.0	50.0000		97.2	80 - 120			
Arsenic	48.8113	1.0	50.0000		97.6	80 - 120			
Matrix Spike (B5K0014-MS1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0014 - EPA 3050B_S (continued)									
Matrix Spike (B5K0014-MS1) - Continued		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	190.215	1.0	125.000	95.3322	75.9	18 - 159			
Beryllium	99.3511	1.0	125.000	0.383649	79.2	61 - 107			
Cadmium	98.3036	1.0	125.000	1.37893	77.5	53 - 104			
Chromium	131.041	1.0	125.000	27.6064	82.7	53 - 121			
Cobalt	104.878	1.0	125.000	8.73980	76.9	55 - 109			
Copper	130.870	2.0	125.000	20.6394	88.2	58 - 124			
Lead	98.8968	1.0	125.000	3.91384	76.0	35 - 129			
Molybdenum	98.6790	1.0	125.000	2.34100	77.1	57 - 108			
Nickel	119.545	1.0	125.000	22.8191	77.4	44 - 122			
Selenium	95.2810	1.0	125.000	ND	76.2	54 - 104			
Silver	102.144	1.0	125.000	ND	81.7	60 - 112			
Thallium	97.5902	1.0	125.000	2.00708	76.5	50 - 103			
Vanadium	147.832	1.0	125.000	49.6292	78.6	54 - 123			
Zinc	138.239	1.0	125.000	46.0876	73.7	29 - 132			
Matrix Spike (B5K0014-MS2)		**Source: 1503684-01RE1**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	77.4334	2.0	125.000	ND	61.9	28 - 106			
Arsenic	128.988	1.0	125.000	27.5562	81.1	57 - 109			
Matrix Spike Dup (B5K0014-MSD1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Barium	190.106	1.0	125.000	95.3322	75.8	18 - 159	0.0573	20	
Beryllium	100.044	1.0	125.000	0.383649	79.7	61 - 107	0.695	20	
Cadmium	99.3634	1.0	125.000	1.37893	78.4	53 - 104	1.07	20	
Chromium	129.937	1.0	125.000	27.6064	81.9	53 - 121	0.846	20	
Cobalt	106.426	1.0	125.000	8.73980	78.1	55 - 109	1.47	20	
Copper	130.726	2.0	125.000	20.6394	88.1	58 - 124	0.110	20	
Lead	104.286	1.0	125.000	3.91384	80.3	35 - 129	5.30	20	
Molybdenum	100.865	1.0	125.000	2.34100	78.8	57 - 108	2.19	20	
Nickel	119.763	1.0	125.000	22.8191	77.6	44 - 122	0.182	20	
Selenium	98.4744	1.0	125.000	ND	78.8	54 - 104	3.30	20	
Silver	103.390	1.0	125.000	ND	82.7	60 - 112	1.21	20	
Thallium	96.7735	1.0	125.000	2.00708	75.8	50 - 103	0.840	20	
Vanadium	149.933	1.0	125.000	49.6292	80.2	54 - 123	1.41	20	
Zinc	139.314	1.0	125.000	46.0876	74.6	29 - 132	0.775	20	
Matrix Spike Dup (B5K0014-MSD2)		**Source: 1503684-01RE1**		Prepared: 11/2/2015 Analyzed: 11/2/2015					
Antimony	81.0953	2.0	125.000	ND	64.9	28 - 106	4.62	20	
Arsenic	130.602	1.0	125.000	27.5562	82.4	57 - 109	1.24	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0052 - EPA 3050B_S									
Blank (B5K0052-BLK1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	ND	2.0			NR				
Arsenic	ND	1.0			NR				
Barium	ND	1.0			NR				
Beryllium	ND	1.0			NR				
Cadmium	ND	1.0			NR				
Chromium	ND	1.0			NR				
Cobalt	ND	1.0			NR				
Copper	ND	2.0			NR				
Lead	ND	1.0			NR				
Molybdenum	ND	1.0			NR				
Nickel	ND	1.0			NR				
Selenium	ND	1.0			NR				
Silver	ND	1.0			NR				
Thallium	ND	1.0			NR				
Vanadium	ND	1.0			NR				
Zinc	ND	1.0			NR				
LCS (B5K0052-BS1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	48.4280	2.0	50.0000		96.9	80 - 120			
Arsenic	46.5596	1.0	50.0000		93.1	80 - 120			
Barium	50.6490	1.0	50.0000		101	80 - 120			
Beryllium	47.9524	1.0	50.0000		95.9	80 - 120			
Cadmium	48.2329	1.0	50.0000		96.5	80 - 120			
Chromium	50.9384	1.0	50.0000		102	80 - 120			
Cobalt	49.0270	1.0	50.0000		98.1	80 - 120			
Copper	48.4809	2.0	50.0000		97.0	80 - 120			
Lead	48.1681	1.0	50.0000		96.3	80 - 120			
Molybdenum	49.5391	1.0	50.0000		99.1	80 - 120			
Nickel	48.1495	1.0	50.0000		96.3	80 - 120			
Selenium	44.2294	1.0	50.0000		88.5	80 - 120			
Silver	49.3429	1.0	50.0000		98.7	80 - 120			
Thallium	49.6844	1.0	50.0000		99.4	80 - 120			
Vanadium	49.1347	1.0	50.0000		98.3	80 - 120			
Zinc	51.3014	1.0	50.0000		103	80 - 120			
Matrix Spike (B5K0052-MS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	98.5828	2.0	125.000	0.859013	78.2	28 - 106			
Arsenic	112.234	1.0	125.000	2.08859	88.1	57 - 109			
Barium	150.099	1.0	125.000	45.2340	83.9	18 - 159			
Beryllium	112.308	1.0	125.000	0.377467	89.5	61 - 107			
Cadmium	105.149	1.0	125.000	ND	84.1	53 - 104			
Chromium	207.452	1.0	125.000	105.795	81.3	53 - 121			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Title 22 Metals by ICP-AES EPA 6010B - Quality Control (cont'd)

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0052 - EPA 3050B_S (continued)									
Matrix Spike (B5K0052-MS1) - Continued		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Cobalt	113.217	1.0	125.000	4.95417	86.6	55 - 109			
Copper	136.921	2.0	125.000	18.0394	95.1	58 - 124			
Lead	110.873	1.0	125.000	3.30797	86.1	35 - 129			
Molybdenum	120.681	1.0	125.000	8.45354	89.8	57 - 108			
Nickel	115.348	1.0	125.000	7.96403	85.9	44 - 122			
Selenium	107.259	1.0	125.000	0.509803	85.4	54 - 104			
Silver	111.107	1.0	125.000	ND	88.9	60 - 112			
Thallium	108.816	1.0	125.000	ND	87.1	50 - 103			
Vanadium	134.490	1.0	125.000	24.3424	88.1	54 - 123			
Zinc	131.083	1.0	125.000	29.2925	81.4	29 - 132			
Matrix Spike Dup (B5K0052-MSD1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Antimony	100.129	2.0	125.000	0.859013	79.4	28 - 106	1.56	20	
Arsenic	115.262	1.0	125.000	2.08859	90.5	57 - 109	2.66	20	
Barium	154.592	1.0	125.000	45.2340	87.5	18 - 159	2.95	20	
Beryllium	113.519	1.0	125.000	0.377467	90.5	61 - 107	1.07	20	
Cadmium	106.172	1.0	125.000	ND	84.9	53 - 104	0.968	20	
Chromium	214.955	1.0	125.000	105.795	87.3	53 - 121	3.55	20	
Cobalt	114.382	1.0	125.000	4.95417	87.5	55 - 109	1.02	20	
Copper	140.067	2.0	125.000	18.0394	97.6	58 - 124	2.27	20	
Lead	111.278	1.0	125.000	3.30797	86.4	35 - 129	0.365	20	
Molybdenum	119.839	1.0	125.000	8.45354	89.1	57 - 108	0.700	20	
Nickel	116.597	1.0	125.000	7.96403	86.9	44 - 122	1.08	20	
Selenium	106.543	1.0	125.000	0.509803	84.8	54 - 104	0.670	20	
Silver	112.538	1.0	125.000	ND	90.0	60 - 112	1.28	20	
Thallium	108.107	1.0	125.000	ND	86.5	50 - 103	0.654	20	
Vanadium	136.994	1.0	125.000	24.3424	90.1	54 - 123	1.84	20	
Zinc	135.536	1.0	125.000	29.2925	85.0	29 - 132	3.34	20	

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

TCLP Metals by ICP-AES EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0138 - EPA 3010A_S									
Blank (B5K0138-BLK1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	ND	0.050			NR				
LCS (B5K0138-BS1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	0.942737	0.050	1.00000		94.3	80 - 120			
Matrix Spike (B5K0138-MS1)		**Source: 1503729-02**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	231.459	1.0	2.50000	225.889	223	77 - 121			D6, M1
Matrix Spike Dup (B5K0138-MSD1)		**Source: 1503729-02**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Lead	227.992	1.0	2.50000	225.889	84.2	77 - 121	1.51	20	D6

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

STLC Metals by ICP-AES by EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0176 - STLC_S Extraction									
Blank (B5K0176-BLK1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	ND	1.0			NR				
Copper	ND	1.0			NR				
Lead	ND	1.0			NR				
LCS (B5K0176-BS1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	1.86205		2.00000		93.1	80 - 120			
Copper	2.08158		2.00000		104	80 - 120			
Lead	1.98020		2.00000		99.0	80 - 120			
Duplicate (B5K0176-DUP1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	ND	1.0		ND	NR			20	
Copper	0.236780	1.0		0.239484	NR		1.14	20	
Lead	0.226691	1.0		0.227873	NR		0.520	20	
Matrix Spike (B5K0176-MS1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	2.68246		2.50000	0.159260	101	90 - 110			
Copper	2.76153		2.50000	0.239484	101	62 - 129			
Lead	2.58336		2.50000	0.227873	94.2	44 - 130			
Matrix Spike Dup (B5K0176-MSD1)		**Source: 1503631-23**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Arsenic	2.57406		2.50000	0.159260	96.6	90 - 110	4.12	20	
Copper	2.68186		2.50000	0.239484	97.7	62 - 129	2.93	20	
Lead	2.56495		2.50000	0.227873	93.5	44 - 130	0.715	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0015 - EPA 7471_S									
Blank (B5K0015-BLK1)				Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	ND	0.10			NR				
LCS (B5K0015-BS1)				Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.791380	0.10	0.833333		95.0	80 - 120			
Matrix Spike (B5K0015-MS1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.880681	0.10	0.833333	0.021069	103	70 - 130			
Matrix Spike Dup (B5K0015-MSD1)		**Source: 1503684-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.865426	0.10	0.833333	0.021069	101	70 - 130	1.75	20	
Post Spike (B5K0015-PS1)		**Source: 1503700-01**		Prepared: 11/2/2015 Analyzed: 11/3/2015					
Mercury	0.005692		5.00000E-3	0.000542	103	85 - 115			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

Mercury by AA (Cold Vapor) EPA 7471A - Quality Control

Analyte	Result (mg/kg)	PQL (mg/kg)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0055 - EPA 7471_S									
Blank (B5K0055-BLK1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	ND	0.10			NR				
LCS (B5K0055-BS1)				Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.771171	0.10	0.833333		92.5	80 - 120			
Matrix Spike (B5K0055-MS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.976980	0.10	0.833333	0.178078	95.9	70 - 130			
Matrix Spike Dup (B5K0055-MSD1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.945413	0.10	0.833333	0.178078	92.1	70 - 130	3.28	20	
Post Spike (B5K0055-PS1)		**Source: 1503716-09**		Prepared: 11/3/2015 Analyzed: 11/4/2015					
Mercury	0.007262		5.00000E-3	0.002137	103	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

STLC Mercury by AA (Cold Vapor) EPA 7470A - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0178 - EPA 245.1/7470_S									
Blank (B5K0178-BLK1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	ND	0.20			NR				
LCS (B5K0178-BS1)				Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	10.1760	0.20	10.0000		102	80 - 120			
Matrix Spike (B5K0178-MS1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	56.8608	1.0	50.0000	5.43035	103	70 - 130			
Matrix Spike Dup (B5K0178-MSD1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	57.7780	1.0	50.0000	5.43035	105	70 - 130	1.60	20	
Post Spike (B5K0178-PS1)		**Source: 1503729-01**		Prepared: 11/6/2015 Analyzed: 11/6/2015					
Mercury	6.40506		5.00000	1.08607	106	85 - 115			

Certificate of Analysis

Sierra Streams Institute	Project Number :	SNC Environs, 805
431 Uren St., Suite C	Report To :	Kyle Leach
Nevada City , CA 95959	Reported :	11/06/2015

TCLP Mercury by AA (Cold Vapor) by EPA 7470A - Quality Control

Analyte	Result (ug/L)	PQL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0162 - EPA 245.1/7470_S									
Blank (B5K0162-BLK1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	ND	0.20			NR				
LCS (B5K0162-BS1)				Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.1488	0.20	10.0000		101	80 - 120			
Matrix Spike (B5K0162-MS1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.1860	0.20	10.0000	ND	102	70 - 130			
Matrix Spike Dup (B5K0162-MSD1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	10.3801	0.20	10.0000	ND	104	70 - 130	1.89	20	
Post Spike (B5K0162-PS1)		**Source: 1503729-01**		Prepared: 11/5/2015 Analyzed: 11/6/2015					
Mercury	5.34538		5.00000	0.023284	106	85 - 115			

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/06/2015

Notes and Definitions

M1	Matrix spike recovery outside of acceptance limit. The analytical batch was validated by the laboratory control sample.
D6	Sample required dilution due to high concentration of target analyte.
ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 1 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only		ATLCOC Ver:20130715
Method of Transport	Sample Conditions Upon Receipt	
Client / ATL / FedEx / OnTrac / GSO / Other:	1. CHILLED YES	5. # OF SAMPLES MATCH COC
	2. HEADSPACE (VOA)	6. PRESERVED
	3. CONTAINER INTACT	7. COOLER TEMP, deg C: 6.0
	4. SEALED	

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street
City: Nevada City
State: CA
Zip: 95959
Tel: (530) 256-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: (SSI) Sierra Streams Institute
Address: 431 Uren St
City: Nevada City
State: CA
Zip: 95959

SEND INVOICE TO: same as SEND REPORT TO
Attn: same
Email:
Company:
Address:
City:
State:
Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #:
PO #:

Special Instructions/Comments: Please 72 hr Rush initial Title 22 metals on 5 samples this COC then run WET Metals and TCLP on sample with highest total lead and mercury results

Encircle or Write Requested Analysis: Select Analysis; Select Analysis; 6010 / 7000 (Title 22 Metals); Select Analysis; Select Analysis; Select Analysis; Select Analysis; Select Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis

Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix

Container: # 8oz glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NAS2O3

QA/QC: Routine / Caltrans / Legal / RWQCB / Level IV

ITEM	Lab No.	Sample ID / Location	Date	Time	6010 / 7000 (Title 22 Metals)	TAT	# 8oz glass	REMARKS
1	1507779 - 1	WR8-B	10/27/15	10:00 am	X	3	X	
2	2	WR21	10/27/15	10:10 am	X	3	X	
3	3	WR21-1'	10/27/15	10:16 am	X	3	X	
4	4	WR9-.75	10/27/15	10:24 am	X	3	X	
5	5	SR13-B	10/27/15	10:30 am	X	3	X	
6								
7								
8								
9								
10								

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
6. Liquid and solid samples will be disposed of after 45 calendar days from receipt of samples; air samples will be disposed of after 14 calendar days after receipt of samples.
7. Electronic records maintained for five (5) years from report date.
8. Hard copy reports will be disposed of after 45 calendar days from report date.
9. Storage and Report Fees:
   - Liquid & solid samples: Complimentary storage for forty-five (45) calendar days from receipt of samples; $2/sample/month if extended storage or hold is requested.
   - Air samples: Complimentary storage for ten (10) calendar days from receipt of samples; $20/ sample/week if extended storage is requested.
   - Hard copy and regenerated reports/EDDs: $17.50 per hard copy report requested; $50.00 per regenerated/reformatted report; $35 per reprocessed EDD.
10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	10/28/15	8 am		10/28/15	9am
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

ADVANCED TECHNOLOGY LABORATORIES
3275 Walnut Ave., Signal Hill, CA 90755
Tel: (562) 989-4045 • Fax: (562) 989-4040

CHAIN OF CUSTODY RECORD

Page 2 of 2

Instruction: Complete all shaded areas.

For Laboratory Use Only					ATLCOC Ver:20130715
Method of Transport	Sample Conditions Upon Receipt				
	Condition	Y	N	Condition	Y N
Client ✓ / FedEx / GSO / Other: / ✓ OnTrac	1. CHILLED	yes		5. # OF SAMPLES MATCH COC	
	2. HEADSPACE (VOA)			6. PRESERVED	
	3. CONTAINER INTACT			7. COOLER TEMP, deg C: 6.0	
	4. SEALED				

CUSTOMER

Company: Sierra Streams Institute
Address: 431 Uren Street
City: Nevada City
State: CA
Zip: 95959
Tel: (530) 256-6090
Fax:

SEND REPORT TO:
Attn: Kyle Leach
Email: kleach08@gmail.com
Company: SSI
Address: 431 Uren St
City: Nevada City
State: CA
Zip: 95959

SEND INVOICE TO: same as SEND REPORT TO
Attn: same
Email:
Company:
Address:
City:
State:
Zip:

PROJECT SAMPLES

Project Name: SNC Environs
Project No.: 805
Sampler: Kyle Leach
Quote #:
PO #:
Special Instructions/Comments: Standard TAT these 9 samples for Title 22 metals

QA/QC: Routine, Caltrans, Legal, RWQCB, Level IV

Encircle or Write Requested Analysis: Select Analysis; Select Analysis; 6010 / 7000 (Title 22 Metals); Select Analysis; Select Analysis; Select Analysis; Select Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis; Enter Custom Analysis

Encircle Sample Matrix: Select Soil Matrix; Select Solid Matrix; Select Water Matrix; Select Wastewater Matrix; Select Aqueous Matrix; Enter Custom Matrix

Container: # 4oz glass; Type: 1=Tube; 2=VOA; 3=Liter; 4=Pint; 5=Jar; 6=Tedlar; 7 = Canister; Material: 1=Glass; 2=Plastic; 3=Metal; Preservative: 1=HCl; 2=HNO3; 3=H2SO4; 4 = 4C; 5=Zn (Ac)2; 6=NaOH; 7=NaOS2O3

ITEM	Lab No.	Sample ID / Location	Date	Time	6010 / 7000 (Title 22 Metals)	TAT	# 4oz glass	REMARKS
1	1503729 - 6	WR9-1.5'	10/27/15	10:08 am	X	5	8	
2	7	SR22	10/27/15	10:00 am	X	5	X	
3	8	WR23	10/27/15	10:44 am	X	5	X	
4	9	WR24	10/27/15	10:50 am	X	5	X	
5	10	WR25	10/27/15	10:56 am	X	5	X	
6	11	US26	10/27/15	11:00 am	X	5	X	
7	12	US27	10/27/15	11:10 am	X	5	X	
8	13	US28	10/27/15	11:20 am	X	5	X	
9	14	US29	10/27/15	11:30 am	X	5	X	
10								

TERMS

1. Sample receiving hours: 7:30 AM to 7:30 PM Monday - Friday; Saturday 8:00 AM to 12:00 PM.
2. Samples submitted AFTER 3:00 PM are considered received the following business day at 8:00 AM.
3. The following turnaround time conditions apply:
   - TAT = 0 : 300% Surcharge SAME BUSINESS DAY if received by 9:00 AM
   - TAT = 1 : 100% Surcharge NEXT BUSINESS DAY (COB 5:00 PM)
   - TAT = 2 : 50% Surcharge 2ND BUSINESS DAY (COB 5:00 PM)
   - TAT = 3 : 30% Surcharge 3RD BUSINESS DAY (COB 5:00 PM)
   - TAT = 4 : 20% Surcharge 4TH BUSINESS DAY (COB 5:00 PM)
   - TAT = 5 : NO SURCHARGE 5th BUSINESS DAY (COB 5:00 PM)
4. Weekend, holiday, after-hours work --- ask for quote.
5. Subcontract TAT is 10 - 15 business days. Projects requiring shorter TATs will incur a surcharge respective to the subcontract lab --- ask for quote.
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10. Rush TCLP/STLC samples: add 2 days to analysis TAT for extraction procedure.
11. Unanalyzed samples will incur a disposal fee of $7 per sample.

As the authorized agent of the company above, I hereby purchase laboratory services from ATL as shown above and hereby guarantee payment as quoted.

Kyle Leach — Submitter Print Name
Signature

CUSTODY

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Kyle Leach	10/28/15	8 am	G. V. Aguila	10/30/15	9:10

Diane Galvan

From: Kyle [kleach08@gmail.com]
Sent: Tuesday, November 03, 2015 6:37 PM
To: Diane Galvan
Subject: Re: Partial/Draft Results - SNC Environs (1503729-01/05)

Hi Diane
Please also add soluble arsenic and copper for sample WR21
Thanks
Kyle

Sent from my iPhone

November 16, 2015

Kyle Leach
Sierra Streams Institute
431 Uren St., Suite C
Nevada City, CA 95959
Tel: (530) 265-6090
Fax:

ELAP No.: 1838
CSDLAC No.: 10196
ORELAP No.: CA300003
TCEQ No. : T104704502

Re: ATL Work Order Number : 1502373
Client Reference : SNC Environs, 805

Enclosed are the results for sample(s) received on July 09, 2015 by Advanced Technology Laboratories. The sample(s) are tested for the parameters as indicated on the enclosed chain of custody in accordance with applicable laboratory certifications. The laboratory results contained in this report specifically pertains to the sample(s) submitted.

Thank you for the opportunity to serve the needs of your company. If you have any questions, please feel free to contact me or your Project Manager.

Sincerely,

Eddie Rodriguez
Laboratory Director

The cover letter and the case narrative are an integral part of this analytical report and its absence renders the report invalid. Test results contained within this data package meet the requirements of applicable state-specific certification programs. The report cannot be reproduced without written permission from the client and Advanced Technology Laboratories.

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

SUMMARY OF SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WR-10	1502373-10	Soil	7/07/15 11:00	7/09/15 11:18
WR-12	1502373-12	Soil	7/07/15 12:00	7/09/15 11:18

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Client Sample ID WR-10

Lab ID: 1502373-10

STLC DI Metals by ICP-AES by EPA 6010B **Analyst: RR**

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.50	10	B5K0399	11/13/2015	11/13/15 13:53	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Client Sample ID WR-12
Lab ID: 1502373-12

STLC DI Metals by ICP-AES by EPA 6010B **Analyst: RR**

Analyte	Result (mg/L)	PQL (mg/L)	Dilution	Batch	Prepared	Date/Time Analyzed	Notes
Lead	ND	0.50	10	B5K0399	11/13/2015	11/13/15 14:05	

QUALITY CONTROL SECTION

STLC DI Metals by ICP-AES by EPA 6010B - Quality Control

Analyte	Result (mg/L)	PQL (mg/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Batch B5K0399 - STLC DI_S Extraction									
Blank (B5K0399-BLK1)				Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	ND	0.50			NR				
LCS (B5K0399-BS1)				Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.02350		2.00000		101	80 - 120			
Matrix Spike (B5K0399-MS1)		**Source: 1502373-10**		Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.54619		2.50000	0.035656	100	70 - 130			
Matrix Spike Dup (B5K0399-MSD1)		**Source: 1502373-10**		Prepared: 11/13/2015 Analyzed: 11/13/2015					
Lead	2.56023		2.50000	0.035656	101	70 - 130	0.550	20	

Certificate of Analysis

Sierra Streams Institute		Project Number :	SNC Environs, 805
431 Uren St., Suite C		Report To :	Kyle Leach
Nevada City , CA 95959		Reported :	11/16/2015

Notes and Definitions

ND	Analyte is not detected at or above the Practical Quantitation Limit (PQL). When client requests quantitation against MDL, analyte is not detected at or above the Method Detection Limit (MDL)
PQL	Practical Quantitation Limit
MDL	Method Detection Limit
NR	Not Reported
RPD	Relative Percent Difference
CA2	CA-ELAP (CDPH)
OR1	OR-NELAP (OSPHL)
TX1	TX-NELAP (TCEQ)

Notes:
(1) The reported MDL and PQL are based on prep ratio variation and analytical dilution.
(2) The suffix [2C] of specific analytes signifies that the reported result is taken from the instrument's second column.
(3) Results are wet unless otherwise specified.

From: Kyle [kleach08@gmail.com]
Sent: Monday, November 09, 2015 6:00 PM
To: Diane Galvan
Subject: Re: Phone Message

Thank you
Yes please run the WET DI analysis for soluble lead on samples WR-10 WR 12 and WR-24 Standard turn around time
Thanks
Kyle

Sent from my iPhone

On Nov 9, 2015, at 3:53 PM, Diane Galvan <Diane@atlglobal.com> wrote:

Hi Kyle,

I've received your voice message and have been informed by our Sample Receiving we do have enough of samples WR10 (1502373-10), WR12 (1502373-12) and WR24 (1503729-09) remaining for WET-DI analysis. You may request the additional analysis via email correspondence or on a Chain of Custody, whichever you prefer.

Thanks,

Diane Galvan
Project Manager

<image001.jpg>**Advanced Technology Laboratories**
www.atlglobal.com
Tel: (562) 989-4045 ext. 238
Fax: (562) 989-4040

Advanced Technology Laboratories is a full-service environmental lab providing organic and inorganic analyses of soil, water, wastewater, storm water and hazardous waste samples. ATL is accredited by the State of California, NELAP and State of Oregon (Air) and holds various SBE, DBE and MBE certificates and a USDA soil permit. ATL takes pride in providing our customers with quick turnaround time, excellent customer service and defensible data while offering very competitive rates. *Advanced Technology Labs - Your Partner for Quality Environmental Testing*

This message is intended for the use of the individual or entity to which it is addressed. This may contain information that is privileged, confidential, and exempt from disclosure under applicable law. If the reader of this message is not the intended recipient, or the employee or agent responsible for delivering the message to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone and delete the original message. Thank you.

APPENDIX B

Background Soil Arsenic Data

Table 1 - Regional Background Arsenic Data

Grass Valley, California

Location	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic by EPA Method 6010B (mg/kg)
North Star Mine Property	BG-2	11/10/03	0 - 0.5	12
	BG-3	11/10/03	0 - 0.5	19
	BG-4	11/10/03	0 - 0.5	6.7
	BG-5	8/16/05	0 - 0.5	16.7
	BG-6	8/16/05	0 - 0.5	5.3
	BG-7	8/16/05	0 - 0.5	27.4
	BG-8	8/16/05	0 - 0.5	1.8
	BG-9	8/16/05	0 - 0.5	2.8
	BG-10	8/16/05	0 - 0.5	ND< 0.5
	BG-11	8/16/05	0 - 0.5	1.3
	BG-12	8/17/05	0 - 0.5	ND< 0.5
	BG-13	8/17/05	0 - 0.5	ND< 0.5
	BG-14	8/17/05	0 - 0.5	3.5
	BG-15	8/17/05	0 - 0.5	1.8
	BG-16	8/17/05	0 - 0.5	ND< 0.5
	BG-17	8/17/05	0 - 0.5	6.6
	BG-18	8/17/05	0 - 0.5	2.9
	BG-19	8/17/05	0 - 0.5	14.8
	BG-20	8/17/05	0 - 0.5	8.7
	BG-21	8/30/05	0 - 0.5	4.4
	BG-22	8/30/05	0 - 0.5	4.1
	BG-23	8/30/05	0 - 0.5	1.9
	BG-24	8/30/05	0 - 0.5	3.1
	BG-25	8/30/05	0 - 0.5	3.8
	BG-26	8/30/05	0 - 0.5	4.0
	BG-27	8/1/06	0 - 0.5	6.3
	BG-28	8/1/06	0 - 0.5	36.7
	BG-29	8/1/06	0 - 0.5	1.3
	BG-30	8/1/06	0 - 0.5	3.7
	BG-31	8/1/06	0 - 0.5	2.3
	BG-32	8/1/06	0 - 0.5	3.2
	BG-33	8/1/06	0 - 0.5	3.3
	BG-34	8/1/06	0 - 0.5	1.2
	BG-35	8/4/06	0 - 0.5	3.1
	BG-36	8/1/06	0 - 0.5	7.2
	BG-37	8/4/06	0 - 0.5	2.4
	BG-38	8/4/06	0 - 0.5	8.9
	BG-39	8/1/06	0 - 0.5	3.5
	BG-40	8/1/06	0 - 0.5	ND<1.0
	BG-41	8/3/06	0 - 0.5	2.7
	BG-42	8/3/06	0 - 0.5	ND<1.0
	BG-43	8/3/06	0 - 0.5	1.1
	BG-44	8/3/06	0 - 0.5	1.7
	BG-45	8/3/06	0 - 0.5	1.7
	BG-46	8/3/06	0 - 0.5	ND<1.0

Table 1 - Regional Background Arsenic Data

Grass Valley, California

Location	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic by EPA Method 6010B (mg/kg)
North Star Mine Property	BG-47	8/4/06	0 - 0.5	26.7
	BG-T1S1	9/28/05	0 - 0.5	6.1
	BG-T1S2	9/28/05	1.0	6.5
	BG-T1S3	9/28/05	2.0	10.1
	BG-T1S4	9/28/05	4.0	11.5
	BG-T2S1	9/28/05	0 - 0.5	13.9
	BG-T2S2	9/28/05	1.0	7.9
	BG-T2S3	9/28/05	2.0	14.8
	BG-T2S4	9/28/05	4.0	11.0
	BG-T2S5	9/28/05	6.0	7.8
	BG-T2S6	9/28/05	8.0	3.0
	BGT3-S1	10/5/05	0 - 0.5	13.7
	BGT3-S2	10/5/05	4.0	3.2
	BGT3-S3	10/5/05	8.0	ND<1.0
	BGT3-S3B	10/5/05	8.0	ND<1.0
	BGT4-S1	8/4/06	0 - 0.5	3.3
	BGT4@5'	8/4/06	5.0	ND<1.0
	BGT4@10'	8/4/06	10.0	1.5
	BGT5-S1	8/4/06	0 - 0.5	1.3
	BGT5@5'	8/4/06	5.0	3.8
	BGT5@10'	8/4/06	10.0	1.3
	BGT6-S1	8/4/06	0 - 0.5	3.2
	BGT6@5'	8/4/06	5.0	2.1
	BGT6@9.5'	8/4/06	9.5	2.5
	BGT7-S1	8/4/06	0 - 0.5	1.5
	BGT7@5'	8/4/06	5.0	5.3
	BGT7@10'	8/4/06	10.0	ND<1.0
	BGT8-S1	8/4/06	0 - 0.5	6.5
	BGT8@5'	8/4/06	5.0	ND<1.0
	BGT8@9'	8/4/06	9.0	ND<1.0
	BGT9-S1	8/4/06	0 - 0.5	10.1
	BGT9@5'	8/4/06	5.0	8.6
	BGT9@10'	8/4/06	10.0	6.3
	BGT10-S1	8/4/06	0 - 0.5	4.3
	BGT10@5'	8/4/06	5.0	6.4
	BGT10@10'	8/4/06	10.0	ND<1.0
	BGT11-S1	8/4/06	0 - 0.5	1.6
	BGT11@5'	8/4/06	5.0	ND<1.0
	BGT11@8'	8/4/06	8.0	1.0
	BGT12-S1	8/4/06	0 - 0.5	ND<1.0
	BGT12@4.5'	8/4/06	4.5	1.6
	BGT12@6.0'	8/4/06	6.0	ND<1.0
	BGT13-S1	8/4/06	0 - 0.5	3.0
	BGT13@5'	8/4/06	5.0	6.7
	BGT13@10'	8/4/06	10.0	10.3

Table 1 - Regional Background Arsenic Data

Grass Valley, California

Location	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic by EPA Method 6010B (mg/kg)
Kenny Ranch	BG-1A	11/13/01	0.5	8.0
	BG-2A	11/13/01	0.5	5.5
	BG-3A	11/13/01	0.5	6.0
	BG-4A	11/13/01	0.5	6.8
	BG-5	3/12/02	0.5	ND<0.3
	BG-6	3/12/02	0.5	ND<0.3
	BG-7	3/12/02	0.5	ND<0.3
	BG-8	3/12/02	0.5	ND<0.3
	BG-9	3/12/02	0.5	ND<0.3
	BG-10	3/12/02	0.5	ND<0.3
Winds Aloft Property	BG-1	8/12/04	0.5	2.3
	BG-2	8/12/04	0.5	ND<2.0
	BG-3	8/12/04	0.5	2.4
	BG-4	8/12/04	0.5	1.0
	BG-5	4/11/05	0.5	6.0
	BG-6	4/11/05	0.5	2.8
	BG-7	8/3/05	0.5	12.8
	BG-8	8/3/05	0.5	19.1
	BG-9	8/3/05	0.5	1.3
	BG-10	8/3/05	0.5	0.9
	BG-11	8/3/05	0.5	2.9
	BG-12	8/3/05	0.5	1.0
Osborne Hill Property	BG-1	4/5/2004	0.5	5.8
	BG-2	4/5/2004	0.5	7.6
	BG-3	4/2/2004	0.5	10
	BG-4	4/2/2004	0.5	6.5
	BG-5	4/2/2004	0.5	4.8
	BG-7	4/5/2004	0.5	3.6
	BG-9	4/5/2004	0.5	2.8
	OHE-1	4/13/2006	0.5	7.7
	OHE-2	4/13/2006	0.5	8.9
	OHE-3	4/13/2006	0.5	6.8
	OHE-4	4/13/2006	0.5	9.0
	OHE-5	4/13/2006	0.5	6.3
	OHE-6	4/13/2006	0.5	6.0
	OHE-6-2.0	4/18/2006	2.0	ND<1.0
	OHE-6-4.0	4/18/2006	4.0	ND<1.0
	OHE-6-6.0	4/18/2006	6.0	ND<1.0
	OHE-7	4/13/2006	0.5	4.4
	OHE-8	4/13/2006	0.5	5.3
	OHE-8-2.0	4/18/2006	2.0	ND<1.0
	OHE-8-4.0	4/18/2006	4.0	ND<1.0
	OHE-9	4/13/2006	0.5	9.2
	OHE-10	4/13/2006	0.5	2.5
	OHE-11	4/13/2006	0.5	ND<1.0
	OHE-12	4/13/2006	0.5	13.7

Table 1 - Regional Background Arsenic Data

Grass Valley, California

Location	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic by EPA Method 6010B (mg/kg)
Loma Rica Ranch	M1-BG1	11/26/2003	0.5	9.4
	M1-BG2	11/26/2003	0.5	14
	M2-BG1	12/4/2003	0.5	20
	M2-BG2	12/4/2003	0.5	5.6
	M3-BG1	11/26/2003	0.5	ND<2.0
	LR-BG1	10/25/2005	0.5	2.5
	LR-BG2	10/25/2005	0.5	7.3
	LR-BG3	10/25/2005	0.5	ND<1.0
	LR-BG4	10/25/2005	0.5	ND<1.0
	LR-BG5	10/25/2005	0.5	ND<1.0
	LR-BG6	10/25/2005	0.5	13.3
	LR-BG7	10/25/2005	0.5	2.1
	LR-BG8	10/25/2005	0.5	2.5
	LR-BG9	10/25/2005	0.5	1.0
	LR-BG10	10/25/2005	0.5	2.6
	LR-BG11	10/25/2005	0.5	2.8
	LR-BG12	10/25/2005	0.5	2.9
La Barr Meadows Property	LBM-4	9/11/2003	0.5	3.9
	BG-1	6/2/2005	0.5	4.0
	BG-2	5/25/2005	0.5	4.6
	BG-3	5/25/2005	0.5	4.5
	BG-4	5/25/2005	0.5	3.3
	BG-5	5/25/2005	0.5	7.4
	BG-6	6/2/2005	0.5	15.3
	BG-7	6/2/2005	0.5	4.4
	LBM-AMB1	8/10/2006	0.5	2.1
	LBM-AMB2	8/10/2006	0.5	7.7
	LBM-AMB3-0.5'	8/11/2006	0.5	1.2
	LBM-AMB3-5.0'	8/11/2006	5.0	3.4
	LBM-AMB3-10.0	8/11/2006	10.0	ND<1.0
	LBM-AMB4	8/10/2006	0.5	3.1
	LBM-AMB5	8/10/2006	0.5	2.5
	LBM-AMB6	8/10/2006	0.5	2.9
	LBM-AMB7	8/10/2006	0.5	3.1
	LBM-AMB8	8/10/2006	0.5	ND<1.0
	LBM-AMB9	8/10/2006	0.5	1.2
	LBM-AMB10-0.5'	8/11/2006	0.5	ND<1.0
	LBM-AMB10-5.0'	8/11/2006	5.0	1.3
	LBM-AMB10-10.0'	8/11/2006	10.0	ND<1.0
	LBM-AMB11	8/10/2006	0.5	4.1
	LBM-AMB-13	8/10/2006	0.5	5.1
	LBM-AMB-14	8/10/2006	0.5	1.0
	M2-SS5-5.0'	8/11/2006	5.0	2.7
	M5-SS1-5.0'	8/11/2006	5.0	2.0
	M8-SS7-5.0'	8/11/2006	5.0	ND<1.0
	Area1-SS2-0.5'	8/11/2006	0.5	ND<1.0

Table 1 - Regional Background Arsenic Data

Grass Valley, California

Location	Sample Number	Sample Date	Sample Depth (feet)	Total Arsenic by EPA Method 6010B (mg/kg)
Bear River Mill Property	BG1A-6	--	0.5	11
	BG1B-6	--	0.5	4.4
	BG1C-6	--	0.5	9.6
	BG1A-10	--	10.0	6.7
	BG1B-10	--	10.0	18
	BG1C-8	--	10.0	9.1
	BG2A-6	--	0.5	36
	BG2B-6	--	0.5	14
	BG2C-6	--	0.5	13
	BG3A-6	--	0.5	32
	BG3B-6	--	0.5	ND<0.25
	BG3C-6	--	0.5	ND<0.25
	BG2A-7.5	--	7.5	48
	BG2B-7.5	--	7.5	0.85
	BG2C-7.5	--	7.5	1.2
	BG3A-7.5	--	7.5	16
	BG3B-7	--	7.5	ND<0.25
	BG3C-7.5	--	7.5	ND<0.25
Former Spring Hill Mine Property	BG-1	5/20/2003	0 - 0.5	ND<1.0
	BG-2	5/20/2003	0 - 0.5	ND<1.0
	BG-3	5/20/2003	0 - 0.5	17
	BG-4	10/11/2005	0 - 0.5	ND<1.0
	BG-5	10/11/2005	0 - 0.5	ND<1.0
	BG-6	10/11/2005	0 - 0.5	ND<1.0
	S-12	4/18/2007	0.25	ND<1.0
	S-13	4/18/2007	0.25	ND<1.0

Notes

EPA = United States Environmental Protection Agency

mg/kg = milligrams per kilogram

ND< = not detected at or above the referenced reporting limit

Table 2 - Descriptive Statistics for Non-Transformed Regional Background Arsenic Data
Grass Valley, California

Descriptive Statistic	Value
Sample size (n)	208
Frequency of Arsenic Detection	157/208 (75%)
Mean (μ)	5.320
Median	3.050
Standard Deviation	6.8563
Standard Error on the Mean	0.4754
Coefficent of Variation (CV)	1.29
Minimum Value[1]	0.13
Maxmium Value	48.00
Lower Quartile (Q1)	1.000
Upper Quartile (Q3)	6.775

Note:

1 Minimum value corresponds to samples BG3B-6, BG3C-6, BG3B-7 and BG3C-7.5 from the Bear River Mill Property, in which total arsenic was not detected above the laboratory reporting limit of 0.25 mg/kg. A value equal to half of the reporting limit was used for total arsenic concentration. See Table 1.

Table 3 - Descriptive Statistics for Log-Transformed Regional Background Arsenic Data
Grass Valley, California

Descriptive Statistic	Value
Sample size (n)	208
Frequency of Arsenic Detection	157/208 (75%)
Mean (μ)	0.401
Median	0.484
Standard Deviation	0.5876
Standard Error on the Mean	0.0407
Coefficent of Variation (CV)	1.47
Minimum Value[1]	-0.903
Maxmium Value	1.681
Lower Quartile (Q1)	0.000
Upper Quartile (Q3)	0.831

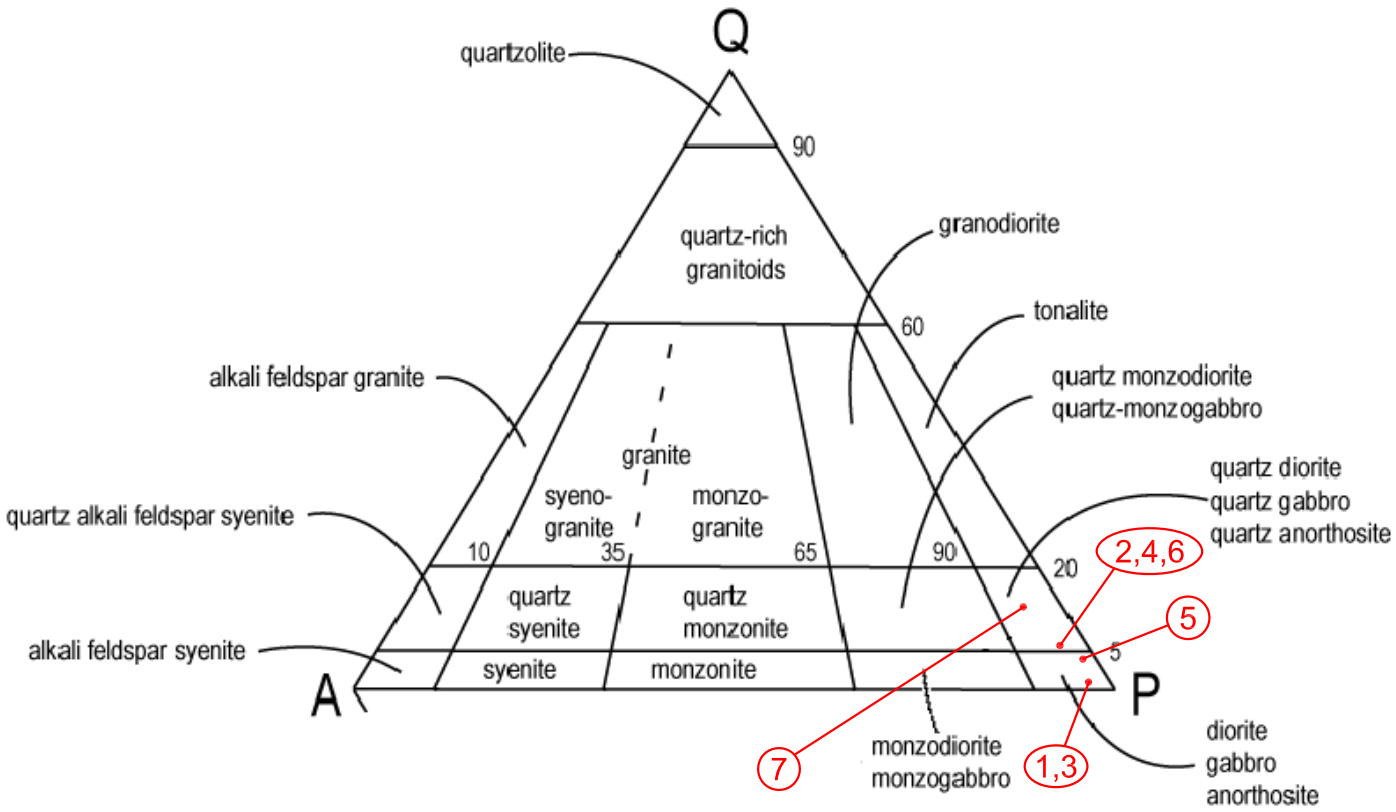
Note:

1 Minimum value corresponds to samples BG3B-6, BG3C-6, BG3B-7 and BG3C-7.5 from the Bear River Mill Property, in which total arsenic was not detected above the laboratory reporting limit of 0.25 mg/kg. A value equal to half of the reporting limit was used for total arsenic concentration. See Table 1.

Table 4 - Geologic Conditions Associated with Regional Background Asenic Data
Grass Valley, California

Location	Geologic Description
Former Spring Hill Mine Property	Based on the Geologic Map of the Grass Valley - Colfax Area (A. Tuminas, 1983)[1], the site is mapped as serpentine rocks of the Early Mesozoic aged Ultramafic- Mafic "Basement" Unit of the Lake Combie Complex. According to the Mineral Land Classification of Nevada County (Special Report 164, California Department of Conservation Division of Mines and Geology, 1990), the site geology is mapped as the ultramafic unit of the Jurassic-aged Lake Combie Complex.
North Star Mine Property	According to the Tuminas map[1], the northern approximately half of the subject site and a small area in the southwestern corner of the site are underlain by early Mesozoic massive diabase unit of the Lake Combie complex. Early Cretaceous La Barr Meadows quartz diorite is depicted in the southern third of the site and in areas to the east and northeast of the site. The middle portion of the site is underlain by Quaternary alluvium. A fault contact identified as the Wolf Creek Fracture Zone is depicted along and running parallel to the central and southern portions of the western property boundary. Areas to the east of the fracture zone, including a narrow strip of land along the western central property boundary are depicted as late Paleozoic to early Mesozoic aged, undifferentiated chert and shale of the Clipper Gap Unit.
Kenny Ranch Property	The Geologic Map of the Chico Quadrangle, California (Chico Quadrangle)[2] published by the California Department of Conservation Division of Mines and Geology in 1992 indicates that the northern portion of project site is underlain by Paleozoic and Mesozoic aged metasedimentary and ultramafic rock and that the southern portion of the site is underlain by Tertiary aged volcanic rock.
Winds Aloft Property	The Tuminas map[1] describes the geology underlying the majority of the site as Tertiary clastic strata. Metasedimentary rock is depicted on the northwestern portion of the site. The Tertiary clastic strata depicted on the site is likely underlain by metasedimentary rock, although the contact between the metasedimentary rock and the massive diabase and volcanic rocks associated with the adjacent Lake Combie Complex is obscured by the Tertiary clastic strata.
Osborne Hill Property	According to the Tuminas map[1], the subject site is underlain by early Mesozoic massive diabase associated with the Lake Combie complex. Intrusive, early Cretaceous La Barr Meadows quartz diorite is depicted near the westernmost property boundary, a short distance east of La Barr Meadows Road. Rocks associated with the Lake Combie complex are overlain by Tertiary clastic deposits northeast of the subject site.
Loma Rica Ranch Property	According to the Chico Quadrangle map[2], the subject site is underlain by Mesozoic to Paleozoic ultramafic rocks. According to the Tuminas map[1], four main rock units underlie the subject site. Oriented generally from west to east, these rock units are the early Mesozoic Lake Combie massive diabase, the undifferentiated Clipper Gap-Colfax transition zone, the early Mesozoic Lake Combie massive to undifferentiated gabbro to quartz diorite, and the Lake Combie serpentinite.
La Barr Meadows Road Property	According to the Chico Quadrangle map[2], the subject site is underlain by Mesozoic quartz diorite, intrusive rocks and massive diabase of the Lake Combie Complex.
Bear River Mill Property	According to the Tuminas map[1], the site is underlain by early Cretaceous, La Barr Meadows quartz diorite. The Chico Quadrangle map[2] indicates that the project site is underlain by Mesozoic plutonic rock, including quartz diorite, tonalite, trondhjemite, and quartz monzonite.

Notes:
1 Tuminas, A., 1983. Geologic Map of the Grass Valley - Colfax Area.
2 California Department of Conservation, Division of Mines and Geology, 1992, Geologic Map of the Chico Quadrangle.



LEGEND

FOR GEOLOGIC DESCRIPTIONS SEE TABLE 4

1. FORMER SPRING HILL MINE (ULTRAMAFIC ROCKS AND SERPENTINE)
2. NORTH STAR (DIABASE, QUARTZ DIORITE)
3. KENNY RANCH (METASEDIMENTARY AND ULTRAMAFIC ROCKS)
4. OSBORNE HILL (DIABASE, QUARTZ DIORITE)
5. LOMA RICA RANCH (DIABASE, QUARTZ DIORITE, GABBRO, SERPENTINITE)
6. LABARR MEADOWS ROAD PROPERTY (DIABASE, QUARTZ DIORITE)
7. BEAR RIVER MILLS (QUARTZ DIORITE)

NOT PLOTTED

8. WINDS ALOFT (METASEDIMENTARY ROCKS AND CLASTIC STRATA)

HOLDREGE & KULL
CONSULTING ENGINEERS · GEOLOGISTS
792 SEARLS AVENUE
NEVADA CITY, CALIFORNIA 95959

GEOLOGIC COMPOSITION

BACKGROUND DATA LOCATIONS

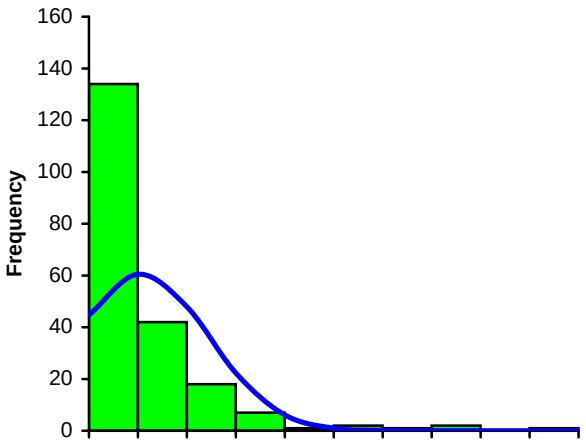
GRASS VALLEY, CALIFORNIA

PROJECT 3856-01

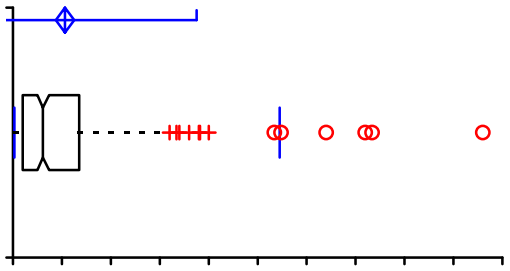
OCTOBER 2010

FIGURE 1

Test	**Continuous summary descriptives**
Variable	Non-transformed Background Arsenic Concentrations (mg/kg)
Performed by	Holdrege & Kull
Date	7 October 2010

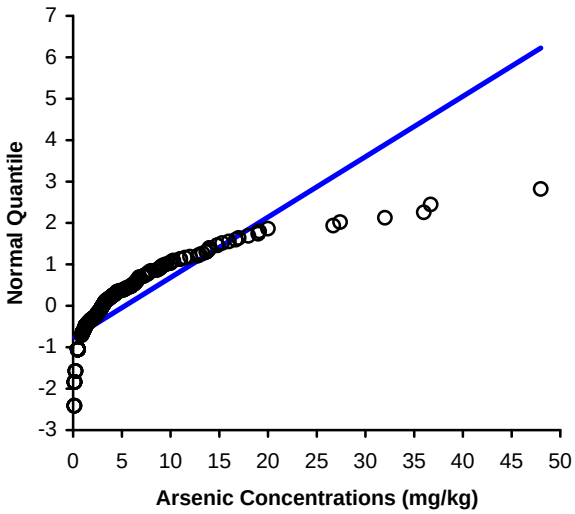


n	208
Mean	5.320
95% CI	4.383 to 6.257
Variance	47.0093
SD	6.8563
SE	0.4754
CV	129%



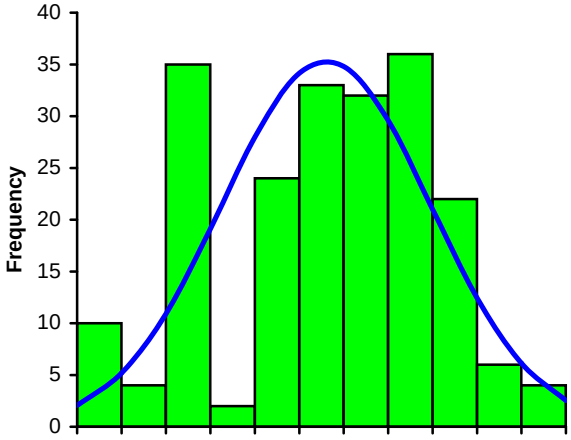
Median	3.050
95.6% CI	2.500 to 3.700
Range	47.875
IQR	5.775

Percentile	
2.5th	0.150
25th	1.000
50th	3.050
75th	6.775
97.5th	27.243

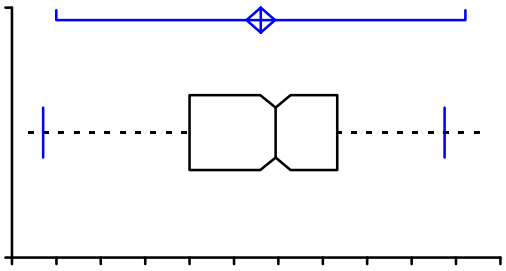


	Coefficient	p
Shapiro-Wilk	0.6945	<0.0001
Skewness	2.9120	<0.0001
Kurtosis	11.4269	<0.0001

Test	**Continuous summary descriptives**
Variable	Log-transformed Arsenic Background Concentrations
Performed by	Holdrege & Kull
Date	7 October 2010

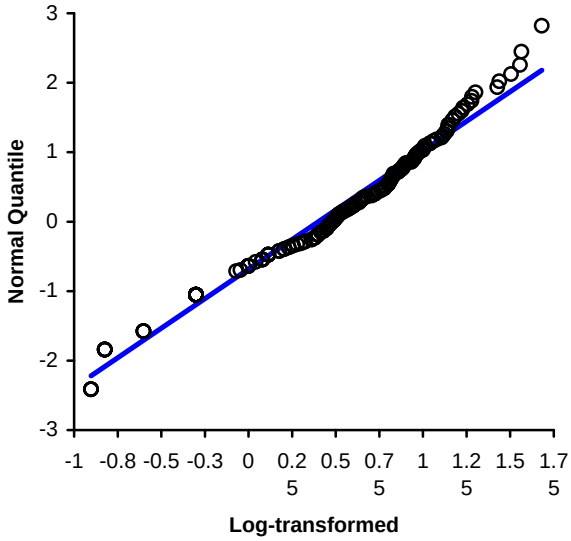


n	208
Mean	0.401
95% CI	0.321 to 0.481
Variance	0.3453
SD	0.5876
SE	0.0407
CV	147%



Median	0.484
95.6% CI	0.398 to 0.568
Range	2.584331224
IQR	0.830900385

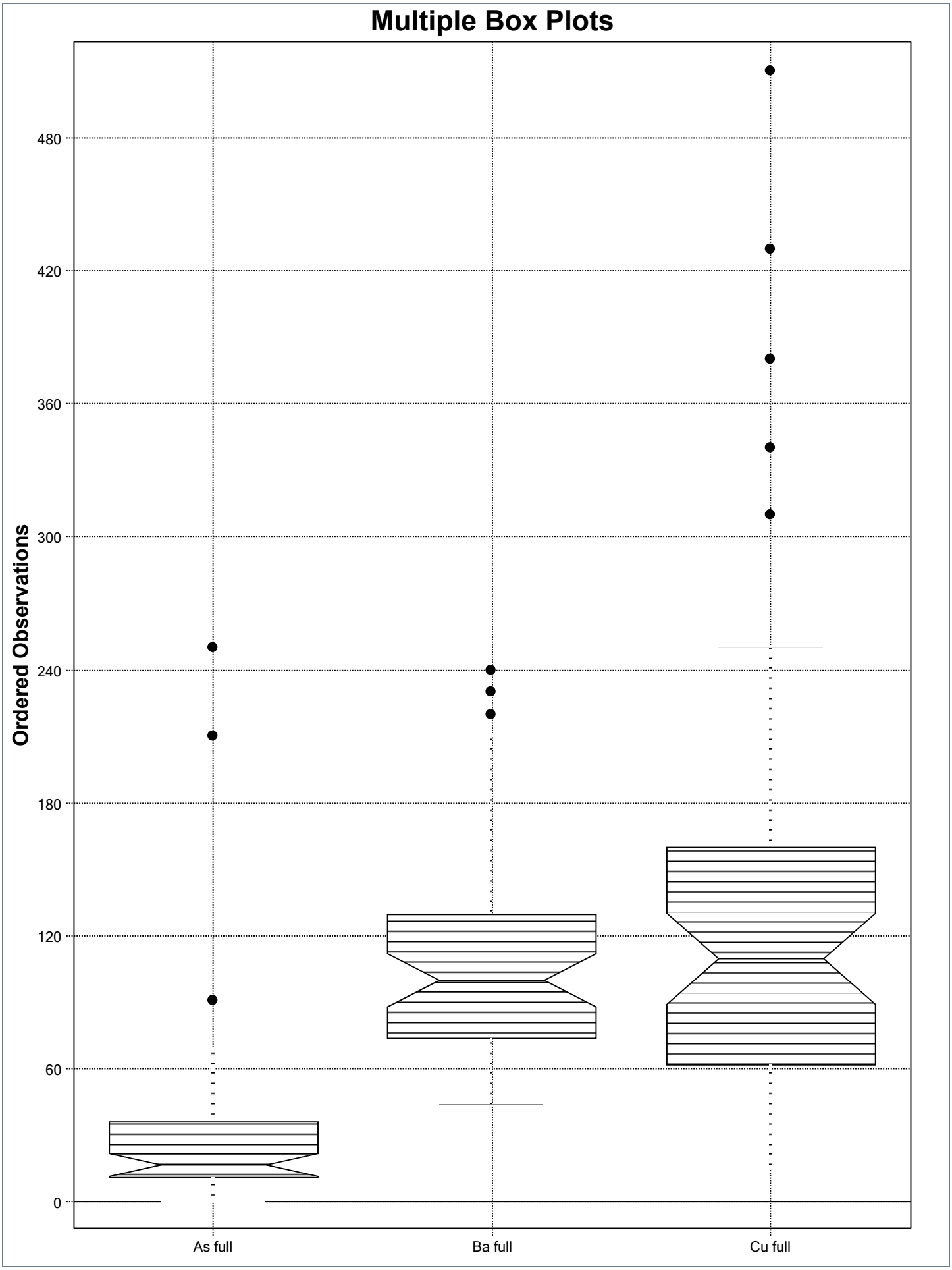
Percentile	
2.5th	-0.824
25th	0.000
50th	0.484
75th	0.831
97.5th	1.435

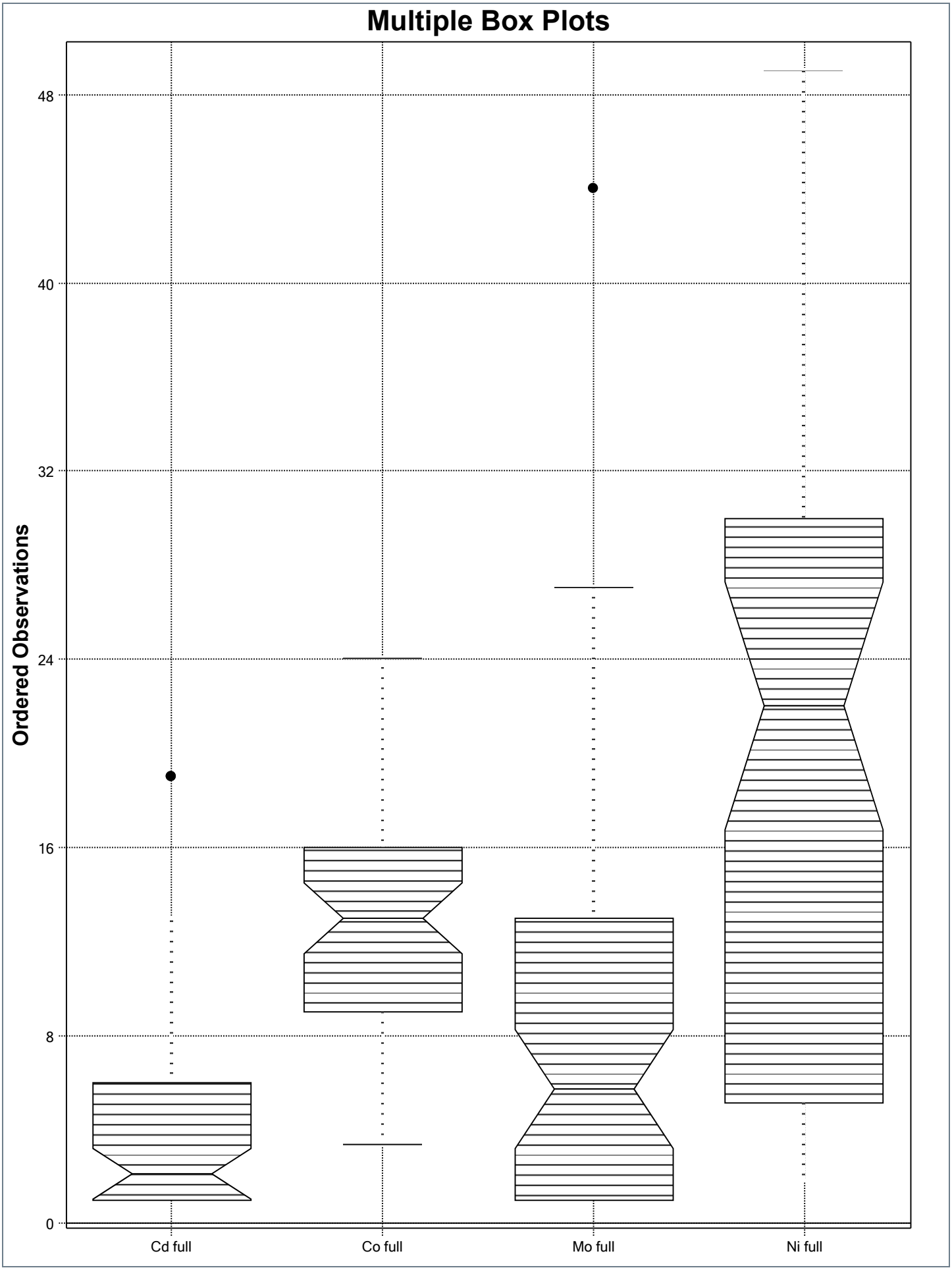


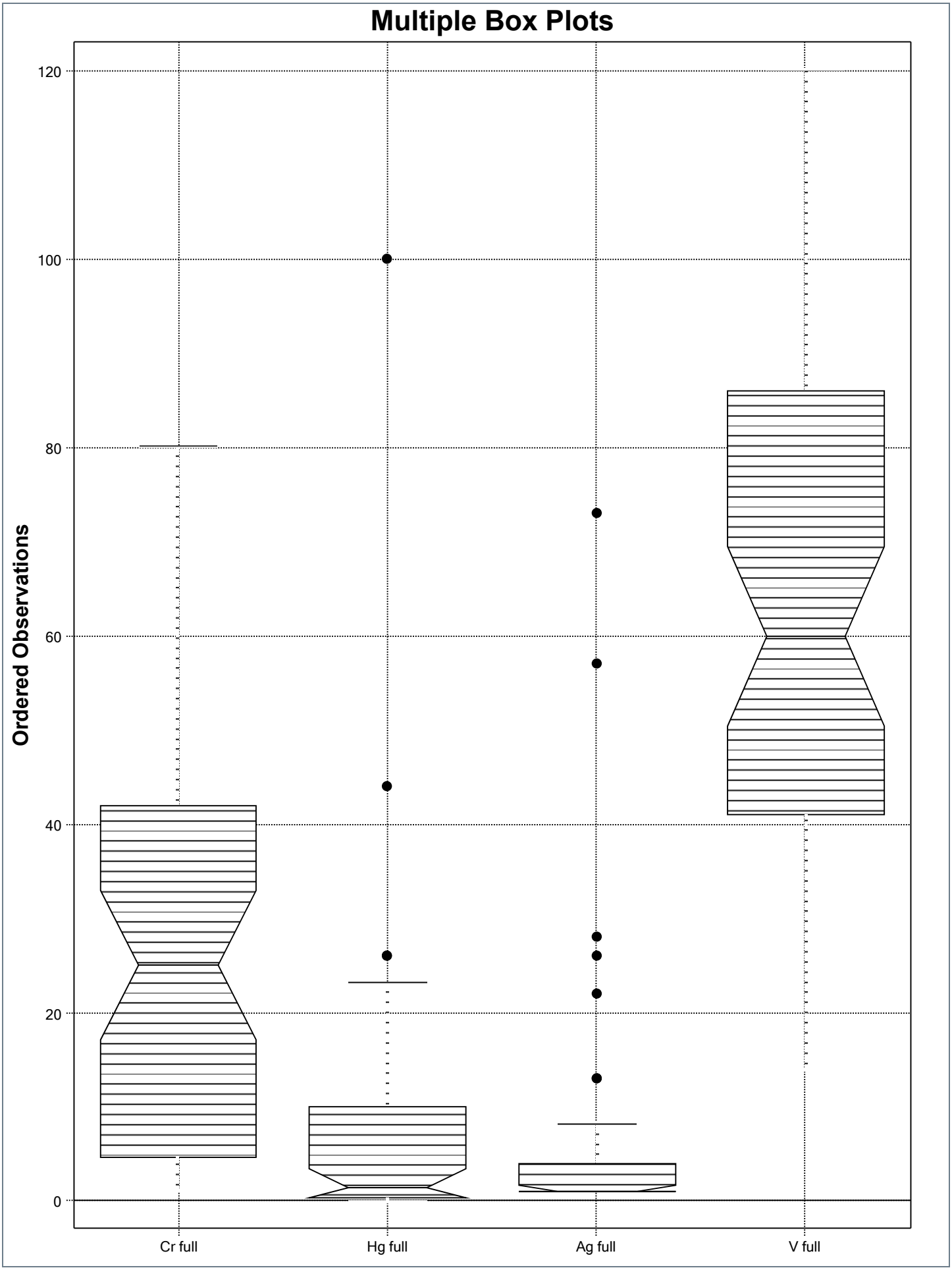
	Coefficient	p
Shapiro-Wilk	0.9676	0.0001
Skewness	-0.3185	0.0597
Kurtosis	-0.6099	0.0126

APPENDIX C

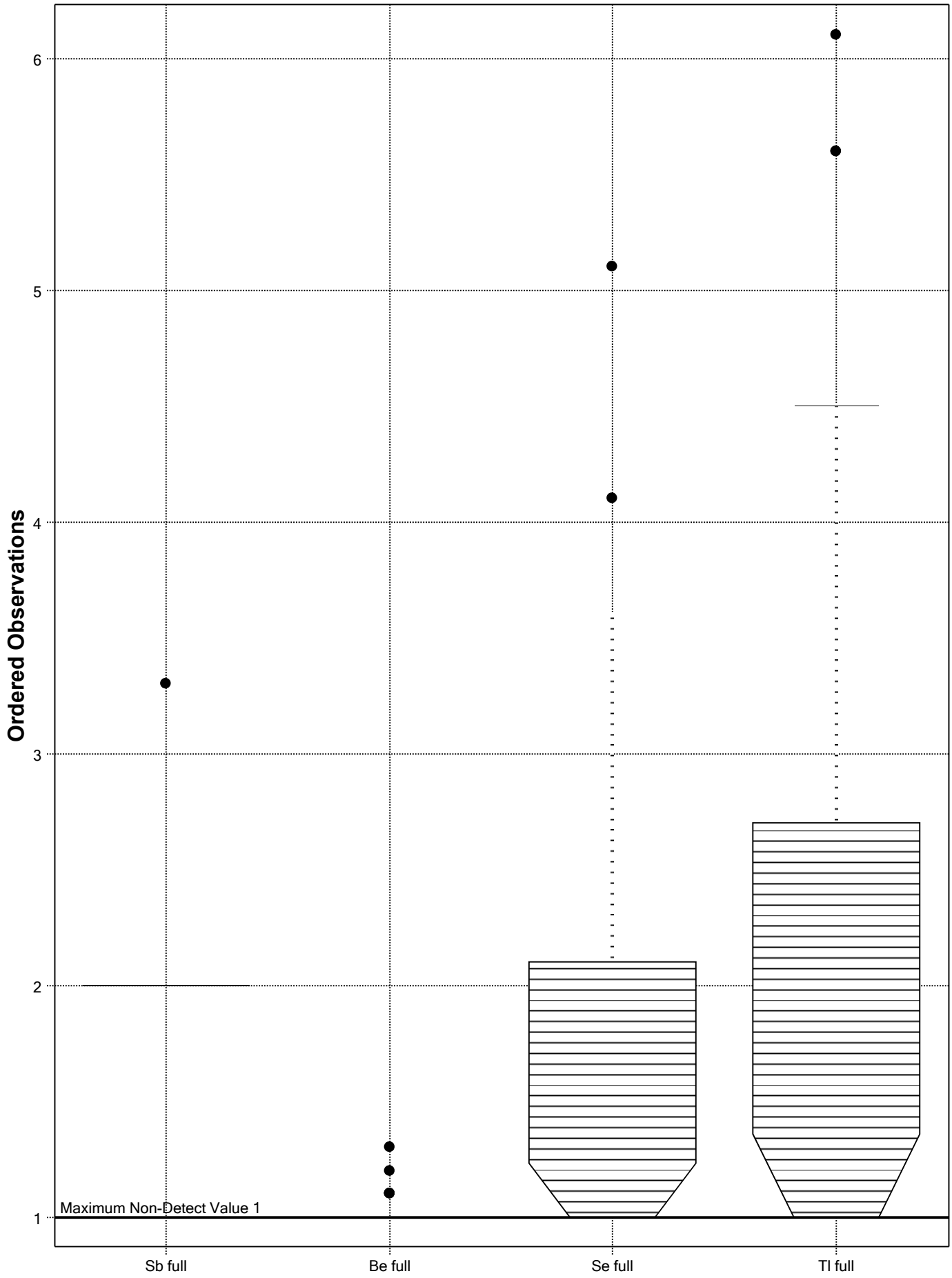
Statistical Summaries

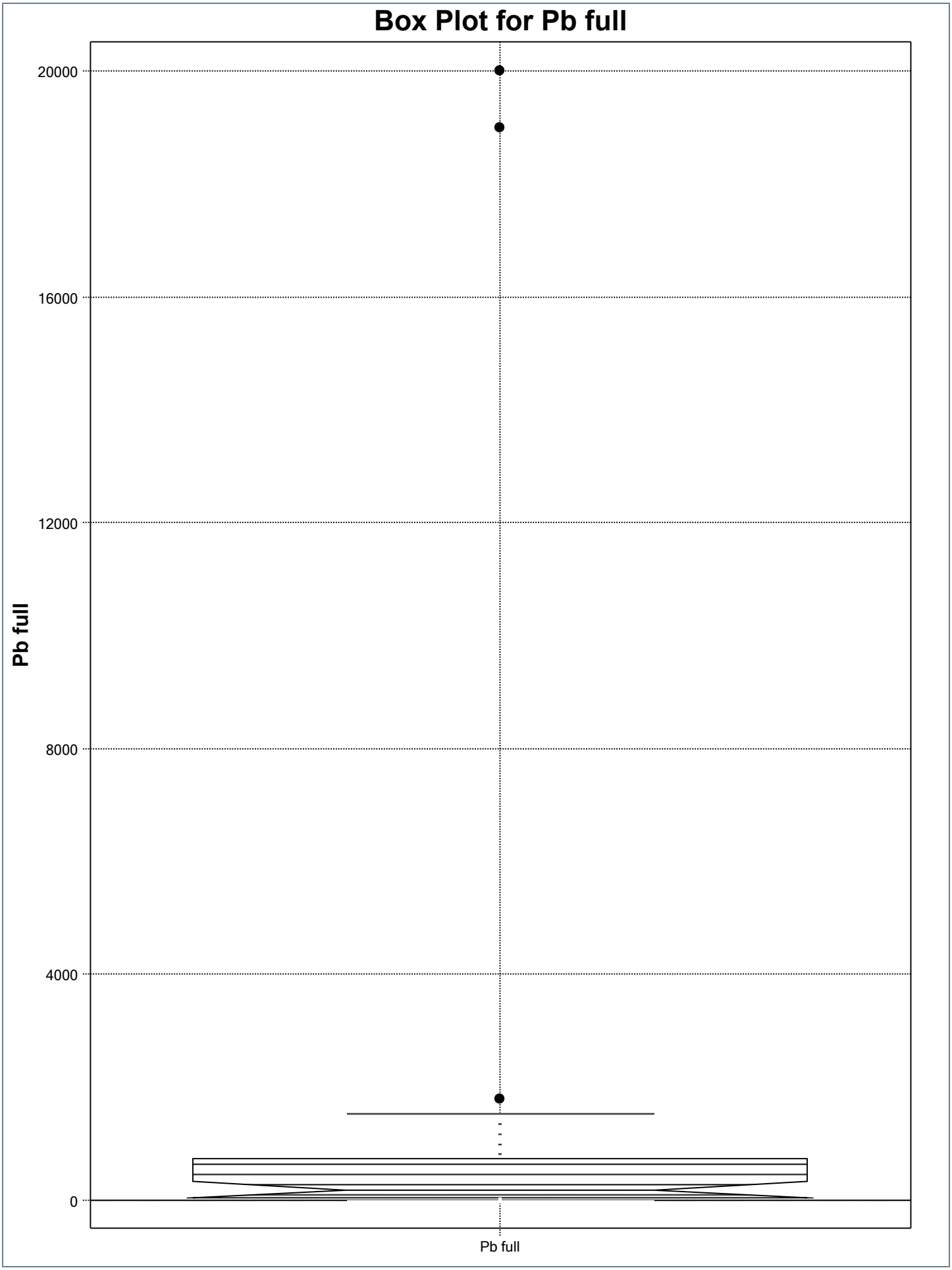

Multiple Box Plots
Ordered Observations
480
420
360
300
240
180
120
60
0
As full
Ba full
Cu full


Multiple Box Plots
Ordered Observations
48
40
32
24
16
8
0
Cd full
Co full
Mo full
Ni full

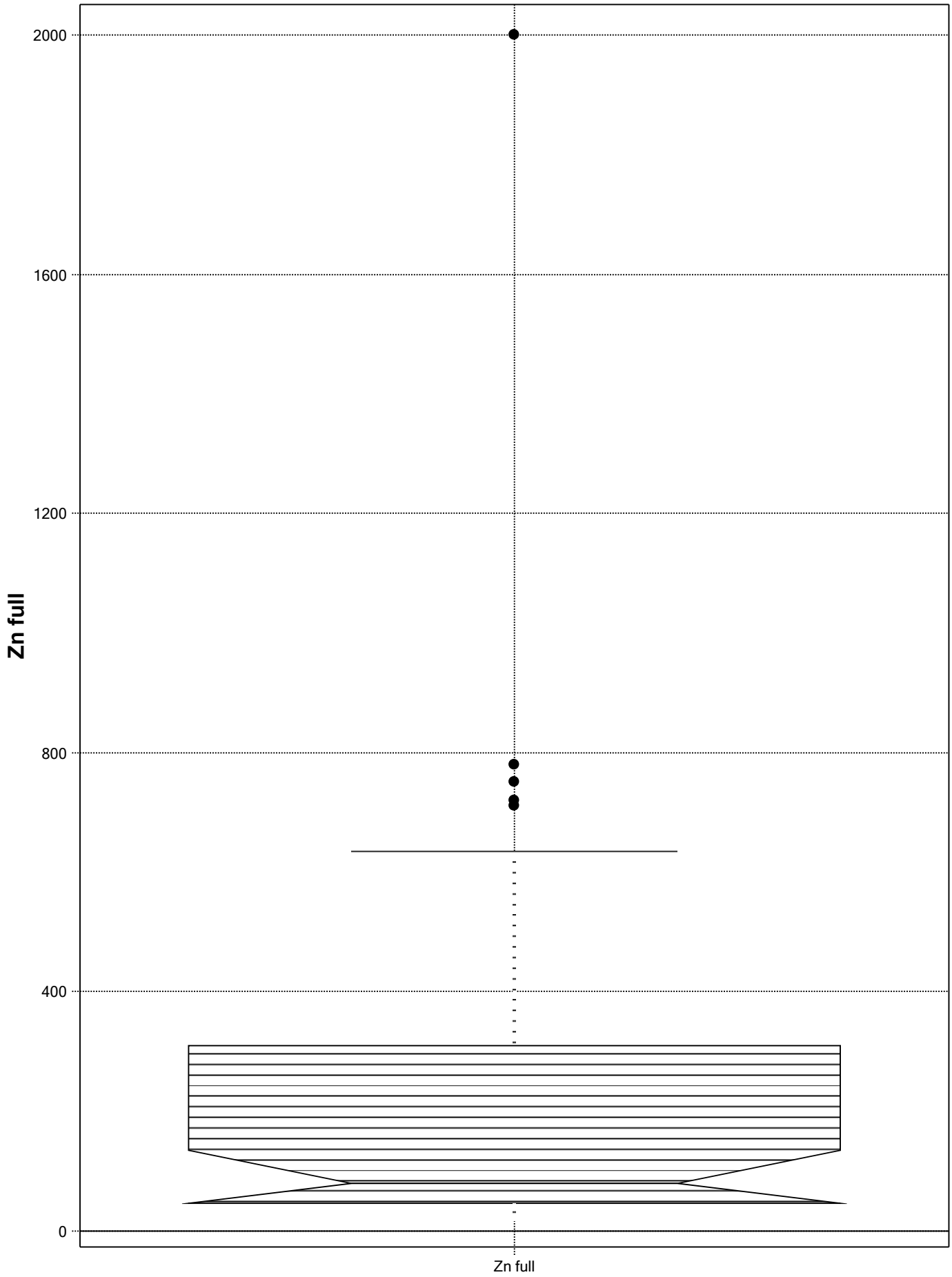

Multiple Box Plots
Ordered Observations
120
100
80
60
40
20
0
Cr full
Hg full
Ag full
V full

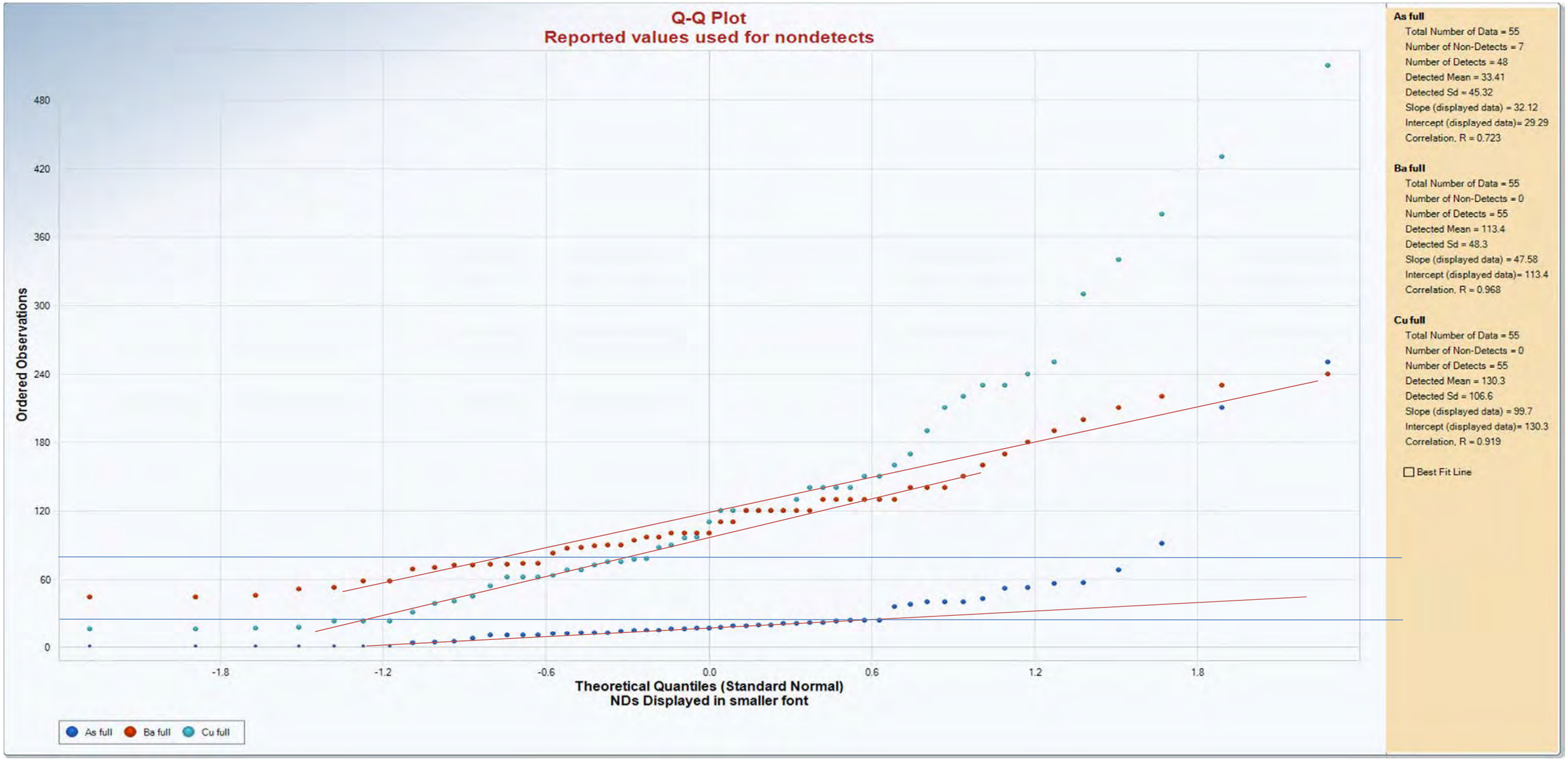
Multiple Box Plots

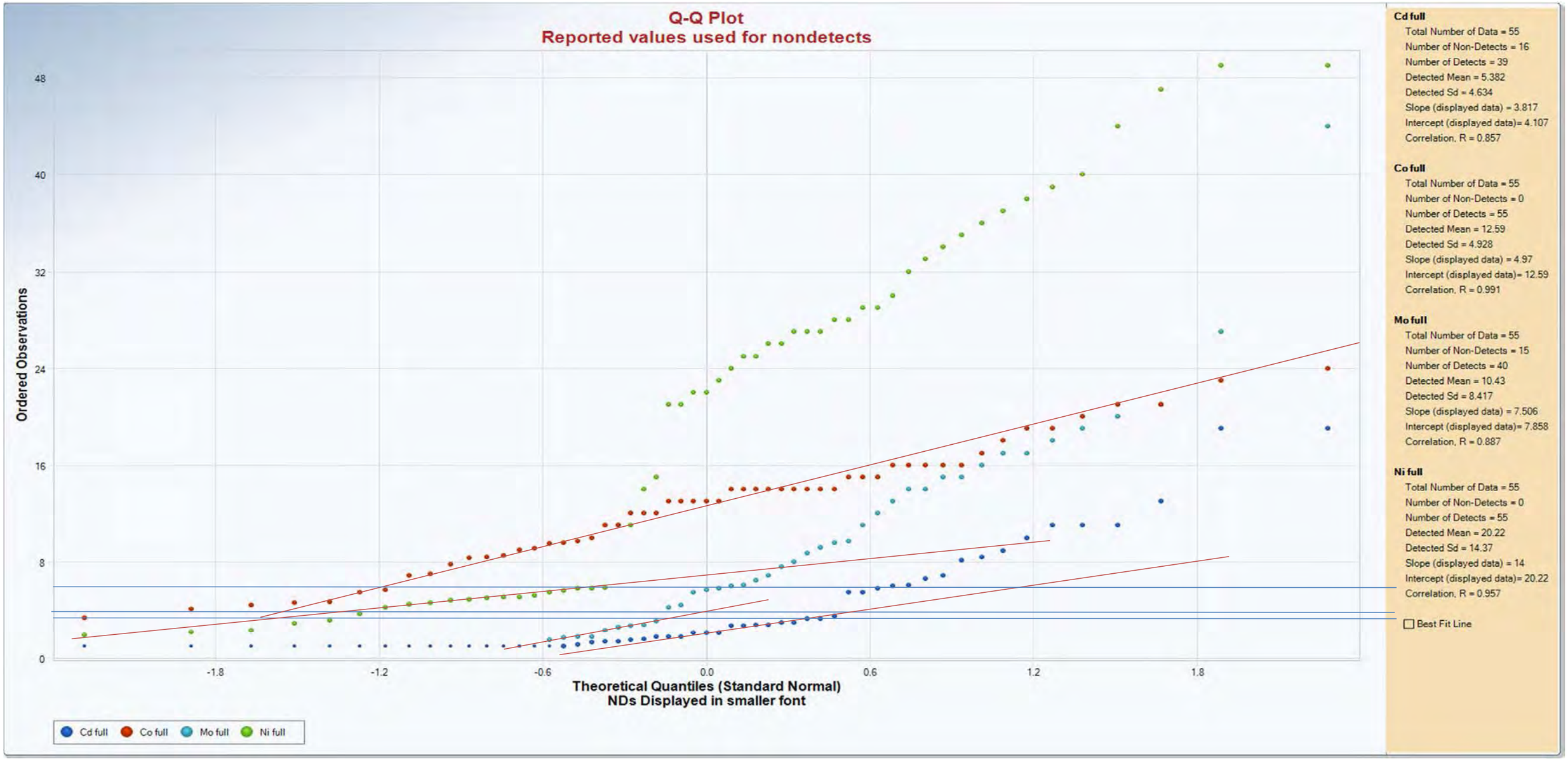



Box Plot for Pb full
Pb full
20000
16000
12000
8000
4000
0
Pb full

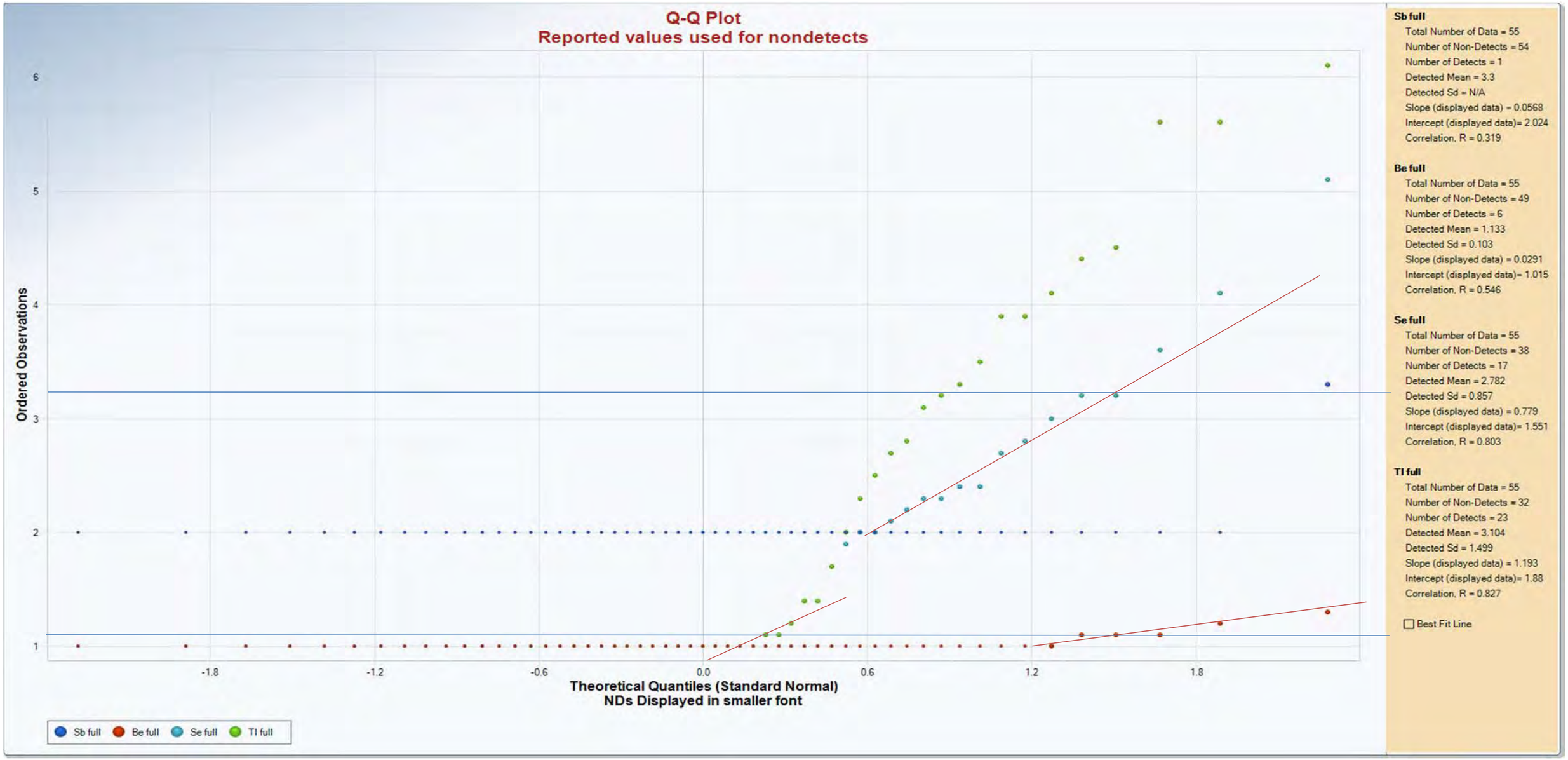
Box Plot for Zn full

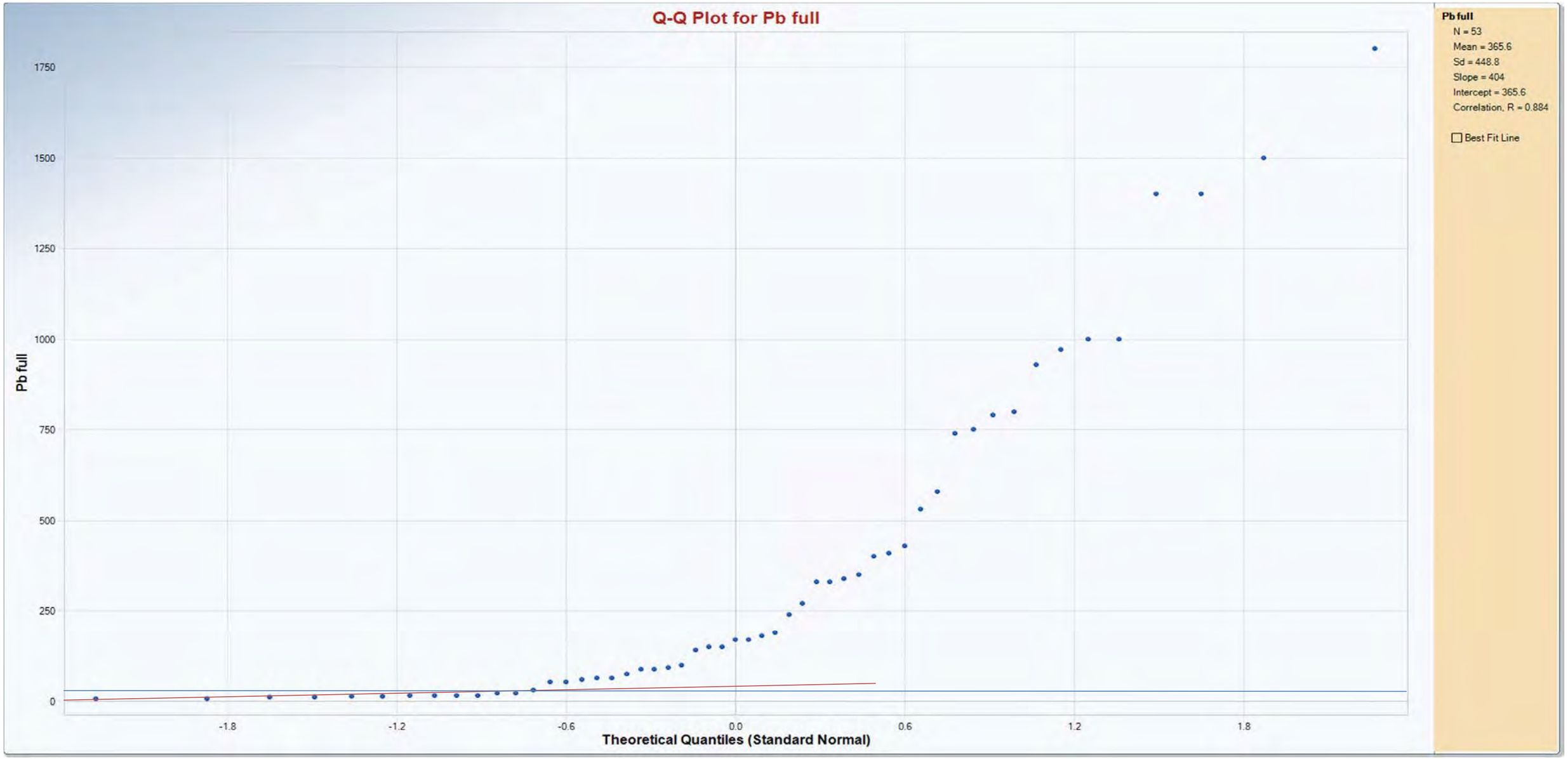


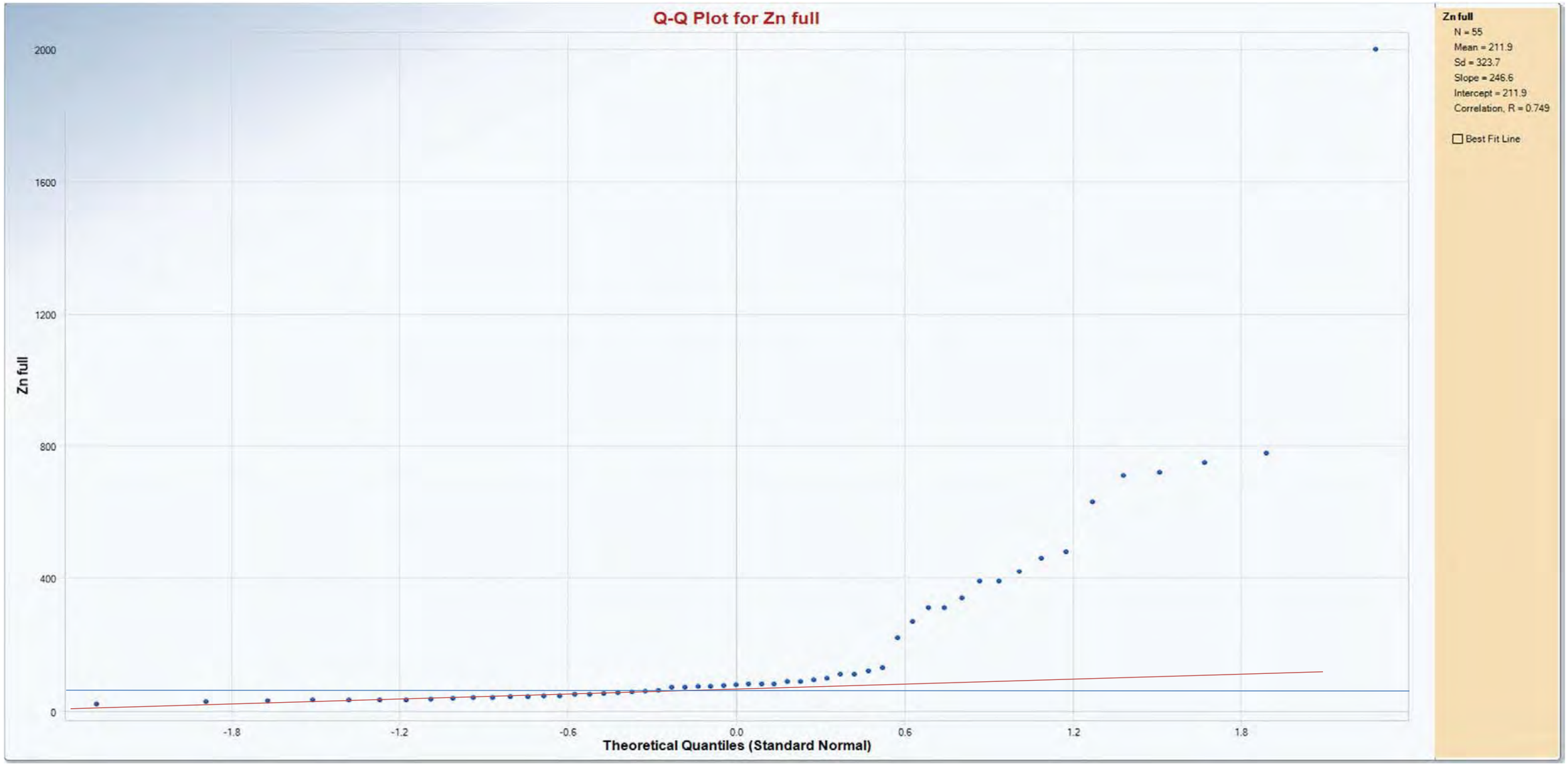

Q-Q Plot
Reported values used for nondetects
Ordered Observations
480
420
360
300
240
180
120
60
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
As full
Ba full
Cu full
As full
Total Number of Data = 55
Number of Non-Detects = 7
Number of Detects = 48
Detected Mean = 33.41
Detected Sd = 45.32
Slope (displayed data) = 32.12
Intercept (displayed data)= 29.29
Correlation, R = 0.723
Ba full
Total Number of Data = 55
Number of Non-Detects = 0
Number of Detects = 55
Detected Mean = 113.4
Detected Sd = 48.3
Slope (displayed data) = 47.58
Intercept (displayed data)= 113.4
Correlation, R = 0.968
Cu full
Total Number of Data = 55
Number of Non-Detects = 0
Number of Detects = 55
Detected Mean = 130.3
Detected Sd = 106.6
Slope (displayed data) = 99.7
Intercept (displayed data)= 130.3
Correlation, R = 0.919
Best Fit Line


Q-Q Plot
Reported values used for nondetects
Ordered Observations
48
40
32
24
16
8
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cd full
Co full
Mo full
Ni full
Cd full
Total Number of Data = 55
Number of Non-Detects = 16
Number of Detects = 39
Detected Mean = 5.382
Detected Sd = 4.634
Slope (displayed data) = 3.817
Intercept (displayed data)= 4.107
Correlation, R = 0.857
Co full
Total Number of Data = 55
Number of Non-Detects = 0
Number of Detects = 55
Detected Mean = 12.59
Detected Sd = 4.928
Slope (displayed data) = 4.97
Intercept (displayed data)= 12.59
Correlation, R = 0.991
Mo full
Total Number of Data = 55
Number of Non-Detects = 15
Number of Detects = 40
Detected Mean = 10.43
Detected Sd = 8.417
Slope (displayed data) = 7.506
Intercept (displayed data)= 7.858
Correlation, R = 0.887
Ni full
Total Number of Data = 55
Number of Non-Detects = 0
Number of Detects = 55
Detected Mean = 20.22
Detected Sd = 14.37
Slope (displayed data) = 14
Intercept (displayed data)= 20.22
Correlation, R = 0.957
Best Fit Line

Q-Q Plot
Reported values used for nondetects
Ordered Observations
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
120
100
80
60
40
20
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Cr full
Hg full
Ag full
V full
Cr full
Total Number of Data = 55
Number of Non-Detects = 0
Number of Detects = 55
Detected Mean = 26.62
Detected Sd = 22.11
Slope (displayed data) = 21.39
Intercept (displayed data)= 26.62
Correlation, R = 0.951
Hg full
Total Number of Data = 55
Number of Non-Detects = 9
Number of Detects = 46
Detected Mean = 9.15
Detected Sd = 16.58
Slope (displayed data) = 11.09
Intercept (displayed data)= 7.669
Correlation, R = 0.703
Ag full
Total Number of Data = 55
Number of Non-Detects = 36
Number of Detects = 19
Detected Mean = 14.99
Detected Sd = 19.55
Slope (displayed data) = 8.558
Intercept (displayed data)= 5.835
Correlation, R = 0.64
V full
Total Number of Data = 55
Number of Non-Detects = 0
Number of Detects = 55
Detected Mean = 63.44
Detected Sd = 28.63
Slope (displayed data) = 28.75
Intercept (displayed data)= 63.44
Correlation, R = 0.987
Best Fit Line


Q-Q Plot
Reported values used for nondetects
Ordered Observations
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Sb full
Be full
Se full
Tl full
Sb full
Total Number of Data = 55
Number of Non-Detects = 54
Number of Detects = 1
Detected Mean = 3.3
Detected Sd = N/A
Slope (displayed data) = 0.0568
Intercept (displayed data)= 2.024
Correlation, R = 0.319
Be full
Total Number of Data = 55
Number of Non-Detects = 49
Number of Detects = 6
Detected Mean = 1.133
Detected Sd = 0.103
Slope (displayed data) = 0.0291
Intercept (displayed data)= 1.015
Correlation, R = 0.546
Se full
Total Number of Data = 55
Number of Non-Detects = 38
Number of Detects = 17
Detected Mean = 2.782
Detected Sd = 0.857
Slope (displayed data) = 0.779
Intercept (displayed data)= 1.551
Correlation, R = 0.803
Tl full
Total Number of Data = 55
Number of Non-Detects = 32
Number of Detects = 23
Detected Mean = 3.104
Detected Sd = 1.499
Slope (displayed data) = 1.193
Intercept (displayed data)= 1.88
Correlation, R = 0.827
Best Fit Line


Q-Q Plot for Pb full
Pb full
N = 53
Mean = 365.6
Sd = 448.8
Slope = 404
Intercept = 365.6
Correlation, R = 0.884
Best Fit Line
Pb full
1750
1500
1250
1000
750
500
250
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)


Q-Q Plot for Zn full
Zn full
N = 55
Mean = 211.9
Sd = 323.7
Slope = 246.6
Intercept = 211.9
Correlation, R = 0.749
Best Fit Line
Zn full
2000
1600
1200
800
400
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Variables excluding nondetects**							
2				**User Selected Options**								
3			Date/Time of Computation	9/6/2016 4:33:07 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8	**Dixon's Outlier Test for Ag EWR**											
9												
10	Total N = 25											
11	Number NDs = 18											
12	Number Detects = 7											
13	10% critical value: 0.434											
14	5% critical value: 0.507											
15	1% critical value: 0.637											
16	Note: NDs excluded from Outlier Test											
17												
18	**1. Data Value 8 is a Potential Outlier (Upper Tail)?**											
19												
20	Test Statistic: 0.452											
21												
22	For 10% significance level, 8 is an outlier.											
23	For 5% significance level, 8 is not an outlier.											
24	For 1% significance level, 8 is not an outlier.											
25												
26	**2. Data Value 1.8 is a Potential Outlier (Lower Tail)?**											
27												
28	Test Statistic: 0.194											
29												
30	For 10% significance level, 1.8 is not an outlier.											
31	For 5% significance level, 1.8 is not an outlier.											
32	For 1% significance level, 1.8 is not an outlier.											
33												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Variables excluding nondetects**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 3:57:48 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8			**Rosner's Outlier Test for 1 Outliers in Ba EWR**									
9												
10												
11			**Total N**	**25**								
12			**Number NDs**	**0**								
13			**Number Detects**	**25**								
14			**Mean of Detects**	**121.1**								
15			**SD of Detects**	**61.63**								
16			**Number of data**	**25**								
17			**Number of suspected outliers**	**1**								
18			**NDs not included in the following:**									
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	121.1	60.39	240	12	1.969	2.82	3.14				
23												
24	For 5% Significance Level, there is no Potential Outlier											
25												
26	For 1% Significance Level, there is no Potential Outlier											
27												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/2/2016 4:48:26 PM								
4				From File	ProUCL Worksheet, All Data.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Ba full**								
9												
10												
11				**Mean**	**113.4**							
12				**Standard Deviation**	**48.3**							
13				**Number of data**	**55**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	113.4	47.86	240	42	2.645	3.165	3.52				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2				**User Selected Options**								
3			Date/Time of Computation	9/6/2016 4:06:52 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Co EWR**								
9												
10												
11				**Mean**	**10.67**							
12				**Standard Deviation**	**4.907**							
13				**Number of data**	**25**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	10.67	4.808	19	22	1.733	2.82	3.14				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 8:48:17 AM								
4				From File	ProUCL Worksheet, All Data.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Co full**								
9												
10												
11			**Mean**	**12.59**								
12			**Standard Deviation**	**4.928**								
13			**Number of data**	**55**								
14			**Number of suspected outliers**	**1**								
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	12.59	4.883	24	17	2.337	3.165	3.52				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2				**User Selected Options**								
3			Date/Time of Computation	9/6/2016 2:44:20 PM								
4				From File	ProUCL Worksheet, Providence Quartz Mine (PQM).xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Co PQM**								
9												
10												
11				**Mean**	**14.18**							
12				**Standard Deviation**	**4.414**							
13				**Number of data**	**30**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	14.18	4.34	24	17	2.262	2.91	3.24				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 4:04:13 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Cr EWR**								
9												
10												
11				**Mean**	**14.69**							
12				**Standard Deviation**	**24.28**							
13				**Number of data**	**25**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	14.69	23.79	80	22	2.745	2.82	3.14				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/2/2016 4:08:39 PM								
4				From File	ProUCL Worksheet, All Data.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Cr full**								
9												
10												
11				**Mean**	**26.62**							
12				**Standard Deviation**	**22.11**							
13				**Number of data**	**55**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	26.62	21.91	80	22	2.436	3.165	3.52				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:07:28 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cu EWR**											
12												
13	**General Statistics**											
14	Total Number of Observations					25	Number of Distinct Observations					18
15							Number of Missing Observations					0
16	Minimum					16	Mean					64.64
17	Maximum					150	Median					62
18	SD					42.78	Std. Error of Mean					8.556
19	Coefficient of Variation					0.662	Skewness					0.656
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.901	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.918	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.128	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.177	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					79.28	95% Adjusted-CLT UCL (Chen-1995)					79.91
31							95% Modified-t UCL (Johnson-1978)					79.46
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.465	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.755	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.139	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.177	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					2.229	k star (bias corrected MLE)					1.988
42	Theta hat (MLE)					29	Theta star (bias corrected MLE)					32.52
43	nu hat (MLE)					111.4	nu star (bias corrected)					99.4
44	MLE Mean (bias corrected)					64.64	MLE Sd (bias corrected)					45.85
45							Approximate Chi Square Value (0.05)					77.4
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					76.07
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					83.01	95% Adjusted Gamma UCL (use when n<50)					84.46
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.926	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.137	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.773				Mean of logged Data		3.928
60					Maximum of Logged Data	5.011				SD of logged Data		0.743
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	93.29				90% Chebyshev (MVUE) UCL		97.91
64					95% Chebyshev (MVUE) UCL	112.3				97.5% Chebyshev (MVUE) UCL		132.4
65					99% Chebyshev (MVUE) UCL	171.8						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	78.71				95% Jackknife UCL		79.28
72					95% Standard Bootstrap UCL	78.71				95% Bootstrap-t UCL		80.11
73					95% Hall's Bootstrap UCL	79.17				95% Percentile Bootstrap UCL		78.76
74					95% BCA Bootstrap UCL	79						
75					90% Chebyshev(Mean, Sd) UCL	90.31				95% Chebyshev(Mean, Sd) UCL		101.9
76					97.5% Chebyshev(Mean, Sd) UCL	118.1				99% Chebyshev(Mean, Sd) UCL		149.8
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	79.28						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 4:31:19 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Ni EWR**								
9												
10												
11				**Mean**	**10.93**							
12				**Standard Deviation**	**14.8**							
13				**Number of data**	**25**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	10.93	14.5	49	22	2.626	2.82	3.14				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 9:17:30 AM								
4				From File	ProUCL Worksheet, All Data.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Ni full**								
9												
10												
11				**Mean**	**20.22**							
12				**Standard Deviation**	**14.37**							
13				**Number of data**	**55**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	20.22	14.24	49	52	2.021	3.165	3.52				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Variables excluding nondetects**							
2			**User Selected Options**									
3		Date/Time of Computation		9/6/2016 4:32:14 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8	**Dixon's Outlier Test for Se EWR**											
9												
10	Total N = 25											
11	Number NDs = 21											
12	Number Detects = 4											
13	10% critical value: 0.679											
14	5% critical value: 0.765											
15	1% critical value: 0.889											
16	Note: NDs excluded from Outlier Test											
17												
18	**1. Data Value 4.1 is a Potential Outlier (Upper Tail)?**											
19												
20	Test Statistic: 0.684											
21												
22	For 10% significance level, 4.1 is an outlier.											
23	For 5% significance level, 4.1 is not an outlier.											
24	For 1% significance level, 4.1 is not an outlier.											
25												
26	**2. Data Value 2.2 is a Potential Outlier (Lower Tail)?**											
27												
28	Test Statistic: 0.105											
29												
30	For 10% significance level, 2.2 is not an outlier.											
31	For 5% significance level, 2.2 is not an outlier.											
32	For 1% significance level, 2.2 is not an outlier.											
33												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Variables excluding nondetects**							
2				**User Selected Options**								
3			Date/Time of Computation	9/6/2016 4:33:49 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8	**Dixon's Outlier Test for Tl EWR**											
9												
10	Total N = 25											
11	Number NDs = 19											
12	Number Detects = 6											
13	10% critical value: 0.482											
14	5% critical value: 0.56											
15	1% critical value: 0.698											
16	Note: NDs excluded from Outlier Test											
17												
18	**1. Data Value 5.6 is a Potential Outlier (Upper Tail)?**											
19												
20	Test Statistic: 0.511											
21												
22	For 10% significance level, 5.6 is an outlier.											
23	For 5% significance level, 5.6 is not an outlier.											
24	For 1% significance level, 5.6 is not an outlier.											
25												
26	**2. Data Value 1.1 is a Potential Outlier (Lower Tail)?**											
27												
28	Test Statistic: 0.000											
29												
30	For 10% significance level, 1.1 is not an outlier.											
31	For 5% significance level, 1.1 is not an outlier.											
32	For 1% significance level, 1.1 is not an outlier.											
33												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 4:34:34 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for V EWR**								
9												
10												
11				**Mean**	**49.68**							
12				**Standard Deviation**	**26.45**							
13				**Number of data**	**25**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	49.68	25.92	110	22	2.327	2.82	3.14				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 9:28:28 AM								
4				From File	ProUCL Worksheet, All Data.xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for V full**								
9												
10												
11				**Mean**	**63.44**							
12				**Standard Deviation**	**28.63**							
13				**Number of data**	**55**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	63.44	28.37	120	18	1.994	3.165	3.52				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2			**User Selected Options**									
3			Date/Time of Computation	9/6/2016 4:34:56 PM								
4				From File	ProUCL Worksheet, Environs Waste Rock (EWR).xls							
5				Full Precision	OFF							
6												
7												
8				**Rosner's Outlier Test for Zn EWR**								
9												
10												
11				**Mean**	**47.52**							
12				**Standard Deviation**	**16.35**							
13				**Number of data**	**25**							
14				**Number of suspected outliers**	**1**							
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	47.52	16.02	82	2	2.152	2.82	3.14				
19												
20	For 5% Significance Level, there is no Potential Outlier											
21												
22	For 1% Significance Level, there is no Potential Outlier											
23												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:20:52 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	**Ag EWR**											
11												
12	**General Statistics**											
13	Total Number of Observations					25	Number of Distinct Observations					8
14	Number of Detects					7	Number of Non-Detects					18
15	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
16	Minimum Detect					1.8	Minimum Non-Detect					1
17	Maximum Detect					8	Maximum Non-Detect					1
18	Variance Detects					3.963	Percent Non-Detects					72%
19	Mean Detects					4.4	SD Detects					1.991
20	Median Detects					4.7	CV Detects					0.452
21	Skewness Detects					0.757	Kurtosis Detects					1.118
22	Mean of Logged Detects					1.389	SD of Logged Detects					0.477
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic					0.945	**Shapiro Wilk GOF Test**					
26	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.201	**Lilliefors GOF Test**					
28	5% Lilliefors Critical Value					0.335	Detected Data appear Normal at 5% Significance Level					
29	**Detected Data appear Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	Mean					1.952	Standard Error of Mean					0.391
33	SD					1.812	95% KM (BCA) UCL					2.62
34	95% KM (t) UCL					2.622	95% KM (Percentile Bootstrap) UCL					2.608
35	95% KM (z) UCL					2.596	95% KM Bootstrap t UCL					2.662
36	90% KM Chebyshev UCL					3.126	95% KM Chebyshev UCL					3.658
37	97.5% KM Chebyshev UCL					4.396	99% KM Chebyshev UCL					5.846
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic					0.232	**Anderson-Darling GOF Test**					
41	5% A-D Critical Value					0.71	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.189	**Kolmogrov-Smirnoff GOF**					
43	5% K-S Critical Value					0.313	Detected data appear Gamma Distributed at 5% Significance Level					
44	**Detected data appear Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)					5.574	k star (bias corrected MLE)					3.28
48	Theta hat (MLE)					0.789	Theta star (bias corrected MLE)					1.341
49	nu hat (MLE)					78.04	nu star (bias corrected)					45.93
50	MLE Mean (bias corrected)					4.4	MLE Sd (bias corrected)					2.429
51												
52	**Gamma Kaplan-Meier (KM) Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.161					nu hat (KM)	58.05
54					Approximate Chi Square Value (58.05, α)	41.54					Adjusted Chi Square Value (58.05, β)	40.58
55					95% Gamma Approximate KM-UCL (use when n>=50)	2.728					95% Gamma Adjusted KM-UCL (use when n<50)	2.792
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.358
63					Maximum	8					Median	0.01
64					SD	2.201					CV	1.62
65					k hat (MLE)	0.272					k star (bias corrected MLE)	0.266
66					Theta hat (MLE)	4.998					Theta star (bias corrected MLE)	5.11
67					nu hat (MLE)	13.59					nu star (bias corrected)	13.29
68					MLE Mean (bias corrected)	1.358					MLE Sd (bias corrected)	2.634
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (13.29, α)	6.088					Adjusted Chi Square Value (13.29, β)	5.757
71					95% Gamma Approximate UCL (use when n>=50)	2.965					95% Gamma Adjusted UCL (use when n<50)	3.135
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.967			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.201			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.335			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.826			Mean in Log Scale			0.093
82					SD in Original Scale	1.965			SD in Log Scale			1.055
83					95% t UCL (assumes normality of ROS data)	2.499			95% Percentile Bootstrap UCL			2.455
84					95% BCA Bootstrap UCL	2.641			95% Bootstrap t UCL			2.813
85					95% H-UCL (Log ROS)	3.327						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.389			95% H-UCL (KM -Log)			2.454
89					KM SD (logged)	0.666			95% Critical H Value (KM-Log)			2.111
90					KM Standard Error of Mean (logged)	0.144						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	1.592			Mean in Log Scale			-0.11
95					SD in Original Scale	2.046			SD in Log Scale			0.984
96					95% t UCL (Assumes normality)	2.292			95% H-Stat UCL			2.388
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	2.622			95% KM (Percentile Bootstrap) UCL			2.608
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:51:47 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	**As EWR**											
11												
12	**General Statistics**											
13	Total Number of Observations					25	Number of Distinct Observations					15
14	Number of Detects					18	Number of Non-Detects					7
15	Number of Distinct Detects					14	Number of Distinct Non-Detects					1
16	Minimum Detect					3.7	Minimum Non-Detect					1
17	Maximum Detect					40	Maximum Non-Detect					1
18	Variance Detects					82.14	Percent Non-Detects					28%
19	Mean Detects					15.77	SD Detects					9.063
20	Median Detects					14.5	CV Detects					0.575
21	Skewness Detects					0.979	Kurtosis Detects					1.594
22	Mean of Logged Detects					2.584	SD of Logged Detects					0.645
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic					0.922	**Shapiro Wilk GOF Test**					
26	5% Shapiro Wilk Critical Value					0.897	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.126	**Lilliefors GOF Test**					
28	5% Lilliefors Critical Value					0.209	Detected Data appear Normal at 5% Significance Level					
29	**Detected Data appear Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	Mean					11.63	Standard Error of Mean					2.056
33	SD					9.991	95% KM (BCA) UCL					14.79
34	95% KM (t) UCL					15.15	95% KM (Percentile Bootstrap) UCL					15.16
35	95% KM (z) UCL					15.01	95% KM Bootstrap t UCL					15.71
36	90% KM Chebyshev UCL					17.8	95% KM Chebyshev UCL					20.59
37	97.5% KM Chebyshev UCL					24.47	99% KM Chebyshev UCL					32.09
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic					0.298	**Anderson-Darling GOF Test**					
41	5% A-D Critical Value					0.746	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.125	**Kolmogrov-Smirnoff GOF**					
43	5% K-S Critical Value					0.205	Detected data appear Gamma Distributed at 5% Significance Level					
44	**Detected data appear Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)					3.026	k star (bias corrected MLE)					2.559
48	Theta hat (MLE)					5.21	Theta star (bias corrected MLE)					6.162
49	nu hat (MLE)					108.9	nu star (bias corrected)					92.12
50	MLE Mean (bias corrected)					15.77	MLE Sd (bias corrected)					9.856
51												
52	**Gamma Kaplan-Meier (KM) Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.356					nu hat (KM)	67.78
54					Approximate Chi Square Value (67.78, α)	49.83					Adjusted Chi Square Value (67.78, β)	48.78
55					95% Gamma Approximate KM-UCL (use when n>=50)	15.82					95% Gamma Adjusted KM-UCL (use when n<50)	16.16
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	11.63
63					Maximum	40					Median	11
64					SD	10.22					CV	0.878
65					k hat (MLE)	0.565					k star (bias corrected MLE)	0.524
66					Theta hat (MLE)	20.6					Theta star (bias corrected MLE)	22.22
67					nu hat (MLE)	28.23					nu star (bias corrected)	26.18
68					MLE Mean (bias corrected)	11.63					MLE Sd (bias corrected)	16.08
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (26.18, α)	15.52					Adjusted Chi Square Value (26.18, β)	14.96
71					95% Gamma Approximate UCL (use when n>=50)	19.63					95% Gamma Adjusted UCL (use when n<50)	20.36
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.943			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.897			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.164			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.209			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	12.23			Mean in Log Scale			2.165
82					SD in Original Scale	9.589			SD in Log Scale			0.894
83					95% t UCL (assumes normality of ROS data)	15.51			95% Percentile Bootstrap UCL			15.51
84					95% BCA Bootstrap UCL	15.89			95% Bootstrap t UCL			16.22
85					95% H-UCL (Log ROS)	19.99						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	1.86			95% H-UCL (KM -Log)			30.61
89					KM SD (logged)	1.276			95% Critical H Value (KM-Log)			2.867
90					KM Standard Error of Mean (logged)	0.263						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	11.49			Mean in Log Scale			1.666
95					SD in Original Scale	10.35			SD in Log Scale			1.597
96					95% t UCL (Assumes normality)	15.03			95% H-Stat UCL			56.26
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	15.15			95% KM (Percentile Bootstrap) UCL			15.16
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:56:03 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ba EWR**											
12												
13	**General Statistics**											
14	Total Number of Observations					25	Number of Distinct Observations					21
15							Number of Missing Observations					0
16	Minimum					44	Mean					121.1
17	Maximum					240	Median					100
18	SD					61.63	Std. Error of Mean					12.33
19	Coefficient of Variation					0.509	Skewness					0.624
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.91	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.918	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.154	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.177	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					142.2	95% Adjusted-CLT UCL (Chen-1995)					143
31							95% Modified-t UCL (Johnson-1978)					142.4
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.397	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.749	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.101	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.175	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					4.069	k star (bias corrected MLE)					3.607
42	Theta hat (MLE)					29.76	Theta star (bias corrected MLE)					33.57
43	nu hat (MLE)					203.4	nu star (bias corrected)					180.4
44	MLE Mean (bias corrected)					121.1	MLE Sd (bias corrected)					63.75
45							Approximate Chi Square Value (0.05)					150.3
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					148.4
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					145.3	95% Adjusted Gamma UCL (use when n<50)					147.1
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.952	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.088	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.784				Mean of logged Data		4.669
60					Maximum of Logged Data	5.481				SD of logged Data		0.524
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	151				90% Chebyshev (MVUE) UCL		161.3
64					95% Chebyshev (MVUE) UCL	179.4				97.5% Chebyshev (MVUE) UCL		204.4
65					99% Chebyshev (MVUE) UCL	253.6						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	141.4				95% Jackknife UCL		142.2
72					95% Standard Bootstrap UCL	140.3				95% Bootstrap-t UCL		143.8
73					95% Hall's Bootstrap UCL	142.9				95% Percentile Bootstrap UCL		140.1
74					95% BCA Bootstrap UCL	142.1						
75					90% Chebyshev(Mean, Sd) UCL	158.1				95% Chebyshev(Mean, Sd) UCL		174.8
76					97.5% Chebyshev(Mean, Sd) UCL	198.1				99% Chebyshev(Mean, Sd) UCL		243.7
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	142.2						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:59:42 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Cd EWR											
11												
12	General Statistics											
13	Total Number of Observations					25	Number of Distinct Observations					12
14	Number of Detects					14	Number of Non-Detects					11
15	Number of Distinct Detects					11	Number of Distinct Non-Detects					1
16	Minimum Detect					1.1	Minimum Non-Detect					1
17	Maximum Detect					6.6	Maximum Non-Detect					1
18	Variance Detects					1.964	Percent Non-Detects					44%
19	Mean Detects					2.536	SD Detects					1.401
20	Median Detects					2.1	CV Detects					0.553
21	Skewness Detects					1.988	Kurtosis Detects					5.148
22	Mean of Logged Detects					0.818	SD of Logged Detects					0.474
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.805	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.874	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.193	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.237	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Approximate Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.86	Standard Error of Mean					0.263
33	SD					1.266	95% KM (BCA) UCL					2.316
34	95% KM (t) UCL					2.309	95% KM (Percentile Bootstrap) UCL					2.3
35	95% KM (z) UCL					2.292	95% KM Bootstrap t UCL					2.533
36	90% KM Chebyshev UCL					2.648	95% KM Chebyshev UCL					3.005
37	97.5% KM Chebyshev UCL					3.501	99% KM Chebyshev UCL					4.474
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.392	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.739	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.164	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.229	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					4.609	k star (bias corrected MLE)					3.669
48	Theta hat (MLE)					0.55	Theta star (bias corrected MLE)					0.691
49	nu hat (MLE)					129	nu star (bias corrected)					102.7
50	MLE Mean (bias corrected)					2.536	MLE Sd (bias corrected)					1.324
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	2.159					nu hat (KM)	108
54					Approximate Chi Square Value (107.95, α)	84.97					Adjusted Chi Square Value (107.95, β)	83.58
55					95% Gamma Approximate KM-UCL (use when n>=50)	2.363					95% Gamma Adjusted KM-UCL (use when n<50)	2.402
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.481
63					Maximum	6.6					Median	1.3
64					SD	1.599					CV	1.08
65					k hat (MLE)	0.456					k star (bias corrected MLE)	0.428
66					Theta hat (MLE)	3.246					Theta star (bias corrected MLE)	3.459
67					nu hat (MLE)	22.81					nu star (bias corrected)	21.41
68					MLE Mean (bias corrected)	1.481					MLE Sd (bias corrected)	2.263
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (21.41, α)	11.9					Adjusted Chi Square Value (21.41, β)	11.41
71					95% Gamma Approximate UCL (use when n>=50)	2.665					95% Gamma Adjusted UCL (use when n<50)	2.778
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.959					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.874					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.135					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.237					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.716					Mean in Log Scale	0.253
82					SD in Original Scale	1.407					SD in Log Scale	0.784
83					95% t UCL (assumes normality of ROS data)	2.198					95% Percentile Bootstrap UCL	2.212
84					95% BCA Bootstrap UCL	2.305					95% Bootstrap t UCL	2.358
85					95% H-UCL (Log ROS)	2.504						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.458					95% H-UCL (KM -Log)	2.257
89					KM SD (logged)	0.531					95% Critical H Value (KM-Log)	1.985
90					KM Standard Error of Mean (logged)	0.11						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	1.64					Mean in Log Scale	0.153
95					SD in Original Scale	1.459					SD in Log Scale	0.841
96					95% t UCL (Assumes normality)	2.139					95% H-Stat UCL	2.465
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Approximate Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	2.309					95% KM (Percentile Bootstrap) UCL	2.3
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:05:33 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Co EWR**											
12												
13	**General Statistics**											
14	Total Number of Observations					25	Number of Distinct Observations					23
15							Number of Missing Observations					0
16	Minimum					3.4	Mean					10.67
17	Maximum					19	Median					9.6
18	SD					4.907	Std. Error of Mean					0.981
19	Coefficient of Variation					0.46	Skewness					0.302
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.933	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.918	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.154	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.177	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					12.35	95% Adjusted-CLT UCL (Chen-1995)					12.35
31							95% Modified-t UCL (Johnson-1978)					12.36
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.415	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.748	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.101	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.175	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					4.52	k star (bias corrected MLE)					4.004
42	Theta hat (MLE)					2.36	Theta star (bias corrected MLE)					2.664
43	nu hat (MLE)					226	nu star (bias corrected)					200.2
44	MLE Mean (bias corrected)					10.67	MLE Sd (bias corrected)					5.331
45							Approximate Chi Square Value (0.05)					168.5
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					166.5
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					12.68	95% Adjusted Gamma UCL (use when n<50)					12.83
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.941	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.224				Mean of logged Data		2.253
60					Maximum of Logged Data	2.944				SD of logged Data		0.509
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	13.28				90% Chebyshev (MVUE) UCL		14.19
64					95% Chebyshev (MVUE) UCL	15.74				97.5% Chebyshev (MVUE) UCL		17.89
65					99% Chebyshev (MVUE) UCL	22.12						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	12.28				95% Jackknife UCL		12.35
72					95% Standard Bootstrap UCL	12.22				95% Bootstrap-t UCL		12.5
73					95% Hall's Bootstrap UCL	12.31				95% Percentile Bootstrap UCL		12.26
74					95% BCA Bootstrap UCL	12.39						
75					90% Chebyshev(Mean, Sd) UCL	13.61				95% Chebyshev(Mean, Sd) UCL		14.95
76					97.5% Chebyshev(Mean, Sd) UCL	16.8				99% Chebyshev(Mean, Sd) UCL		20.43
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	12.35						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:02:33 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cr EWR**											
12												
13	**General Statistics**											
14	Total Number of Observations					25	Number of Distinct Observations					24
15							Number of Missing Observations					0
16	Minimum					1.3	Mean					14.69
17	Maximum					80	Median					4.2
18	SD					24.28	Std. Error of Mean					4.856
19	Coefficient of Variation					1.653	Skewness					2.059
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.542	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.918	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.429	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.177	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					23	95% Adjusted-CLT UCL (Chen-1995)					24.82
31							95% Modified-t UCL (Johnson-1978)					23.33
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					3.402	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.787	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.321	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.182	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					0.708	k star (bias corrected MLE)					0.649
42	Theta hat (MLE)					20.76	Theta star (bias corrected MLE)					22.62
43	nu hat (MLE)					35.39	nu star (bias corrected)					32.47
44	MLE Mean (bias corrected)					14.69	MLE Sd (bias corrected)					18.23
45							Approximate Chi Square Value (0.05)					20.45
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					19.8
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					23.33	95% Adjusted Gamma UCL (use when n<50)					24.1
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.817	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.235	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	0.262			Mean of logged Data			1.835
60					Maximum of Logged Data	4.382			SD of logged Data			1.16
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	23.27			90% Chebyshev (MVUE) UCL			21.34
64					95% Chebyshev (MVUE) UCL	25.67			97.5% Chebyshev (MVUE) UCL			31.69
65					99% Chebyshev (MVUE) UCL	43.51						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	22.68			95% Jackknife UCL			23
72					95% Standard Bootstrap UCL	22.45			95% Bootstrap-t UCL			26.76
73					95% Hall's Bootstrap UCL	21.07			95% Percentile Bootstrap UCL			22.78
74					95% BCA Bootstrap UCL	25.5						
75					90% Chebyshev(Mean, Sd) UCL	29.26			95% Chebyshev(Mean, Sd) UCL			35.86
76					97.5% Chebyshev(Mean, Sd) UCL	45.02			99% Chebyshev(Mean, Sd) UCL			63.01
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	35.86						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:13:14 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Hg EWR											
11												
12	General Statistics											
13	Total Number of Observations					25	Number of Distinct Observations					16
14	Number of Detects					16	Number of Non-Detects					9
15	Number of Distinct Detects					15	Number of Distinct Non-Detects					1
16	Minimum Detect					0.12	Minimum Non-Detect					0.1
17	Maximum Detect					1.4	Maximum Non-Detect					0.1
18	Variance Detects					0.0894	Percent Non-Detects					36%
19	Mean Detects					0.439	SD Detects					0.299
20	Median Detects					0.43	CV Detects					0.682
21	Skewness Detects					2.282	Kurtosis Detects					7.28
22	Mean of Logged Detects					-1.004	SD of Logged Detects					0.622
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.766	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.887	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.221	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.222	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Approximate Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					0.317	Standard Error of Mean					0.0585
33	SD					0.283	95% KM (BCA) UCL					0.416
34	95% KM (t) UCL					0.417	95% KM (Percentile Bootstrap) UCL					0.42
35	95% KM (z) UCL					0.413	95% KM Bootstrap t UCL					0.466
36	90% KM Chebyshev UCL					0.492	95% KM Chebyshev UCL					0.572
37	97.5% KM Chebyshev UCL					0.682	99% KM Chebyshev UCL					0.898
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.484	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.745	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.158	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.217	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					2.937	k star (bias corrected MLE)					2.428
48	Theta hat (MLE)					0.149	Theta star (bias corrected MLE)					0.181
49	nu hat (MLE)					93.98	nu star (bias corrected)					77.69
50	MLE Mean (bias corrected)					0.439	MLE Sd (bias corrected)					0.282
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.253					nu hat (KM)	62.66
54					Approximate Chi Square Value (62.66, α)	45.45					Adjusted Chi Square Value (62.66, β)	44.45
55					95% Gamma Approximate KM-UCL (use when n>=50)	0.437					95% Gamma Adjusted KM-UCL (use when n<50)	0.447
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	0.287
63					Maximum	1.4					Median	0.21
64					SD	0.314					CV	1.095
65					k hat (MLE)	0.647					k star (bias corrected MLE)	0.596
66					Theta hat (MLE)	0.443					Theta star (bias corrected MLE)	0.481
67					nu hat (MLE)	32.36					nu star (bias corrected)	29.81
68					MLE Mean (bias corrected)	0.287					MLE Sd (bias corrected)	0.372
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (29.81, α)	18.34					Adjusted Chi Square Value (29.81, β)	17.73
71					95% Gamma Approximate UCL (use when n>=50)	0.466					95% Gamma Adjusted UCL (use when n<50)	0.482
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.942			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.887			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.197			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.222			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	0.312			Mean in Log Scale			-1.549
82					SD in Original Scale	0.293			SD in Log Scale			0.924
83					95% t UCL (assumes normality of ROS data)	0.412			95% Percentile Bootstrap UCL			0.414
84					95% BCA Bootstrap UCL	0.433			95% Bootstrap t UCL			0.456
85					95% H-UCL (Log ROS)	0.512						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	-1.471			95% H-UCL (KM -Log)			0.449
89					KM SD (logged)	0.788			95% Critical H Value (KM-Log)			2.241
90					KM Standard Error of Mean (logged)	0.163						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	0.299			Mean in Log Scale			-1.721
95					SD in Original Scale	0.304			SD in Log Scale			1.093
96					95% t UCL (Assumes normality)	0.403			95% H-Stat UCL			0.582
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Approximate Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	0.417			95% KM (Percentile Bootstrap) UCL			0.42
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:15:02 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	**Mo EWR**											
11												
12	**General Statistics**											
13	Total Number of Observations					25	Number of Distinct Observations					18
14	Number of Detects					17	Number of Non-Detects					8
15	Number of Distinct Detects					17	Number of Distinct Non-Detects					1
16	Minimum Detect					1.7	Minimum Non-Detect					1
17	Maximum Detect					44	Maximum Non-Detect					1
18	Variance Detects					115.5	Percent Non-Detects					32%
19	Mean Detects					10.95	SD Detects					10.75
20	Median Detects					8.7	CV Detects					0.982
21	Skewness Detects					2.137	Kurtosis Detects					5.166
22	Mean of Logged Detects					2.014	SD of Logged Detects					0.905
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic					0.763	**Shapiro Wilk GOF Test**					
26	5% Shapiro Wilk Critical Value					0.892	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.248	**Lilliefors GOF Test**					
28	5% Lilliefors Critical Value					0.215	Detected Data Not Normal at 5% Significance Level					
29	**Detected Data Not Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	Mean					7.764	Standard Error of Mean					2.014
33	SD					9.769	95% KM (BCA) UCL					11.66
34	95% KM (t) UCL					11.21	95% KM (Percentile Bootstrap) UCL					11.36
35	95% KM (z) UCL					11.08	95% KM Bootstrap t UCL					13.33
36	90% KM Chebyshev UCL					13.81	95% KM Chebyshev UCL					16.54
37	97.5% KM Chebyshev UCL					20.34	99% KM Chebyshev UCL					27.8
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic					0.37	**Anderson-Darling GOF Test**					
41	5% A-D Critical Value					0.756	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.136	**Kolmogrov-Smirnoff GOF**					
43	5% K-S Critical Value					0.213	Detected data appear Gamma Distributed at 5% Significance Level					
44	**Detected data appear Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)					1.464	k star (bias corrected MLE)					1.245
48	Theta hat (MLE)					7.477	Theta star (bias corrected MLE)					8.794
49	nu hat (MLE)					49.78	nu star (bias corrected)					42.33
50	MLE Mean (bias corrected)					10.95	MLE Sd (bias corrected)					9.811
51												
52	**Gamma Kaplan-Meier (KM) Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	0.632					nu hat (KM)	31.58
54					Approximate Chi Square Value (31.58, α)	19.74					Adjusted Chi Square Value (31.58, β)	19.1
55					95% Gamma Approximate KM-UCL (use when n>=50)	12.42					95% Gamma Adjusted KM-UCL (use when n<50)	12.84
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	7.447
63					Maximum	44					Median	3.1
64					SD	10.2					CV	1.37
65					k hat (MLE)	0.323					k star (bias corrected MLE)	0.311
66					Theta hat (MLE)	23.08					Theta star (bias corrected MLE)	23.98
67					nu hat (MLE)	16.13					nu star (bias corrected)	15.53
68					MLE Mean (bias corrected)	7.447					MLE Sd (bias corrected)	13.36
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (15.53, α)	7.632					Adjusted Chi Square Value (15.53, β)	7.256
71					95% Gamma Approximate UCL (use when n>=50)	15.15					95% Gamma Adjusted UCL (use when n<50)	15.94
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.966					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.892					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.13					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.215					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	7.738					Mean in Log Scale	1.298
82					SD in Original Scale	9.992					SD in Log Scale	1.336
83					95% t UCL (assumes normality of ROS data)	11.16					95% Percentile Bootstrap UCL	11.38
84					95% BCA Bootstrap UCL	12.17					95% Bootstrap t UCL	13.75
85					95% H-UCL (Log ROS)	20.01						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	1.37					95% H-UCL (KM -Log)	15.43
89					KM SD (logged)	1.186					95% Critical H Value (KM-Log)	2.741
90					KM Standard Error of Mean (logged)	0.244						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	7.604					Mean in Log Scale	1.148
95					SD in Original Scale	10.09					SD in Log Scale	1.486
96					95% t UCL (Assumes normality)	11.06					95% H-Stat UCL	24.87
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Gamma Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (Percentile Bootstrap) UCL	11.36					95% GROS Adjusted Gamma UCL	15.94
104					95% Adjusted Gamma KM-UCL	12.84						

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:17:08 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Ni EWR											
12												
13	General Statistics											
14	Total Number of Observations					25	Number of Distinct Observations					22
15							Number of Missing Observations					0
16	Minimum					1.9	Mean					10.93
17	Maximum					49	Median					5.1
18	SD					14.8	Std. Error of Mean					2.959
19	Coefficient of Variation					1.354	Skewness					2.021
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.56	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.918	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.433	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.177	Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL					15.99	95% Adjusted-CLT UCL (Chen-1995)					17.07
31							95% Modified-t UCL (Johnson-1978)					16.19
32												
33	Gamma GOF Test											
34	A-D Test Statistic					3.493	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.772	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.391	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.179	Data Not Gamma Distributed at 5% Significance Level					
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					1.05	k star (bias corrected MLE)					0.95
42	Theta hat (MLE)					10.41	Theta star (bias corrected MLE)					11.5
43	nu hat (MLE)					52.48	nu star (bias corrected)					47.51
44	MLE Mean (bias corrected)					10.93	MLE Sd (bias corrected)					11.21
45							Approximate Chi Square Value (0.05)					32.69
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					31.86
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					15.88	95% Adjusted Gamma UCL (use when n<50)					16.3
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.791	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.33	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	0.642			Mean of logged Data			1.844
60					Maximum of Logged Data	3.892			SD of logged Data			0.932
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	15.43			90% Chebyshev (MVUE) UCL			15.51
64					95% Chebyshev (MVUE) UCL	18.22			97.5% Chebyshev (MVUE) UCL			21.97
65					99% Chebyshev (MVUE) UCL	29.36						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	15.8			95% Jackknife UCL			15.99
72					95% Standard Bootstrap UCL	15.75			95% Bootstrap-t UCL			18.61
73					95% Hall's Bootstrap UCL	14.88			95% Percentile Bootstrap UCL			16
74					95% BCA Bootstrap UCL	16.63						
75					90% Chebyshev(Mean, Sd) UCL	19.81			95% Chebyshev(Mean, Sd) UCL			23.83
76					97.5% Chebyshev(Mean, Sd) UCL	29.41			99% Chebyshev(Mean, Sd) UCL			40.37
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	23.83						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:10:02 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Pb EWR**											
12												
13	**General Statistics**											
14	Total Number of Observations					25	Number of Distinct Observations					19
15							Number of Missing Observations					0
16	Minimum					7.3	Mean					113.3
17	Maximum					530	Median					30
18	SD					156	Std. Error of Mean					31.21
19	Coefficient of Variation					1.377	Skewness					1.545
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.697	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.918	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.344	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.177	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					166.7	95% Adjusted-CLT UCL (Chen-1995)					174.9
31							95% Modified-t UCL (Johnson-1978)					168.3
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					1.647	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.792	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.218	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.182	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					0.659	k star (bias corrected MLE)					0.606
42	Theta hat (MLE)					172	Theta star (bias corrected MLE)					186.9
43	nu hat (MLE)					32.94	nu star (bias corrected)					30.32
44	MLE Mean (bias corrected)					113.3	MLE Sd (bias corrected)					145.5
45							Approximate Chi Square Value (0.05)					18.74
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					18.12
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					183.3	95% Adjusted Gamma UCL (use when n<50)					189.6
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.891	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.171	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level					
56	**Data appear Approximate Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.988			Mean of logged Data			3.805
60					Maximum of Logged Data	6.273			SD of logged Data			1.39
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	279			90% Chebyshev (MVUE) UCL			221.8
64					95% Chebyshev (MVUE) UCL	272.3			97.5% Chebyshev (MVUE) UCL			342.5
65					99% Chebyshev (MVUE) UCL	480.3						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	164.6			95% Jackknife UCL			166.7
72					95% Standard Bootstrap UCL	162.7			95% Bootstrap-t UCL			187.5
73					95% Hall's Bootstrap UCL	167.3			95% Percentile Bootstrap UCL			166
74					95% BCA Bootstrap UCL	176.7						
75					90% Chebyshev(Mean, Sd) UCL	206.9			95% Chebyshev(Mean, Sd) UCL			249.3
76					97.5% Chebyshev(Mean, Sd) UCL	308.2			99% Chebyshev(Mean, Sd) UCL			423.8
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	249.3						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:19:01 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Se EWR											
11												
12	General Statistics											
13	Total Number of Observations					25	Number of Distinct Observations					5
14	Number of Detects					4	Number of Non-Detects					21
15	Number of Distinct Detects					4	Number of Distinct Non-Detects					1
16	Minimum Detect					2.2	Minimum Non-Detect					1
17	Maximum Detect					4.1	Maximum Non-Detect					1
18	Variance Detects					0.729	Percent Non-Detects					84%
19	Mean Detects					2.875	SD Detects					0.854
20	Median Detects					2.6	CV Detects					0.297
21	Skewness Detects					1.524	Kurtosis Detects					2.239
22	Mean of Logged Detects					1.026	SD of Logged Detects					0.275
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.861	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.285	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.443	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.3	Standard Error of Mean					0.173
33	SD					0.748	95% KM (BCA) UCL					N/A
34	95% KM (t) UCL					1.596	95% KM (Percentile Bootstrap) UCL					N/A
35	95% KM (z) UCL					1.584	95% KM Bootstrap t UCL					N/A
36	90% KM Chebyshev UCL					1.818	95% KM Chebyshev UCL					2.053
37	97.5% KM Chebyshev UCL					2.379	99% KM Chebyshev UCL					3.02
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.382	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.657	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.261	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					16.88	k star (bias corrected MLE)					4.386
48	Theta hat (MLE)					0.17	Theta star (bias corrected MLE)					0.656
49	nu hat (MLE)					135	nu star (bias corrected)					35.09
50	MLE Mean (bias corrected)					2.875	MLE Sd (bias corrected)					1.373
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	3.018					nu hat (KM)	150.9
54					Approximate Chi Square Value (150.89, α)	123.5					Adjusted Chi Square Value (150.89, β)	121.8
55					95% Gamma Approximate KM-UCL (use when n>=50)	1.588					95% Gamma Adjusted KM-UCL (use when n<50)	1.61
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	0.614
63					Maximum	4.1					Median	0.01
64					SD	1.105					CV	1.798
65					k hat (MLE)	0.29					k star (bias corrected MLE)	0.282
66					Theta hat (MLE)	2.119					Theta star (bias corrected MLE)	2.18
67					nu hat (MLE)	14.5					nu star (bias corrected)	14.09
68					MLE Mean (bias corrected)	0.614					MLE Sd (bias corrected)	1.157
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (14.09, α)	6.634					Adjusted Chi Square Value (14.09, β)	6.287
71					95% Gamma Approximate UCL (use when n>=50)	1.305					95% Gamma Adjusted UCL (use when n<50)	N/A
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.905					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.748					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.245					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.443					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.077					Mean in Log Scale	-0.242
82					SD in Original Scale	0.939					SD in Log Scale	0.817
83					95% t UCL (assumes normality of ROS data)	1.399					95% Percentile Bootstrap UCL	1.405
84					95% BCA Bootstrap UCL	1.469					95% Bootstrap t UCL	1.508
85					95% H-UCL (Log ROS)	1.601						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.164					95% H-UCL (KM -Log)	1.474
89					KM SD (logged)	0.388					95% Critical H Value (KM-Log)	1.872
90					KM Standard Error of Mean (logged)	0.0896						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	0.88					Mean in Log Scale	-0.418
95					SD in Original Scale	0.939					SD in Log Scale	0.651
96					95% t UCL (Assumes normality)	1.201					95% H-Stat UCL	1.075
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	1.596					95% KM (Percentile Bootstrap) UCL	N/A
104					**Warning: One or more Recommended UCL(s) not available!**							

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:22:16 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	TI EWR											
11												
12	General Statistics											
13	Total Number of Observations					25	Number of Distinct Observations					6
14	Number of Detects					6	Number of Non-Detects					19
15	Number of Distinct Detects					5	Number of Distinct Non-Detects					1
16	Minimum Detect					1.1	Minimum Non-Detect					1
17	Maximum Detect					5.6	Maximum Non-Detect					1
18	Variance Detects					2.807	Percent Non-Detects					76%
19	Mean Detects					2.833	SD Detects					1.675
20	Median Detects					2.95	CV Detects					0.591
21	Skewness Detects					0.696	Kurtosis Detects					0.567
22	Mean of Logged Detects					0.877	SD of Logged Detects					0.653
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.901	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.224	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.362	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.44	Standard Error of Mean					0.237
33	SD					1.084	95% KM (BCA) UCL					1.868
34	95% KM (t) UCL					1.846	95% KM (Percentile Bootstrap) UCL					1.828
35	95% KM (z) UCL					1.831	95% KM Bootstrap t UCL					1.964
36	90% KM Chebyshev UCL					2.152	95% KM Chebyshev UCL					2.475
37	97.5% KM Chebyshev UCL					2.923	99% KM Chebyshev UCL					3.802
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.411	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.701	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.23	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.334	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					3.203	k star (bias corrected MLE)					1.712
48	Theta hat (MLE)					0.885	Theta star (bias corrected MLE)					1.655
49	nu hat (MLE)					38.43	nu star (bias corrected)					20.55
50	MLE Mean (bias corrected)					2.833	MLE Sd (bias corrected)					2.165
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.766					nu hat (KM)	88.28
54					Approximate Chi Square Value (88.28, α)	67.62					Adjusted Chi Square Value (88.28, β)	66.39
55					95% Gamma Approximate KM-UCL (use when n>=50)	1.88					95% Gamma Adjusted KM-UCL (use when n<50)	1.915
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	0.697
63					Maximum	5.6					Median	0.01
64					SD	1.445					CV	2.073
65					k hat (MLE)	0.253					k star (bias corrected MLE)	0.249
66					Theta hat (MLE)	2.754					Theta star (bias corrected MLE)	2.795
67					nu hat (MLE)	12.66					nu star (bias corrected)	12.47
68					MLE Mean (bias corrected)	0.697					MLE Sd (bias corrected)	1.396
69											Adjusted Level of Significance (β)	0.0395
70					Approximate Chi Square Value (12.47, α)	5.539					Adjusted Chi Square Value (12.47, β)	5.226
71					95% Gamma Approximate UCL (use when n>=50)	1.569					95% Gamma Adjusted UCL (use when n<50)	1.663
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.88			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.788			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.237			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.362			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	0.884			Mean in Log Scale			-1.141
82					SD in Original Scale	1.37			SD in Log Scale			1.526
83					95% t UCL (assumes normality of ROS data)	1.353			95% Percentile Bootstrap UCL			1.369
84					95% BCA Bootstrap UCL	1.491			95% Bootstrap t UCL			1.707
85					95% H-UCL (Log ROS)	2.802						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.211			95% H-UCL (KM -Log)			1.668
89					KM SD (logged)	0.475			95% Critical H Value (KM-Log)			1.939
90					KM Standard Error of Mean (logged)	0.104						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	1.06			Mean in Log Scale			-0.316
95					SD in Original Scale	1.272			SD in Log Scale			0.747
96					95% t UCL (Assumes normality)	1.495			95% H-Stat UCL			1.346
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	1.846			95% KM (Percentile Bootstrap) UCL			1.828
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:24:21 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**V EWR**											
12												
13	**General Statistics**											
14	Total Number of Observations					25	Number of Distinct Observations					17
15							Number of Missing Observations					0
16	Minimum					14	Mean					49.68
17	Maximum					110	Median					47
18	SD					26.45	Std. Error of Mean					5.291
19	Coefficient of Variation					0.532	Skewness					1.167
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.859	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.918	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.235	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.177	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					58.73	95% Adjusted-CLT UCL (Chen-1995)					59.7
31							95% Modified-t UCL (Johnson-1978)					58.94
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.641	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.749	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.169	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.175	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					4.016	k star (bias corrected MLE)					3.561
42	Theta hat (MLE)					12.37	Theta star (bias corrected MLE)					13.95
43	nu hat (MLE)					200.8	nu star (bias corrected)					178.1
44	MLE Mean (bias corrected)					49.68	MLE Sd (bias corrected)					26.33
45							Approximate Chi Square Value (0.05)					148.2
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					146.3
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					59.69	95% Adjusted Gamma UCL (use when n<50)					60.45
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.949	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.143	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.639				Mean of logged Data		3.776
60					Maximum of Logged Data	4.7				SD of logged Data		0.527
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	62.03				90% Chebyshev (MVUE) UCL		66.27
64					95% Chebyshev (MVUE) UCL	73.73				97.5% Chebyshev (MVUE) UCL		84.07
65					99% Chebyshev (MVUE) UCL	104.4						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	58.38				95% Jackknife UCL		58.73
72					95% Standard Bootstrap UCL	58.07				95% Bootstrap-t UCL		60.19
73					95% Hall's Bootstrap UCL	59.75				95% Percentile Bootstrap UCL		58.2
74					95% BCA Bootstrap UCL	59.96						
75					90% Chebyshev(Mean, Sd) UCL	65.55				95% Chebyshev(Mean, Sd) UCL		72.74
76					97.5% Chebyshev(Mean, Sd) UCL	82.72				99% Chebyshev(Mean, Sd) UCL		102.3
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	60.45						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 4:25:50 PM								
5	From File			ProUCL Worksheet, Environs Waste Rock (EWR).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Zn EWR											
12												
13	General Statistics											
14	Total Number of Observations					25	Number of Distinct Observations					20
15							Number of Missing Observations					0
16	Minimum					22	Mean					47.52
17	Maximum					82	Median					43
18	SD					16.35	Std. Error of Mean					3.27
19	Coefficient of Variation					0.344	Skewness					0.792
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.924	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.918	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.137	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.177	Data appear Normal at 5% Significance Level					
26	Data appear Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL					53.11	95% Adjusted-CLT UCL (Chen-1995)					53.45
31							95% Modified-t UCL (Johnson-1978)					53.2
32												
33	Gamma GOF Test											
34	A-D Test Statistic					0.357	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.745	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.0959	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.175	Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					9.354	k star (bias corrected MLE)					8.258
42	Theta hat (MLE)					5.08	Theta star (bias corrected MLE)					5.755
43	nu hat (MLE)					467.7	nu star (bias corrected)					412.9
44	MLE Mean (bias corrected)					47.52	MLE Sd (bias corrected)					16.54
45							Approximate Chi Square Value (0.05)					366.8
46	Adjusted Level of Significance					0.0395	Adjusted Chi Square Value					363.8
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					53.49	95% Adjusted Gamma UCL (use when n<50)					53.93
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.973	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0784	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.177	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.091			Mean of logged Data			3.807
60					Maximum of Logged Data	4.407			SD of logged Data			0.335
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	53.98			90% Chebyshev (MVUE) UCL			57.24
64					95% Chebyshev (MVUE) UCL	61.65			97.5% Chebyshev (MVUE) UCL			67.77
65					99% Chebyshev (MVUE) UCL	79.8						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	52.9			95% Jackknife UCL			53.11
72					95% Standard Bootstrap UCL	52.7			95% Bootstrap-t UCL			53.59
73					95% Hall's Bootstrap UCL	53.41			95% Percentile Bootstrap UCL			52.84
74					95% BCA Bootstrap UCL	53.4						
75					90% Chebyshev(Mean, Sd) UCL	57.33			95% Chebyshev(Mean, Sd) UCL			61.77
76					97.5% Chebyshev(Mean, Sd) UCL	67.94			99% Chebyshev(Mean, Sd) UCL			80.06
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	53.11						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:05:28 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Ag PQM											
11												
12	General Statistics											
13	Total Number of Observations					30	Number of Distinct Observations					12
14	Number of Detects					12	Number of Non-Detects					18
15	Number of Distinct Detects					11	Number of Distinct Non-Detects					1
16	Minimum Detect					1.4	Minimum Non-Detect					1
17	Maximum Detect					73	Maximum Non-Detect					1
18	Variance Detects					510.1	Percent Non-Detects					60%
19	Mean Detects					21.18	SD Detects					22.59
20	Median Detects					13	CV Detects					1.067
21	Skewness Detects					1.508	Kurtosis Detects					1.612
22	Mean of Logged Detects					2.461	SD of Logged Detects					1.242
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.812	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.859	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.225	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.256	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Approximate Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					9.07	Standard Error of Mean					3.218
33	SD					16.87	95% KM (BCA) UCL					15.22
34	95% KM (t) UCL					14.54	95% KM (Percentile Bootstrap) UCL					14.55
35	95% KM (z) UCL					14.36	95% KM Bootstrap t UCL					19.26
36	90% KM Chebyshev UCL					18.72	95% KM Chebyshev UCL					23.1
37	97.5% KM Chebyshev UCL					29.16	99% KM Chebyshev UCL					41.09
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.198	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.758	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.121	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.253	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					0.978	k star (bias corrected MLE)					0.789
48	Theta hat (MLE)					21.66	Theta star (bias corrected MLE)					26.85
49	nu hat (MLE)					23.46	nu star (bias corrected)					18.93
50	MLE Mean (bias corrected)					21.18	MLE Sd (bias corrected)					23.84
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	0.289					nu hat (KM)	17.34
54					Approximate Chi Square Value (17.34, α)	8.913					Adjusted Chi Square Value (17.34, β)	8.564
55					95% Gamma Approximate KM-UCL (use when n>=50)	17.64					95% Gamma Adjusted KM-UCL (use when n<50)	18.36
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	8.476
63					Maximum	73					Median	0.01
64					SD	17.46					CV	2.059
65					k hat (MLE)	0.19					k star (bias corrected MLE)	0.193
66					Theta hat (MLE)	44.73					Theta star (bias corrected MLE)	43.97
67					nu hat (MLE)	11.37					nu star (bias corrected)	11.57
68					MLE Mean (bias corrected)	8.476					MLE Sd (bias corrected)	19.3
69											Adjusted Level of Significance (β)	0.041
70					Approximate Chi Square Value (11.57, α)	4.943					Adjusted Chi Square Value (11.57, β)	4.694
71					95% Gamma Approximate UCL (use when n>=50)	19.83					95% Gamma Adjusted UCL (use when n<50)	20.88
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.966			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.859			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.117			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.256			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	8.776			Mean in Log Scale			0.147
82					SD in Original Scale	17.31			SD in Log Scale			2.348
83					95% t UCL (assumes normality of ROS data)	14.15			95% Percentile Bootstrap UCL			14.04
84					95% BCA Bootstrap UCL	15.81			95% Bootstrap t UCL			19.7
85					95% H-UCL (Log ROS)	129.6						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.984			95% H-UCL (KM -Log)			16.41
89					KM SD (logged)	1.421			95% Critical H Value (KM-Log)			3.049
90					KM Standard Error of Mean (logged)	0.271						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	8.77			Mean in Log Scale			0.568
95					SD in Original Scale	17.31			SD in Log Scale			1.748
96					95% t UCL (Assumes normality)	14.14			95% H-Stat UCL			25.65
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Approximate Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	14.54			95% KM (Percentile Bootstrap) UCL			14.55
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:12:15 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	As PQM											
12												
13	General Statistics											
14	Total Number of Observations					30	Number of Distinct Observations				22	
15							Number of Missing Observations				0	
16	Minimum					11	Mean				44	
17	Maximum					250	Median				21.5	
18	SD					54.5	Std. Error of Mean				9.951	
19	Coefficient of Variation					1.239	Skewness				2.984	
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.582	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.927	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.272	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.162	Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL					60.91	95% Adjusted-CLT UCL (Chen-1995)				66.16	
31							95% Modified-t UCL (Johnson-1978)				61.81	
32												
33	Gamma GOF Test											
34	A-D Test Statistic					1.856	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.766	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.235	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.163	Data Not Gamma Distributed at 5% Significance Level					
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					1.391	k star (bias corrected MLE)				1.274	
42	Theta hat (MLE)					31.63	Theta star (bias corrected MLE)				34.53	
43	nu hat (MLE)					83.47	nu star (bias corrected)				76.46	
44	MLE Mean (bias corrected)					44	MLE Sd (bias corrected)				38.98	
45							Approximate Chi Square Value (0.05)				57.32	
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value				56.36	
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					58.69	95% Adjusted Gamma UCL (use when n<50)				59.69	
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.894	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.208	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.398			Mean of logged Data			3.384
60					Maximum of Logged Data	5.521			SD of logged Data			0.811
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	57.48			90% Chebyshev (MVUE) UCL			60.19
64					95% Chebyshev (MVUE) UCL	69.17			97.5% Chebyshev (MVUE) UCL			81.63
65					99% Chebyshev (MVUE) UCL	106.1						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	60.37			95% Jackknife UCL			60.91
72					95% Standard Bootstrap UCL	60.27			95% Bootstrap-t UCL			85.14
73					95% Hall's Bootstrap UCL	142.6			95% Percentile Bootstrap UCL			61.73
74					95% BCA Bootstrap UCL	65.2						
75					90% Chebyshev(Mean, Sd) UCL	73.85			95% Chebyshev(Mean, Sd) UCL			87.38
76					97.5% Chebyshev(Mean, Sd) UCL	106.1			99% Chebyshev(Mean, Sd) UCL			143
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	87.38						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:16:13 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ba PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					18
15							Number of Missing Observations					0
16	Minimum					44	Mean					107
17	Maximum					190	Median					105
18	SD					33.28	Std. Error of Mean					6.076
19	Coefficient of Variation					0.311	Skewness					0.358
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.979	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.0857	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					117.3	95% Adjusted-CLT UCL (Chen-1995)					117.4
31							95% Modified-t UCL (Johnson-1978)					117.4
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.262	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.745	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.117	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.16	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					10.13	k star (bias corrected MLE)					9.138
42	Theta hat (MLE)					10.56	Theta star (bias corrected MLE)					11.71
43	nu hat (MLE)					607.7	nu star (bias corrected)					548.3
44	MLE Mean (bias corrected)					107	MLE Sd (bias corrected)					35.39
45							Approximate Chi Square Value (0.05)					494.9
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					492
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					118.5	95% Adjusted Gamma UCL (use when n<50)					119.2
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.967	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.124	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.784				Mean of logged Data		4.622
60					Maximum of Logged Data	5.247				SD of logged Data		0.332
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	120.3				90% Chebyshev (MVUE) UCL		127.2
64					95% Chebyshev (MVUE) UCL	136.2				97.5% Chebyshev (MVUE) UCL		148.7
65					99% Chebyshev (MVUE) UCL	173.2						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	117				95% Jackknife UCL		117.3
72					95% Standard Bootstrap UCL	116.7				95% Bootstrap-t UCL		118
73					95% Hall's Bootstrap UCL	117.8				95% Percentile Bootstrap UCL		116.8
74					95% BCA Bootstrap UCL	117						
75					90% Chebyshev(Mean, Sd) UCL	125.2				95% Chebyshev(Mean, Sd) UCL		133.5
76					97.5% Chebyshev(Mean, Sd) UCL	144.9				99% Chebyshev(Mean, Sd) UCL		167.4
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	117.3						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:18:21 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Be PQM											
11												
12	General Statistics											
13	Total Number of Observations					30	Number of Distinct Observations					4
14	Number of Detects					6	Number of Non-Detects					24
15	Number of Distinct Detects					4	Number of Distinct Non-Detects					1
16	Minimum Detect					1	Minimum Non-Detect					1
17	Maximum Detect					1.3	Maximum Non-Detect					1
18	Variance Detects					0.0107	Percent Non-Detects					80%
19	Mean Detects					1.133	SD Detects					0.103
20	Median Detects					1.1	CV Detects					0.0911
21	Skewness Detects					0.666	Kurtosis Detects					0.586
22	Mean of Logged Detects					0.122	SD of Logged Detects					0.0898
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.916	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.293	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.362	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.027	Standard Error of Mean					0.0136
33	SD					0.068	95% KM (BCA) UCL					N/A
34	95% KM (t) UCL					1.05	95% KM (Percentile Bootstrap) UCL					N/A
35	95% KM (z) UCL					1.049	95% KM Bootstrap t UCL					N/A
36	90% KM Chebyshev UCL					1.067	95% KM Chebyshev UCL					1.086
37	97.5% KM Chebyshev UCL					1.112	99% KM Chebyshev UCL					1.162
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.413	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.696	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.297	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.332	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					147.5	k star (bias corrected MLE)					73.86
48	Theta hat (MLE)					0.00768	Theta star (bias corrected MLE)					0.0153
49	nu hat (MLE)					1770	nu star (bias corrected)					886.3
50	MLE Mean (bias corrected)					1.133	MLE Sd (bias corrected)					0.132
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	228					nu hat (KM)	13682
54					Approximate Chi Square Value (N/A, α)	13411					Adjusted Chi Square Value (N/A, β)	13396
55					95% Gamma Approximate KM-UCL (use when n>=50)	1.047					95% Gamma Adjusted KM-UCL (use when n<50)	1.049
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.31					Mean	0.776
63					Maximum	1.3					Median	0.766
64					SD	0.245					CV	0.316
65					k hat (MLE)	9.601					k star (bias corrected MLE)	8.663
66					Theta hat (MLE)	0.0809					Theta star (bias corrected MLE)	0.0896
67					nu hat (MLE)	576.1					nu star (bias corrected)	519.8
68					MLE Mean (bias corrected)	0.776					MLE Sd (bias corrected)	0.264
69											Adjusted Level of Significance (β)	0.041
70					Approximate Chi Square Value (519.78, α)	467.9					Adjusted Chi Square Value (519.78, β)	465.1
71					95% Gamma Approximate UCL (use when n>=50)	0.862					95% Gamma Adjusted UCL (use when n<50)	0.868
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.924					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.282					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.362					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	0.836					Mean in Log Scale	-0.205
82					SD in Original Scale	0.193					SD in Log Scale	0.229
83					95% t UCL (assumes normality of ROS data)	0.896					95% Percentile Bootstrap UCL	0.893
84					95% BCA Bootstrap UCL	0.895					95% Bootstrap t UCL	0.9
85					95% H-UCL (Log ROS)	0.902						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.0244					95% H-UCL (KM -Log)	N/A
89					KM SD (logged)	0.061					95% Critical H Value (KM-Log)	N/A
90					KM Standard Error of Mean (logged)	0.0122						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	0.627					Mean in Log Scale	-0.53
95					SD in Original Scale	0.261					SD in Log Scale	0.334
96					95% t UCL (Assumes normality)	0.708					95% H-Stat UCL	0.697
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	1.05					95% KM (Percentile Bootstrap) UCL	N/A
104					**Warning: One or more Recommended UCL(s) not available!**							

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:38:54 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Cd PQM											
11												
12	General Statistics											
13	Total Number of Observations					30	Number of Distinct Observations					19
14	Number of Detects					25	Number of Non-Detects					5
15	Number of Distinct Detects					19	Number of Distinct Non-Detects					1
16	Minimum Detect					1	Minimum Non-Detect					1
17	Maximum Detect					19	Maximum Non-Detect					1
18	Variance Detects					25.57	Percent Non-Detects					16.67%
19	Mean Detects					6.976	SD Detects					5.056
20	Median Detects					6	CV Detects					0.725
21	Skewness Detects					0.99	Kurtosis Detects					0.652
22	Mean of Logged Detects					1.651	SD of Logged Detects					0.835
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.896	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.918	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.129	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.177	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Approximate Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					5.98	Standard Error of Mean					0.939
33	SD					5.041	95% KM (BCA) UCL					7.523
34	95% KM (t) UCL					7.576	95% KM (Percentile Bootstrap) UCL					7.47
35	95% KM (z) UCL					7.525	95% KM Bootstrap t UCL					7.787
36	90% KM Chebyshev UCL					8.798	95% KM Chebyshev UCL					10.07
37	97.5% KM Chebyshev UCL					11.85	99% KM Chebyshev UCL					15.33
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.341	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.758	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.116	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.177	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					1.863	k star (bias corrected MLE)					1.666
48	Theta hat (MLE)					3.744	Theta star (bias corrected MLE)					4.187
49	nu hat (MLE)					93.16	nu star (bias corrected)					83.31
50	MLE Mean (bias corrected)					6.976	MLE Sd (bias corrected)					5.404
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.407					nu hat (KM)	84.43
54					Approximate Chi Square Value (84.43, α)	64.25					Adjusted Chi Square Value (84.43, β)	63.24
55					95% Gamma Approximate KM-UCL (use when n>=50)	7.858					95% Gamma Adjusted KM-UCL (use when n<50)	7.984
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	5.824
63					Maximum	19					Median	5.5
64					SD	5.294					CV	0.909
65					k hat (MLE)	0.593					k star (bias corrected MLE)	0.556
66					Theta hat (MLE)	9.814					Theta star (bias corrected MLE)	10.47
67					nu hat (MLE)	35.6					nu star (bias corrected)	33.38
68					MLE Mean (bias corrected)	5.824					MLE Sd (bias corrected)	7.809
69											Adjusted Level of Significance (β)	0.041
70					Approximate Chi Square Value (33.38, α)	21.17					Adjusted Chi Square Value (33.38, β)	20.61
71					95% Gamma Approximate UCL (use when n>=50)	9.183					95% Gamma Adjusted UCL (use when n<50)	9.434
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.949					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.918					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.166					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.177					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	5.95					Mean in Log Scale	1.334
82					SD in Original Scale	5.159					SD in Log Scale	1.055
83					95% t UCL (assumes normality of ROS data)	7.55					95% Percentile Bootstrap UCL	7.434
84					95% BCA Bootstrap UCL	7.636					95% Bootstrap t UCL	7.748
85					95% H-UCL (Log ROS)	10.91						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	1.376					95% H-UCL (KM -Log)	9.791
89					KM SD (logged)	0.967					95% Critical H Value (KM-Log)	2.437
90					KM Standard Error of Mean (logged)	0.18						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	5.897					Mean in Log Scale	1.26
95					SD in Original Scale	5.214					SD in Log Scale	1.169
96					95% t UCL (Assumes normality)	7.514					95% H-Stat UCL	12.53
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Approximate Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	7.576					95% KM (Percentile Bootstrap) UCL	7.47
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:42:29 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Co PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					14
15							Number of Missing Observations					0
16	Minimum					4.4	Mean					14.18
17	Maximum					24	Median					14
18	SD					4.414	Std. Error of Mean					0.806
19	Coefficient of Variation					0.311	Skewness					0.275
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.932	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.183	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data Not Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					15.55	95% Adjusted-CLT UCL (Chen-1995)					15.55
31							95% Modified-t UCL (Johnson-1978)					15.56
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					1.101	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.746	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.181	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.16	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					9.497	k star (bias corrected MLE)					8.57
42	Theta hat (MLE)					1.493	Theta star (bias corrected MLE)					1.655
43	nu hat (MLE)					569.8	nu star (bias corrected)					514.2
44	MLE Mean (bias corrected)					14.18	MLE Sd (bias corrected)					4.845
45							Approximate Chi Square Value (0.05)					462.6
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					459.8
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					15.76	95% Adjusted Gamma UCL (use when n<50)					15.86
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.89	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.207	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	1.482			Mean of logged Data			2.598
60					Maximum of Logged Data	3.178			SD of logged Data			0.352
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	16.13			90% Chebyshev (MVUE) UCL			17.09
64					95% Chebyshev (MVUE) UCL	18.36			97.5% Chebyshev (MVUE) UCL			20.13
65					99% Chebyshev (MVUE) UCL	23.6						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	15.51			95% Jackknife UCL			15.55
72					95% Standard Bootstrap UCL	15.47			95% Bootstrap-t UCL			15.57
73					95% Hall's Bootstrap UCL	15.7			95% Percentile Bootstrap UCL			15.49
74					95% BCA Bootstrap UCL	15.45						
75					90% Chebyshev(Mean, Sd) UCL	16.6			95% Chebyshev(Mean, Sd) UCL			17.7
76					97.5% Chebyshev(Mean, Sd) UCL	19.22			99% Chebyshev(Mean, Sd) UCL			22.2
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	15.55						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:40:47 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Cr PQM											
12												
13	General Statistics											
14	Total Number of Observations					30	Number of Distinct Observations					23
15							Number of Missing Observations					0
16	Minimum					11	Mean					36.57
17	Maximum					80	Median					37.5
18	SD					14.06	Std. Error of Mean					2.567
19	Coefficient of Variation					0.385	Skewness					0.603
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.949	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.927	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.122	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.162	Data appear Normal at 5% Significance Level					
26	Data appear Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL					40.93	95% Adjusted-CLT UCL (Chen-1995)					41.09
31							95% Modified-t UCL (Johnson-1978)					40.98
32												
33	Gamma GOF Test											
34	A-D Test Statistic					0.697	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.746	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.177	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.16	Data Not Gamma Distributed at 5% Significance Level					
38	Detected data follow Appr. Gamma Distribution at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					6.234	k star (bias corrected MLE)					5.633
42	Theta hat (MLE)					5.866	Theta star (bias corrected MLE)					6.492
43	nu hat (MLE)					374	nu star (bias corrected)					338
44	MLE Mean (bias corrected)					36.57	MLE Sd (bias corrected)					15.41
45							Approximate Chi Square Value (0.05)					296.4
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					294.1
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					41.7	95% Adjusted Gamma UCL (use when n<50)					42.02
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.914	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.202	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.398			Mean of logged Data			3.517
60					Maximum of Logged Data	4.382			SD of logged Data			0.44
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	43.33			90% Chebyshev (MVUE) UCL			46.17
64					95% Chebyshev (MVUE) UCL	50.34			97.5% Chebyshev (MVUE) UCL			56.13
65					99% Chebyshev (MVUE) UCL	67.49						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	40.79			95% Jackknife UCL			40.93
72					95% Standard Bootstrap UCL	40.76			95% Bootstrap-t UCL			40.93
73					95% Hall's Bootstrap UCL	42.02			95% Percentile Bootstrap UCL			40.83
74					95% BCA Bootstrap UCL	40.97						
75					90% Chebyshev(Mean, Sd) UCL	44.27			95% Chebyshev(Mean, Sd) UCL			47.76
76					97.5% Chebyshev(Mean, Sd) UCL	52.6			99% Chebyshev(Mean, Sd) UCL			62.11
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	40.93						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:45:12 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cu PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					25
15							Number of Missing Observations					0
16	Minimum					62	Mean					185.1
17	Maximum					510	Median					145
18	SD					113.3	Std. Error of Mean					20.68
19	Coefficient of Variation					0.612	Skewness					1.307
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.871	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.155	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					220.2	95% Adjusted-CLT UCL (Chen-1995)					224.4
31							95% Modified-t UCL (Johnson-1978)					221.1
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.411	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.752	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.113	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.161	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					3.223	k star (bias corrected MLE)					2.923
42	Theta hat (MLE)					57.42	Theta star (bias corrected MLE)					63.32
43	nu hat (MLE)					193.4	nu star (bias corrected)					175.4
44	MLE Mean (bias corrected)					185.1	MLE Sd (bias corrected)					108.3
45							Approximate Chi Square Value (0.05)					145.8
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					144.2
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					222.7	95% Adjusted Gamma UCL (use when n<50)					225.1
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.969	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0807	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.127				Mean of logged Data		5.058
60					Maximum of Logged Data	6.234				SD of logged Data		0.576
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	230.3				90% Chebyshev (MVUE) UCL		245.9
64					95% Chebyshev (MVUE) UCL	273.8				97.5% Chebyshev (MVUE) UCL		312.4
65					99% Chebyshev (MVUE) UCL	388.4						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	219.1				95% Jackknife UCL		220.2
72					95% Standard Bootstrap UCL	218.4				95% Bootstrap-t UCL		227.4
73					95% Hall's Bootstrap UCL	224.9				95% Percentile Bootstrap UCL		220.2
74					95% BCA Bootstrap UCL	224.8						
75					90% Chebyshev(Mean, Sd) UCL	247.1				95% Chebyshev(Mean, Sd) UCL		275.3
76					97.5% Chebyshev(Mean, Sd) UCL	314.3				99% Chebyshev(Mean, Sd) UCL		390.9
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	220.2						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:55:42 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Hg PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					25
15							Number of Missing Observations					0
16	Minimum					0.74	Mean					13.8
17	Maximum					100	Median					9.7
18	SD					19.03	Std. Error of Mean					3.475
19	Coefficient of Variation					1.38	Skewness					3.504
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.619	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.246	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					19.7	95% Adjusted-CLT UCL (Chen-1995)					21.89
31							95% Modified-t UCL (Johnson-1978)					20.07
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.378	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.781	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.09	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.165	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					0.894	k star (bias corrected MLE)					0.826
42	Theta hat (MLE)					15.44	Theta star (bias corrected MLE)					16.69
43	nu hat (MLE)					53.61	nu star (bias corrected)					49.59
44	MLE Mean (bias corrected)					13.8	MLE Sd (bias corrected)					15.18
45							Approximate Chi Square Value (0.05)					34.42
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					33.69
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					19.88	95% Adjusted Gamma UCL (use when n<50)					20.31
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.969	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.131	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	-0.301				Mean of logged Data		1.97
60					Maximum of Logged Data	4.605				SD of logged Data		1.222
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	28.37				90% Chebyshev (MVUE) UCL		26.21
64					95% Chebyshev (MVUE) UCL	31.5				97.5% Chebyshev (MVUE) UCL		38.85
65					99% Chebyshev (MVUE) UCL	53.27						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	19.51				95% Jackknife UCL		19.7
72					95% Standard Bootstrap UCL	19.48				95% Bootstrap-t UCL		25.6
73					95% Hall's Bootstrap UCL	45.4				95% Percentile Bootstrap UCL		19.71
74					95% BCA Bootstrap UCL	22.89						
75					90% Chebyshev(Mean, Sd) UCL	24.22				95% Chebyshev(Mean, Sd) UCL		28.94
76					97.5% Chebyshev(Mean, Sd) UCL	35.5				99% Chebyshev(Mean, Sd) UCL		48.37
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	20.31						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:57:13 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Mo PQM											
11												
12	General Statistics											
13	Total Number of Observations					30	Number of Distinct Observations					20
14	Number of Detects					23	Number of Non-Detects					7
15	Number of Distinct Detects					19	Number of Distinct Non-Detects					1
16	Minimum Detect					1.5	Minimum Non-Detect					1
17	Maximum Detect					21	Maximum Non-Detect					1
18	Variance Detects					41.25	Percent Non-Detects					23.33%
19	Mean Detects					10.05	SD Detects					6.422
20	Median Detects					8	CV Detects					0.639
21	Skewness Detects					0.227	Kurtosis Detects					-1.465
22	Mean of Logged Detects					2.039	SD of Logged Detects					0.826
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.909	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.914	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.166	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.185	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Approximate Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					7.937	Standard Error of Mean					1.251
33	SD					6.7	95% KM (BCA) UCL					10.05
34	95% KM (t) UCL					10.06	95% KM (Percentile Bootstrap) UCL					10.09
35	95% KM (z) UCL					9.994	95% KM Bootstrap t UCL					10.28
36	90% KM Chebyshev UCL					11.69	95% KM Chebyshev UCL					13.39
37	97.5% KM Chebyshev UCL					15.75	99% KM Chebyshev UCL					20.38
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.662	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.755	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.202	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.184	Detected Data Not Gamma Distributed at 5% Significance Level					
44	Detected data follow Appr. Gamma Distribution at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					2.014	k star (bias corrected MLE)					1.78
48	Theta hat (MLE)					4.99	Theta star (bias corrected MLE)					5.645
49	nu hat (MLE)					92.63	nu star (bias corrected)					81.88
50	MLE Mean (bias corrected)					10.05	MLE Sd (bias corrected)					7.531
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.403					nu hat (KM)	84.19
54					Approximate Chi Square Value (84.19, α)	64.04					Adjusted Chi Square Value (84.19, β)	63.03
55					95% Gamma Approximate KM-UCL (use when n>=50)	10.43					95% Gamma Adjusted KM-UCL (use when n<50)	10.6
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	7.863
63					Maximum	21					Median	5.75
64					SD	6.901					CV	0.878
65					k hat (MLE)	0.643					k star (bias corrected MLE)	0.601
66					Theta hat (MLE)	12.22					Theta star (bias corrected MLE)	13.08
67					nu hat (MLE)	38.61					nu star (bias corrected)	36.08
68					MLE Mean (bias corrected)	7.863					MLE Sd (bias corrected)	10.14
69											Adjusted Level of Significance (β)	0.041
70					Approximate Chi Square Value (36.08, α)	23.33					Adjusted Chi Square Value (36.08, β)	22.74
71					95% Gamma Approximate UCL (use when n>=50)	12.16					95% Gamma Adjusted UCL (use when n<50)	12.48
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.905			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.914			Detected Data Not Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.201			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.185			Detected Data Not Lognormal at 5% Significance Level			
78					**Detected Data Not Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	8.009			Mean in Log Scale			1.61
82					SD in Original Scale	6.743			SD in Log Scale			1.086
83					95% t UCL (assumes normality of ROS data)	10.1			95% Percentile Bootstrap UCL			10.07
84					95% BCA Bootstrap UCL	10.18			95% Bootstrap t UCL			10.28
85					95% H-UCL (Log ROS)	15.2						
86												
87					**DL/2 Statistics**							
88					**DL/2 Normal**				**DL/2 Log-Transformed**			
89					Mean in Original Scale	7.82			Mean in Log Scale			1.401
90					SD in Original Scale	6.94			SD in Log Scale			1.378
91					95% t UCL (Assumes normality)	9.973			95% H-Stat UCL			22.53
92					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
93												
94					**Nonparametric Distribution Free UCL Statistics**							
95					**Detected Data appear Approximate Normal Distributed at 5% Significance Level**							
96												
97					**Suggested UCL to Use**							
98					95% KM (t) UCL	10.06			95% KM (Percentile Bootstrap) UCL			10.09
99												
100					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
101					Recommendations are based upon data size, data distribution, and skewness.							
102					These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).							
103					However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.							
104												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:59:54 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ni PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					22
15							Number of Missing Observations					0
16	Minimum					11	Mean					27.97
17	Maximum					47	Median					27
18	SD					8.189	Std. Error of Mean					1.495
19	Coefficient of Variation					0.293	Skewness					0.251
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.977	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.116	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					30.51	95% Adjusted-CLT UCL (Chen-1995)					30.5
31							95% Modified-t UCL (Johnson-1978)					30.52
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.37	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.745	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.109	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.16	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					11.12	k star (bias corrected MLE)					10.03
42	Theta hat (MLE)					2.514	Theta star (bias corrected MLE)					2.787
43	nu hat (MLE)					667.4	nu star (bias corrected)					602
44	MLE Mean (bias corrected)					27.97	MLE Sd (bias corrected)					8.829
45							Approximate Chi Square Value (0.05)					546.1
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					543
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					30.83	95% Adjusted Gamma UCL (use when n<50)					31
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.947	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.398				Mean of logged Data		3.285
60					Maximum of Logged Data	3.85				SD of logged Data		0.319
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	31.32				90% Chebyshev (MVUE) UCL		33.06
64					95% Chebyshev (MVUE) UCL	35.33				97.5% Chebyshev (MVUE) UCL		38.47
65					99% Chebyshev (MVUE) UCL	44.64						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	30.43				95% Jackknife UCL		30.51
72					95% Standard Bootstrap UCL	30.32				95% Bootstrap-t UCL		30.61
73					95% Hall's Bootstrap UCL	30.49				95% Percentile Bootstrap UCL		30.57
74					95% BCA Bootstrap UCL	30.37						
75					90% Chebyshev(Mean, Sd) UCL	32.45				95% Chebyshev(Mean, Sd) UCL		34.48
76					97.5% Chebyshev(Mean, Sd) UCL	37.3				99% Chebyshev(Mean, Sd) UCL		42.84
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	30.51						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 2:53:05 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Pb PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					26
15							Number of Missing Observations					0
16	Minimum					74	Mean					1851
17	Maximum					20000	Median					505
18	SD					4824	Std. Error of Mean					880.7
19	Coefficient of Variation					2.605	Skewness					3.601
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.364	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.438	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					3348	95% Adjusted-CLT UCL (Chen-1995)					3919
31							95% Modified-t UCL (Johnson-1978)					3444
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					3.071	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.813	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.264	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.17	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					0.484	k star (bias corrected MLE)					0.458
42	Theta hat (MLE)					3824	Theta star (bias corrected MLE)					4042
43	nu hat (MLE)					29.05	nu star (bias corrected)					27.48
44	MLE Mean (bias corrected)					1851	MLE Sd (bias corrected)					2736
45							Approximate Chi Square Value (0.05)					16.52
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					16.03
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					3079	95% Adjusted Gamma UCL (use when n<50)					3173
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.902	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.115	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data appear Lognormal at 5% Significance Level					
56	**Data appear Approximate Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.304			Mean of logged Data			6.205
60					Maximum of Logged Data	9.903			SD of logged Data			1.404
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	2921			90% Chebyshev (MVUE) UCL			2444
64					95% Chebyshev (MVUE) UCL	2984			97.5% Chebyshev (MVUE) UCL			3735
65					99% Chebyshev (MVUE) UCL	5209						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	3300			95% Jackknife UCL			3348
72					95% Standard Bootstrap UCL	3288			95% Bootstrap-t UCL			14700
73					95% Hall's Bootstrap UCL	12210			95% Percentile Bootstrap UCL			3277
74					95% BCA Bootstrap UCL	3819						
75					90% Chebyshev(Mean, Sd) UCL	4494			95% Chebyshev(Mean, Sd) UCL			5690
76					97.5% Chebyshev(Mean, Sd) UCL	7351			99% Chebyshev(Mean, Sd) UCL			10614
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	5690						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:02:27 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Se PQM											
11												
12	General Statistics											
13	Total Number of Observations					30	Number of Distinct Observations					11
14	Number of Detects					13	Number of Non-Detects					17
15	Number of Distinct Detects					10	Number of Distinct Non-Detects					1
16	Minimum Detect					1.9	Minimum Non-Detect					1
17	Maximum Detect					5.1	Maximum Non-Detect					1
18	Variance Detects					0.793	Percent Non-Detects					56.67%
19	Mean Detects					2.754	SD Detects					0.89
20	Median Detects					2.4	CV Detects					0.323
21	Skewness Detects					1.636	Kurtosis Detects					3.172
22	Mean of Logged Detects					0.972	SD of Logged Detects					0.286
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.838	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.866	Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.193	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.246	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Approximate Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.76	Standard Error of Mean					0.197
33	SD					1.036	95% KM (BCA) UCL					2.113
34	95% KM (t) UCL					2.094	95% KM (Percentile Bootstrap) UCL					2.087
35	95% KM (z) UCL					2.084	95% KM Bootstrap t UCL					2.142
36	90% KM Chebyshev UCL					2.35	95% KM Chebyshev UCL					2.618
37	97.5% KM Chebyshev UCL					2.989	99% KM Chebyshev UCL					3.718
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.501	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.734	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.186	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.237	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					12.45	k star (bias corrected MLE)					9.625
48	Theta hat (MLE)					0.221	Theta star (bias corrected MLE)					0.286
49	nu hat (MLE)					323.6	nu star (bias corrected)					250.2
50	MLE Mean (bias corrected)					2.754	MLE Sd (bias corrected)					0.888
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	2.888					nu hat (KM)	173.3
54					Approximate Chi Square Value (173.31, α)	143.9					Adjusted Chi Square Value (173.31, β)	142.3
55					95% Gamma Approximate KM-UCL (use when n>=50)	2.12					95% Gamma Adjusted KM-UCL (use when n<50)	2.143
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.53
63					Maximum	5.1					Median	1.299
64					SD	1.29					CV	0.843
65					k hat (MLE)	0.681					k star (bias corrected MLE)	0.635
66					Theta hat (MLE)	2.248					Theta star (bias corrected MLE)	2.41
67					nu hat (MLE)	40.83					nu star (bias corrected)	38.08
68					MLE Mean (bias corrected)	1.53					MLE Sd (bias corrected)	1.92
69											Adjusted Level of Significance (β)	0.041
70					Approximate Chi Square Value (38.08, α)	24.95					Adjusted Chi Square Value (38.08, β)	24.34
71					95% Gamma Approximate UCL (use when n>=50)	2.335					95% Gamma Adjusted UCL (use when n<50)	2.394
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.914					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.866					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.171					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.246					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.843					Mean in Log Scale	0.473
82					SD in Original Scale	1.023					SD in Log Scale	0.537
83					95% t UCL (assumes normality of ROS data)	2.161					95% Percentile Bootstrap UCL	2.159
84					95% BCA Bootstrap UCL	2.192					95% Bootstrap t UCL	2.222
85					95% H-UCL (Log ROS)	2.259						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.421					95% H-UCL (KM -Log)	2.099
89					KM SD (logged)	0.515					95% Critical H Value (KM-Log)	1.963
90					KM Standard Error of Mean (logged)	0.0978						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	1.477					Mean in Log Scale	0.0285
95					SD in Original Scale	1.272					SD in Log Scale	0.859
96					95% t UCL (Assumes normality)	1.871					95% H-Stat UCL	2.151
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Approximate Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	2.094					95% KM (Percentile Bootstrap) UCL	2.087
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:07:28 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	TI PQM											
11												
12	General Statistics											
13	Total Number of Observations					30	Number of Distinct Observations					16
14	Number of Detects					17	Number of Non-Detects					13
15	Number of Distinct Detects					15	Number of Distinct Non-Detects					1
16	Minimum Detect					1.2	Minimum Non-Detect					1
17	Maximum Detect					6.1	Maximum Non-Detect					1
18	Variance Detects					2.176	Percent Non-Detects					43.33%
19	Mean Detects					3.2	SD Detects					1.475
20	Median Detects					3.1	CV Detects					0.461
21	Skewness Detects					0.39	Kurtosis Detects					-0.676
22	Mean of Logged Detects					1.052	SD of Logged Detects					0.502
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.952	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.892	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.0942	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.215	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					2.247	Standard Error of Mean					0.288
33	SD					1.533	95% KM (BCA) UCL					2.71
34	95% KM (t) UCL					2.737	95% KM (Percentile Bootstrap) UCL					2.71
35	95% KM (z) UCL					2.721	95% KM Bootstrap t UCL					2.805
36	90% KM Chebyshev UCL					3.112	95% KM Chebyshev UCL					3.504
37	97.5% KM Chebyshev UCL					4.048	99% KM Chebyshev UCL					5.117
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.276	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.742	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.136	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.21	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					4.677	k star (bias corrected MLE)					3.891
48	Theta hat (MLE)					0.684	Theta star (bias corrected MLE)					0.822
49	nu hat (MLE)					159	nu star (bias corrected)					132.3
50	MLE Mean (bias corrected)					3.2	MLE Sd (bias corrected)					1.622
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	2.149					nu hat (KM)	128.9
54					Approximate Chi Square Value (128.92, α)	103.7					Adjusted Chi Square Value (128.92, β)	102.4
55					95% Gamma Approximate KM-UCL (use when n>=50)	2.793					95% Gamma Adjusted KM-UCL (use when n<50)	2.829
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.979
63					Maximum	6.1					Median	1.4
64					SD	1.814					CV	0.917
65					k hat (MLE)	0.586					k star (bias corrected MLE)	0.55
66					Theta hat (MLE)	3.374					Theta star (bias corrected MLE)	3.597
67					nu hat (MLE)	35.19					nu star (bias corrected)	33
68					MLE Mean (bias corrected)	1.979					MLE Sd (bias corrected)	2.668
69											Adjusted Level of Significance (β)	0.041
70					Approximate Chi Square Value (33.00, α)	20.87					Adjusted Chi Square Value (33.00, β)	20.31
71					95% Gamma Approximate UCL (use when n>=50)	3.129					95% Gamma Adjusted UCL (use when n<50)	3.215
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.95			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.892			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.143			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.215			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	2.176			Mean in Log Scale			0.488
82					SD in Original Scale	1.63			SD in Log Scale			0.802
83					95% t UCL (assumes normality of ROS data)	2.682			95% Percentile Bootstrap UCL			2.653
84					95% BCA Bootstrap UCL	2.663			95% Bootstrap t UCL			2.79
85					95% H-UCL (Log ROS)	3.135						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.596			95% H-UCL (KM -Log)			2.843
89					KM SD (logged)	0.637			95% Critical H Value (KM-Log)			2.073
90					KM Standard Error of Mean (logged)	0.12						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	2.03			Mean in Log Scale			0.296
95					SD in Original Scale	1.747			SD in Log Scale			0.955
96					95% t UCL (Assumes normality)	2.572			95% H-Stat UCL			3.261
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	2.737			95% KM (Percentile Bootstrap) UCL			2.71
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:10:25 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**V PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					24
15							Number of Missing Observations					0
16	Minimum					23	Mean					74.9
17	Maximum					120	Median					76.5
18	SD					25.46	Std. Error of Mean					4.648
19	Coefficient of Variation					0.34	Skewness					-0.265
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.968	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.0932	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					82.8	95% Adjusted-CLT UCL (Chen-1995)					82.31
31							95% Modified-t UCL (Johnson-1978)					82.76
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.729	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.746	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.15	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.16	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					7.046	k star (bias corrected MLE)					6.364
42	Theta hat (MLE)					10.63	Theta star (bias corrected MLE)					11.77
43	nu hat (MLE)					422.8	nu star (bias corrected)					381.8
44	MLE Mean (bias corrected)					74.9	MLE Sd (bias corrected)					29.69
45							Approximate Chi Square Value (0.05)					337.5
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					335.2
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					84.73	95% Adjusted Gamma UCL (use when n<50)					85.33
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.876	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.135			Mean of logged Data			4.244
60					Maximum of Logged Data	4.787			SD of logged Data			0.421
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	88.25			90% Chebyshev (MVUE) UCL			93.94
64					95% Chebyshev (MVUE) UCL	102.1			97.5% Chebyshev (MVUE) UCL			113.5
65					99% Chebyshev (MVUE) UCL	135.8						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	82.55			95% Jackknife UCL			82.8
72					95% Standard Bootstrap UCL	82.37			95% Bootstrap-t UCL			83.05
73					95% Hall's Bootstrap UCL	82.44			95% Percentile Bootstrap UCL			82.5
74					95% BCA Bootstrap UCL	81.77						
75					90% Chebyshev(Mean, Sd) UCL	88.84			95% Chebyshev(Mean, Sd) UCL			95.16
76					97.5% Chebyshev(Mean, Sd) UCL	103.9			99% Chebyshev(Mean, Sd) UCL			121.1
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	82.8						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												
86	**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**											
87	**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**											
88												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			9/6/2016 3:12:00 PM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Zn PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					30	Number of Distinct Observations					27
15							Number of Missing Observations					0
16	Minimum					60	Mean					348.9
17	Maximum					2000	Median					245
18	SD					390.1	Std. Error of Mean					71.23
19	Coefficient of Variation					1.118	Skewness					2.816
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.694	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.927	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.23	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.162	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					469.9	95% Adjusted-CLT UCL (Chen-1995)					505.2
31							95% Modified-t UCL (Johnson-1978)					476
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					1.113	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.769	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.201	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.164	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					1.242	k star (bias corrected MLE)					1.14
42	Theta hat (MLE)					281	Theta star (bias corrected MLE)					306.1
43	nu hat (MLE)					74.49	nu star (bias corrected)					68.38
44	MLE Mean (bias corrected)					348.9	MLE Sd (bias corrected)					326.8
45							Approximate Chi Square Value (0.05)					50.35
46	Adjusted Level of Significance					0.041	Adjusted Chi Square Value					49.45
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					473.8	95% Adjusted Gamma UCL (use when n<50)					482.4
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.913	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.927	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.179	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.162	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.094			Mean of logged Data			5.401
60					Maximum of Logged Data	7.601			SD of logged Data			0.954
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	536			90% Chebyshev (MVUE) UCL			545.1
64					95% Chebyshev (MVUE) UCL	637.1			97.5% Chebyshev (MVUE) UCL			764.9
65					99% Chebyshev (MVUE) UCL	1016						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	466			95% Jackknife UCL			469.9
72					95% Standard Bootstrap UCL	463.5			95% Bootstrap-t UCL			542.3
73					95% Hall's Bootstrap UCL	996.8			95% Percentile Bootstrap UCL			476.3
74					95% BCA Bootstrap UCL	507.9						
75					90% Chebyshev(Mean, Sd) UCL	562.6			95% Chebyshev(Mean, Sd) UCL			659.3
76					97.5% Chebyshev(Mean, Sd) UCL	793.7			99% Chebyshev(Mean, Sd) UCL			1058
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	659.3						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	Sb full	D_Sb full	As full	D_As full	Ba full	D_Ba full	Be full	D_Be full	Cd full	D_Cd full	Cr full	D_Cr full
2	2	0	20	1	150	1	1	0	2.8	1	43	1
3	2	0	13	1	190	1	1.2	1	1	0	56	1
4	2	0	13	1	170	1	1	0	1.4	1	41	1
5	2	0	13	1	120	1	1	0	1.8	1	43	1
6	2	0	15	1	100	1	1	0	2.7	1	38	1
7	2	0	17	1	130	1	1	0	3.3	1	47	1
8	2	0	11	1	120	1	1.3	1	2.1	1	35	1
9	2	0	91	1	72	1	1	0	5.8	1	36	1
10	2	0	57	1	100	1	1	0	6.9	1	39	1
11	2	0	56	1	69	1	1	0	11	1	18	1
12	2	0	53	1	97	1	1	0	13	1	22	1
13	3.3	1	52	1	90	1	1	0	10	1	23	1
14	2	0	21	1	140	1	1	0	6.1	1	29	1
15	2	0	38	1	120	1	1	0	8.1	1	40	1
16	2	0	21	1	100	1	1	0	8.9	1	25	1
17	2	0	40	1	110	1	1	0	19	1	32	1
18	2	0	36	1	130	1	1	0	19	1	37	1
19	2	0	19	1	120	1	1.1	1	1	0	47	1
20	2	0	18	1	83	1	1	0	11	1	35	1
21	2	0	15	1	130	1	1.1	1	1	1	49	1
22	2	0	11	1	120	1	1.1	1	1	0	46	1
23	2	0	22	1	72	1	1	1	1	0	80	1
24	2	0	19	1	74	1	1	0	1	0	51	1
25	2	0	22	1	94	1	1	0	1.4	1	42	1
26	2	0	250	1	51	1	1	0	5.5	1	11	1
27	2	0	210	1	44	1	1	0	6	1	11	1
28	2	0	68	1	74	1	1	0	11	1	25	1
29	2	0	40	1	110	1	1	0	5.5	1	21	1
30	2	0	43	1	89	1	1	0	8.4	1	36	1
31	2	0	16	1	140	1	1	0	2.7	1	39	1
32	2	0	40	1	120	1	1	0	3.5	1	3.5	1
33	2	0	11	1	140	1	1	0	3	1	3.4	1
34	2	0	17	1	97	1	1	0	2.1	1	3.5	1
35	2	0	1	0	70	1	1	0	6.6	1	1.3	1
36	2	0	11	1	87	1	1	0	1.6	1	4.1	1
37	2	0	23	1	46	1	1	0	1.8	1	1.8	1
38	2	0	4.9	1	130	1	1	0	1.8	1	5.3	1
39	2	0	20	1	88	1	1	0	2.8	1	5.5	1
40	2	0	16	1	73	1	1	0	3	1	2.7	1
41	2	0	24	1	44	1	1	0	3.3	1	2.5	1
42	2	0	3.7	1	58	1	1	0	1.3	1	3.9	1
43	2	0	1	0	240	1	1	0	1	0	4.6	1
44	2	0	1	0	200	1	1	0	1	0	4.2	1
45	2	0	1	0	220	1	1	0	1	0	6	1
46	2	0	4.4	1	130	1	1	0	2.1	1	5.1	1
47	2	0	1	0	160	1	1	0	1	0	3.7	1
48	2	0	1	0	90	1	1	0	1	0	8.9	1
49	2	0	1	0	230	1	1	0	1	0	4	1
50	2	0	24	1	73	1	1	0	1	0	9.1	1
51	2	0	15	1	58	1	1	0	1.5	1	2	1
52	2	0	24	1	53	1	1	0	1	0	9.2	1

	A	B	C	D	E	F	G	H	I	J	K	L
53	2	0	14	1	180	1	1	0	1.1	1	80	1
54	2	0	12	1	130	1	1	0	1	0	75	1
55	2	0	12	1	100	1	1	0	1	0	55	1
56	2	0	7.8	1	210	1	1	0	1	0	63	1

	M	N	O	P	Q	R	S	T	U	V	W	X
1	Co full	D_Co full	Cu full	D_Cu full	Pb full	D_Pb full	Hg full	D_Hg full	Mo full	D_Mo full	Ni full	D_Ni full
2	13	1	97	1	430	1	14	1	14	1	26	1
3	14	1	62	1	98	1	1.5	1	1	0	34	1
4	12	1	68	1	190	1	3.8	1	1	0	27	1
5	13	1	63	1	89	1	0.74	1	1.5	1	25	1
6	14	1	77	1	89	1	0.86	1	1.8	1	24	1
7	13	1	78	1	140	1	3.5	1	2.8	1	29	1
8	20	1	88	1	74	1	1.4	1	1	0	26	1
9	14	1	430	1	1800	1	44	1	17	1	28	1
10	21	1	510	1	1400	1	100	1	17	1	29	1
11	14	1	310	1	1000	1	15	1	15	1	21	1
12	14	1	210	1	1500	1	26	1	18	1	22	1
13	13	1	240	1	1400	1	26	1	20	1	23	1
14	15	1	110	1	340	1	7.5	1	5.5	1	21	1
15	15	1	160	1	750	1	11	1	6.9	1	28	1
16	16	1	120	1	580	1	9.7	1	4.4	1	22	1
17	21	1	250	1	1000	1	23	1	8	1	38	1
18	24	1	220	1	970	1	14	1	9.2	1	47	1
19	14	1	120	1	150	1	2.2	1	4.2	1	35	1
20	23	1	230	1	800	1	6.1	1	5.7	1	44	1
21	12	1	120	1	180	1	3.2	1	1.8	1	33	1
22	16	1	130	1	93	1	1.1	1	1	0	37	1
23	8.3	1	140	1	270	1	6.4	1	1	0	39	1
24	7.8	1	150	1	240	1	10	1	1	0	27	1
25	11	1	140	1	350	1	18	1	1	0	32	1
26	4.4	1	340	1	20000	1	11	1	14	1	11	1
27	7	1	380	1	19000	1	19	1	16	1	14	1
28	14	1	190	1	740	1	4.5	1	21	1	27	1
29	12	1	230	1	790	1	9.7	1	5.8	1	15	1
30	16	1	170	1	930	1	19	1	15	1	30	1
31	14	1	120	1	150	1	1.7	1	6.5	1	25	1
32	18	1	140	1	530	1	0.52	1	9.6	1	4.6	1
33	15	1	120	1	400	1	0.43	1	13	1	4.2	1
34	14	1	120	1	410	1	1.4	1	7.6	1	3.7	1
35	4.1	1	23	1	23	1	0.1	0	12	1	1.9	1
36	9	1	54	1	59	1	0.29	1	6.1	1	4.8	1
37	3.4	1	96	1	170	1	0.45	1	1	0	2.3	1
38	11	1	75	1	64	1	0.51	1	44	1	5.9	1
39	8.5	1	150	1	330	1	0.57	1	11	1	11	1
40	4.6	1	90	1	170	1	0.47	1	19	1	2.9	1
41	10	1	140	1	330	1	0.27	1	8.7	1	3.2	1
42	13	1	62	1	53	1	0.2	1	6	1	5.2	1
43	8.4	1	16	1	7.3	1	0.1	0	1	0	5.1	1
44	9.1	1	18	1	12	1	0.1	0	1	0	5.1	1
45	9.6	1	31	1	15	1	0.13	1	1	0	5.6	1
46	9.7	1	41	1	52	1	0.21	1	9.7	1	5.8	1
47	16	1	62	1	30	1	0.1	0	3.1	1	5	1
48	6.9	1	23	1	13	1	0.12	1	1	0	5.8	1
49	9.5	1	16	1	7.5	1	0.1	0	1	0	4.9	1
50	5.5	1	23	1	21	1	0.43	1	1	0	5.5	1
51	5.7	1	45	1	64	1	0.41	1	27	1	2.2	1
52	4.7	1	17	1	16	1	0.61	1	1	0	4.5	1

	M	N	O	P	Q	R	S	T	U	V	W	X
53	19	1	68	1	15	1	0.1	0	2.3	1	49	1
54	19	1	72	1	12	1	0.1	0	2.7	1	49	1
55	16	1	75	1	15	1	0.1	0	2.6	1	36	1
56	17	1	39	1	14	1	0.1	0	1.7	1	40	1

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1	Se full	D_Se full	Ag full	D_Ag full	Tl full	D_Tl full	V full	D_V full	Zn full	D_Zn full	Cu log full	Mo log full
2	1	0	1	0	4.1	1	87	1	120	1	1.987	1.146128
3	1	0	1	0	5.6	1	110	1	60	1	1.792	
4	1	0	1	0	3.9	1	93	1	80	1	1.833	
5	1	0	1	0	3.1	1	77	1	74	1	1.799	0.1760913
6	1	0	1	0	2.8	1	69	1	88	1	1.886	0.2552725
7	1	0	1	0	2.5	1	84	1	110	1	1.892	0.447158
8	1	0	1	0	3.5	1	100	1	89	1	1.944	
9	1	0	2	1	1	0	76	1	750	1	2.633	1.2304489
10	3.6	1	8.1	1	1	0	72	1	480	1	2.708	1.2304489
11	2	1	28	1	1	0	32	1	340	1	2.491	1.1760913
12	1	0	26	1	1	0	47	1	460	1	2.322	1.2552725
13	2.3	1	13	1	1	0	50	1	390	1	2.38	1.30103
14	1	0	1	0	1.4	1	68	1	270	1	2.041	0.7403627
15	1	0	1	0	2	1	77	1	310	1	2.204	0.8388491
16	1	0	1	0	1.7	1	60	1	2000	1	2.079	0.6434527
17	1	0	1	0	1.2	1	71	1	710	1	2.398	0.90309
18	1	0	3.9	1	1	0	75	1	720	1	2.342	0.9637878
19	1.9	1	1	0	1	0	120	1	130	1	2.079	0.6232493
20	1	0	1	0	1.4	1	86	1	420	1	2.362	0.7558749
21	1	0	1	0	2.3	1	120	1	110	1	2.079	0.2552725
22	1	0	1	0	4.5	1	110	1	72	1	2.114	
23	3.2	1	1	0	4.4	1	93	1	83	1	2.146	
24	2.3	1	1	0	3.9	1	92	1	77	1	2.176	
25	2	1	1	0	6.1	1	86	1	93	1	2.146	
26	3	1	73	1	1	0	23	1	630	1	2.531	1.146128
27	2.1	1	57	1	1	0	23	1	780	1	2.58	1.20412
28	5.1	1	22	1	1	0	49	1	310	1	2.279	1.3222193
29	2.7	1	6.7	1	1	0	56	1	220	1	2.362	0.763428
30	3.2	1	13	1	1	0	61	1	390	1	2.23	1.1760913
31	2.4	1	1.4	1	1	0	80	1	100	1	2.079	0.8129134
32	1	0	1	0	1	0	54	1	81	1	2.146	0.9822712
33	1	0	1	0	1	0	48	1	82	1	2.079	1.1139434
34	1	0	1.8	1	1	0	53	1	62	1	2.079	0.8808136
35	1	0	1	0	5.6	1	19	1	75	1	1.362	1.0791812
36	1	0	1	0	1	0	34	1	46	1	1.732	0.7853298
37	1	0	3	1	1.1	1	14	1	43	1	1.982	
38	1	0	3.3	1	1	0	38	1	40	1	1.875	1.6434527
39	1	0	4.7	1	2.7	1	29	1	53	1	2.176	1.0413927
40	1	0	4.8	1	1.1	1	19	1	50	1	1.954	1.2787536
41	1	0	8	1	3.3	1	22	1	71	1	2.146	0.9395193
42	1	0	1	0	1	0	48	1	36	1	1.792	0.7781513
43	1	0	1	0	1	0	48	1	34	1	1.204	
44	1	0	1	0	1	0	42	1	34	1	1.255	
45	1	0	1	0	1	0	54	1	34	1	1.491	
46	1	0	1	0	1	0	38	1	58	1	1.613	0.9867717
47	1	0	1	0	1	0	47	1	40	1	1.792	0.4913617
48	1	0	1	0	1	0	61	1	29	1	1.362	
49	1	0	1	0	1	0	48	1	55	1	1.204	
50	1	0	1	0	1	0	41	1	32	1	1.362	
51	1	0	5.2	1	3.2	1	35	1	33	1	1.653	1.4313638
52	1	0	1	0	1	0	41	1	22	1	1.23	

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
53	2.4	1	1	0	1	0	110	1	51	1	1.833	0.3617278
54	4.1	1	1	0	1	0	110	1	43	1	1.857	0.4313638
55	2.8	1	1	0	1	0	97	1	38	1	1.875	0.4149733
56	2.2	1	1	0	1	0	92	1	46	1	1.591	0.2304489

	A	B	C	D	E	F	G	H	I	J	K	L
1	Sb EWR	D_Sb EWR	As EWR	D_As EWR	Ba EWR	D_Ba EWR	Be EWR	D_Be EWR	Cd EWR	D_Cd EWR	Cr EWR	D_Cr EWR
2	2	0	40	1	120	1	1	0	3.5	1	3.5	1
3	2	0	11	1	140	1	1	0	3	1	3.4	1
4	2	0	17	1	97	1	1	0	2.1	1	3.5	1
5	2	0	1	0	70	1	1	0	6.6	1	1.3	1
6	2	0	11	1	87	1	1	0	1.6	1	4.1	1
7	2	0	23	1	46	1	1	0	1.8	1	1.8	1
8	2	0	4.9	1	130	1	1	0	1.8	1	5.3	1
9	2	0	20	1	88	1	1	0	2.8	1	5.5	1
10	2	0	16	1	73	1	1	0	3	1	2.7	1
11	2	0	24	1	44	1	1	0	3.3	1	2.5	1
12	2	0	3.7	1	58	1	1	0	1.3	1	3.9	1
13	2	0	1	0	240	1	1	0	1	0	4.6	1
14	2	0	1	0	200	1	1	0	1	0	4.2	1
15	2	0	1	0	220	1	1	0	1	0	6	1
16	2	0	4.4	1	130	1	1	0	2.1	1	5.1	1
17	2	0	1	0	160	1	1	0	1	0	3.7	1
18	2	0	1	0	90	1	1	0	1	0	8.9	1
19	2	0	1	0	230	1	1	0	1	0	4	1
20	2	0	24	1	73	1	1	0	1	0	9.1	1
21	2	0	15	1	58	1	1	0	1.5	1	2	1
22	2	0	24	1	53	1	1	0	1	0	9.2	1
23	2	0	14	1	180	1	1	0	1.1	1	80	1
24	2	0	12	1	130	1	1	0	1	0	75	1
25	2	0	12	1	100	1	1	0	1	0	55	1
26	2	0	7.8	1	210	1	1	0	1	0	63	1

	M	N	O	P	Q	R	S	T	U	V	W	X
1	Co EWR	D_Co EWR	Cu EWR	D_Cu EWR	Pb EWR	D_Pb EWR	Hg EWR	D_Hg EWR	Mo EWR	D_Mo EWR	Ni EWR	D_Ni EWR
2	18	1	140	1	530	1	0.52	1	9.6	1	4.6	1
3	15	1	120	1	400	1	0.43	1	13	1	4.2	1
4	14	1	120	1	410	1	1.4	1	7.6	1	3.7	1
5	4.1	1	23	1	23	1	0.1	0	12	1	1.9	1
6	9	1	54	1	59	1	0.29	1	6.1	1	4.8	1
7	3.4	1	96	1	170	1	0.45	1	1	0	2.3	1
8	11	1	75	1	64	1	0.51	1	44	1	5.9	1
9	8.5	1	150	1	330	1	0.57	1	11	1	11	1
10	4.6	1	90	1	170	1	0.47	1	19	1	2.9	1
11	10	1	140	1	330	1	0.27	1	8.7	1	3.2	1
12	13	1	62	1	53	1	0.2	1	6	1	5.2	1
13	8.4	1	16	1	7.3	1	0.1	0	1	0	5.1	1
14	9.1	1	18	1	12	1	0.1	0	1	0	5.1	1
15	9.6	1	31	1	15	1	0.13	1	1	0	5.6	1
16	9.7	1	41	1	52	1	0.21	1	9.7	1	5.8	1
17	16	1	62	1	30	1	0.1	0	3.1	1	5	1
18	6.9	1	23	1	13	1	0.12	1	1	0	5.8	1
19	9.5	1	16	1	7.5	1	0.1	0	1	0	4.9	1
20	5.5	1	23	1	21	1	0.43	1	1	0	5.5	1
21	5.7	1	45	1	64	1	0.41	1	27	1	2.2	1
22	4.7	1	17	1	16	1	0.61	1	1	0	4.5	1
23	19	1	68	1	15	1	0.1	0	2.3	1	49	1
24	19	1	72	1	12	1	0.1	0	2.7	1	49	1
25	16	1	75	1	15	1	0.1	0	2.6	1	36	1
26	17	1	39	1	14	1	0.1	0	1.7	1	40	1

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	Se EWR	D_Se EWR	Ag EWR	D_Ag EWR	Tl EWR	D_Tl EWR	V EWR	D_V EWR	Zn EWR	D_Zn EWR
2	1	0	1	0	1	0	54	1	81	1
3	1	0	1	0	1	0	48	1	82	1
4	1	0	1.8	1	1	0	53	1	62	1
5	1	0	1	0	5.6	1	19	1	75	1
6	1	0	1	0	1	0	34	1	46	1
7	1	0	3	1	1.1	1	14	1	43	1
8	1	0	3.3	1	1	0	38	1	40	1
9	1	0	4.7	1	2.7	1	29	1	53	1
10	1	0	4.8	1	1.1	1	19	1	50	1
11	1	0	8	1	3.3	1	22	1	71	1
12	1	0	1	0	1	0	48	1	36	1
13	1	0	1	0	1	0	48	1	34	1
14	1	0	1	0	1	0	42	1	34	1
15	1	0	1	0	1	0	54	1	34	1
16	1	0	1	0	1	0	38	1	58	1
17	1	0	1	0	1	0	47	1	40	1
18	1	0	1	0	1	0	61	1	29	1
19	1	0	1	0	1	0	48	1	55	1
20	1	0	1	0	1	0	41	1	32	1
21	1	0	5.2	1	3.2	1	35	1	33	1
22	1	0	1	0	1	0	41	1	22	1
23	2.4	1	1	0	1	0	110	1	51	1
24	4.1	1	1	0	1	0	110	1	43	1
25	2.8	1	1	0	1	0	97	1	38	1
26	2.2	1	1	0	1	0	92	1	46	1

	A	B	C	D	E	F	G	H	I	J	K	L
1	Sb PQM	D_Sb PQM	As PQM	D_As PQM	Ba PQM	D_Ba PQM	Be PQM	D_Be PQM	Cd PQM	D_Cd PQM	Cr PQM	D_Cr PQM
2	2	0	20	1	150	1	1	0	2.8	1	43	1
3	2	0	13	1	190	1	1.2	1	1	0	56	1
4	2	0	13	1	170	1	1	0	1.4	1	41	1
5	2	0	13	1	120	1	1	0	1.8	1	43	1
6	2	0	15	1	100	1	1	0	2.7	1	38	1
7	2	0	17	1	130	1	1	0	3.3	1	47	1
8	2	0	11	1	120	1	1.3	1	2.1	1	35	1
9	2	0	91	1	72	1	1	0	5.8	1	36	1
10	2	0	57	1	100	1	1	0	6.9	1	39	1
11	2	0	56	1	69	1	1	0	11	1	18	1
12	2	0	53	1	97	1	1	0	13	1	22	1
13	3.3	1	52	1	90	1	1	0	10	1	23	1
14	2	0	21	1	140	1	1	0	6.1	1	29	1
15	2	0	38	1	120	1	1	0	8.1	1	40	1
16	2	0	21	1	100	1	1	0	8.9	1	25	1
17	2	0	40	1	110	1	1	0	19	1	32	1
18	2	0	36	1	130	1	1	0	19	1	37	1
19	2	0	19	1	120	1	1.1	1	1	0	47	1
20	2	0	18	1	83	1	1	0	11	1	35	1
21	2	0	15	1	130	1	1.1	1	1	1	49	1
22	2	0	11	1	120	1	1.1	1	1	0	46	1
23	2	0	22	1	72	1	1	1	1	0	80	1
24	2	0	19	1	74	1	1	0	1	0	51	1
25	2	0	22	1	94	1	1	0	1.4	1	42	1
26	2	0	250	1	51	1	1	0	5.5	1	11	1
27	2	0	210	1	44	1	1	0	6	1	11	1
28	2	0	68	1	74	1	1	0	11	1	25	1
29	2	0	40	1	110	1	1	0	5.5	1	21	1
30	2	0	43	1	89	1	1	0	8.4	1	36	1
31	2	0	16	1	140	1	1	0	2.7	1	39	1

	M	N	O	P	Q	R	S	T	U	V	W	X
1	Co PQM	D_Co PQM	Cu PQM	D_Cu PQM	Pb PQM	D_Pb PQM	Hg PQM	D_Hg PQM	Mo PQM	D_Mo PQM	Ni PQM	D_Ni PQM
2	13	1	97	1	430	1	14	1	14	1	26	1
3	14	1	62	1	98	1	1.5	1	1	0	34	1
4	12	1	68	1	190	1	3.8	1	1	0	27	1
5	13	1	63	1	89	1	0.74	1	1.5	1	25	1
6	14	1	77	1	89	1	0.86	1	1.8	1	24	1
7	13	1	78	1	140	1	3.5	1	2.8	1	29	1
8	20	1	88	1	74	1	1.4	1	1	0	26	1
9	14	1	430	1	1800	1	44	1	17	1	28	1
10	21	1	510	1	1400	1	100	1	17	1	29	1
11	14	1	310	1	1000	1	15	1	15	1	21	1
12	14	1	210	1	1500	1	26	1	18	1	22	1
13	13	1	240	1	1400	1	26	1	20	1	23	1
14	15	1	110	1	340	1	7.5	1	5.5	1	21	1
15	15	1	160	1	750	1	11	1	6.9	1	28	1
16	16	1	120	1	580	1	9.7	1	4.4	1	22	1
17	21	1	250	1	1000	1	23	1	8	1	38	1
18	24	1	220	1	970	1	14	1	9.2	1	47	1
19	14	1	120	1	150	1	2.2	1	4.2	1	35	1
20	23	1	230	1	800	1	6.1	1	5.7	1	44	1
21	12	1	120	1	180	1	3.2	1	1.8	1	33	1
22	16	1	130	1	93	1	1.1	1	1	0	37	1
23	8.3	1	140	1	270	1	6.4	1	1	0	39	1
24	7.8	1	150	1	240	1	10	1	1	0	27	1
25	11	1	140	1	350	1	18	1	1	0	32	1
26	4.4	1	340	1	20000	1	11	1	14	1	11	1
27	7	1	380	1	19000	1	19	1	16	1	14	1
28	14	1	190	1	740	1	4.5	1	21	1	27	1
29	12	1	230	1	790	1	9.7	1	5.8	1	15	1
30	16	1	170	1	930	1	19	1	15	1	30	1
31	14	1	120	1	150	1	1.7	1	6.5	1	25	1

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	Se PQM	D_Se PQM	Ag PQM	D_Ag PQM	Tl PQM	D_Tl PQM	V PQM	D_V PQM	Zn PQM	D_Zn PQM
2	1	0	1	0	4.1	1	87	1	120	1
3	1	0	1	0	5.6	1	110	1	60	1
4	1	0	1	0	3.9	1	93	1	80	1
5	1	0	1	0	3.1	1	77	1	74	1
6	1	0	1	0	2.8	1	69	1	88	1
7	1	0	1	0	2.5	1	84	1	110	1
8	1	0	1	0	3.5	1	100	1	89	1
9	1	0	2	1	1	0	76	1	750	1
10	3.6	1	8.1	1	1	0	72	1	480	1
11	2	1	28	1	1	0	32	1	340	1
12	1	0	26	1	1	0	47	1	460	1
13	2.3	1	13	1	1	0	50	1	390	1
14	1	0	1	0	1.4	1	68	1	270	1
15	1	0	1	0	2	1	77	1	310	1
16	1	0	1	0	1.7	1	60	1	2000	1
17	1	0	1	0	1.2	1	71	1	710	1
18	1	0	3.9	1	1	0	75	1	720	1
19	1.9	1	1	0	1	0	120	1	130	1
20	1	0	1	0	1.4	1	86	1	420	1
21	1	0	1	0	2.3	1	120	1	110	1
22	1	0	1	0	4.5	1	110	1	72	1
23	3.2	1	1	0	4.4	1	93	1	83	1
24	2.3	1	1	0	3.9	1	92	1	77	1
25	2	1	1	0	6.1	1	86	1	93	1
26	3	1	73	1	1	0	23	1	630	1
27	2.1	1	57	1	1	0	23	1	780	1
28	5.1	1	22	1	1	0	49	1	310	1
29	2.7	1	6.7	1	1	0	56	1	220	1
30	3.2	1	13	1	1	0	61	1	390	1
31	2.4	1	1.4	1	1	0	80	1	100	1

	A	B	C	D	E	F	G	H	I	J	K	L
1	Sb PQM	D_Sb PQM	As PQM	D_As PQM	Ba PQM	D_Ba PQM	Be PQM	D_Be PQM	Cd PQM	D_Cd PQM	Cr PQM	D_Cr PQM
2	2	0	20	1	150	1	1	0	2.8	1	43	1
3	2	0	13	1	190	1	1.2	1	1	0	56	1
4	2	0	13	1	170	1	1	0	1.4	1	41	1
5	2	0	13	1	120	1	1	0	1.8	1	43	1
6	2	0	15	1	100	1	1	0	2.7	1	38	1
7	2	0	17	1	130	1	1	0	3.3	1	47	1
8	2	0	11	1	120	1	1.3	1	2.1	1	35	1
9												
10												
11												
12												
13												
14	2	0	21	1	140	1	1	0	6.1	1	29	1
15	2	0	38	1	120	1	1	0	8.1	1	40	1
16	2	0	21	1	100	1	1	0	8.9	1	25	1
17												
18	2	0	36	1	130	1	1	0	19	1	37	1
19	2	0	19	1	120	1	1.1	1	1	0	47	1
20	2	0	18	1	83	1	1	0	11	1	35	1
21	2	0	15	1	130	1	1.1	1	1	1	49	1
22	2	0	11	1	120	1	1.1	1	1	0	46	1
23	2	0	22	1	72	1	1	1	1	0	80	1
24	2	0	19	1	74	1	1	0	1	0	51	1
25	2	0	22	1	94	1	1	0	1.4	1	42	1
26												
27												
28	2	0	68	1	74	1	1	0	11	1	25	1
29	2	0	40	1	110	1	1	0	5.5	1	21	1
30	2	0	43	1	89	1	1	0	8.4	1	36	1
31	2	0	16	1	140	1	1	0	2.7	1	39	1

	M	N	O	P	Q	R	S	T	U	V	W	X
1	Co PQM	D_Co PQM	Cu PQM	D_Cu PQM	Pb PQM	D_Pb PQM	Hg PQM	D_Hg PQM	Mo PQM	D_Mo PQM	Ni PQM	D_Ni PQM
2	13	1	97	1	430	1	14	1	14	1	26	1
3	14	1	62	1	98	1	1.5	1	1	0	34	1
4	12	1	68	1	190	1	3.8	1	1	0	27	1
5	13	1	63	1	89	1	0.74	1	1.5	1	25	1
6	14	1	77	1	89	1	0.86	1	1.8	1	24	1
7	13	1	78	1	140	1	3.5	1	2.8	1	29	1
8	20	1	88	1	74	1	1.4	1	1	0	26	1
9												
10												
11												
12												
13												
14	15	1	110	1	340	1	7.5	1	5.5	1	21	1
15	15	1	160	1	750	1	11	1	6.9	1	28	1
16	16	1	120	1	580	1	9.7	1	4.4	1	22	1
17												
18	24	1	220	1	970	1	14	1	9.2	1	47	1
19	14	1	120	1	150	1	2.2	1	4.2	1	35	1
20	23	1	230	1	800	1	6.1	1	5.7	1	44	1
21	12	1	120	1	180	1	3.2	1	1.8	1	33	1
22	16	1	130	1	93	1	1.1	1	1	0	37	1
23	8.3	1	140	1	270	1	6.4	1	1	0	39	1
24	7.8	1	150	1	240	1	10	1	1	0	27	1
25	11	1	140	1	350	1	18	1	1	0	32	1
26												
27												
28	14	1	190	1	740	1	4.5	1	21	1	27	1
29	12	1	230	1	790	1	9.7	1	5.8	1	15	1
30	16	1	170	1	930	1	19	1	15	1	30	1
31	14	1	120	1	150	1	1.7	1	6.5	1	25	1

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	Se PQM	D_Se PQM	Ag PQM	D_Ag PQM	Tl PQM	D_Tl PQM	V PQM	D_V PQM	Zn PQM	D_Zn PQM
2	1	0	1	0	4.1	1	87	1	120	1
3	1	0	1	0	5.6	1	110	1	60	1
4	1	0	1	0	3.9	1	93	1	80	1
5	1	0	1	0	3.1	1	77	1	74	1
6	1	0	1	0	2.8	1	69	1	88	1
7	1	0	1	0	2.5	1	84	1	110	1
8	1	0	1	0	3.5	1	100	1	89	1
9										
10										
11										
12										
13										
14	1	0	1	0	1.4	1	68	1	270	1
15	1	0	1	0	2	1	77	1	310	1
16	1	0	1	0	1.7	1	60	1	2000	1
17										
18	1	0	3.9	1	1	0	75	1	720	1
19	1.9	1	1	0	1	0	120	1	130	1
20	1	0	1	0	1.4	1	86	1	420	1
21	1	0	1	0	2.3	1	120	1	110	1
22	1	0	1	0	4.5	1	110	1	72	1
23	3.2	1	1	0	4.4	1	93	1	83	1
24	2.3	1	1	0	3.9	1	92	1	77	1
25	2	1	1	0	6.1	1	86	1	93	1
26										
27										
28	5.1	1	22	1	1	0	49	1	310	1
29	2.7	1	6.7	1	1	0	56	1	220	1
30	3.2	1	13	1	1	0	61	1	390	1
31	2.4	1	1.4	1	1	0	80	1	100	1

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:49:31 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Ag PQM											
11												
12	General Statistics											
13	Total Number of Observations					22	Number of Distinct Observations					6
14							Number of Missing Observations					8
15	Number of Detects					5	Number of Non-Detects					17
16	Number of Distinct Detects					5	Number of Distinct Non-Detects					1
17	Minimum Detect					1.4	Minimum Non-Detect					1
18	Maximum Detect					22	Maximum Non-Detect					1
19	Variance Detects					68.32	Percent Non-Detects					77.27%
20	Mean Detects					9.4	SD Detects					8.265
21	Median Detects					6.7	CV Detects					0.879
22	Skewness Detects					0.995	Kurtosis Detects					0.152
23	Mean of Logged Detects					1.851	SD of Logged Detects					1.071
24												
25	Normal GOF Test on Detects Only											
26	Shapiro Wilk Test Statistic					0.924	Shapiro Wilk GOF Test					
27	5% Shapiro Wilk Critical Value					0.762	Detected Data appear Normal at 5% Significance Level					
28	Lilliefors Test Statistic					0.228	Lilliefors GOF Test					
29	5% Lilliefors Critical Value					0.396	Detected Data appear Normal at 5% Significance Level					
30	Detected Data appear Normal at 5% Significance Level											
31												
32	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
33	Mean					2.909	Standard Error of Mean					1.187
34	SD					4.981	95% KM (BCA) UCL					4.95
35	95% KM (t) UCL					4.952	95% KM (Percentile Bootstrap) UCL					4.809
36	95% KM (z) UCL					4.862	95% KM Bootstrap t UCL					5.653
37	90% KM Chebyshev UCL					6.471	95% KM Chebyshev UCL					8.085
38	97.5% KM Chebyshev UCL					10.32	99% KM Chebyshev UCL					14.72
39												
40	Gamma GOF Tests on Detected Observations Only											
41	A-D Test Statistic					0.171	Anderson-Darling GOF Test					
42	5% A-D Critical Value					0.687	Detected data appear Gamma Distributed at 5% Significance Level					
43	K-S Test Statistic					0.153	Kolmogrov-Smirnoff GOF					
44	5% K-S Critical Value					0.362	Detected data appear Gamma Distributed at 5% Significance Level					
45	Detected data appear Gamma Distributed at 5% Significance Level											
46												
47	Gamma Statistics on Detected Data Only											
48	k hat (MLE)					1.427	k star (bias corrected MLE)					0.704
49	Theta hat (MLE)					6.587	Theta star (bias corrected MLE)					13.35
50	nu hat (MLE)					14.27	nu star (bias corrected)					7.042
51	MLE Mean (bias corrected)					9.4	MLE Sd (bias corrected)					11.2
52												

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Gamma Kaplan-Meier (KM) Statistics**											
54					k hat (KM)	0.341					nu hat (KM)	15.01
55					Approximate Chi Square Value (15.01, α)	7.266					Adjusted Chi Square Value (15.01, β)	6.866
56					95% Gamma Approximate KM-UCL (use when n>=50)	6.008					95% Gamma Adjusted KM-UCL (use when n<50)	6.358
57												
58	**Gamma ROS Statistics using Imputed Non-Detects**											
59	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
60	GROS may not be used when kstar of detected data is small such as < 0.1											
61	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63					Minimum	0.01					Mean	2.144
64					Maximum	22					Median	0.01
65					SD	5.407					CV	2.522
66					k hat (MLE)	0.19					k star (bias corrected MLE)	0.195
67					Theta hat (MLE)	11.28					Theta star (bias corrected MLE)	11.02
68					nu hat (MLE)	8.367					nu star (bias corrected)	8.559
69					MLE Mean (bias corrected)	2.144					MLE Sd (bias corrected)	4.861
70											Adjusted Level of Significance (β)	0.0386
71					Approximate Chi Square Value (8.56, α)	3.063					Adjusted Chi Square Value (8.56, β)	2.822
72					95% Gamma Approximate UCL (use when n>=50)	5.991					95% Gamma Adjusted UCL (use when n<50)	6.503
73												
74	**Lognormal GOF Test on Detected Observations Only**											
75					Shapiro Wilk Test Statistic	0.982			**Shapiro Wilk GOF Test**			
76					5% Shapiro Wilk Critical Value	0.762			Detected Data appear Lognormal at 5% Significance Level			
77					Lilliefors Test Statistic	0.148			**Lilliefors GOF Test**			
78					5% Lilliefors Critical Value	0.396			Detected Data appear Lognormal at 5% Significance Level			
79	**Detected Data appear Lognormal at 5% Significance Level**											
80												
81	**Lognormal ROS Statistics Using Imputed Non-Detects**											
82					Mean in Original Scale	2.284					Mean in Log Scale	-1.823
83					SD in Original Scale	5.354					SD in Log Scale	2.703
84					95% t UCL (assumes normality of ROS data)	4.248					95% Percentile Bootstrap UCL	4.283
85					95% BCA Bootstrap UCL	5.121					95% Bootstrap t UCL	8.446
86					95% H-UCL (Log ROS)	153.7						
87												
88	**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**											
89					KM Mean (logged)	0.421					95% H-UCL (KM -Log)	3.694
90					KM SD (logged)	0.9					95% Critical H Value (KM-Log)	2.449
91					KM Standard Error of Mean (logged)	0.215						
92												
93	**DL/2 Statistics**											
94					**DL/2 Normal**				**DL/2 Log-Transformed**			
95					Mean in Original Scale	2.523					Mean in Log Scale	-0.115
96					SD in Original Scale	5.252					SD in Log Scale	1.187
97					95% t UCL (Assumes normality)	4.45					95% H-Stat UCL	3.776
98	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
99												
100	**Nonparametric Distribution Free UCL Statistics**											
101	**Detected Data appear Normal Distributed at 5% Significance Level**											
102												
103	**Suggested UCL to Use**											
104					95% KM (t) UCL	4.952					95% KM (Percentile Bootstrap) UCL	4.809

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:28:53 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	As PQM											
12												
13	General Statistics											
14	Total Number of Observations					22	Number of Distinct Observations					15
15							Number of Missing Observations					8
16	Minimum					11	Mean					23.23
17	Maximum					68	Median					19
18	SD					13.77	Std. Error of Mean					2.937
19	Coefficient of Variation					0.593	Skewness					1.976
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.764	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.911	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.308	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.189	Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL					28.28	95% Adjusted-CLT UCL (Chen-1995)					29.38
31							95% Modified-t UCL (Johnson-1978)					28.49
32												
33	Gamma GOF Test											
34	A-D Test Statistic					1.103	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.747	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.251	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.186	Data Not Gamma Distributed at 5% Significance Level					
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					4.163	k star (bias corrected MLE)					3.625
42	Theta hat (MLE)					5.58	Theta star (bias corrected MLE)					6.407
43	nu hat (MLE)					183.2	nu star (bias corrected)					159.5
44	MLE Mean (bias corrected)					23.23	MLE Sd (bias corrected)					12.2
45							Approximate Chi Square Value (0.05)					131.3
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					129.4
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					28.22	95% Adjusted Gamma UCL (use when n<50)					28.63
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.911	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.398			Mean of logged Data			3.02
60					Maximum of Logged Data	4.22			SD of logged Data			0.481
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	28.33			90% Chebyshev (MVUE) UCL			30.18
64					95% Chebyshev (MVUE) UCL	33.48			97.5% Chebyshev (MVUE) UCL			38.07
65					99% Chebyshev (MVUE) UCL	47.08						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	28.06			95% Jackknife UCL			28.28
72					95% Standard Bootstrap UCL	28			95% Bootstrap-t UCL			30.53
73					95% Hall's Bootstrap UCL	31.53			95% Percentile Bootstrap UCL			28.64
74					95% BCA Bootstrap UCL	29.45						
75					90% Chebyshev(Mean, Sd) UCL	32.04			95% Chebyshev(Mean, Sd) UCL			36.03
76					97.5% Chebyshev(Mean, Sd) UCL	41.57			99% Chebyshev(Mean, Sd) UCL			52.45
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	28.28			or 95% Modified-t UCL			28.49
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:31:39 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ba PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					13
15							Number of Missing Observations					8
16	Minimum					72	Mean					117.1
17	Maximum					190	Median					120
18	SD					30.59	Std. Error of Mean					6.523
19	Coefficient of Variation					0.261	Skewness					0.486
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.955	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.129	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					128.3	95% Adjusted-CLT UCL (Chen-1995)					128.5
31							95% Modified-t UCL (Johnson-1978)					128.4
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.335	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.742	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.163	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.185	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					15.41	k star (bias corrected MLE)					13.34
42	Theta hat (MLE)					7.6	Theta star (bias corrected MLE)					8.78
43	nu hat (MLE)					677.9	nu star (bias corrected)					586.8
44	MLE Mean (bias corrected)					117.1	MLE Sd (bias corrected)					32.06
45							Approximate Chi Square Value (0.05)					531.6
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					527.7
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					129.2	95% Adjusted Gamma UCL (use when n<50)					130.2
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.961	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.177	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.277				Mean of logged Data		4.73
60					Maximum of Logged Data	5.247				SD of logged Data		0.264
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	130.3				90% Chebyshev (MVUE) UCL		137.1
64					95% Chebyshev (MVUE) UCL	146.2				97.5% Chebyshev (MVUE) UCL		158.8
65					99% Chebyshev (MVUE) UCL	183.5						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	127.8				95% Jackknife UCL		128.3
72					95% Standard Bootstrap UCL	127.6				95% Bootstrap-t UCL		129.5
73					95% Hall's Bootstrap UCL	129.2				95% Percentile Bootstrap UCL		127.5
74					95% BCA Bootstrap UCL	128.7						
75					90% Chebyshev(Mean, Sd) UCL	136.7				95% Chebyshev(Mean, Sd) UCL		145.5
76					97.5% Chebyshev(Mean, Sd) UCL	157.8				99% Chebyshev(Mean, Sd) UCL		182
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	128.3						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:33:11 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Be PQM											
11												
12	General Statistics											
13	Total Number of Observations					22	Number of Distinct Observations				4	
14							Number of Missing Observations				8	
15	Number of Detects					6	Number of Non-Detects				16	
16	Number of Distinct Detects					4	Number of Distinct Non-Detects				1	
17	Minimum Detect					1	Minimum Non-Detect				1	
18	Maximum Detect					1.3	Maximum Non-Detect				1	
19	Variance Detects					0.0107	Percent Non-Detects				72.73%	
20	Mean Detects					1.133	SD Detects				0.103	
21	Median Detects					1.1	CV Detects				0.0911	
22	Skewness Detects					0.666	Kurtosis Detects				0.586	
23	Mean of Logged Detects					0.122	SD of Logged Detects				0.0898	
24												
25	Normal GOF Test on Detects Only											
26	Shapiro Wilk Test Statistic					0.916	Shapiro Wilk GOF Test					
27	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
28	Lilliefors Test Statistic					0.293	Lilliefors GOF Test					
29	5% Lilliefors Critical Value					0.362	Detected Data appear Normal at 5% Significance Level					
30	Detected Data appear Normal at 5% Significance Level											
31												
32	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
33	Mean					1.036	Standard Error of Mean				0.018	
34	SD					0.0771	95% KM (BCA) UCL				N/A	
35	95% KM (t) UCL					1.067	95% KM (Percentile Bootstrap) UCL				N/A	
36	95% KM (z) UCL					1.066	95% KM Bootstrap t UCL				N/A	
37	90% KM Chebyshev UCL					1.09	95% KM Chebyshev UCL				1.115	
38	97.5% KM Chebyshev UCL					1.149	99% KM Chebyshev UCL				1.216	
39												
40	Gamma GOF Tests on Detected Observations Only											
41	A-D Test Statistic					0.413	Anderson-Darling GOF Test					
42	5% A-D Critical Value					0.696	Detected data appear Gamma Distributed at 5% Significance Level					
43	K-S Test Statistic					0.297	Kolmogrov-Smirnoff GOF					
44	5% K-S Critical Value					0.332	Detected data appear Gamma Distributed at 5% Significance Level					
45	Detected data appear Gamma Distributed at 5% Significance Level											
46												
47	Gamma Statistics on Detected Data Only											
48	k hat (MLE)					147.5	k star (bias corrected MLE)				73.86	
49	Theta hat (MLE)					0.00768	Theta star (bias corrected MLE)				0.0153	
50	nu hat (MLE)					1770	nu star (bias corrected)				886.3	
51	MLE Mean (bias corrected)					1.133	MLE Sd (bias corrected)				0.132	
52												

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Gamma Kaplan-Meier (KM) Statistics**											
54	k hat (KM)					180.5	nu hat (KM)					7942
55	Approximate Chi Square Value (N/A, α)					7736	Adjusted Chi Square Value (N/A, β)					7721
56	95% Gamma Approximate KM-UCL (use when n>=50)					1.064	95% Gamma Adjusted KM-UCL (use when n<50)					1.066
57												
58	**Gamma ROS Statistics using Imputed Non-Detects**											
59	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
60	GROS may not be used when kstar of detected data is small such as < 0.1											
61	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63	Minimum					0.444	Mean					0.849
64	Maximum					1.3	Median					0.837
65	SD					0.225	CV					0.265
66	k hat (MLE)					14.33	k star (bias corrected MLE)					12.4
67	Theta hat (MLE)					0.0592	Theta star (bias corrected MLE)					0.0684
68	nu hat (MLE)					630.3	nu star (bias corrected)					545.7
69	MLE Mean (bias corrected)					0.849	MLE Sd (bias corrected)					0.241
70							Adjusted Level of Significance (β)					0.0386
71	Approximate Chi Square Value (545.72, α)					492.5	Adjusted Chi Square Value (545.72, β)					488.8
72	95% Gamma Approximate UCL (use when n>=50)					0.94	95% Gamma Adjusted UCL (use when n<50)					0.948
73												
74	**Lognormal GOF Test on Detected Observations Only**											
75	Shapiro Wilk Test Statistic					0.924	**Shapiro Wilk GOF Test**					
76	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Lognormal at 5% Significance Level					
77	Lilliefors Test Statistic					0.282	**Lilliefors GOF Test**					
78	5% Lilliefors Critical Value					0.362	Detected Data appear Lognormal at 5% Significance Level					
79	**Detected Data appear Lognormal at 5% Significance Level**											
80												
81	**Lognormal ROS Statistics Using Imputed Non-Detects**											
82	Mean in Original Scale					0.889	Mean in Log Scale					-0.138
83	SD in Original Scale					0.187	SD in Log Scale					0.208
84	95% t UCL (assumes normality of ROS data)					0.958	95% Percentile Bootstrap UCL					0.954
85	95% BCA Bootstrap UCL					0.955	95% Bootstrap t UCL					0.969
86	95% H-UCL (Log ROS)					0.965						
87												
88	**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**											
89	KM Mean (logged)					0.0332	95% H-UCL (KM -Log)					N/A
90	KM SD (logged)					0.0691	95% Critical H Value (KM-Log)					N/A
91	KM Standard Error of Mean (logged)					0.0161						
92												
93	**DL/2 Statistics**											
94	**DL/2 Normal**						**DL/2 Log-Transformed**					
95	Mean in Original Scale					0.673	Mean in Log Scale					-0.471
96	SD in Original Scale					0.293	SD in Log Scale					0.374
97	95% t UCL (Assumes normality)					0.78	95% H-Stat UCL					0.782
98	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
99												
100	**Nonparametric Distribution Free UCL Statistics**											
101	**Detected Data appear Normal Distributed at 5% Significance Level**											
102												
103	**Suggested UCL to Use**											
104	95% KM (t) UCL					1.067	95% KM (Percentile Bootstrap) UCL					N/A

	A	B	C	D	E	F	G	H	I	J	K	L
105	**Warning: One or more Recommended UCL(s) not available!**											
106												
107	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
108	Recommendations are based upon data size, data distribution, and skewness.											
109	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
110	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
111												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:34:54 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	**Cd PQM**											
11												
12	**General Statistics**											
13	Total Number of Observations					22	Number of Distinct Observations					14
14							Number of Missing Observations					8
15	Number of Detects					17	Number of Non-Detects					5
16	Number of Distinct Detects					14	Number of Distinct Non-Detects					1
17	Minimum Detect					1	Minimum Non-Detect					1
18	Maximum Detect					19	Maximum Non-Detect					1
19	Variance Detects					23.5	Percent Non-Detects					22.73%
20	Mean Detects					5.718	SD Detects					4.847
21	Median Detects					3.3	CV Detects					0.848
22	Skewness Detects					1.39	Kurtosis Detects					2.073
23	Mean of Logged Detects					1.404	SD of Logged Detects					0.869
24												
25	**Normal GOF Test on Detects Only**											
26	Shapiro Wilk Test Statistic					0.846	**Shapiro Wilk GOF Test**					
27	5% Shapiro Wilk Critical Value					0.892	Detected Data Not Normal at 5% Significance Level					
28	Lilliefors Test Statistic					0.22	**Lilliefors GOF Test**					
29	5% Lilliefors Critical Value					0.215	Detected Data Not Normal at 5% Significance Level					
30	**Detected Data Not Normal at 5% Significance Level**											
31												
32	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
33	Mean					4.645	Standard Error of Mean					1.007
34	SD					4.582	95% KM (BCA) UCL					6.436
35	95% KM (t) UCL					6.378	95% KM (Percentile Bootstrap) UCL					6.332
36	95% KM (z) UCL					6.302	95% KM Bootstrap t UCL					6.888
37	90% KM Chebyshev UCL					7.667	95% KM Chebyshev UCL					9.035
38	97.5% KM Chebyshev UCL					10.93	99% KM Chebyshev UCL					14.67
39												
40	**Gamma GOF Tests on Detected Observations Only**											
41	A-D Test Statistic					0.45	**Anderson-Darling GOF Test**					
42	5% A-D Critical Value					0.754	Detected data appear Gamma Distributed at 5% Significance Level					
43	K-S Test Statistic					0.175	**Kolmogrov-Smirnoff GOF**					
44	5% K-S Critical Value					0.213	Detected data appear Gamma Distributed at 5% Significance Level					
45	**Detected data appear Gamma Distributed at 5% Significance Level**											
46												
47	**Gamma Statistics on Detected Data Only**											
48	k hat (MLE)					1.62	k star (bias corrected MLE)					1.373
49	Theta hat (MLE)					3.529	Theta star (bias corrected MLE)					4.163
50	nu hat (MLE)					55.09	nu star (bias corrected)					46.7
51	MLE Mean (bias corrected)					5.718	MLE Sd (bias corrected)					4.879
52												

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Gamma Kaplan-Meier (KM) Statistics**											
54					k hat (KM)	1.028					nu hat (KM)	45.22
55					Approximate Chi Square Value (45.22, α)	30.79					Adjusted Chi Square Value (45.22, β)	29.91
56					95% Gamma Approximate KM-UCL (use when n>=50)	6.822					95% Gamma Adjusted KM-UCL (use when n<50)	7.024
57												
58	**Gamma ROS Statistics using Imputed Non-Detects**											
59	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
60	GROS may not be used when kstar of detected data is small such as < 0.1											
61	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63					Minimum	0.01					Mean	4.42
64					Maximum	19					Median	2.7
65					SD	4.888					CV	1.106
66					k hat (MLE)	0.447					k star (bias corrected MLE)	0.416
67					Theta hat (MLE)	9.898					Theta star (bias corrected MLE)	10.63
68					nu hat (MLE)	19.65					nu star (bias corrected)	18.3
69					MLE Mean (bias corrected)	4.42					MLE Sd (bias corrected)	6.854
70											Adjusted Level of Significance (β)	0.0386
71					Approximate Chi Square Value (18.30, α)	9.61					Adjusted Chi Square Value (18.30, β)	9.141
72					95% Gamma Approximate UCL (use when n>=50)	8.419					95% Gamma Adjusted UCL (use when n<50)	8.851
73												
74	**Lognormal GOF Test on Detected Observations Only**											
75					Shapiro Wilk Test Statistic	0.954			**Shapiro Wilk GOF Test**			
76					5% Shapiro Wilk Critical Value	0.892			Detected Data appear Lognormal at 5% Significance Level			
77					Lilliefors Test Statistic	0.138			**Lilliefors GOF Test**			
78					5% Lilliefors Critical Value	0.215			Detected Data appear Lognormal at 5% Significance Level			
79	**Detected Data appear Lognormal at 5% Significance Level**											
80												
81	**Lognormal ROS Statistics Using Imputed Non-Detects**											
82					Mean in Original Scale	4.544					Mean in Log Scale	0.934
83					SD in Original Scale	4.777					SD in Log Scale	1.184
84					95% t UCL (assumes normality of ROS data)	6.297					95% Percentile Bootstrap UCL	6.212
85					95% BCA Bootstrap UCL	6.579					95% Bootstrap t UCL	6.692
86					95% H-UCL (Log ROS)	10.7						
87												
88	**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**											
89					KM Mean (logged)	1.085					95% H-UCL (KM -Log)	7.779
90					KM SD (logged)	0.946					95% Critical H Value (KM-Log)	2.51
91					KM Standard Error of Mean (logged)	0.208						
92												
93	**DL/2 Statistics**											
94					**DL/2 Normal**				**DL/2 Log-Transformed**			
95					Mean in Original Scale	4.532					Mean in Log Scale	0.928
96					SD in Original Scale	4.787					SD in Log Scale	1.177
97					95% t UCL (Assumes normality)	6.288					95% H-Stat UCL	10.47
98	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
99												
100	**Nonparametric Distribution Free UCL Statistics**											
101	**Detected Data appear Gamma Distributed at 5% Significance Level**											
102												
103	**Suggested UCL to Use**											
104					95% KM (BCA) UCL	6.436					95% GROS Adjusted Gamma UCL	8.851

	A	B	C	D	E	F	G	H	I	J	K	L
105					95% Adjusted Gamma KM-UCL	7.024						
106												
107	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
108	Recommendations are based upon data size, data distribution, and skewness.											
109	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
110	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
111												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:37:37 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Co PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					11
15							Number of Missing Observations					8
16	Minimum					7.8	Mean					14.41
17	Maximum					24	Median					14
18	SD					3.917	Std. Error of Mean					0.835
19	Coefficient of Variation					0.272	Skewness					0.952
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.896	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.206	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					15.85	95% Adjusted-CLT UCL (Chen-1995)					15.97
31							95% Modified-t UCL (Johnson-1978)					15.88
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.712	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.742	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.173	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.185	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					14.96	k star (bias corrected MLE)					12.95
42	Theta hat (MLE)					0.964	Theta star (bias corrected MLE)					1.113
43	nu hat (MLE)					658.2	nu star (bias corrected)					569.7
44	MLE Mean (bias corrected)					14.41	MLE Sd (bias corrected)					4.006
45							Approximate Chi Square Value (0.05)					515.4
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					511.5
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					15.93	95% Adjusted Gamma UCL (use when n<50)					16.05
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.933	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.054				Mean of logged Data		2.634
60					Maximum of Logged Data	3.178				SD of logged Data		0.266
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	16.04				90% Chebyshev (MVUE) UCL		16.9
64					95% Chebyshev (MVUE) UCL	18.02				97.5% Chebyshev (MVUE) UCL		19.58
65					99% Chebyshev (MVUE) UCL	22.65						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	15.79				95% Jackknife UCL		15.85
72					95% Standard Bootstrap UCL	15.77				95% Bootstrap-t UCL		16.29
73					95% Hall's Bootstrap UCL	16.31				95% Percentile Bootstrap UCL		15.75
74					95% BCA Bootstrap UCL	15.89						
75					90% Chebyshev(Mean, Sd) UCL	16.92				95% Chebyshev(Mean, Sd) UCL		18.05
76					97.5% Chebyshev(Mean, Sd) UCL	19.63				99% Chebyshev(Mean, Sd) UCL		22.72
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	16.05						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:36:35 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cr PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					18
15							Number of Missing Observations					8
16	Minimum					21	Mean					41.14
17	Maximum					80	Median					40.5
18	SD					12.34	Std. Error of Mean					2.631
19	Coefficient of Variation					0.3	Skewness					1.251
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.904	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.136	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					45.66	95% Adjusted-CLT UCL (Chen-1995)					46.21
31							95% Modified-t UCL (Johnson-1978)					45.78
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.414	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.743	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.141	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.185	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					12.48	k star (bias corrected MLE)					10.81
42	Theta hat (MLE)					3.297	Theta star (bias corrected MLE)					3.806
43	nu hat (MLE)					549	nu star (bias corrected)					475.5
44	MLE Mean (bias corrected)					41.14	MLE Sd (bias corrected)					12.51
45							Approximate Chi Square Value (0.05)					425.9
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					422.4
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					45.92	95% Adjusted Gamma UCL (use when n<50)					46.3
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.958	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.158	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.045				Mean of logged Data		3.676
60					Maximum of Logged Data	4.382				SD of logged Data		0.292
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	46.33				90% Chebyshev (MVUE) UCL		48.93
64					95% Chebyshev (MVUE) UCL	52.46				97.5% Chebyshev (MVUE) UCL		57.36
65					99% Chebyshev (MVUE) UCL	66.98						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	45.46				95% Jackknife UCL		45.66
72					95% Standard Bootstrap UCL	45.33				95% Bootstrap-t UCL		46.58
73					95% Hall's Bootstrap UCL	48.77				95% Percentile Bootstrap UCL		45.41
74					95% BCA Bootstrap UCL	45.77						
75					90% Chebyshev(Mean, Sd) UCL	49.03				95% Chebyshev(Mean, Sd) UCL		52.61
76					97.5% Chebyshev(Mean, Sd) UCL	57.57				99% Chebyshev(Mean, Sd) UCL		67.32
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	45.66						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:39:01 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cu PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					17
15							Number of Missing Observations					8
16	Minimum					62	Mean					131
17	Maximum					230	Median					120
18	SD					52.05	Std. Error of Mean					11.1
19	Coefficient of Variation					0.397	Skewness					0.595
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.929	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.129	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					150.1	95% Adjusted-CLT UCL (Chen-1995)					150.8
31							95% Modified-t UCL (Johnson-1978)					150.4
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.288	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.745	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.0986	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.186	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					6.71	k star (bias corrected MLE)					5.825
42	Theta hat (MLE)					19.53	Theta star (bias corrected MLE)					22.5
43	nu hat (MLE)					295.2	nu star (bias corrected)					256.3
44	MLE Mean (bias corrected)					131	MLE Sd (bias corrected)					54.29
45							Approximate Chi Square Value (0.05)					220.2
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					217.8
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					152.5	95% Adjusted Gamma UCL (use when n<50)					154.3
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.956	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.127				Mean of logged Data		4.799
60					Maximum of Logged Data	5.438				SD of logged Data		0.404
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	156				90% Chebyshev (MVUE) UCL		166.1
64					95% Chebyshev (MVUE) UCL	181.8				97.5% Chebyshev (MVUE) UCL		203.7
65					99% Chebyshev (MVUE) UCL	246.7						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	149.3				95% Jackknife UCL		150.1
72					95% Standard Bootstrap UCL	148.9				95% Bootstrap-t UCL		152.2
73					95% Hall's Bootstrap UCL	151.3				95% Percentile Bootstrap UCL		149.9
74					95% BCA Bootstrap UCL	150.1						
75					90% Chebyshev(Mean, Sd) UCL	164.3				95% Chebyshev(Mean, Sd) UCL		179.4
76					97.5% Chebyshev(Mean, Sd) UCL	200.4				99% Chebyshev(Mean, Sd) UCL		241.5
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	150.1						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:41:48 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Hg PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					20
15							Number of Missing Observations					8
16	Minimum					0.74	Mean					6.814
17	Maximum					19	Median					5.3
18	SD					5.652	Std. Error of Mean					1.205
19	Coefficient of Variation					0.83	Skewness					0.818
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.892	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.159	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					8.887	95% Adjusted-CLT UCL (Chen-1995)					9.02
31							95% Modified-t UCL (Johnson-1978)					8.922
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.364	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.763	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.127	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.189	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					1.335	k star (bias corrected MLE)					1.183
42	Theta hat (MLE)					5.103	Theta star (bias corrected MLE)					5.758
43	nu hat (MLE)					58.75	nu star (bias corrected)					52.07
44	MLE Mean (bias corrected)					6.814	MLE Sd (bias corrected)					6.263
45							Approximate Chi Square Value (0.05)					36.5
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					35.52
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					9.721	95% Adjusted Gamma UCL (use when n<50)					9.988
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.941	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.139	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	-0.301				Mean of logged Data		1.5
60					Maximum of Logged Data	2.944				SD of logged Data		1.021
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	13.5				90% Chebyshev (MVUE) UCL		12.68
64					95% Chebyshev (MVUE) UCL	15.12				97.5% Chebyshev (MVUE) UCL		18.5
65					99% Chebyshev (MVUE) UCL	25.15						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	8.796				95% Jackknife UCL		8.887
72					95% Standard Bootstrap UCL	8.729				95% Bootstrap-t UCL		9.176
73					95% Hall's Bootstrap UCL	9.012				95% Percentile Bootstrap UCL		8.776
74					95% BCA Bootstrap UCL	8.911						
75					90% Chebyshev(Mean, Sd) UCL	10.43				95% Chebyshev(Mean, Sd) UCL		12.07
76					97.5% Chebyshev(Mean, Sd) UCL	14.34				99% Chebyshev(Mean, Sd) UCL		18.8
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	8.887						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:43:17 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Mo PQM											
11												
12	General Statistics											
13	Total Number of Observations					22	Number of Distinct Observations					15
14							Number of Missing Observations					8
15	Number of Detects					15	Number of Non-Detects					7
16	Number of Distinct Detects					14	Number of Distinct Non-Detects					1
17	Minimum Detect					1.5	Minimum Non-Detect					1
18	Maximum Detect					21	Maximum Non-Detect					1
19	Variance Detects					31.14	Percent Non-Detects					31.82%
20	Mean Detects					7.073	SD Detects					5.58
21	Median Detects					5.7	CV Detects					0.789
22	Skewness Detects					1.397	Kurtosis Detects					1.541
23	Mean of Logged Detects					1.676	SD of Logged Detects					0.792
24												
25	Normal GOF Test on Detects Only											
26	Shapiro Wilk Test Statistic					0.847	Shapiro Wilk GOF Test					
27	5% Shapiro Wilk Critical Value					0.881	Detected Data Not Normal at 5% Significance Level					
28	Lilliefors Test Statistic					0.246	Lilliefors GOF Test					
29	5% Lilliefors Critical Value					0.229	Detected Data Not Normal at 5% Significance Level					
30	Detected Data Not Normal at 5% Significance Level											
31												
32	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
33	Mean					5.141	Standard Error of Mean					1.164
34	SD					5.274	95% KM (BCA) UCL					7.159
35	95% KM (t) UCL					7.144	95% KM (Percentile Bootstrap) UCL					7.082
36	95% KM (z) UCL					7.055	95% KM Bootstrap t UCL					7.992
37	90% KM Chebyshev UCL					8.633	95% KM Chebyshev UCL					10.21
38	97.5% KM Chebyshev UCL					12.41	99% KM Chebyshev UCL					16.72
39												
40	Gamma GOF Tests on Detected Observations Only											
41	A-D Test Statistic					0.328	Anderson-Darling GOF Test					
42	5% A-D Critical Value					0.748	Detected data appear Gamma Distributed at 5% Significance Level					
43	K-S Test Statistic					0.151	Kolmogrov-Smirnoff GOF					
44	5% K-S Critical Value					0.225	Detected data appear Gamma Distributed at 5% Significance Level					
45	Detected data appear Gamma Distributed at 5% Significance Level											
46												
47	Gamma Statistics on Detected Data Only											
48	k hat (MLE)					1.936	k star (bias corrected MLE)					1.593
49	Theta hat (MLE)					3.654	Theta star (bias corrected MLE)					4.44
50	nu hat (MLE)					58.07	nu star (bias corrected)					47.79
51	MLE Mean (bias corrected)					7.073	MLE Sd (bias corrected)					5.604
52												

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Gamma Kaplan-Meier (KM) Statistics**											
54					k hat (KM)	0.95					nu hat (KM)	41.8
55					Approximate Chi Square Value (41.80, α)	27.98					Adjusted Chi Square Value (41.80, β)	27.14
56					95% Gamma Approximate KM-UCL (use when n>=50)	7.68					95% Gamma Adjusted KM-UCL (use when n<50)	7.919
57												
58	**Gamma ROS Statistics using Imputed Non-Detects**											
59	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
60	GROS may not be used when kstar of detected data is small such as < 0.1											
61	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63					Minimum	0.01					Mean	4.826
64					Maximum	21					Median	3.5
65					SD	5.666					CV	1.174
66					k hat (MLE)	0.354					k star (bias corrected MLE)	0.336
67					Theta hat (MLE)	13.63					Theta star (bias corrected MLE)	14.36
68					nu hat (MLE)	15.57					nu star (bias corrected)	14.78
69					MLE Mean (bias corrected)	4.826					MLE Sd (bias corrected)	8.326
70											Adjusted Level of Significance (β)	0.0386
71					Approximate Chi Square Value (14.78, α)	7.111					Adjusted Chi Square Value (14.78, β)	6.716
72					95% Gamma Approximate UCL (use when n>=50)	10.03					95% Gamma Adjusted UCL (use when n<50)	10.62
73												
74	**Lognormal GOF Test on Detected Observations Only**											
75					Shapiro Wilk Test Statistic	0.958			**Shapiro Wilk GOF Test**			
76					5% Shapiro Wilk Critical Value	0.881			Detected Data appear Lognormal at 5% Significance Level			
77					Lilliefors Test Statistic	0.115			**Lilliefors GOF Test**			
78					5% Lilliefors Critical Value	0.229			Detected Data appear Lognormal at 5% Significance Level			
79	**Detected Data appear Lognormal at 5% Significance Level**											
80												
81	**Lognormal ROS Statistics Using Imputed Non-Detects**											
82					Mean in Original Scale	5.088					Mean in Log Scale	1.053
83					SD in Original Scale	5.445					SD in Log Scale	1.169
84					95% t UCL (assumes normality of ROS data)	7.086					95% Percentile Bootstrap UCL	7.1
85					95% BCA Bootstrap UCL	7.497					95% Bootstrap t UCL	8.035
86					95% H-UCL (Log ROS)	11.67						
87												
88	**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**											
89					KM Mean (logged)	1.143					95% H-UCL (KM -Log)	9.156
90					KM SD (logged)	1.004					95% Critical H Value (KM-Log)	2.589
91					KM Standard Error of Mean (logged)	0.222						
92												
93	**DL/2 Statistics**											
94					**DL/2 Normal**				**DL/2 Log-Transformed**			
95					Mean in Original Scale	4.982					Mean in Log Scale	0.922
96					SD in Original Scale	5.53					SD in Log Scale	1.301
97					95% t UCL (Assumes normality)	7.011					95% H-Stat UCL	13.86
98	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
99												
100	**Nonparametric Distribution Free UCL Statistics**											
101	**Detected Data appear Gamma Distributed at 5% Significance Level**											
102												
103	**Suggested UCL to Use**											
104					95% KM (Percentile Bootstrap) UCL	7.082					95% GROS Adjusted Gamma UCL	10.62

	A	B	C	D	E	F	G	H	I	J	K	L
105					95% Adjusted Gamma KM-UCL	7.919						
106												
107	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
108	Recommendations are based upon data size, data distribution, and skewness.											
109	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
110	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
111												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:45:12 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ni PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					18
15							Number of Missing Observations					8
16	Minimum					15	Mean					29.68
17	Maximum					47	Median					27.5
18	SD					7.518	Std. Error of Mean					1.603
19	Coefficient of Variation					0.253	Skewness					0.59
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.96	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.139	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					32.44	95% Adjusted-CLT UCL (Chen-1995)					32.53
31							95% Modified-t UCL (Johnson-1978)					32.47
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.286	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.741	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.116	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.185	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					16.46	k star (bias corrected MLE)					14.24
42	Theta hat (MLE)					1.804	Theta star (bias corrected MLE)					2.084
43	nu hat (MLE)					724.1	nu star (bias corrected)					626.7
44	MLE Mean (bias corrected)					29.68	MLE Sd (bias corrected)					7.865
45							Approximate Chi Square Value (0.05)					569.6
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					565.6
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					32.66	95% Adjusted Gamma UCL (use when n<50)					32.89
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.971	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.708				Mean of logged Data		3.36
60					Maximum of Logged Data	3.85				SD of logged Data		0.256
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	32.91				90% Chebyshev (MVUE) UCL		34.61
64					95% Chebyshev (MVUE) UCL	36.84				97.5% Chebyshev (MVUE) UCL		39.93
65					99% Chebyshev (MVUE) UCL	46						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	32.32				95% Jackknife UCL		32.44
72					95% Standard Bootstrap UCL	32.25				95% Bootstrap-t UCL		32.87
73					95% Hall's Bootstrap UCL	32.91				95% Percentile Bootstrap UCL		32.27
74					95% BCA Bootstrap UCL	32.41						
75					90% Chebyshev(Mean, Sd) UCL	34.49				95% Chebyshev(Mean, Sd) UCL		36.67
76					97.5% Chebyshev(Mean, Sd) UCL	39.69				99% Chebyshev(Mean, Sd) UCL		45.63
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	32.44						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:40:25 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Pb PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					20
15							Number of Missing Observations					8
16	Minimum					74	Mean					383.8
17	Maximum					970	Median					255
18	SD					308.8	Std. Error of Mean					65.83
19	Coefficient of Variation					0.805	Skewness					0.741
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.844	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.189	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					497.1	95% Adjusted-CLT UCL (Chen-1995)					503.2
31							95% Modified-t UCL (Johnson-1978)					498.8
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.784	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.758	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.154	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.188	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					1.592	k star (bias corrected MLE)					1.405
42	Theta hat (MLE)					241.1	Theta star (bias corrected MLE)					273.2
43	nu hat (MLE)					70.03	nu star (bias corrected)					61.81
44	MLE Mean (bias corrected)					383.8	MLE Sd (bias corrected)					323.8
45							Approximate Chi Square Value (0.05)					44.73
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					43.64
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					530.3	95% Adjusted Gamma UCL (use when n<50)					543.5
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.916	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.146	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.304				Mean of logged Data		5.604
60					Maximum of Logged Data	6.877				SD of logged Data		0.878
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	635.1				90% Chebyshev (MVUE) UCL		632.2
64					95% Chebyshev (MVUE) UCL	741.8				97.5% Chebyshev (MVUE) UCL		893.9
65					99% Chebyshev (MVUE) UCL	1193						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	492.1				95% Jackknife UCL		497.1
72					95% Standard Bootstrap UCL	487.2				95% Bootstrap-t UCL		508.9
73					95% Hall's Bootstrap UCL	494.5				95% Percentile Bootstrap UCL		489.1
74					95% BCA Bootstrap UCL	497.6						
75					90% Chebyshev(Mean, Sd) UCL	581.3				95% Chebyshev(Mean, Sd) UCL		670.7
76					97.5% Chebyshev(Mean, Sd) UCL	794.9				99% Chebyshev(Mean, Sd) UCL		1039
77												
78	**Suggested UCL to Use**											
79					95% Adjusted Gamma UCL	543.5						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:46:23 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Se PQM											
11												
12	General Statistics											
13	Total Number of Observations					22	Number of Distinct Observations					8
14							Number of Missing Observations					8
15	Number of Detects					8	Number of Non-Detects					14
16	Number of Distinct Detects					7	Number of Distinct Non-Detects					1
17	Minimum Detect					1.9	Minimum Non-Detect					1
18	Maximum Detect					5.1	Maximum Non-Detect					1
19	Variance Detects					1.066	Percent Non-Detects					63.64%
20	Mean Detects					2.85	SD Detects					1.032
21	Median Detects					2.55	CV Detects					0.362
22	Skewness Detects					1.687	Kurtosis Detects					3.289
23	Mean of Logged Detects					0.999	SD of Logged Detects					0.32
24												
25	Normal GOF Test on Detects Only											
26	Shapiro Wilk Test Statistic					0.831	Shapiro Wilk GOF Test					
27	5% Shapiro Wilk Critical Value					0.818	Detected Data appear Normal at 5% Significance Level					
28	Lilliefors Test Statistic					0.242	Lilliefors GOF Test					
29	5% Lilliefors Critical Value					0.313	Detected Data appear Normal at 5% Significance Level					
30	Detected Data appear Normal at 5% Significance Level											
31												
32	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
33	Mean					1.673	Standard Error of Mean					0.242
34	SD					1.064	95% KM (BCA) UCL					2.064
35	95% KM (t) UCL					2.09	95% KM (Percentile Bootstrap) UCL					2.086
36	95% KM (z) UCL					2.071	95% KM Bootstrap t UCL					2.153
37	90% KM Chebyshev UCL					2.4	95% KM Chebyshev UCL					2.729
38	97.5% KM Chebyshev UCL					3.187	99% KM Chebyshev UCL					4.085
39												
40	Gamma GOF Tests on Detected Observations Only											
41	A-D Test Statistic					0.401	Anderson-Darling GOF Test					
42	5% A-D Critical Value					0.715	Detected data appear Gamma Distributed at 5% Significance Level					
43	K-S Test Statistic					0.189	Kolmogrov-Smirnoff GOF					
44	5% K-S Critical Value					0.294	Detected data appear Gamma Distributed at 5% Significance Level					
45	Detected data appear Gamma Distributed at 5% Significance Level											
46												
47	Gamma Statistics on Detected Data Only											
48	k hat (MLE)					10.52	k star (bias corrected MLE)					6.656
49	Theta hat (MLE)					0.271	Theta star (bias corrected MLE)					0.428
50	nu hat (MLE)					168.3	nu star (bias corrected)					106.5
51	MLE Mean (bias corrected)					2.85	MLE Sd (bias corrected)					1.105
52												

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Gamma Kaplan-Meier (KM) Statistics**											
54					k hat (KM)	2.474					nu hat (KM)	108.8
55					Approximate Chi Square Value (108.85, α)	85.77					Adjusted Chi Square Value (108.85, β)	84.24
56					95% Gamma Approximate KM-UCL (use when n>=50)	2.123					95% Gamma Adjusted KM-UCL (use when n<50)	2.161
57												
58	**Gamma ROS Statistics using Imputed Non-Detects**											
59	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
60	GROS may not be used when kstar of detected data is small such as < 0.1											
61	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63					Minimum	0.01					Mean	1.257
64					Maximum	5.1					Median	0.775
65					SD	1.414					CV	1.125
66					k hat (MLE)	0.426					k star (bias corrected MLE)	0.398
67					Theta hat (MLE)	2.953					Theta star (bias corrected MLE)	3.159
68					nu hat (MLE)	18.73					nu star (bias corrected)	17.51
69					MLE Mean (bias corrected)	1.257					MLE Sd (bias corrected)	1.993
70											Adjusted Level of Significance (β)	0.0386
71					Approximate Chi Square Value (17.51, α)	9.038					Adjusted Chi Square Value (17.51, β)	8.585
72					95% Gamma Approximate UCL (use when n>=50)	2.436					95% Gamma Adjusted UCL (use when n<50)	2.564
73												
74	**Lognormal GOF Test on Detected Observations Only**											
75					Shapiro Wilk Test Statistic	0.919			**Shapiro Wilk GOF Test**			
76					5% Shapiro Wilk Critical Value	0.818			Detected Data appear Lognormal at 5% Significance Level			
77					Lilliefors Test Statistic	0.179			**Lilliefors GOF Test**			
78					5% Lilliefors Critical Value	0.313			Detected Data appear Lognormal at 5% Significance Level			
79	**Detected Data appear Lognormal at 5% Significance Level**											
80												
81	**Lognormal ROS Statistics Using Imputed Non-Detects**											
82					Mean in Original Scale	1.655					Mean in Log Scale	0.296
83					SD in Original Scale	1.138					SD in Log Scale	0.663
84					95% t UCL (assumes normality of ROS data)	2.072					95% Percentile Bootstrap UCL	2.037
85					95% BCA Bootstrap UCL	2.138					95% Bootstrap t UCL	2.219
86					95% H-UCL (Log ROS)	2.29						
87												
88	**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**											
89					KM Mean (logged)	0.363					95% H-UCL (KM -Log)	2.055
90					KM SD (logged)	0.513					95% Critical H Value (KM-Log)	2.009
91					KM Standard Error of Mean (logged)	0.117						
92												
93	**DL/2 Statistics**											
94					**DL/2 Normal**				**DL/2 Log-Transformed**			
95					Mean in Original Scale	1.355					Mean in Log Scale	-0.0778
96					SD in Original Scale	1.302					SD in Log Scale	0.853
97					95% t UCL (Assumes normality)	1.832					95% H-Stat UCL	2.077
98	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
99												
100	**Nonparametric Distribution Free UCL Statistics**											
101	**Detected Data appear Normal Distributed at 5% Significance Level**											
102												
103	**Suggested UCL to Use**											
104					95% KM (t) UCL	2.09			95% KM (Percentile Bootstrap) UCL			2.086

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:50:54 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	TI PQM											
11												
12	General Statistics											
13	Total Number of Observations					22	Number of Distinct Observations					15
14							Number of Missing Observations					8
15	Number of Detects					16	Number of Non-Detects					6
16	Number of Distinct Detects					14	Number of Distinct Non-Detects					1
17	Minimum Detect					1.4	Minimum Non-Detect					1
18	Maximum Detect					6.1	Maximum Non-Detect					1
19	Variance Detects					2.038	Percent Non-Detects					27.27%
20	Mean Detects					3.325	SD Detects					1.428
21	Median Detects					3.3	CV Detects					0.429
22	Skewness Detects					0.371	Kurtosis Detects					-0.613
23	Mean of Logged Detects					1.107	SD of Logged Detects					0.463
24												
25	Normal GOF Test on Detects Only											
26	Shapiro Wilk Test Statistic					0.955	Shapiro Wilk GOF Test					
27	5% Shapiro Wilk Critical Value					0.887	Detected Data appear Normal at 5% Significance Level					
28	Lilliefors Test Statistic					0.0939	Lilliefors GOF Test					
29	5% Lilliefors Critical Value					0.222	Detected Data appear Normal at 5% Significance Level					
30	Detected Data appear Normal at 5% Significance Level											
31												
32	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
33	Mean					2.691	Standard Error of Mean					0.345
34	SD					1.569	95% KM (BCA) UCL					3.282
35	95% KM (t) UCL					3.285	95% KM (Percentile Bootstrap) UCL					3.273
36	95% KM (z) UCL					3.259	95% KM Bootstrap t UCL					3.343
37	90% KM Chebyshev UCL					3.727	95% KM Chebyshev UCL					4.197
38	97.5% KM Chebyshev UCL					4.848	99% KM Chebyshev UCL					6.128
39												
40	Gamma GOF Tests on Detected Observations Only											
41	A-D Test Statistic					0.245	Anderson-Darling GOF Test					
42	5% A-D Critical Value					0.741	Detected data appear Gamma Distributed at 5% Significance Level					
43	K-S Test Statistic					0.137	Kolmogrov-Smirnoff GOF					
44	5% K-S Critical Value					0.216	Detected data appear Gamma Distributed at 5% Significance Level					
45	Detected data appear Gamma Distributed at 5% Significance Level											
46												
47	Gamma Statistics on Detected Data Only											
48	k hat (MLE)					5.445	k star (bias corrected MLE)					4.466
49	Theta hat (MLE)					0.611	Theta star (bias corrected MLE)					0.745
50	nu hat (MLE)					174.2	nu star (bias corrected)					142.9
51	MLE Mean (bias corrected)					3.325	MLE Sd (bias corrected)					1.573
52												

	A	B	C	D	E	F	G	H	I	J	K	L
53	**Gamma Kaplan-Meier (KM) Statistics**											
54					k hat (KM)	2.941					nu hat (KM)	129.4
55					Approximate Chi Square Value (129.42, α)	104.1					Adjusted Chi Square Value (129.42, β)	102.5
56					95% Gamma Approximate KM-UCL (use when n>=50)	3.344					95% Gamma Adjusted KM-UCL (use when n<50)	3.399
57												
58	**Gamma ROS Statistics using Imputed Non-Detects**											
59	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs											
60	GROS may not be used when kstar of detected data is small such as < 0.1											
61	For such situations, GROS method tends to yield inflated values of UCLs and BTVs											
62	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates											
63					Minimum	0.01					Mean	2.584
64					Maximum	6.1					Median	2.4
65					SD	1.742					CV	0.674
66					k hat (MLE)	1.239					k star (bias corrected MLE)	1.1
67					Theta hat (MLE)	2.086					Theta star (bias corrected MLE)	2.349
68					nu hat (MLE)	54.51					nu star (bias corrected)	48.41
69					MLE Mean (bias corrected)	2.584					MLE Sd (bias corrected)	2.463
70											Adjusted Level of Significance (β)	0.0386
71					Approximate Chi Square Value (48.41, α)	33.44					Adjusted Chi Square Value (48.41, β)	32.51
72					95% Gamma Approximate UCL (use when n>=50)	3.741					95% Gamma Adjusted UCL (use when n<50)	3.848
73												
74	**Lognormal GOF Test on Detected Observations Only**											
75					Shapiro Wilk Test Statistic	0.95			**Shapiro Wilk GOF Test**			
76					5% Shapiro Wilk Critical Value	0.887			Detected Data appear Lognormal at 5% Significance Level			
77					Lilliefors Test Statistic	0.146			**Lilliefors GOF Test**			
78					5% Lilliefors Critical Value	0.222			Detected Data appear Lognormal at 5% Significance Level			
79	**Detected Data appear Lognormal at 5% Significance Level**											
80												
81	**Lognormal ROS Statistics Using Imputed Non-Detects**											
82					Mean in Original Scale	2.699					Mean in Log Scale	0.805
83					SD in Original Scale	1.602					SD in Log Scale	0.652
84					95% t UCL (assumes normality of ROS data)	3.287					95% Percentile Bootstrap UCL	3.255
85					95% BCA Bootstrap UCL	3.267					95% Bootstrap t UCL	3.335
86					95% H-UCL (Log ROS)	3.755						
87												
88	**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**											
89					KM Mean (logged)	0.805					95% H-UCL (KM -Log)	3.627
90					KM SD (logged)	0.624					95% Critical H Value (KM-Log)	2.12
91					KM Standard Error of Mean (logged)	0.137						
92												
93	**DL/2 Statistics**											
94					**DL/2 Normal**				**DL/2 Log-Transformed**			
95					Mean in Original Scale	2.555					Mean in Log Scale	0.616
96					SD in Original Scale	1.765					SD in Log Scale	0.909
97					95% t UCL (Assumes normality)	3.202					95% H-Stat UCL	4.56
98	**DL/2 is not a recommended method, provided for comparisons and historical reasons**											
99												
100	**Nonparametric Distribution Free UCL Statistics**											
101	**Detected Data appear Normal Distributed at 5% Significance Level**											
102												
103	**Suggested UCL to Use**											
104					95% KM (t) UCL	3.285			95% KM (Percentile Bootstrap) UCL			3.273

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:52:43 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**V PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					17
15							Number of Missing Observations					8
16	Minimum					49	Mean					84.23
17	Maximum					120	Median					85
18	SD					19.8	Std. Error of Mean					4.221
19	Coefficient of Variation					0.235	Skewness					0.197
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.972	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.102	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					91.49	95% Adjusted-CLT UCL (Chen-1995)					91.36
31							95% Modified-t UCL (Johnson-1978)					91.52
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.186	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.741	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.081	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.185	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					18.48	k star (bias corrected MLE)					15.99
42	Theta hat (MLE)					4.559	Theta star (bias corrected MLE)					5.269
43	nu hat (MLE)					812.9	nu star (bias corrected)					703.4
44	MLE Mean (bias corrected)					84.23	MLE Sd (bias corrected)					21.07
45							Approximate Chi Square Value (0.05)					642.9
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					638.5
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					92.16	95% Adjusted Gamma UCL (use when n<50)					92.78
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.973	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.0859	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.892				Mean of logged Data		4.406
60					Maximum of Logged Data	4.787				SD of logged Data		0.242
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	92.83				90% Chebyshev (MVUE) UCL		97.47
64					95% Chebyshev (MVUE) UCL	103.4				97.5% Chebyshev (MVUE) UCL		111.7
65					99% Chebyshev (MVUE) UCL	128						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	91.17				95% Jackknife UCL		91.49
72					95% Standard Bootstrap UCL	91.15				95% Bootstrap-t UCL		91.77
73					95% Hall's Bootstrap UCL	90.8				95% Percentile Bootstrap UCL		91
74					95% BCA Bootstrap UCL	91.18						
75					90% Chebyshev(Mean, Sd) UCL	96.89				95% Chebyshev(Mean, Sd) UCL		102.6
76					97.5% Chebyshev(Mean, Sd) UCL	110.6				99% Chebyshev(Mean, Sd) UCL		126.2
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	91.49						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 10:53:46 AM								
5	From File			ProUCL Worksheet, Providence Quartz Mine (PQM).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Zn PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					22	Number of Distinct Observations					20
15							Number of Missing Observations					8
16	Minimum					60	Mean					269.4
17	Maximum					2000	Median					110
18	SD					419	Std. Error of Mean					89.34
19	Coefficient of Variation					1.556	Skewness					3.701
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.501	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.911	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.309	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.189	Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					423.1	95% Adjusted-CLT UCL (Chen-1995)					491.6
31							95% Modified-t UCL (Johnson-1978)					434.8
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					1.917	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.769	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.271	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.19	Data Not Gamma Distributed at 5% Significance Level					
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					1.095	k star (bias corrected MLE)					0.976
42	Theta hat (MLE)					246.1	Theta star (bias corrected MLE)					276.1
43	nu hat (MLE)					48.16	nu star (bias corrected)					42.93
44	MLE Mean (bias corrected)					269.4	MLE Sd (bias corrected)					272.7
45							Approximate Chi Square Value (0.05)					28.91
46	Adjusted Level of Significance					0.0386	Adjusted Chi Square Value					28.05
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					400	95% Adjusted Gamma UCL (use when n<50)					412.3
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.852	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.911	Data Not Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.227	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.189	Data Not Lognormal at 5% Significance Level					
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.094			Mean of logged Data			5.074
60					Maximum of Logged Data	7.601			SD of logged Data			0.897
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	385.4			90% Chebyshev (MVUE) UCL			381.1
64					95% Chebyshev (MVUE) UCL	448.2			97.5% Chebyshev (MVUE) UCL			541.2
65					99% Chebyshev (MVUE) UCL	724						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	416.3			95% Jackknife UCL			423.1
72					95% Standard Bootstrap UCL	412			95% Bootstrap-t UCL			738.2
73					95% Hall's Bootstrap UCL	983.5			95% Percentile Bootstrap UCL			434.6
74					95% BCA Bootstrap UCL	501.3						
75					90% Chebyshev(Mean, Sd) UCL	537.4			95% Chebyshev(Mean, Sd) UCL			658.8
76					97.5% Chebyshev(Mean, Sd) UCL	827.3			99% Chebyshev(Mean, Sd) UCL			1158
77												
78	**Suggested UCL to Use**											
79					95% Chebyshev (Mean, Sd) UCL	658.8						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	Sb PQM	D_Sb PQM	As PQM	D_As PQM	Ba PQM	D_Ba PQM	Be PQM	D_Be PQM	Cd PQM	D_Cd PQM	Cr PQM	D_Cr PQM
2	2	0	13	1	190	1	1.2	1	1	0	56	1
3	2	0	13	1	170	1	1	0	1.4	1	41	1
4	2	0	13	1	120	1	1	0	1.8	1	43	1
5	2	0	15	1	100	1	1	0	2.7	1	38	1
6	2	0	17	1	130	1	1	0	3.3	1	47	1
7	2	0	11	1	120	1	1.3	1	2.1	1	35	1
8	2	0	19	1	120	1	1.1	1	1	0	47	1
9	2	0	15	1	130	1	1.1	1	1	1	49	1
10	2	0	11	1	120	1	1.1	1	1	0	46	1
11	2	0	22	1	72	1	1	1	1	0	80	1
12	2	0	19	1	74	1	1	0	1	0	51	1
13	2	0	16	1	140	1	1	0	2.7	1	39	1

	M	N	O	P	Q	R	S	T	U	V	W	X
1	Co PQM	D_Co PQM	Cu PQM	D_Cu PQM	Pb PQM	D_Pb PQM	Hg PQM	D_Hg PQM	Mo PQM	D_Mo PQM	Ni PQM	D_Ni PQM
2	14	1	62	1	98	1	1.5	1	1	0	34	1
3	12	1	68	1	190	1	3.8	1	1	0	27	1
4	13	1	63	1	89	1	0.74	1	1.5	1	25	1
5	14	1	77	1	89	1	0.86	1	1.8	1	24	1
6	13	1	78	1	140	1	3.5	1	2.8	1	29	1
7	20	1	88	1	74	1	1.4	1	1	0	26	1
8	14	1	120	1	150	1	2.2	1	4.2	1	35	1
9	12	1	120	1	180	1	3.2	1	1.8	1	33	1
10	16	1	130	1	93	1	1.1	1	1	0	37	1
11	8.3	1	140	1	270	1	6.4	1	1	0	39	1
12	7.8	1	150	1	240	1	10	1	1	0	27	1
13	14	1	120	1	150	1	1.7	1	6.5	1	25	1

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	Se PQM	D_Se PQM	Ag PQM	D_Ag PQM	Tl PQM	D_Tl PQM	V PQM	D_V PQM	Zn PQM	D_Zn PQM
2	1	0	1	0	5.6	1	110	1	60	1
3	1	0	1	0	3.9	1	93	1	80	1
4	1	0	1	0	3.1	1	77	1	74	1
5	1	0	1	0	2.8	1	69	1	88	1
6	1	0	1	0	2.5	1	84	1	110	1
7	1	0	1	0	3.5	1	100	1	89	1
8	1.9	1	1	0	1	0	120	1	130	1
9	1	0	1	0	2.3	1	120	1	110	1
10	1	0	1	0	4.5	1	110	1	72	1
11	3.2	1	1	0	4.4	1	93	1	83	1
12	2.3	1	1	0	3.9	1	92	1	77	1
13	2.4	1	1.4	1	1	0	80	1	100	1

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 12:57:07 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**As PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					7
15							Number of Missing Observations					0
16	Minimum					11	Mean					15.33
17	Maximum					22	Median					15
18	SD					3.42	Std. Error of Mean					0.987
19	Coefficient of Variation					0.223	Skewness					0.542
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.941	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.169	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					17.11	95% Adjusted-CLT UCL (Chen-1995)					17.12
31							95% Modified-t UCL (Johnson-1978)					17.13
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.286	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.732	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.172	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					22.56	k star (bias corrected MLE)					16.98
42	Theta hat (MLE)					0.68	Theta star (bias corrected MLE)					0.903
43	nu hat (MLE)					541.5	nu star (bias corrected)					407.5
44	MLE Mean (bias corrected)					15.33	MLE Sd (bias corrected)					3.721
45							Approximate Chi Square Value (0.05)					361.7
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					355.1
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					17.27	95% Adjusted Gamma UCL (use when n<50)					17.6
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.953	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.159	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.398				Mean of logged Data		2.708
60					Maximum of Logged Data	3.091				SD of logged Data		0.22
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	17.38				90% Chebyshev (MVUE) UCL		18.27
64					95% Chebyshev (MVUE) UCL	19.59				97.5% Chebyshev (MVUE) UCL		21.44
65					99% Chebyshev (MVUE) UCL	25.06						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	16.96				95% Jackknife UCL		17.11
72					95% Standard Bootstrap UCL	16.91				95% Bootstrap-t UCL		17.34
73					95% Hall's Bootstrap UCL	17.2				95% Percentile Bootstrap UCL		16.92
74					95% BCA Bootstrap UCL	16.92						
75					90% Chebyshev(Mean, Sd) UCL	18.3				95% Chebyshev(Mean, Sd) UCL		19.64
76					97.5% Chebyshev(Mean, Sd) UCL	21.5				99% Chebyshev(Mean, Sd) UCL		25.16
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	17.11						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 12:59:25 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ba PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					8
15							Number of Missing Observations					0
16	Minimum					72	Mean					123.8
17	Maximum					190	Median					120
18	SD					33.9	Std. Error of Mean					9.787
19	Coefficient of Variation					0.274	Skewness					0.325
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.93	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.205	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					141.4	95% Adjusted-CLT UCL (Chen-1995)					140.9
31							95% Modified-t UCL (Johnson-1978)					141.6
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.496	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.731	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.239	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					14.06	k star (bias corrected MLE)					10.6
42	Theta hat (MLE)					8.808	Theta star (bias corrected MLE)					11.68
43	nu hat (MLE)					337.4	nu star (bias corrected)					254.4
44	MLE Mean (bias corrected)					123.8	MLE Sd (bias corrected)					38.04
45							Approximate Chi Square Value (0.05)					218.5
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					213.4
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					144.2	95% Adjusted Gamma UCL (use when n<50)					147.6
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.917	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.256	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data Not Lognormal at 5% Significance Level					
56	**Data appear Approximate Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.277			Mean of logged Data			4.783
60					Maximum of Logged Data	5.247			SD of logged Data			0.286
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	146.7			90% Chebyshev (MVUE) UCL			154.9
64					95% Chebyshev (MVUE) UCL	168.9			97.5% Chebyshev (MVUE) UCL			188.3
65					99% Chebyshev (MVUE) UCL	226.5						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	139.9			95% Jackknife UCL			141.4
72					95% Standard Bootstrap UCL	139.4			95% Bootstrap-t UCL			142.7
73					95% Hall's Bootstrap UCL	146.8			95% Percentile Bootstrap UCL			140
74					95% BCA Bootstrap UCL	139.5						
75					90% Chebyshev(Mean, Sd) UCL	153.2			95% Chebyshev(Mean, Sd) UCL			166.5
76					97.5% Chebyshev(Mean, Sd) UCL	185			99% Chebyshev(Mean, Sd) UCL			221.2
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	141.4						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:00:30 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Be PQM											
11												
12	General Statistics											
13	Total Number of Observations					12	Number of Distinct Observations					4
14	Number of Detects					6	Number of Non-Detects					6
15	Number of Distinct Detects					4	Number of Distinct Non-Detects					1
16	Minimum Detect					1	Minimum Non-Detect					1
17	Maximum Detect					1.3	Maximum Non-Detect					1
18	Variance Detects					0.0107	Percent Non-Detects					50%
19	Mean Detects					1.133	SD Detects					0.103
20	Median Detects					1.1	CV Detects					0.0911
21	Skewness Detects					0.666	Kurtosis Detects					0.586
22	Mean of Logged Detects					0.122	SD of Logged Detects					0.0898
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.916	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.293	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.362	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.067	Standard Error of Mean					0.0298
33	SD					0.0943	95% KM (BCA) UCL					N/A
34	95% KM (t) UCL					1.12	95% KM (Percentile Bootstrap) UCL					N/A
35	95% KM (z) UCL					1.116	95% KM Bootstrap t UCL					N/A
36	90% KM Chebyshev UCL					1.156	95% KM Chebyshev UCL					1.197
37	97.5% KM Chebyshev UCL					1.253	99% KM Chebyshev UCL					1.363
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.413	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.696	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.297	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.332	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					147.5	k star (bias corrected MLE)					73.86
48	Theta hat (MLE)					0.00768	Theta star (bias corrected MLE)					0.0153
49	nu hat (MLE)					1770	nu star (bias corrected)					886.3
50	MLE Mean (bias corrected)					1.133	MLE Sd (bias corrected)					0.132
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	128					nu hat (KM)	3072
54					Approximate Chi Square Value (N/A, α)	2944					Adjusted Chi Square Value (N/A, β)	2925
55					95% Gamma Approximate KM-UCL (use when n>=50)	1.113					95% Gamma Adjusted KM-UCL (use when n<50)	1.12
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.7					Mean	0.985
63					Maximum	1.3					Median	0.973
64					SD	0.18					CV	0.183
65					k hat (MLE)	32.22					k star (bias corrected MLE)	24.22
66					Theta hat (MLE)	0.0306					Theta star (bias corrected MLE)	0.0407
67					nu hat (MLE)	773.3					nu star (bias corrected)	581.3
68					MLE Mean (bias corrected)	0.985					MLE Sd (bias corrected)	0.2
69											Adjusted Level of Significance (β)	0.029
70					Approximate Chi Square Value (581.28, α)	526.4					Adjusted Chi Square Value (581.28, β)	518.4
71					95% Gamma Approximate UCL (use when n>=50)	1.088					95% Gamma Adjusted UCL (use when n<50)	1.105
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.924					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.282					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.362					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1					Mean in Log Scale	-0.0124
82					SD in Original Scale	0.163					SD in Log Scale	0.163
83					95% t UCL (assumes normality of ROS data)	1.085					95% Percentile Bootstrap UCL	1.079
84					95% BCA Bootstrap UCL	1.081					95% Bootstrap t UCL	1.091
85					95% H-UCL (Log ROS)	1.095						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.0609					95% H-UCL (KM -Log)	N/A
89					KM SD (logged)	0.0841					95% Critical H Value (KM-Log)	N/A
90					KM Standard Error of Mean (logged)	0.0266						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	0.817					Mean in Log Scale	-0.286
95					SD in Original Scale	0.338					SD in Log Scale	0.43
96					95% t UCL (Assumes normality)	0.992					95% H-Stat UCL	1.076
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	1.12					95% KM (Percentile Bootstrap) UCL	N/A
104					**Warning: One or more Recommended UCL(s) not available!**							

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:01:47 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Cd PQM											
11												
12	General Statistics											
13	Total Number of Observations					12	Number of Distinct Observations					6
14	Number of Detects					7	Number of Non-Detects					5
15	Number of Distinct Detects					6	Number of Distinct Non-Detects					1
16	Minimum Detect					1	Minimum Non-Detect					1
17	Maximum Detect					3.3	Maximum Non-Detect					1
18	Variance Detects					0.656	Percent Non-Detects					41.67%
19	Mean Detects					2.143	SD Detects					0.81
20	Median Detects					2.1	CV Detects					0.378
21	Skewness Detects					-0.021	Kurtosis Detects					-1.054
22	Mean of Logged Detects					0.692	SD of Logged Detects					0.419
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.969	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.803	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.183	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.335	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.667	Standard Error of Mean					0.251
33	SD					0.803	95% KM (BCA) UCL					2.058
34	95% KM (t) UCL					2.117	95% KM (Percentile Bootstrap) UCL					2.058
35	95% KM (z) UCL					2.079	95% KM Bootstrap t UCL					2.151
36	90% KM Chebyshev UCL					2.418	95% KM Chebyshev UCL					2.759
37	97.5% KM Chebyshev UCL					3.231	99% KM Chebyshev UCL					4.159
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.231	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.709	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.208	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.313	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					7.33	k star (bias corrected MLE)					4.284
48	Theta hat (MLE)					0.292	Theta star (bias corrected MLE)					0.5
49	nu hat (MLE)					102.6	nu star (bias corrected)					59.97
50	MLE Mean (bias corrected)					2.143	MLE Sd (bias corrected)					1.035
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	4.303					nu hat (KM)	103.3
54					Approximate Chi Square Value (103.27, α)	80.82					Adjusted Chi Square Value (103.27, β)	77.8
55					95% Gamma Approximate KM-UCL (use when n>=50)	2.13					95% Gamma Adjusted KM-UCL (use when n<50)	2.212
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.394
63					Maximum	3.3					Median	1.2
64					SD	1.119					CV	0.803
65					k hat (MLE)	0.827					k star (bias corrected MLE)	0.676
66					Theta hat (MLE)	1.686					Theta star (bias corrected MLE)	2.063
67					nu hat (MLE)	19.85					nu star (bias corrected)	16.22
68					MLE Mean (bias corrected)	1.394					MLE Sd (bias corrected)	1.696
69											Adjusted Level of Significance (β)	0.029
70					Approximate Chi Square Value (16.22, α)	8.116					Adjusted Chi Square Value (16.22, β)	7.258
71					95% Gamma Approximate UCL (use when n>=50)	2.786					95% Gamma Adjusted UCL (use when n<50)	3.116
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.951			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.803			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.192			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.335			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.529			Mean in Log Scale			0.221
82					SD in Original Scale	0.974			SD in Log Scale			0.688
83					95% t UCL (assumes normality of ROS data)	2.034			95% Percentile Bootstrap UCL			1.961
84					95% BCA Bootstrap UCL	2.035			95% Bootstrap t UCL			2.143
85					95% H-UCL (Log ROS)	2.599						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.404			95% H-UCL (KM -Log)			2.203
89					KM SD (logged)	0.452			95% Critical H Value (KM-Log)			2.084
90					KM Standard Error of Mean (logged)	0.141						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	1.458			Mean in Log Scale			0.115
95					SD in Original Scale	1.036			SD in Log Scale			0.778
96					95% t UCL (Assumes normality)	1.995			95% H-Stat UCL			2.75
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	2.117			95% KM (Percentile Bootstrap) UCL			2.058
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:04:07 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Co PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					7
15							Number of Missing Observations					0
16	Minimum					7.8	Mean					13.18
17	Maximum					20	Median					13.5
18	SD					3.202	Std. Error of Mean					0.924
19	Coefficient of Variation					0.243	Skewness					0.227
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.913	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.232	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					14.83	95% Adjusted-CLT UCL (Chen-1995)					14.76
31							95% Modified-t UCL (Johnson-1978)					14.84
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.649	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.731	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.214	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					17.55	k star (bias corrected MLE)					13.21
42	Theta hat (MLE)					0.751	Theta star (bias corrected MLE)					0.997
43	nu hat (MLE)					421.1	nu star (bias corrected)					317.2
44	MLE Mean (bias corrected)					13.18	MLE Sd (bias corrected)					3.624
45							Approximate Chi Square Value (0.05)					276.9
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					271.2
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					15.09	95% Adjusted Gamma UCL (use when n<50)					15.41
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.893	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.234	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	2.054				Mean of logged Data		2.55
60					Maximum of Logged Data	2.996				SD of logged Data		0.256
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	15.31				90% Chebyshev (MVUE) UCL		16.14
64					95% Chebyshev (MVUE) UCL	17.48				97.5% Chebyshev (MVUE) UCL		19.33
65					99% Chebyshev (MVUE) UCL	22.97						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	14.7				95% Jackknife UCL		14.83
72					95% Standard Bootstrap UCL	14.61				95% Bootstrap-t UCL		14.83
73					95% Hall's Bootstrap UCL	15.02				95% Percentile Bootstrap UCL		14.68
74					95% BCA Bootstrap UCL	14.83						
75					90% Chebyshev(Mean, Sd) UCL	15.95				95% Chebyshev(Mean, Sd) UCL		17.2
76					97.5% Chebyshev(Mean, Sd) UCL	18.95				99% Chebyshev(Mean, Sd) UCL		22.37
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	14.83						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:03:10 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cr PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					11
15							Number of Missing Observations					0
16	Minimum					35	Mean					47.67
17	Maximum					80	Median					46.5
18	SD					11.78	Std. Error of Mean					3.401
19	Coefficient of Variation					0.247	Skewness					2.03
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.807	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.222	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					53.77	95% Adjusted-CLT UCL (Chen-1995)					55.39
31							95% Modified-t UCL (Johnson-1978)					54.11
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.54	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.732	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.182	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					21.63	k star (bias corrected MLE)					16.28
42	Theta hat (MLE)					2.204	Theta star (bias corrected MLE)					2.929
43	nu hat (MLE)					519.1	nu star (bias corrected)					390.6
44	MLE Mean (bias corrected)					47.67	MLE Sd (bias corrected)					11.82
45							Approximate Chi Square Value (0.05)					345.8
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					339.4
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					53.84	95% Adjusted Gamma UCL (use when n<50)					54.86
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.902	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.171	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.555				Mean of logged Data		3.841
60					Maximum of Logged Data	4.382				SD of logged Data		0.216
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	53.81				90% Chebyshev (MVUE) UCL		56.54
64					95% Chebyshev (MVUE) UCL	60.59				97.5% Chebyshev (MVUE) UCL		66.22
65					99% Chebyshev (MVUE) UCL	77.29						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	53.26				95% Jackknife UCL		53.77
72					95% Standard Bootstrap UCL	52.93				95% Bootstrap-t UCL		58.01
73					95% Hall's Bootstrap UCL	81.58				95% Percentile Bootstrap UCL		53.67
74					95% BCA Bootstrap UCL	54.75						
75					90% Chebyshev(Mean, Sd) UCL	57.87				95% Chebyshev(Mean, Sd) UCL		62.49
76					97.5% Chebyshev(Mean, Sd) UCL	68.9				99% Chebyshev(Mean, Sd) UCL		81.5
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	53.77						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:05:10 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Cu PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					10
15							Number of Missing Observations					0
16	Minimum					62	Mean					101.3
17	Maximum					150	Median					104
18	SD					31.87	Std. Error of Mean					9.2
19	Coefficient of Variation					0.315	Skewness					0.109
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.895	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.221	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					117.9	95% Adjusted-CLT UCL (Chen-1995)					116.8
31							95% Modified-t UCL (Johnson-1978)					117.9
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.613	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.73	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.248	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Data Not Gamma Distributed at 5% Significance Level					
38	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					10.67	k star (bias corrected MLE)					8.058
42	Theta hat (MLE)					9.497	Theta star (bias corrected MLE)					12.57
43	nu hat (MLE)					256.1	nu star (bias corrected)					193.4
44	MLE Mean (bias corrected)					101.3	MLE Sd (bias corrected)					35.7
45							Approximate Chi Square Value (0.05)					162.2
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					157.9
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					120.8	95% Adjusted Gamma UCL (use when n<50)					124.1
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.891	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.247	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.127				Mean of logged Data		4.571
60					Maximum of Logged Data	5.011				SD of logged Data		0.326
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	123.4				90% Chebyshev (MVUE) UCL		130.4
64					95% Chebyshev (MVUE) UCL	143.5				97.5% Chebyshev (MVUE) UCL		161.7
65					99% Chebyshev (MVUE) UCL	197.4						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	116.5				95% Jackknife UCL		117.9
72					95% Standard Bootstrap UCL	115.9				95% Bootstrap-t UCL		117.1
73					95% Hall's Bootstrap UCL	115.2				95% Percentile Bootstrap UCL		115.3
74					95% BCA Bootstrap UCL	115.9						
75					90% Chebyshev(Mean, Sd) UCL	128.9				95% Chebyshev(Mean, Sd) UCL		141.4
76					97.5% Chebyshev(Mean, Sd) UCL	158.8				99% Chebyshev(Mean, Sd) UCL		192.9
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	117.9						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:07:35 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Hg PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					12
15							Number of Missing Observations					0
16	Minimum					0.74	Mean					3.033
17	Maximum					10	Median					1.95
18	SD					2.729	Std. Error of Mean					0.788
19	Coefficient of Variation					0.9	Skewness					1.806
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.791	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.223	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Approximate Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					4.448	95% Adjusted-CLT UCL (Chen-1995)					4.768
31							95% Modified-t UCL (Johnson-1978)					4.516
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.374	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.743	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.17	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.249	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					1.769	k star (bias corrected MLE)					1.382
42	Theta hat (MLE)					1.714	Theta star (bias corrected MLE)					2.194
43	nu hat (MLE)					42.46	nu star (bias corrected)					33.18
44	MLE Mean (bias corrected)					3.033	MLE Sd (bias corrected)					2.58
45							Approximate Chi Square Value (0.05)					21.01
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					19.54
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					4.79	95% Adjusted Gamma UCL (use when n<50)					5.15
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.964	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	-0.301				Mean of logged Data		0.801
60					Maximum of Logged Data	2.303				SD of logged Data		0.801
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	5.712				90% Chebyshev (MVUE) UCL		5.137
64					95% Chebyshev (MVUE) UCL	6.118				97.5% Chebyshev (MVUE) UCL		7.479
65					99% Chebyshev (MVUE) UCL	10.15						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	4.329				95% Jackknife UCL		4.448
72					95% Standard Bootstrap UCL	4.264				95% Bootstrap-t UCL		5.89
73					95% Hall's Bootstrap UCL	10.76				95% Percentile Bootstrap UCL		4.35
74					95% BCA Bootstrap UCL	4.708						
75					90% Chebyshev(Mean, Sd) UCL	5.397				95% Chebyshev(Mean, Sd) UCL		6.467
76					97.5% Chebyshev(Mean, Sd) UCL	7.953				99% Chebyshev(Mean, Sd) UCL		10.87
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	4.448						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Data Sets with Non-Detects**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:09:00 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	**Mo PQM**											
11												
12	**General Statistics**											
13	Total Number of Observations					12	Number of Distinct Observations					6
14	Number of Detects					6	Number of Non-Detects					6
15	Number of Distinct Detects					5	Number of Distinct Non-Detects					1
16	Minimum Detect					1.5	Minimum Non-Detect					1
17	Maximum Detect					6.5	Maximum Non-Detect					1
18	Variance Detects					3.76	Percent Non-Detects					50%
19	Mean Detects					3.1	SD Detects					1.939
20	Median Detects					2.3	CV Detects					0.626
21	Skewness Detects					1.322	Kurtosis Detects					1.047
22	Mean of Logged Detects					0.986	SD of Logged Detects					0.573
23												
24	**Normal GOF Test on Detects Only**											
25	Shapiro Wilk Test Statistic					0.841	**Shapiro Wilk GOF Test**					
26	5% Shapiro Wilk Critical Value					0.788	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.249	**Lilliefors GOF Test**					
28	5% Lilliefors Critical Value					0.362	Detected Data appear Normal at 5% Significance Level					
29	**Detected Data appear Normal at 5% Significance Level**											
30												
31	**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**											
32	Mean					2.05	Standard Error of Mean					0.517
33	SD					1.634	95% KM (BCA) UCL					2.95
34	95% KM (t) UCL					2.978	95% KM (Percentile Bootstrap) UCL					2.942
35	95% KM (z) UCL					2.9	95% KM Bootstrap t UCL					3.688
36	90% KM Chebyshev UCL					3.6	95% KM Chebyshev UCL					4.302
37	97.5% KM Chebyshev UCL					5.276	99% KM Chebyshev UCL					7.191
38												
39	**Gamma GOF Tests on Detected Observations Only**											
40	A-D Test Statistic					0.421	**Anderson-Darling GOF Test**					
41	5% A-D Critical Value					0.701	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.277	**Kolmogrov-Smirnoff GOF**					
43	5% K-S Critical Value					0.334	Detected data appear Gamma Distributed at 5% Significance Level					
44	**Detected data appear Gamma Distributed at 5% Significance Level**											
45												
46	**Gamma Statistics on Detected Data Only**											
47	k hat (MLE)					3.603	k star (bias corrected MLE)					1.913
48	Theta hat (MLE)					0.86	Theta star (bias corrected MLE)					1.621
49	nu hat (MLE)					43.24	nu star (bias corrected)					22.95
50	MLE Mean (bias corrected)					3.1	MLE Sd (bias corrected)					2.242
51												
52	**Gamma Kaplan-Meier (KM) Statistics**											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	1.574					nu hat (KM)	37.79
54					Approximate Chi Square Value (37.79, α)	24.71					Adjusted Chi Square Value (37.79, β)	23.11
55					95% Gamma Approximate KM-UCL (use when n>=50)	3.135					95% Gamma Adjusted KM-UCL (use when n<50)	3.352
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.555
63					Maximum	6.5					Median	0.755
64					SD	2.077					CV	1.336
65					k hat (MLE)	0.305					k star (bias corrected MLE)	0.285
66					Theta hat (MLE)	5.091					Theta star (bias corrected MLE)	5.463
67					nu hat (MLE)	7.331					nu star (bias corrected)	6.831
68					MLE Mean (bias corrected)	1.555					MLE Sd (bias corrected)	2.915
69											Adjusted Level of Significance (β)	0.029
70					Approximate Chi Square Value (6.83, α)	2.078					Adjusted Chi Square Value (6.83, β)	1.703
71					95% Gamma Approximate UCL (use when n>=50)	5.111					95% Gamma Adjusted UCL (use when n<50)	6.239
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.905					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.788					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.257					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.362					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.81					Mean in Log Scale	0.105
82					SD in Original Scale	1.886					SD in Log Scale	1.069
83					95% t UCL (assumes normality of ROS data)	2.787					95% Percentile Bootstrap UCL	2.747
84					95% BCA Bootstrap UCL	2.857					95% Bootstrap t UCL	3.601
85					95% H-UCL (Log ROS)	5.235						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.493					95% H-UCL (KM -Log)	3.033
89					KM SD (logged)	0.616					95% Critical H Value (KM-Log)	2.294
90					KM Standard Error of Mean (logged)	0.195						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	1.8					Mean in Log Scale	0.147
95					SD in Original Scale	1.885					SD in Log Scale	0.958
96					95% t UCL (Assumes normality)	2.777					95% H-Stat UCL	4.164
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	2.978					95% KM (Percentile Bootstrap) UCL	2.942
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:10:56 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Ni PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					10
15							Number of Missing Observations					0
16	Minimum					24	Mean					30.08
17	Maximum					39	Median					28
18	SD					5.23	Std. Error of Mean					1.51
19	Coefficient of Variation					0.174	Skewness					0.479
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.897	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.222	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					32.79	95% Adjusted-CLT UCL (Chen-1995)					32.79
31							95% Modified-t UCL (Johnson-1978)					32.83
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.558	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.731	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.223	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					37.18	k star (bias corrected MLE)					27.94
42	Theta hat (MLE)					0.809	Theta star (bias corrected MLE)					1.077
43	nu hat (MLE)					892.4	nu star (bias corrected)					670.6
44	MLE Mean (bias corrected)					30.08	MLE Sd (bias corrected)					5.691
45							Approximate Chi Square Value (0.05)					611.5
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					602.9
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					32.99	95% Adjusted Gamma UCL (use when n<50)					33.46
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.906	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.21	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	3.178				Mean of logged Data		3.39
60					Maximum of Logged Data	3.664				SD of logged Data		0.171
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	33.07				90% Chebyshev (MVUE) UCL		34.53
64					95% Chebyshev (MVUE) UCL	36.55				97.5% Chebyshev (MVUE) UCL		39.35
65					99% Chebyshev (MVUE) UCL	44.86						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	32.57				95% Jackknife UCL		32.79
72					95% Standard Bootstrap UCL	32.46				95% Bootstrap-t UCL		32.95
73					95% Hall's Bootstrap UCL	32.42				95% Percentile Bootstrap UCL		32.58
74					95% BCA Bootstrap UCL	32.5						
75					90% Chebyshev(Mean, Sd) UCL	34.61				95% Chebyshev(Mean, Sd) UCL		36.66
76					97.5% Chebyshev(Mean, Sd) UCL	39.51				99% Chebyshev(Mean, Sd) UCL		45.11
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	32.79						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:06:02 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Pb PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					10
15							Number of Missing Observations					0
16	Minimum					74	Mean					146.9
17	Maximum					270	Median					145
18	SD					63.36	Std. Error of Mean					18.29
19	Coefficient of Variation					0.431	Skewness					0.745
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.907	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.197	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					179.8	95% Adjusted-CLT UCL (Chen-1995)					181.2
31							95% Modified-t UCL (Johnson-1978)					180.4
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.401	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.732	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.206	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.246	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					6.177	k star (bias corrected MLE)					4.688
42	Theta hat (MLE)					23.79	Theta star (bias corrected MLE)					31.34
43	nu hat (MLE)					148.2	nu star (bias corrected)					112.5
44	MLE Mean (bias corrected)					146.9	MLE Sd (bias corrected)					67.85
45							Approximate Chi Square Value (0.05)					89.03
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					85.84
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					185.7	95% Adjusted Gamma UCL (use when n<50)					192.6
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.935	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.192	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.304				Mean of logged Data		4.907
60					Maximum of Logged Data	5.598				SD of logged Data		0.425
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	192.5				90% Chebyshev (MVUE) UCL		201.7
64					95% Chebyshev (MVUE) UCL	226.6				97.5% Chebyshev (MVUE) UCL		261.2
65					99% Chebyshev (MVUE) UCL	329						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	177				95% Jackknife UCL		179.8
72					95% Standard Bootstrap UCL	175.3				95% Bootstrap-t UCL		185.7
73					95% Hall's Bootstrap UCL	184.3				95% Percentile Bootstrap UCL		175.4
74					95% BCA Bootstrap UCL	179.7						
75					90% Chebyshev(Mean, Sd) UCL	201.8				95% Chebyshev(Mean, Sd) UCL		226.6
76					97.5% Chebyshev(Mean, Sd) UCL	261.1				99% Chebyshev(Mean, Sd) UCL		328.9
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	179.8						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:12:16 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Se PQM											
11												
12	General Statistics											
13	Total Number of Observations					12	Number of Distinct Observations					5
14	Number of Detects					4	Number of Non-Detects					8
15	Number of Distinct Detects					4	Number of Distinct Non-Detects					1
16	Minimum Detect					1.9	Minimum Non-Detect					1
17	Maximum Detect					3.2	Maximum Non-Detect					1
18	Variance Detects					0.297	Percent Non-Detects					66.67%
19	Mean Detects					2.45	SD Detects					0.545
20	Median Detects					2.35	CV Detects					0.222
21	Skewness Detects					1.04	Kurtosis Detects					1.969
22	Mean of Logged Detects					0.878	SD of Logged Detects					0.215
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.931	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.748	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.287	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.443	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					1.483	Standard Error of Mean					0.245
33	SD					0.736	95% KM (BCA) UCL					N/A
34	95% KM (t) UCL					1.924	95% KM (Percentile Bootstrap) UCL					N/A
35	95% KM (z) UCL					1.887	95% KM Bootstrap t UCL					N/A
36	90% KM Chebyshev UCL					2.219	95% KM Chebyshev UCL					2.552
37	97.5% KM Chebyshev UCL					3.015	99% KM Chebyshev UCL					3.924
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.297	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.657	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.269	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.394	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					28.35	k star (bias corrected MLE)					7.253
48	Theta hat (MLE)					0.0864	Theta star (bias corrected MLE)					0.338
49	nu hat (MLE)					226.8	nu star (bias corrected)					58.03
50	MLE Mean (bias corrected)					2.45	MLE Sd (bias corrected)					0.91
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	4.064					nu hat (KM)	97.54
54					Approximate Chi Square Value (97.54, α)	75.76					Adjusted Chi Square Value (97.54, β)	72.83
55					95% Gamma Approximate KM-UCL (use when n>=50)	1.91					95% Gamma Adjusted KM-UCL (use when n<50)	1.987
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	0.01					Mean	1.223
63					Maximum	3.2					Median	1.046
64					SD	1.038					CV	0.849
65					k hat (MLE)	0.697					k star (bias corrected MLE)	0.578
66					Theta hat (MLE)	1.755					Theta star (bias corrected MLE)	2.115
67					nu hat (MLE)	16.73					nu star (bias corrected)	13.88
68					MLE Mean (bias corrected)	1.223					MLE Sd (bias corrected)	1.609
69											Adjusted Level of Significance (β)	0.029
70					Approximate Chi Square Value (13.88, α)	6.49					Adjusted Chi Square Value (13.88, β)	5.736
71					95% Gamma Approximate UCL (use when n>=50)	2.617					95% Gamma Adjusted UCL (use when n<50)	N/A
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.96					**Shapiro Wilk GOF Test**	
75					5% Shapiro Wilk Critical Value	0.748					Detected Data appear Lognormal at 5% Significance Level	
76					Lilliefors Test Statistic	0.255					**Lilliefors GOF Test**	
77					5% Lilliefors Critical Value	0.443					Detected Data appear Lognormal at 5% Significance Level	
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	1.536					Mean in Log Scale	0.316
82					SD in Original Scale	0.776					SD in Log Scale	0.499
83					95% t UCL (assumes normality of ROS data)	1.939					95% Percentile Bootstrap UCL	1.925
84					95% BCA Bootstrap UCL	1.948					95% Bootstrap t UCL	2.007
85					95% H-UCL (Log ROS)	2.143						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	0.293					95% H-UCL (KM -Log)	1.915
89					KM SD (logged)	0.428					95% Critical H Value (KM-Log)	2.056
90					KM Standard Error of Mean (logged)	0.143						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**						**DL/2 Log-Transformed**	
94					Mean in Original Scale	1.15					Mean in Log Scale	-0.169
95					SD in Original Scale	1.001					SD in Log Scale	0.782
96					95% t UCL (Assumes normality)	1.669					95% H-Stat UCL	2.086
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	1.924					95% KM (Percentile Bootstrap) UCL	N/A
104					**Warning: One or more Recommended UCL(s) not available!**							

	A	B	C	D	E	F	G	H	I	J	K	L
105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:14:21 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	TI PQM											
11												
12	General Statistics											
13	Total Number of Observations					12	Number of Distinct Observations					10
14	Number of Detects					10	Number of Non-Detects					2
15	Number of Distinct Detects					9	Number of Distinct Non-Detects					1
16	Minimum Detect					2.3	Minimum Non-Detect					1
17	Maximum Detect					5.6	Maximum Non-Detect					1
18	Variance Detects					1.045	Percent Non-Detects					16.67%
19	Mean Detects					3.65	SD Detects					1.022
20	Median Detects					3.7	CV Detects					0.28
21	Skewness Detects					0.483	Kurtosis Detects					-0.144
22	Mean of Logged Detects					1.259	SD of Logged Detects					0.282
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic					0.962	Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value					0.842	Detected Data appear Normal at 5% Significance Level					
27	Lilliefors Test Statistic					0.105	Lilliefors GOF Test					
28	5% Lilliefors Critical Value					0.28	Detected Data appear Normal at 5% Significance Level					
29	Detected Data appear Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean					3.208	Standard Error of Mean					0.404
33	SD					1.326	95% KM (BCA) UCL					3.842
34	95% KM (t) UCL					3.933	95% KM (Percentile Bootstrap) UCL					3.808
35	95% KM (z) UCL					3.872	95% KM Bootstrap t UCL					3.868
36	90% KM Chebyshev UCL					4.419	95% KM Chebyshev UCL					4.968
37	97.5% KM Chebyshev UCL					5.729	99% KM Chebyshev UCL					7.224
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic					0.186	Anderson-Darling GOF Test					
41	5% A-D Critical Value					0.725	Detected data appear Gamma Distributed at 5% Significance Level					
42	K-S Test Statistic					0.133	Kolmogrov-Smirnoff GOF					
43	5% K-S Critical Value					0.266	Detected data appear Gamma Distributed at 5% Significance Level					
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)					14.29	k star (bias corrected MLE)					10.07
48	Theta hat (MLE)					0.255	Theta star (bias corrected MLE)					0.362
49	nu hat (MLE)					285.9	nu star (bias corrected)					201.4
50	MLE Mean (bias corrected)					3.65	MLE Sd (bias corrected)					1.15
51												
52	Gamma Kaplan-Meier (KM) Statistics											

	A	B	C	D	E	F	G	H	I	J	K	L
53					k hat (KM)	5.852					nu hat (KM)	140.4
54					Approximate Chi Square Value (140.44, α)	114.1					Adjusted Chi Square Value (140.44, β)	110.4
55					95% Gamma Approximate KM-UCL (use when n>=50)	3.951					95% Gamma Adjusted KM-UCL (use when n<50)	4.08
56												
57					**Gamma ROS Statistics using Imputed Non-Detects**							
58					GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs							
59					GROS may not be used when kstar of detected data is small such as < 0.1							
60					For such situations, GROS method tends to yield inflated values of UCLs and BTVs							
61					For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates							
62					Minimum	1.297					Mean	3.291
63					Maximum	5.6					Median	3.3
64					SD	1.251					CV	0.38
65					k hat (MLE)	6.73					k star (bias corrected MLE)	5.103
66					Theta hat (MLE)	0.489					Theta star (bias corrected MLE)	0.645
67					nu hat (MLE)	161.5					nu star (bias corrected)	122.5
68					MLE Mean (bias corrected)	3.291					MLE Sd (bias corrected)	1.457
69											Adjusted Level of Significance (β)	0.029
70					Approximate Chi Square Value (122.47, α)	97.91					Adjusted Chi Square Value (122.47, β)	94.57
71					95% Gamma Approximate UCL (use when n>=50)	4.116					95% Gamma Adjusted UCL (use when n<50)	4.262
72												
73					**Lognormal GOF Test on Detected Observations Only**							
74					Shapiro Wilk Test Statistic	0.973			**Shapiro Wilk GOF Test**			
75					5% Shapiro Wilk Critical Value	0.842			Detected Data appear Lognormal at 5% Significance Level			
76					Lilliefors Test Statistic	0.141			**Lilliefors GOF Test**			
77					5% Lilliefors Critical Value	0.28			Detected Data appear Lognormal at 5% Significance Level			
78					**Detected Data appear Lognormal at 5% Significance Level**							
79												
80					**Lognormal ROS Statistics Using Imputed Non-Detects**							
81					Mean in Original Scale	3.339			Mean in Log Scale			1.145
82					SD in Original Scale	1.177			SD in Log Scale			0.37
83					95% t UCL (assumes normality of ROS data)	3.949			95% Percentile Bootstrap UCL			3.917
84					95% BCA Bootstrap UCL	3.896			95% Bootstrap t UCL			3.995
85					95% H-UCL (Log ROS)	4.204						
86												
87					**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**							
88					KM Mean (logged)	1.049			95% H-UCL (KM -Log)			4.648
89					KM SD (logged)	0.529			95% Critical H Value (KM-Log)			2.177
90					KM Standard Error of Mean (logged)	0.161						
91												
92					**DL/2 Statistics**							
93					**DL/2 Normal**				**DL/2 Log-Transformed**			
94					Mean in Original Scale	3.125			Mean in Log Scale			0.934
95					SD in Original Scale	1.536			SD in Log Scale			0.802
96					95% t UCL (Assumes normality)	3.921			95% H-Stat UCL			6.533
97					**DL/2 is not a recommended method, provided for comparisons and historical reasons**							
98												
99					**Nonparametric Distribution Free UCL Statistics**							
100					**Detected Data appear Normal Distributed at 5% Significance Level**							
101												
102					**Suggested UCL to Use**							
103					95% KM (t) UCL	3.933			95% KM (Percentile Bootstrap) UCL			3.808
104												

	A	B	C	D	E	F	G	H	I	J	K	L
105	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
106	Recommendations are based upon data size, data distribution, and skewness.											
107	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
108	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
109												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:17:03 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**V PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					9
15							Number of Missing Observations					0
16	Minimum					69	Mean					95.67
17	Maximum					120	Median					93
18	SD					16.74	Std. Error of Mean					4.833
19	Coefficient of Variation					0.175	Skewness					0.0883
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.95	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.147	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					104.3	95% Adjusted-CLT UCL (Chen-1995)					103.7
31							95% Modified-t UCL (Johnson-1978)					104.4
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.258	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.731	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.15	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					35.13	k star (bias corrected MLE)					26.41
42	Theta hat (MLE)					2.723	Theta star (bias corrected MLE)					3.623
43	nu hat (MLE)					843.2	nu star (bias corrected)					633.8
44	MLE Mean (bias corrected)					95.67	MLE Sd (bias corrected)					18.62
45							Approximate Chi Square Value (0.05)					576.4
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					568
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					105.2	95% Adjusted Gamma UCL (use when n<50)					106.7
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.955	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.14	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.234				Mean of logged Data		4.547
60					Maximum of Logged Data	4.787				SD of logged Data		0.178
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	105.7				90% Chebyshev (MVUE) UCL		110.4
64					95% Chebyshev (MVUE) UCL	117.1				97.5% Chebyshev (MVUE) UCL		126.4
65					99% Chebyshev (MVUE) UCL	144.7						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	103.6				95% Jackknife UCL		104.3
72					95% Standard Bootstrap UCL	103.2				95% Bootstrap-t UCL		104.7
73					95% Hall's Bootstrap UCL	103.6				95% Percentile Bootstrap UCL		103.6
74					95% BCA Bootstrap UCL	103.6						
75					90% Chebyshev(Mean, Sd) UCL	110.2				95% Chebyshev(Mean, Sd) UCL		116.7
76					97.5% Chebyshev(Mean, Sd) UCL	125.8				99% Chebyshev(Mean, Sd) UCL		143.7
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	104.3						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			10/18/2016 1:18:00 PM								
5	From File			ProUCL Worksheet, PQM, Max Pb 270.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Zn PQM**											
12												
13	**General Statistics**											
14	Total Number of Observations					12	Number of Distinct Observations					11
15							Number of Missing Observations					0
16	Minimum					60	Mean					89.42
17	Maximum					130	Median					85.5
18	SD					19.77	Std. Error of Mean					5.707
19	Coefficient of Variation					0.221	Skewness					0.678
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.954	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.859	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.175	**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value					0.256	Data appear Normal at 5% Significance Level					
26	**Data appear Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL					99.67	95% Adjusted-CLT UCL (Chen-1995)					100
31							95% Modified-t UCL (Johnson-1978)					99.85
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.231	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.732	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.148	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.245	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					23.22	k star (bias corrected MLE)					17.47
42	Theta hat (MLE)					3.852	Theta star (bias corrected MLE)					5.119
43	nu hat (MLE)					557.2	nu star (bias corrected)					419.2
44	MLE Mean (bias corrected)					89.42	MLE Sd (bias corrected)					21.39
45							Approximate Chi Square Value (0.05)					372.8
46	Adjusted Level of Significance					0.029	Adjusted Chi Square Value					366.1
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))					100.6	95% Adjusted Gamma UCL (use when n<50)					102.4
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.979	**Shapiro Wilk Lognormal GOF Test**					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	4.094				Mean of logged Data		4.472
60					Maximum of Logged Data	4.868				SD of logged Data		0.216
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	101.1				90% Chebyshev (MVUE) UCL		106.2
64					95% Chebyshev (MVUE) UCL	113.9				97.5% Chebyshev (MVUE) UCL		124.4
65					99% Chebyshev (MVUE) UCL	145.2						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71					95% CLT UCL	98.8				95% Jackknife UCL		99.67
72					95% Standard Bootstrap UCL	98.21				95% Bootstrap-t UCL		101
73					95% Hall's Bootstrap UCL	101.7				95% Percentile Bootstrap UCL		99
74					95% BCA Bootstrap UCL	99.17						
75					90% Chebyshev(Mean, Sd) UCL	106.5				95% Chebyshev(Mean, Sd) UCL		114.3
76					97.5% Chebyshev(Mean, Sd) UCL	125.1				99% Chebyshev(Mean, Sd) UCL		146.2
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	99.67						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

APPENDIX D

Recreational Runner Memorandum

Linda S. Adams
Secretary for
Environmental Protection

Department of Toxic Substances Control

Maureen F. Gorsen, Director
8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Perry Myers
Northern California Central Cleanup Operations Branch
8800 Cal Center Drive
Sacramento, CA 95826

FROM: Kimiko Klein, Ph.D.
Staff Toxicologist
Human and Ecological Risk Division (HERD)

DATE: September 29, 2006

SUBJECT: Remediation Goals for the Recreational Runner on Trails
EMPIRE MINE STATE HISTORICAL PARK, GRASS VALLEY
PCA: 11045 SITE: 100235-00

Background

Empire Mine State Historical Park comprises 845 acres and is the site of one of the oldest, largest, deepest, longest and richest gold mines in California. The mine existed for more than 100 years, closing in 1956. The Park contains many of the mine's buildings, the owner's home and restored gardens, as well as the entrance to 367 miles of abandoned and flooded mine shafts. The park consists of forested backcountry and 12 miles of trails for hiking, mountain biking and horseback riding. There are also residences within the park occupied by park employees. There are extremely elevated concentrations of arsenic, lead, and mercury at various locations within the park, along with elevated cyanide and other metals. These elevated concentrations have been associated with mine and mill tailings. A recent investigation indicates elevated levels of arsenic along the trails. The Human and Ecological Risk Division (HERD) has been requested to develop remediation goals for arsenic for the recreational user of the trails.

Exposure Scenario

On a recent site visit, the HERD observed walkers, bicyclists, horseback riders and runners using the trails. The HERD determined that the runner who uses the trails routinely over the years would likely have the highest chronic exposure to contaminants in

the soil because of the extent of heavy physical activity involved in running compared to the other observed uses of the trails. The parameters used to define potential exposure by the runner were as follows.

The runner is assumed to run every other day, or approximately four times a week, except for two weeks out of the year (200 days per year), for an hour each running day over a period of 30 years. The runner is assumed to share the trails with other users, and, therefore, dusty conditions would prevail with as high as 1,000 ug/m^3 of respirable dust in the air, resulting in a particulate emission factor (PEF) of 1,000,000 m^3/kg. The breathing rate is assumed to be 3.9 m^3/hour, equivalent to heavy physical activity (US. Environmental Protection Agency (US EPA) Exposure Factors Handbook (EFH), 1997). The runner would breathe through the mouth as well as the nose and, thus, some fraction of dust is assumed to be taken in through the mouth and swallowed. This amount is estimated to be equal to 100 times the adult soil ingestion rate indoors of 0.03 mg/hour (professional judgment based on US EPA EFH Table 4-15). The runner is assumed to be wearing shorts and a short-sleeved shirt, and, thus, the default adult skin surface area of 5700 cm^2 is appropriate. An adherence of soil to skin of 0.2 mg/cm^2 is assumed to account for the increased likelihood of dust adhering to sweat-dampened skin. Dust will adhere to the skin for the duration of the run and until the runner showers. In order to account for the absorption that could take place during that time, an absorption correction factor of 0.1 is included to assume an absorption time of 2.4 hours (professional judgment based on the default absorption time for a dermal event of 24 hours multiplied by 0.1). This assumption is site-specific and a highly simplified incorporation of the work of McKone and Howd (1992), in which uptake of a chemical by skin from dermal contact with contaminated soil was considered to be dependent on exposure time, the thickness of the soil layer on the skin, and soil-skin permeability.

Toxicity Criteria

The oral cancer slope factor (CSF_o) for arsenic is 9.45 (mg/kg/day)$^{-1}$. The inhalation CSF (CSF_i) is 12 (mg/kg/day)$^{-1}$. The oral reference dose is 0.0003 mg/kg/day, and the inhalation reference dose is 0.0000086 mg/kg/day.

Remedial Goals for Arsenic

Using the exposure parameters and toxicity criteria as described above, the risk-based soil remedial goals for arsenic are: 3 to 300 mg/kg, representing a target risk range of 10^{-6} to 10^{-4}. The non-cancer soil remedial goal, representing a hazard index (HI) of one is 270 mg/kg.

Discussion

The remedial goals for arsenic were calculated assuming that the inhalation, ingestion and dermal routes are complete exposure pathways for the runner. This differs from the assumption described in the preliminary endangerment assessment (PEA) in

which only the inhalation pathway was assumed to be complete (Harding Lawson Associates 1992). The HERD considers that dust will easily adhere to the damp, sweat-laden skin of a runner and so utilized the adherence factor of 0.2 mg/cm^2. This is the reasonable maximum exposure (RME) value for the industrial worker but should be considered a central tendency value for the actively running person. The amount of dust a runner may ingest during breathing is very uncertain, but the HERD considers 3 mg dust ingested per hour to be reasonable. This is less than the prorated value of the amount of soil potentially incidentally ingested during a work day for a commercial/industrial worker of 12.5 mg/hour (100 mg soil/8-hour work day). Also, the exposure duration in the PEA was assumed to be nine years, whereas, the HERD assumes an exposure duration of 30 years. The HERD considers the assumption of 30 years to be a RME parameter.

In addition to these major differences in exposure assumptions, the PEA also assumed an active breathing rate and dust in air concentration that are somewhat lower than HERD's assumptions. These differences in breathing rate and dust in air concentrations only slightly affect the calculated results.

The PEA performed in 1992 also evaluated the child recreationist who visits the site once a week for six years and is exposed to contaminants anywhere on-site via incidental ingestion of soils and inhalation of dusts. The remedial goal for arsenic under this scenario was calculated to be 3 mg/kg at a target cancer risk of 10^{-6}, The toxicity criteria for arsenic have been recently been revised, so the remedial goal protective of the child recreationist is now 0.7 mg/kg, using the same PEA exposure assumptions.

Conclusions

The non-cancer-based remedial goal of 270 mg/kg is within the target cancer risk range of 3 to 300 mg/kg. If the risk management goal for this site is to be set at the 10^{-6} or 10^{-5} target risk level, this exposure analysis indicates that the trails should be remediated to close to the local background of approximately 15 mg/kg of arsenic. However, the HERD has determined that in this exposure scenario of using the trails for short time durations, considering arsenic as a threshold toxicant, rather than as a carcinogen, is appropriate and health protective. Therefore, the HERD recommends the consideration of a remedial goal for arsenic on the trails of 270 mg/kg.

The HERD emphasizes that this evaluation and these remedial goals are applicable for this site only. If you have any questions, please contact me at (510) 540-3762, (916) 255-6643, or via electronic mail at kklein@dtsc.ca.gov.

References

McKone, T.E. and Howd, R.A. 1992, Estimating Dermal Uptake of Nonionic Organic Chemicals from Water and Soil: Part 1, Unified Fugacity-Based Models for Risk Assessments, *Risk Analysis* 12: 543-557.

Preliminary Endangerment Assessment, Empire Mine State Historical Park. September 1992, Harding Lawson Associates.

U.S. Environmental Protection Agency Exposure Factors Handbook. 1997, Office of Research and Development.

Reviewed by: David Berry, Ph.D.
Senior Toxicologist
Human and Ecological Risk Division

Karen DiBiasio, Ph.D.
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Tracy Taras, Ph.D.
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Attachment

Calculation of Risks
Recreationist at Empire Mine State Park

		Dose		Hazard Index		Risk
ingestion:	**$Dose_{ing}$ =**	$\frac{Cs * IRs * EF * ED * ET * CF1}{BW * AP}$	**HI_{ing} =**	$Dose_{ing}/RfDo$	**$Risk_{ing}$ =**	$Dose_{ing} * CSFo$
dermal contact:	**$Dose_{der}$ =**	$\frac{Cs * SSA * ABS * SAR * EF * ED * ACF * CF1}{BW * AP}$	**HI_{der} =**	$Dose_{der}/RfDo$	**$Risk_{der}$ =**	$Dose_{der} * CSFo$
inhalation:	**$Dose_{inh}$ =**	$\frac{Cs * InhRs * EF * ED * ET * [(1/VF) \text{ or } (1/PEF)]}{BW * AP}$	**HI_{inh} =**	$Dose_{inh}/RfDi$	**$Risk_{inh}$ =**	$Dose_{inh} * CSFi$

Parameter	Description	Units	Value	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
HI	Hazard index	unitless	See below	Calculated
Risk	Risk	unitless	See below	Calculated
Cs	Chemical concentration in soil	mg/kg	See below	Calculated
IRs	Soil ingestion rate	mg/hr	3	a
EF	Exposure frequency	days/year	200	b
ED	Exposure duration	years	30	
ET	Exposure time	hr/day	1	c
ACF	Absorption correction factor	unitless	0.1	d
BW	Body weight	kg	70	
AP	Averaging period	days	See below	Calculated
PEF	Particulate emission factor	m^3/kg	1.00E+06	1,000 ug/m^3
SSA	Skin surface area	cm^2/day	5700	
ABS	Absorption factor	unitless	See below	Calculated
SAR	Soil adherence	mg/cm^2	0.2	e

InhRs	Inhalation rate	m^3/hr	3.9	USEPA EFH 1997
CF1	Conversion factor, mg to kg	kg/mg	1.00E-06	Calculated
RfDo	Oral reference dose	mg/kg-day	See below	EPA IRIS
RfDi	Inhalation reference dose	mg/kg-day	See below	OEHHA
CSFo	Oral cancer slope factor	$(mg/kg\text{-}day)^{-1}$	See below	OEHHA
CSFi	Inhalation cancer slope factor	$(mg/kg\text{-}day)^{-1}$	See below	OEHHA

Carcinogens			*AP =*	*25,550*	*days*							**Total**
Compound	**Cs**	**ABS**	**VF**	**CSFo**	**CSFi**	**$Dose_{ing}$**	**$Dose_{der}$**	**$Dose_{inh}$**	**$Risk_{ing}$**	**$Risk_{der}$**	**$Risk_{inh}$**	**Risk**
Arsenic	3.00E+00	0.03		9.45E+00	1.20E+01	3.02E-08	3.44E-08	3.93E-08	2.85E-07	3.25E-07	4.71E-07	1.08E-06

Noncarcinogens			*AP =*	*10,950*	*days*							**Total**
Compound	**Cs**	**ABS**	**VF**	**RfDo**	**RfDi**	**$Dose_{ing}$**	**$Dose_{der}$**	**$Dose_{inh}$**	**HI_{ing}**	**HI_{der}**	**HI_{inh}**	**HI**
Arsenic	2.70E+02	0.03		3.00E-04	8.60E-06	6.46E-06	7.36E-06	8.40E-06	2.15E-02	2.45E-02	9.76E-01	1.00E+00

a) Professional judgment - ingestion of dust by breathing in and swallowing dust while running. 100 times adult soil ingestion rate indoors of 0.03 mg/hr (EFH Table 4-15).
b) Professional judgment - running every other day, four days/week.
c) Professional judgment - running for one hr.
d) Professional judgment - absorption correction factor for dermal exposure time - default is assumed to be 24h/d. 0.1 x 24 hr/d = 2.4 hr.
e) Professional judgment - assumed to be equivalent to outdoor workers. (Exhibit 3-3 in EPA RAGS Volume I, Part E Dermal Risk Assessment 2004).

APPENDIX E

Lead Risk Assessment Summaries

LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	5690.0
Respirable Dust (ug/m^3)	1.5

OUTPUT					
Percentile Estimate of Blood Pb (ug/dl)					
	50th	90th	95th	98th	99th
BLOOD Pb, CHILD	40.4	73.8	87.3	106.1	120.8
BLOOD Pb, PICA CHILD	80.5	147.0	173.9	211.4	240.5

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.33	1%		0.33	0%
Soil Ingestion	7.0E-3	40.06	99%	1.4E-2	80.12	100%
Inhalation	2.0E-6	0.01	0%		0.01	0%

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LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

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INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	20000.0
Respirable Dust (ug/m^3)	1.5

OUTPUT					
Percentile Estimate of Blood Pb (ug/dl)					
	50th	90th	95th	98th	99th
BLOOD Pb, CHILD	142.0	259.4	306.9	373.0	424.5
BLOOD Pb, PICA CHILD	282.8	516.6	611.3	742.9	845.4

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	1.16	1%		1.16	0%
Soil Ingestion	7.0E-3	#####	99%	1.4E-2	#####	100%
Inhalation	2.0E-6	0.04	0%		0.04	0%

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LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	249.0
Respirable Dust (ug/m^3)	1.5

OUTPUT					
Percentile Estimate of Blood Pb (ug/dl)					
	50th	90th	95th	98th	99th
BLOOD Pb, CHILD	1.8	3.2	3.8	4.6	5.3
BLOOD Pb, PICA CHILD	3.5	6.4	7.6	9.2	10.5

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.01	1%		0.01	0%
Soil Ingestion	7.0E-3	1.75	99%	1.4E-2	3.51	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

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LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	530.0
Respirable Dust (ug/m^3)	1.5

OUTPUT					
Percentile Estimate of Blood Pb (ug/dl)					
	50th	90th	95th	98th	99th
BLOOD Pb, CHILD	3.8	6.9	8.1	9.9	11.2
BLOOD Pb, PICA CHILD	7.5	13.7	16.2	19.7	22.4

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.03	1%		0.03	0%
Soil Ingestion	7.0E-3	3.73	99%	1.4E-2	7.46	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	5690
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**9.4**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	17.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**100.0%**

PRG90 **318**

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	20000
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**32.9**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	62.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**100.0%**

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	249
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.4**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	0.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**4.5%**

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	530
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.9**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	1.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**34.0%**

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LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Providence Quartz Mill, Proposed Soil Lead Cleanup Goal, 270 mg/kg

Exposure Frequency modified from 7 days/wk (default) to 2 days/wk (routine visitation)

RED CELLS HAVE BEEN MODIFIED FROM DEFAULT VALUES

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	270.0
Respirable Dust (ug/m^3)	1.5

OUTPUT						
Percentile Estimate of Blood Pb (ug/dl)						PRG-90
	50th	90th	95th	98th	99th	(ug/g)
BLOOD Pb, CHILD	0.5	1.0	1.2	1.4	1.6	270
BLOOD Pb, PICA CHILD	1.1	2.0	2.4	2.9	3.3	135

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	2
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	1.7E-5	0.00	1%		0.00	0%
Soil Ingestion	2.0E-3	0.54	99%	4.0E-3	1.09	100%
Inhalation	5.6E-7	0.00	0%		0.00	0%

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

Providence Quartz Mill, Proposed Soil Lead Cleanup Goal, 270 mg/kg

Exposure Frequency modified from 250 days/yr (default) to 104 days/yr (routine visitation; based on 2 days/wk)

RED CELLS HAVE BEEN MODIFIED FROM DEFAULT VALUES

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	**270**
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	**104**
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.2**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	0.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.1%**

PRG90 **765**

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LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	544.0
Respirable Dust (ug/m^3)	1.5

OUTPUT					
Percentile Estimate of Blood Pb (ug/dl)					
	50th	90th	95th	98th	99th
BLOOD Pb, CHILD	3.9	7.1	8.3	10.1	11.5
BLOOD Pb, PICA CHILD	7.7	14.1	16.6	20.2	23.0

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.03	1%		0.03	0%
Soil Ingestion	7.0E-3	3.83	99%	1.4E-2	7.66	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

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LEAD RISK ASSESSMENT SPREADSHEET 8

CALIFORNIA DEPARTMENT OF TOXIC SUBSTANCES CONTROL

Click here for ABBREVIATED INSTRUCTIONS FOR LEADSPREAD 8

INPUT	
MEDIUM	LEVEL
Lead in Soil/Dust (ug/g)	970.0
Respirable Dust (ug/m^3)	1.5

OUTPUT					
Percentile Estimate of Blood Pb (ug/dl)					
	50th	90th	95th	98th	99th
BLOOD Pb, CHILD	6.9	12.6	14.9	18.1	20.6
BLOOD Pb, PICA CHILD	13.7	25.1	29.6	36.0	41.0

EXPOSURE PARAMETERS		
	units	children
Days per week	days/wk	7
Geometric Standard Deviation		1.6
Blood lead level of concern (ug/dl)		1
Skin area, residential	cm^2	2900
Soil adherence	ug/cm^2	200
Dermal uptake constant	(ug/dl)/(ug/day)	0.0001
Soil ingestion	mg/day	100
Soil ingestion, pica	mg/day	200
Ingestion constant	(ug/dl)/(ug/day)	0.16
Bioavailability	unitless	0.44
Breathing rate	m^3/day	6.8
Inhalation constant	(ug/dl)/(ug/day)	0.192

PATHWAYS						
CHILDREN	typical			with pica		
	Pathway contribution			Pathway contribution		
Pathway	PEF	ug/dl	percent	PEF	ug/dl	percent
Soil Contact	5.8E-5	0.06	1%		0.06	0%
Soil Ingestion	7.0E-3	6.83	99%	1.4E-2	13.66	100%
Inhalation	2.0E-6	0.00	0%		0.00	0%

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	544
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**0.9**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	1.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**35.6%**

PRG90 **318**

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MODIFIED VERSION OF USEPA ADULT LEAD MODEL

CALCULATIONS OF BLOOD LEAD CONCENTRATIONS (PbBs) AND PRELMIINARY REMEDIATION GOAL (PRG)

EDIT RED CELL

Variable	Description of Variable	Units	
PbS	Soil lead concentration	ug/g or ppm	970
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	0.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.6**
$PbB_{fetal, 0.90}$	90th percentile PbB among fetuses of adult workers	ug/dL	3.0
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**1.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**73.1%**

PRG90 **318**

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Ecological Scoping Assessment
Providence Quartz Mill, Nevada City, CA

This report presents the results of an Ecological Scoping Assessment (ESA) for the Providence Quartz Mill site, an abandoned gold mine located in the northwestern portion of an approximately 38-acre property owned by the City of Nevada City, California. A mine waste remediation and cleanup project is proposed for this currently undeveloped site. This report was prepared in accordance with the State of California Department of Toxic Substances Control guidelines (DTSC 1996), and it includes the following sections: Background, Methods, Ecological Characterization, Toxicity Assessment, and Pathway Assessment. Additional information can be found in the associated Draft Site Characterization and Removal Action Work Plan for this project.

BACKGROUND

The Site is located in Nevada City, California, within the historic Nevada City Mining District. Referencing the Mount Diablo geodetic datum, the Site is located in Section 12, Township 16 North, Range 8 East. The center of the Site is approximately located at latitude 39.258541 degrees, longitude -121.037968 degrees.

Figure 1 depicts the site location with respect to Nevada City and local roads. The Site is located in a rural forested area along the south side of Deer Creek, approximately one mile downstream of downtown Nevada City. The Site is located on a less than 1.0 acre portion in the northwest corner of a 38-acre parcel owned by the City of Nevada City, known as the Environs Property. The Environs Property comprises Nevada County Assessor's Parcel Number (APN) 05-100-87. For the purposes of the cleanup of the site, one Brownfields grant site has been delineated on the property, the approximately 0.9 acre Quartz Mill Area. **Figure 2** depicts the approximate Quartz Mill site boundary within the property boundary of the Environs Property.

Access to the Site is from Providence Mine Road, which is gated to the south of the site and terminates near the northeast corner of the site. A pubic use trail crosses to the east of the site from Providence Mine Road and extends across the Environs Property to Jordan Street east of the site. In general, the Site is forested with various sized trees and undergrowth.

The site is situated at the historic location of the Providence Mine, a large hard rock gold mine, which operated between the 1850s and 1920s. A 40-stamp quartz mill, sulphuret room, and a roasting furnace was formerly located west of Providence Mine Road, in an area which was re-graded during construction of Providence Mine Road in the 1960s. The structures are no longer present at the Site.

Surface topography at the site generally slopes toward the north to Deer Creek, which is located along the northern property boundary. The site elevation ranges from approximately 2260 feet to approximately 2360 feet above mean sea level. The site is generally vegetated by fir, oak, cedar and pine trees and various underbrush including honeysuckle, Himalayan blackberry and poison oak. Rock outcrop was observed on the site.

The property is currently undeveloped, except for the abandoned mining features and the unpaved trail extending through the Environs Property from west to east. Current use of the site includes routine recreational trail use from the nearby Tribute Trail. The surrounding land use includes undeveloped rural residential property to the north, west, southwest and southeast, the Nevada City Waste Water Treatment Plant to the east and a light industrial campus to the south.

Hardrock gold mining waste including impacted soil and waste rock associated with the historic Providence Quartz Mill has been identified in areas surrounding and down slope of the former Quartz Mill site. Areas of concern have been identified in the RAW and are described below.

AOC 1, the Providence Quartz Mill site, contains mine waste from the former mining operations that occurred on the property including a 40-stamp quartz mill, a sulphuret room, and a roasting furnace. The former sulphuret area is a relatively level, benched area containing crushed quartz ore and fine-grained purple soil (typical of sulphuret process waste) on the ground surface. Mine waste rock and mill tailings are located north and west of the former sulphuret area. The former roasting furnace location is an elongated, level area, which was apparently cut into native soil and rock along the western Site boundary. Soil sampling has indicated lead and mercury concentrations exceeding Hazardous Waste levels at the Quartz Mill Site. A map of soil sample locations is provided in **Figure 3**.

PROPOSED SITE CLEANUP ACTIONS

The proposed site cleanup actions include excavation and off site disposal of a limited quantity of soil impacted by lead and mercury exceeding Hazardous Waste levels, and placement of clean cover over contaminated areas that remain in place and that may be subject to future use. A statistical evaluation and risk assessment was performed to simulate two possible removal actions:

- Removal of soil with metals (lead and mercury) concentrations exceeding the corresponding Total Threshold Limit Concentration (TTLC; 1,000 mg/kg and 20 mg/kg, respectively).
- Removal of soil with lead concentrations exceeding a cleanup goal (270 mg/kg) previously used for the adjacent Providence Mine site.

Existing mine waste currently covered in perennial vegetation and areas of mine waste on steep inaccessible slopes will be left in place. Exposed mine waste in other

accessible areas of the site will be covered with 8 to 12 inches of imported clean fill soil (topsoil).

METHODS

Ecological Risk Assessment

The purpose of the ecological risk assessment was to review existing information and to prepare a list of special-status plants and animals with potential to occur in the vicinity of the project area. Sources of information included a records search of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB 2011), U.S. Fish and Wildlife Service (USFWS) and the California Native Plant Society (CNPS) Electronic Inventory (CNPS 2006) for the USGS Nevada City 7.5-minute quadrangle and surrounding quadrangles. The Nevada County Natural Resources Report (Beedy & Brussard 2002) was consulted for information on the distribution and extent of habitats, and the relationships between habitats and special status species in the local and regional contexts. The Biological Inventory for the Deer Creek Tribute Trail (Susan Sanders Biological Consulting 2008) was consulted for additional site-specific biological survey data for the Deer Creek corridor from Pioneer Park to Stocking Flat, several miles downstream.

Special-Status Species

Special-status plants and animals include the following:

- animal and plant species that are listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17.11 for wildlife, 50 CFR 17.12 for plants; various notices in the Federal Register for individual, proposed species);
- animal and plant species that are candidates for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17, February 28, 1996);
- species that are listed or proposed for listing by the State of California as threatened or endangered under the California Endangered Species Act (California Administrative Code, Title 14, Section 670.5);
- animal species identified by the CDFW as species of concern (wildlife species that do not have state or federal threatened or endangered status but may still be threatened with extinction [Remsen 1978, Williams 1986, Jennings and Hayes 1994]);
- animal species that are designated as fully protected by CDFW (California Administrative Code, Title 14, Section 670.5);
- plants considered by the CNPS to be rare, threatened, or endangered in California and elsewhere (Tibor 2001, CNPS 2006); and
- plant species that meet the definition of rare or endangered under the California Environmental Quality Act (1970).

Field Surveys

Biologists Oriana Chafe and Rachel Durben conducted field surveys on May 17, 2013, and Oriana Chafe conducted follow-up surveys on May 20 and June 18, 2013 in order to describe biological resources at the Environs Property. Additionally, biologist Jeff Lauder conducted a detailed habitat assessment on January 25, 2013, and again on January 28, 2013, to determine the availability of suitable habitat for the California Red Legged Frog. Mr. Lauder also consulted with Certified Wildlife Biologist Anne Wallace to obtain expert advice on the suitability of available habitat in the project area for the California Red Legged Frog (see Appendices A and B for qualifications of all surveyors and consultants). During these surveys, the areas immediately surrounding the mine, including staging areas and vehicle parking areas, were examined to characterize the existing vegetation in terms of dominant plant and animal species (including the potential for special-status species), approximate canopy closure, and other constraints. The extent of past disturbance was also noted. Animal species observed in the vicinity of the mine also were characterized by specific foraging guilds (e.g., herbivore, omnivore, and carnivore). The plant community descriptions below are based generally on classifications in Holland (1986) and/or Manual of California Vegetation (Sawyer and Keeler-Wolf 1995) and include large- and small-patch community types.

ECOLOGICAL CHARACTERIZATION

Soils

The Soil Survey of Nevada County, California, Western Part (United States Department of Agriculture, Soil Conservation Service, August 1993) indicates that soil conditions across the site are mapped as Musick sandy loam, 5 to 50% slopes. This soil type is found on gently sloping to strongly sloping terrain with 1% to 10% rock outcroppings. Runoff is medium and the hazard of erosion is moderate. The Musick soil type is used primarily for timber production.

Biotic Communities

The project area mainly consists of stands of mixed-conifer forest, co-dominated by Douglas fir (*Pseudotsuga menziesii*) and incense cedar (*Calocedrus decurrens*), with a sparse shrub layer in the forest canopy openings created by disturbance or mine tailings, and roads. A mix of pines, oaks, and other deciduous trees dominates the understory, as well as shrubs in varying age classes. No landmark oak groves occur in the project area. The area within a one-mile radius of the abandoned mine equals approximately 2,010 acres (ac) (814 ha), and the approximate percentages and area of each major habitat are as follows: Douglas fir forest (75%, 610 ha), annual grassland (15%, 123 ha), riparian woodland (10%, 81 ha).

Plant and animal species observed in each of these habitats on the Providence Quartz Mill project area are summarized below.

Mixed-conifer Forest

Plant Communities

In the Providence Quartz Mill project area, mid-successional mixed-evergreen forests dominate the hill slopes above Deer Creek. Douglas fir (*Pseudotsuga menziesii*), incense cedar (*Calocedrus decurrens*), and big leaf maple (*Acer macrophyllum*) are codominant in the overstory tree layer. The subcanopy is composed of black oak (*Quercus kelloggii*), interior live oak (*Quercus wislizenii*), bitter cherry (*Prunus emarginata*), and Pacific mountain dogwood (*Cornus nuttallii*). Topographic disturbance from historic mining is evident throughout the project area, particularly near drainages.

The shrub layer is sparse, with the noxious weed Himalayan blackberry (*Rubus armeniacus*) commonly occurring in areas disturbed by earlier mining or logging. Shrubby or pole stage Douglas fir and incense cedar occur in the shrub layer. In disturbed areas, the noxious weed Scotch broom (*Cytisus scoparius*) often dominates the shrub layer. The herb layer consists of a mix of native and non-native species. Light gaps typically consist of non-native hedge parsley (*Torilis arvensis*) and woolly mullein (*Verbascum thapsus*). A few natives also occur, such as trail plant (*Adenocaulon bicolor*), pink honeysuckle (*Lonicera hispidula*), poison oak (*Toxicodendron diversilobum*), bleeding heart (*Dicentra formosa*), and miner's lettuce (*Claytonia parviflora*).

Animal Communities

Mixed conifer forests support a high diversity of animal species, with approximately 142 vertebrate species potentially occurring in this habitat in Nevada County. About 109 species use mixed conifer forest for breeding (Beedy and Brussard 2002). Representative bird species observed in this habitat during the field surveys include: Steller's jay (*Cyanocitta stelleri*), blackheaded grosbeak (*Pheucticus melanocephalus*), dark-eyed junco (*Junco hyemalis*), western tanager (*Piranga ludoviciana*), brown creeper (*Certhia americana*), and Pacific wren (*Troglodytes pacificus*). Representative mammal species include: dusky-footed woodrat (*Neotoma fuscipes*), western gray squirrel (*Sciurus griseus*), and mule deer (*Odocoileus hemionus*). In the project area, however, the habitat values of the mixed conifer forest are limited by proximity to development and human disturbance.

Riparian Woodland

Plant Communities

Deer Creek, a perennial tributary of the South Yuba River, occurs just inside the boundary of the Environs Property, north of the Providence Quartz Mill site. The reach of Deer Creek within the project area is just downstream of the town of

Nevada City and the confluence with two small tributaries, Little Deer Creek and Gold Run Creek. This section of Deer Creek is a mid-gradient, meandering reach. Steep, low terrace floodplains of historic mining debris occur primarily south of the stream, and more recent fluvial deposits of gravel or cobble also common. Within the project area, Deer Creek is located between two large depositional reaches of remnant mining gravels, reflecting the unnaturally high sediment production and channel aggradation that resulted from hydraulic gold mining. With the end of hydraulic mining and the construction of the Scotts Flat dams, the creek has eroded through the unnaturally elevated creek bed of mining sediment, elevating the floodplain to as much as six feet in some areas. Nevertheless, the terraces support a narrow corridor of riparian vegetation, approximately 10-30 feet wide. The riparian forest ascends the steeply graded remnants of mining waste rock prior to transitioning into upland mixed conifer forest. The species composition of the riparian woodland is similar to other Sierran foothill and lower montane riparian woodlands, but also includes non-native tree species such as black locust (*Robinia pseudo-acacia*) and tree of heaven (Ailanthus *altissima*). White alder (*Alnus rhombifolia*), in a variety of age and size classes, is the dominant species in the tree layer, with occasional conifers, oaks, or bigleaf maple in the adjacent xeroriparian zone. Riparian shrubs are also present, such as Pacific mountain dogwood (*Cornus nuttallii*), and arroyo willow (*Salix lasiolepis*). The invasive Himalayan blackberry dominates the shrub layer, characteristic of many other foothill streams. The dense thickets of blackberry generally preclude an herb layer. Characteristic herbs include torrent sedge (*Carex nudata*), and blue wildrye (*Elymus glaucus*).

Animal Communities

Despite their relatively small area in Nevada County, riparian woodlands support a disproportionately high number of animals because they provide all of the habitat requirements: food, cover, and a source of water. In Nevada County, riparian woodlands may support more than 170 vertebrate species, including 110 potential breeders, the highest totals for any large patch ecosystem in the county (Beedy & Brussard 2002). The riparian woodland at the project provides foraging, nesting, and roosting habitat for many migrant and resident species, such as Pacific slope flycatchers (*Empidonax difficilis*), and western tanager (*Piranga ludoviciana*). The riparian habitat also offers a movement corridor for mule deer, gray fox, coyotes, and other wide-ranging animals.

Annual Grassland

Plant Communities

Non-native Mediterranean annual grasses and forbs dominate the heavily disturbed areas. Dominant non-native grasses and forbs include a mix of yellow star thistle (*Centaurea solstitialis*), perennial sweetpea (*Lathyrus latifolius*), soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum*), rattail sixweeks grass (*Festuca myuros*) and rose clover (*Trifolium hirtum*). The non-

native species fennel (*Foeniculum vulgare*), black mustard (*Brassica nigra*), wild mustard (*Hirschfeldia incana*), goat's beard (*Tragopogon dubius*), English plantain (*Plantago lanceolata*), hairy pink (*Petrorhagia dubia*), cutleaf geranium (*Geranium dissectum*), and broad leaf filaree (*Erodium botrys*), are also present. Native vegetation is minimal with species such as gumweed (*Grindelia hirsutula*) and blue wildrye (*Elymus glaucus*) present.

Animal Communities

The annual grasslands at the project site provide potential habitat for species such as Mule deer, California ground squirrels (*Spermophilus beecheyi*), California voles (*Microtus californicus*), California deer mice (*Peromyscus maniculatus*), pocket gophers (*Thomomys bottae*), vagrant shrews (*Sorex vagrans*), and broad-footed moles (*Scapanus latimanus*). These small mammals attract predators such as coyotes (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), red-tailed hawks and red-shouldered hawks. No grassland associated bird species were observed at the site.

Special-Status Species

The CNDDB (2006) results for the Nevada City 7.5' USGS quadrangle are included as Appendix C. Based on this information, field surveys, and other published sources, lists of threatened, endangered, and other special-status plants and animals with potential to occur in the project area were summarized (**Tables 1a, 1b**).

Special-Status Plants

No state or federally listed threatened or endangered plants were observed during the surveys. The surveys were conducted at a time of year adequate for detecting the state-listed Scadden Flat checkerbloom (*Sidalcea stipularis*) but it was not found. Suitable habitat for the other listed plant species known from the vicinity – Stebbin's morning glory (*Caystegia stebbinsii*) and Pine Hill flannelbush (*Fremontodendron decumbens*) – is not present in the project area. These species are endemic to serpentine and gabbroderived soils, which are not present in the project area.

This site has the potential to support a small population of Butte County fritillary (*Fritillaria eastwoodiae*) and Humboldt lily (*Lilium humboldtii*), which are ranked 3.2 and 4.2, respectively, by CNPS. The rank assignments of 3 and 4 refer to the California Rare Plant Rank, where 3 signifies plants for which CNPS need more information to assign a rank, and 4 signifies plants with limited or infrequent distribution. The number following the California Rare Plant Rank is the CNPS Threat Rank, a recent extension added onto the California Rare Plant Rank that designates the level of endangerment by a 1 to 3 ranking with 1 being the most endangered and 3 being the least endangered. Rankings ending in .2 are considered fairly threatened in California. These plants' vulnerability or susceptibility to endangerment appears low at this time, relative to plants described as rare,

threatened, or endangered by CNPS, CDFW, and USFWS (CNPS 2012).

No special-status plants were found on site during the field surveys (May 17, 2013; May 20, 2013; and June 19, 2013) or are expected to occur, based on the absence of suitable habitat.

Special-Status Animals

Cooper's hawk (*Accipiter cooperii*), a CDFW Species of Special Concern, could nest among the interior live oaks, mature stands of riparian habitat (of which there is none on the Quartz Mill site), or other densely vegetated stands of trees, but it was not observed onsite during the field surveys, nor were 2 other raptor Species of Special Concern, Sharpshinned hawk (*Accipiter striatus*) and White-tailed kite (*Elanus leucurus*). There is no suitable habitat on the project site for the threatened California Black Rail (*Laterallus jamaicensis coturniculus*), and very limited habitat is available north of the project site for the endangered Willow Flycatcher (*Empidonax traillii*). Very little suitable habitat exists north of the project site for Tricolored Blackbird (*Agelaius tricolor*), California Yellow Warbler (*Dendroica petecia brewsteri*), and Yellow-breasted chat (*Icteria virens*), all Species of Special Concern. None of these birds were observed during surveys, nor do any occurrence records exist in the immediate vicinity.

No suitable habitat exists for California Horned Lizard (*Phrynosoma coronatum frontale*), the Northwestern Pond Turtle (*Clemmys marmorata marmorata*), California Red-Legged Frog (*Rana aurora draytonii*), and Foothill Yellow-Legged Frog (*Rana boylii*), all of which are CDFW Species of Special Concern that were not observed during surveys. Due to the federally threatened status of *R. draytonii*, a special survey (summarized below) was conducted at the site to specifically determine the availability of suitable breeding and non-breeding habitat of this threatened species.

Of three bat Species of Special Concern, low habitat availability exists for Pale Townsend's Big-Eared Bat (*Plecotus townsedii pallescens*), which has no historical or current regional occurrence records, and no available habitat exists for Greater Western Mastiff Bat (*Eumops perotis californicus*) or Spotted Bat (*Euderma maculatum*). None of these species were observed during site surveys.

Pacific Fisher (*Martes pennanti*), also a CDFW Species of Special Concern and a Candidate Species for federal listing, does not have suitable habitat available in the project area.

Of the four fish species recognized as having the potential to occur in this area, all are precluded from upstream migration to the project site by a man-made dam at Lake Wildwood, approximately 15 miles downstream. No accessible habitat exists for the Threatened Delta Smelt (*Hypomesus transpacificus*), Central Valley Steelhead (*Oncorhyncus mykiss*), Central Valley Spring-run Chinook Salmon (*Oncorhyncus*

tshawytscha), or the Endangered Winter-run Chinook Salmon (*Oncorhyncus tshawytscha*).

One invertebrate, Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*) is identified as having potential to occur in this region. However, no suitable habitat exists on the project site as no elderberries (*Sambucus spp*., the beetle's required host plant throughout its life cycle) are present, and we observed none of these beetles in our surveys.

California Red-Legged Frog (Rana draytonii) Habitat Assessment

California Red Legged Frog (*Rana draytonii*) habitat assessments were carried out in accordance with the U.S. Fish and Wildlife Service protocols (2005). The site rests within the historical and current believed range of this species, although updated occurrence records do not list observations within Nevada County. Visual characterization of habitat types at the site found no potential *R. draytonii* habitat within the work site boundary. There are no areas of standing or slow-moving water on site, and no potential for these pools to form. The main stem of Deer Creek is the only major source of water near the site, located north of the Quartz Mill site, and is far too swift and deep to support *R. draytonii* breeding or non-breeding habitat.

A thorough survey was also conducted across the creek along the low floodplain, but no evidence of pooling was present, nor were there any sites with potential for pooling. The terrain surrounding the site is rugged and steep, and while limited potential exists for upland migration habitat, the lack of any points of standing water preclude use of the area by *R. draytonii* and other Ranids. Photographs and maps with photo points were used in consultation with Anne Wallace, a local biologist with extensive California Red-Legged Frog survey experience, and her determination agrees with the initial assessment conclusion of no potential habitat.

TOXICITY ASSESSMENT

The Human Health Screening Evaluation (HHSE) presented in the draft RAW report identified mine waste impacted by lead and mercury, Constituents of Potential Concern (COPCs) to human health. In the absence of adequate characterization of background soil metals concentrations, all detected metals are considered the COPCs for ecological receptors. **Table 2** presents a summary of target metals concentrations detected in mine waste and soil at the Environs Property. Results of other Title 22 metals analyses are presented in the RAW and evaluated in the Human Health Risk Assessment for the project.

Mine Waste

Metal constituents in mine waste and site soil are summarized in **Table 2**. Results from the Quartz Mill site samples indicated significantly elevated levels of lead, mercury, arsenic, and to a lesser extent cadmium. Other Title 22 metals were

generally below typical levels of concern. Lead, mercury, arsenic and cadmium are considered COCs for the site. Metals concentrations for the Quartz Mill samples are summarized below.

Arsenic

Arsenic concentrations ranged from 11 milligrams per kilogram (mg/kg) to 250 mg/kg. None of the samples exceeded the TTLC (500 mg/kg), all 30 samples exceeded the CHHSL for arsenic (0.07 mg/kg) and 15 of 30 samples exceeded typical regional background levels of arsenic (21 mg/kg).

Cadmium

Cadmium concentrations ranged from less than 1.0 mg/kg to 19 mg/kg. None of the samples exceeded the TTLC (100 mg/kg), 22 of 30 samples exceeded the CHHSL for cadmium (1.7 mg/kg). No site specific cleanup goal was established for cadmium.

Lead

Lead concentrations in the 30 samples from the Quartz Mill site ranged from 74 (mg/kg) to 20,000 mg/kg. Eight samples exceeded TTLC levels (1,000 mg/kg). 29 of 30 samples exceeded the CHHSL for lead (80 mg/kg) and 11 of 30 samples exceeded the Providence Mine cleanup goal (270 mg/kg).

Mercury

Mercury concentrations ranged from 0.74 mg/kg to 100 mg/kg. 5 of 30 samples exceeded the TTLC for mercury (20 mg/kg), 8 of 30 samples equaled or exceeded the CHHSL for mercury (18 mg/kg).

Surface Water

Recent metals analytical data is available for surface water in Deer Creek at the Environs Property. Surface water samples were collected between 2014 and 2016 as part of USEPA Brownfields and Sierra Nevada Conservancy abandoned mine cleanup projects. The metals concentrations for all samples are summarized below:

Arsenic

Arsenic was detected in surface water in concentrations ranging from 10.7 µg/L to 46.6 µg/L. The mean concentration was 24.4 µg/L.

Cadmium

Cadmium was detected in surface water in concentrations ranging from less than 1.0 µg/L to 2.5 µg/L. The mean concentration was 1.2 µg/L.

Lead

Lead was detected in surface water in concentrations ranging from 5.4 µg/L to 61.8 µg/L. The mean concentration was 24.1 µg/L.

Mercury

Mercury was not detected in surface water from Deer Creek in the samples collected between 2014 and 2016 at the Environs Property.

PATHWAY ASSESSMENT

The purpose of this assessment was to identify possible direct and indirect pathways of exposure for wildlife under existing conditions and after potential site remediation has been performed.

Existing Conditions

Representative, resident species that were observed within one mile of the abandoned mine site during the field surveys were categorized into foraging guilds and possible exposure pathways based on their primary foods and foraging behaviors (**Table 3**). Direct exposure pathways could include inhalation of dust, soil or water ingestion, or dermal contact with contaminated soils or surface waters that may include elevated levels of arsenic, cadmium, chromium, lead, or mercury.

The most likely groups to experience direct effects include plants, macroinvertebrates, fish and amphibians. Indirect exposure pathways include herbivores and omnivores consuming plants containing elevated levels of these metals, or by insectivores consuming macroinvertebrates that had consumed the plants or that had direct exposure to the soil or water. Most carnivores would probably have only indirect exposure pathways from consuming other animals that may have experienced incidental soil ingestion, dermal contact, or inhalation of airborne particulates or water (**Figure 4**).

Remediation Impacts

The proposed site remediation includes excavation and grading to reduce environmental exposure and erosion of mine waste into Deer Creek. Accessible exposed areas of mine waste will be covered with clean soil or aggregate; erosion control measures will be implemented and the site will be re-vegetated with native plant species. These measures will significantly reduce exposure pathways to biological receptors by reducing impacts to surface water and stream sediments and reducing direct exposure of biological receptors to mine waste at the ground surface. Providing clean near-surface soil for re-vegetation will reduce potential accumulation of metals in site vegetation and thus limit exposure through the food

chain.

CONCLUSIONS

This assessment identified a low potential for one endangered plant species (Scadden Flat Checkerbloom) and one endangered animal species (Willow Flycatcher) to occupy the Environs Property. However, field surveys did not identify the presence of these species on the site. The assessment identified no potential for the federally threatened California Red-Legged Frog to inhabit the project area, and additional detailed surveys confirmed no potential habitat for this species within the work site boundary. The assessment also identified a low potential for six animal species of concern and a moderate potential for one animal species of concern (Yellow Breasted Chat) to occupy portions of the Environs Property north of the work site. Field surveys did not identify any of these species on the site.

While direct and indirect exposure pathways may exist under current conditions, the magnitude of these pathways could be limited by implementing the remediation measures described above. If you desire any further information, please contact me at (530) 265-6090 x200.

Sincerely,

Joanne Hild, Executive Director, Sierra Streams Institute

Appendix A. Qualifications of Surveyors (See CVs for each surveyor in **Appendix B**)

Oriana Chafe is a restoration ecologist at Sierra Streams Institute in Nevada City, CA. She is experienced in conducting botanical surveys and restoring degraded landscapes throughout California. Previous projects include censusing forb and graminoid communities throughout subalpine meadows in the Sierra Nevada; conducting rare vegetation surveys in sensitive habitats in the Sierra Nevada foothills; quantifying conifer seedling success; describing coastal grassland community dynamics; and characterizing altered vegetation community dynamics prior to, during, and following restoration. Ms. Chafe holds Bachelor's degrees in Environmental Studies and Studio Art from the University of California, Santa Cruz.

Joanne Hild is Executive Director and Biologist at Sierra Streams Institute in Nevada City, CA. Joanne received her B.S. in Biology from Tufts University and an M.S. in Zoology from University of Massachusetts, Amherst. Her research specializes in riparian ecology and ornithology with field experience focused on habitat Assessments, wildlife and endangered species surveys, and restoration plans.

Rachel Durben is a biologist and ecologist at Sierra Streams Institute, specializing in riparian ecology. Her field experience includes vegetation and invertebrate surveys of riparian corridors in Colorado's San Juan Mountains, California's Sierra Nevada, and throughout Arizona, as well as bird, mammal, and in-stream biological, habitat, and water quality assessments in northern California. Ms. Durben holds a B.S. in Zoology and an M.S. in Biology from Northern Arizona University.

Jeff Lauder is a river scientist at Sierra Streams Institute, and performed the California Red-Legged Frog (CRF) surveys for this study. In accordance with the guidelines described in the U.S. Fish and Wildlife Service Revised Guidance on Site Assessments and Field Surveys for the California Red-Legged Frog (2005), he meets all of qualifications for performing CRF surveys. He holds a B.S. in Environmental Science with an option in Applied Ecology from CSU Chico and as completed coursework in herpetology and study-design/survey-methodology. He has verifiable experience in the design and implementation of amphibian surveys and equivalent relevant experience. He also has verifiable experience handling and identifying a minimum of 10 CRF, or similar species, with a minimum of 5 adults and a combination of larva and juveniles, and has obtained a minimum of 40 hours of field experience through assisting in surveys of CRF. Mr. Lauder has familiarity with suitable habitats for the species and can identify the major vegetative components of communities in which CRF research or surveys may have been conducted, and also has familiarity with and is able to identify both native and non-native amphibians that may co-occur with the listed species.

Anne Wallace is a Certified Wildlife Biologist for EcoBridges, and was consulted for advice on performing and interpreting the Red-Legged Frog surveys conducted by Jeff

Lauder. She has over 30 years of experience in a range of natural resource investigations including wildlife research, inventory, and survey techniques; trapping and tagging methods; and technical writing and editing. She specializes in endangered species surveys, habitat and impact assessment, and environmental compliance, having extensive experience with NEPA, CEQA, state/federal endangered species acts, and all other relevant local, state, and federal regulations.

Appendix B. Surveyor's Curricula Vitae

SIERRA Streams INSTITUTE

ORIANA ELIZABETH HOLTZ CHAFE

Phone: 530) 265-6090 ext. 201
oriva.sierrastreamsinstitute.org

431 Uren Street, Suite C
Nevada City, CA 95959

EDUCATION

BA University of California, Santa Cruz: Environmental Studies — June 2011
Concentration: Ecological Restoration and Climate Change Ecology

BA University of California, Santa Cruz: Studio Art — June 2011
Concentration: Photography and Intermedia

EMPLOYMENT HISTORY

Restoration Ecologist, Nevada City, CA — 2013
Sierra Streams Institute
Term of employment: January 2013 - present
Position description: Lead ecological restoration program; implement watershed restoration and research activities; conduct vegetation, water quality, and wildlife surveys; create restoration plans and environmental monitoring protocols. Responsible for restoration of critical riparian habitat areas degraded by historic gold mining activities, implementing brownfield remediation of abandoned mine lands, and improving water quality in streams throughout the Sierra Nevada foothills.

Research Associate, Barrow, AK — 2013
Lawrence Berkeley National Laboratory
Term of employment: June 2013 - present
Position description: Conduct monitoring of multiple biogeochemistry parameters in collaboration with the Next Generation Ecosystem Experiment. Fieldwork entails quantifying the impact of permafrost degradation upon carbon dioxide and methane gas fluxes across arctic tundra ecosystems.

Laboratory Assistant II, Sequoia National Park, CA — 2012
University of California, Berkeley
Term of employment: August 2012 - September 2012
Position Description: Provided field assistance with inventory of red fir forest annular seedling growth. Study was located in forest site within western Sequoia National Park. Also helped to conduct experiments which characterized forest microclimate conditions and water relations.

Junior Specialist, Harte Macroecology Lab, Sequoia National Park, CA — 2012
University of California, Berkeley
Position description: Conducted botanical fieldwork in remote subalpine meadows throughout Sequoia National Park. Worked both independently and with an assistant to identify and quantify the composition of herbaceous forb and graminoid communities.

Seasonal Field Assistant. Younger Lagoon Reserve, Santa Cruz, CA 2012
University of California Natural Reserve System
Term of employment: January 2012 - June 2012
Position Description: Served as interim Reserve Restoration Steward, lead daily implementation of coastal habitat restoration, conducted ecological monitoring, managed reserve lands, and facilitated undergraduate internship program. Performed public outreach and directed multiple volunteer stewardships events. Educated student interns on methods employed in ecological restoration, plant identification, and regional natural history. Provided instruction to visiting undergraduate classes on topics of plant ecophysiology, techniques of coastal habitat restoration, and botanical identification.

Student Field Assistant. Younger Lagoon Reserve, Santa Cruz, CA 2011
University of California Natural Reserve System
Term of employment: March 2011 - September 2011
Position description: Assisted with implementation of coastal habitat restoration, including: invasive vegetation management; seed collection, propagation, transplanting, and irrigation of native plant species; conducted ecological monitoring; and performed reserve maintenance. Assisted with education of undergraduate interns, organization of public stewardship events, and supervised student employee work crews. Instructed visiting undergraduate classes on methods of performing botanical surveys and implementing coastal habitat restoration

RESEARCH EXPERIENCE

Researcher. Deer Creek watershed, CA 2013
Sierra Streams Institute
Title: "Implications of ecological restoration activities for vegetation, wildlife, and water quality throughout the Deer Creek watershed"

Researcher. South Yuba River watershed, CA 2013
Sierra Streams Institute
Title: "Climatic variation and botanical phenology in the Sierra Nevada foothills"

Field Assistant. Sequoia National Park, CA 2012
Harte Macroecology Lab, University of California, Berkeley
Principal Investigator: Danielle Christianson
Title: "Microclimatic implications for red fir seedling success in the central Sierra"

Field Technician. Sequoia National Park, CA 2012
Harte Macroecology Lab, University of California, Berkeley
Principal Investigators: Dr. John Harte, Dr. Irene Berlow, and Erica Newman
Title: "Novel and climate-induced stress in subalpine meadows of the high Sierra"

Research Assistant. Santa Cruz, CA 2012
Forest Ecology Research Plot, University of California, Santa Cruz
Principal Investigator: Sharita Crandall

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Title: "Microclimate diversity of fungal spores within a mixed-evergreen forest ecosystem"

Research Assistant. Santa Cruz, CA 2012
University of California Natural Reserve System, Younger Lagoon Reserve
Principal Investigator: Dr. Gage Dayton
Title: "Monitoring aquatic and terrestrial ecosystem composition of protected and public-use coastal areas in western Santa Cruz County"

Undergraduate Research. Santa Cruz, CA 2011
University of California, Santa Cruz
Advisors: Dr. Karen Holl and Dr. Michael Loik
Title: "Methods of exotic vegetation removal in coastal grassland restoration: Impacts upon native grass seedling physiology"

Research Assistant. Pinnacles National Monument, CA 2011
National Park Service, UCSC Arboretum, Amah Mutsun Tribal Band
Principal Investigator: Dr. Michael Loik, UCSC
Title: "Photosynthetic responses of culturally important plants from Pinnacles National Monument"

Research Assistant. Santa Cruz, CA 2011
University of California Natural Reserve System, Younger Lagoon Reserve
Principal Investigator: Daniel Wilson
Title: "Spatial analysis of dune and vegetation establishment on protected and public-use socket beaches along the California central coast"

Research Assistant. Santa Cruz, CA 2011
University of California, Santa Cruz
Principal Investigator: Kathlyn Franco
Title: "Abundance and distribution of the endemic Santa Cruz kangaroo rat (*Dipodomys venustus venustus*)"

Research Assistant. Santa Cruz, CA 2011
University of California, Santa Cruz
Principal Investigator: Karen Holl
Title: "Manipulating disturbance regimes and seeding to restore mesic Mediterranean grasslands"

Peregrine Falcon Nest Camera Operator. Santa Cruz, CA 2010
Santa Cruz Predatory Bird Research Group
Principal Investigator: Glenn Stewart
Title: "Prey delivery and developmental behavior of Peregrine Falcon (*Falco peregrinus*) eyasses within the eyrie"

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Certifications and Trainings

Rare Vegetation Survey Training. California Native Plant Society — April 2013

Wilderness First Responder Certification. Wilderness Medicine Institute — March 2012

Adult and Child CPR Certification. Wilderness Medicine Institute — March 2012

Presentations

Project presentation. "Environmental assessment and forest management plan for Hirschman's Pond" City of Nevada City Recreation Committee. April 22, 2013

Panel Participant. "Integrating sustainability and geoscience through career and education" Interdisciplinary Teaching of Geoscience for a Sustainable Future. Stanford University. May 24, 2012

Poster Presentation. "Methods of exotic vegetation removal in coastal grassland restoration: Impacts upon native grass seedling physiology" Department of Environmental Studies Undergraduate Research Poster Symposium. June 1, 2011

Affiliations

California Native Plant Society. Redbud Chapter — 2013

American Society of Plant Biologists — 2013

Community Service

South Yuba River Citizens League
Volunteer water quality monitor. South Yuba River watershed. CA. 2013.

Sierra Lakes County Water District
Natural resources management citizen's committee participant. Serene Lakes. CA. 2013.

California Native Plant Society
Invasive species management. Santa Cruz, CA and Nevada City, CA. 2011-2013.

University of California, Santa Cruz
Volunteer research assistant. PI: Dr. Karen Holl. "Manipulating disturbance regimes and seeding to restore mesic Mediterranean grasslands" Santa Cruz, CA. 2011.

University of California Natural Reserve System
Invasive species management. Younger Lagoon Reserve. Santa Cruz, CA. 2010.

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SIERRA Streams INSTITUTE

Rachel Marie Durben

10300 Jeffery Pine Rd Apt D7 • Truckee, CA 96161
Phone: (928)380-2384 • E-mail: rdurben@gmail.com

Education

Northern Arizona University
Masters of Science in Biology: December 2010 (GPA 3.0/4.0)
B.S. in Zoology: December 2001

Experience

Sierra Streams Institute- Training Program Coordinator
December 2011-Present

- Designing and teaching California state-standards aligned environmental education curriculum for grades K-8
- Developing a regional coalition of environmental educators
- Grant writing, reporting, and management
- Organizing training workshops for watershed groups, state employees, and community members
- Research and report writing for EPA Brownfields Eco Risk Assessments

Sierra Streams Institute- Outreach and Restoration Coordinator
January-December 2011

- Instructed ecology component of grade 1 / 12 science class, including lectures and field trips
- Designed science curriculum to follow California State Science Standards for K-12 charter and home school groups
- Instructed Watershed Science course for 6 - 8 grade students
- Restored riparian areas by removing invasive vegetation and re-planting with natives, installing erosion control features and blocking access to sensitive areas
- Built and maintained trail across city, federal, and privately owned land
- Worked with Native American tribes to design and install interpretive signs
- Collected and statistically analyzed water quality, macroinvertebrate, and algae data for publication and presentation

Northern Arizona University- Teaching Assistant: Invertebrate Zoology
January-May 2010

- Instructed two lab classrooms consisting of a total of 32 students
- Taught taxonomy, anatomy, microscope techniques and the scientific method
- Prepared lectures and quizzes, graded quizzes and lab practicals
- Assisted students with individual projects and poster construction for Undergraduate Research Symposium
- Co-taught field course, Intertidal Invertebrates of the Sea of Cortez, involving 10 students conducting field research in Puerto Peñasco, Mexico

Northern Arizona University- Teaching Assistant: Parasitology
January-May 2009

- Instructed two lab classrooms consisting of a total of 20 students
- Taught taxonomy, pathology, anatomy and epidemiology of parasitic organisms
- Prepared lectures and quizzes, graded quizzes and lab practicals
- Created study guides and held open labs for exam preparation

Northern Arizona University- Teaching Assistant: Introductory Biology
August-December 2007

- Instructed 3 lab classrooms consisting of a total of 72 students
- Taught basic biological science concepts, the scientific method, laboratory skills and safety
- Prepared lectures and quizzes, graded quizzes, lab notebooks, and lab reports
- Demonstrated experiments and lab techniques, assisted with group experiments
- Advised new students on future directions for a career in biology

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Rachel Marie Durben

Northern Arizona University- Graduate Research Assistant
December 2007 – December 2010

- Conducted individual research project on riparian community ecology
- Spent consecutive weeks in remote field locations to collect data over 3 years
- Conducted arthropod surveys, collected, identified and preserved specimens
- Recorded and analyzed univariate and multivariate data using multiple statistical software programs
- Collected and processed tree tissue (leaves and twigs) for chemistry analyses
- Trained and supervised a team of undergraduates in the field

Additional Involvements and Awards

- Project Learning Tree Training (2012)
- Volunteer River Guide, Environmental Traveling Companions (March 2011- Present)
- First Aid/CPR Certification (2001 – 2013)
- ACA Swift Water Rescue Training (June 2011)
- Project WET (Watershed Education for Teachers) Training (2011, 2012)
- Outstanding Graduate Student Award, Biological Sciences (2010)
- Volunteer, Community Supported Agriculture Newsletter (2010)
- Volunteer, City of Flagstaff Urban Watershed Renewal Project, Rio de Flag (2010)
- Graduate Student Organization Travel Award (2010, 2009)
- Graduate Student Organization Representative for Biology Graduate Student Association (2009- 2010)
- Member, Biology Graduate Student Association (2007- 2010)
- Science Fair Judge, DeMiguel Elementary School (2008- 2010)
- Member, Ecological Society of America (2008- Present)
- Member, Arizona Riparian Council (2008- 2011)
- NAUI Open Water Diver Certification (2008)

Papers and Presentations

- Presentation and Poster- "Citizen-based monitoring characterizes water quality and macroinvertebrate composition throughout a western Sierra Stream", California Aquatic Bioassessment Workshop, UC Davis, CA (Presentation- November 2011), Ecological Society of America, Austin, TX (Poster- August 2011)
- Poster- "Developmental trajectories of *Populus* defensive chemistry in the presence of a mammalian herbivore, *Castor canadensis*", European Society for Evolutionary Developmental Biology, Paris (July 2010)
- Presentation- "Arthropods, Beavers, and Chemistry: The ABC's of cottonwood ecology", Cottonwood Symposium, Flagstaff, AZ (February 2010)
- Presentation and Poster- "Beavers and Bugs: Mammalian herbivore changes arthropod communities on *Populus fremontii*", Ecological Society of America, Albuquerque, NM (Poster- August 2009); Arizona Riparian Council, Camp Verde, AZ (Presentation- April 2009); Cottonwood Symposium, Flagstaff, AZ (Presentation- February 2009)
- Presentation- "Distribution, orientation, and abundance of the intertidal barnacle, *Tetraclita squamosa*, and other invertebrate diversity at Punta Sylvana in Puerto Peñasco, Sonora, Mexico", Arizona Nevada Academy of Sciences, Phoenix, AZ (May 2012)

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SIERRA Streams INSTITUTE

JEFF LAUDER

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[illegible] | jeff@sierrastreamsinstitute.org (office)

EDUCATION

California State University, Chico — Chico, CA

B.S. Environmental Science — **12/2011**

Option in Applied Ecology
Senior Thesis: Forest Structure and Composition in a Geographically Isolated Caldera, Papua New Guinea

M.S. Environmental Science, Applied Ecology — **05/2015** (Expected)

Thesis: Tropical Forest Structure and Composition in a Dynamic Landscape: Assessing the Role of Large-Scale Disturbances in West New Britain, Papua New Guinea

EXPERIENCE

Sierra Streams Institute — Nevada City, CA

River Scientist — **01/2011-Present**

- Monthly water quality and algae sampling of perennial stream.
- Multivariate analysis of benthic macroinvertebrate communities and role of water quality and habitat.
- Design and implement assessments of phytoremediation potential of native plants at two contaminated mine sites in Nevada City, CA (lead, arsenic, and cadmium extraction and stabilization)
- Design and implement mammal monitoring protocols throughout watershed, small mammal live traps, track plates, and remote camera traps

California State University, Chico — Chico, CA

Researcher/Research Assistant/Field Assistant — **06/2010-Present**

- Biological Expedition to quantify forest structure and composition in previously unexplored caldera on New Britain island, Papua New Guinea, that resulted in poster and publication in progress
- Plant identification, plot delineation, GPS data collection, soil sampling and analysis.
- Spatial Analysis including LiDAR, MODIS, ASTER imagery and data.
- Lead field crew of 2-5 individuals in field plot measurements.

California State University, Chico — Chico, CA

Research Assistant/Field Assistant — **09/2011-12/2011**

- Assist in radio-telemetry tracking of Northern Saw-Whet Owls (*Aegolius acadicus*)
- Characterize roosting habitat, including overall habitat type, micro habitat, and roost tree species.
- Small mammal identification via use of bone fragments in owl pellets. Identification to genus using cranial elements.

USGS, Western Ecological Research Center Yosemite Field Station — Oakhurst, CA

Ecology Intern — **05/2011-08/2011**

- Collect data in relation to USA candidacy for Yosemite toad (*Bufo canorus*), including habitat delineation and characterization, soil moisture, temperature, conifer encroachment, water body distribution and characterization
- Identify, net, and handle California Red-Legged Frog (*Rana draytonii*) during surveys of foothill habitat in the vicinity of Yosemite National Park.
- Collected data on efficacy of three herbicide treatments to two invasive grasses, *Bromus tectorum* and *Holcus lanatus*.

PUBLICATIONS

Lauder, J.D., Senock, R. 2013. Forest Structure and Composition in a Geographically Isolated Lowland Tropical Forest, Papua New Guinea. Manuscript in preparation.

Lauder, J.D. 2011. Forest Structure and Composition in a Geographically Isolated Lowland Tropical Forest, Papua New Guinea. CSU, Chico Senior Thesis. CSUC.

TECHNICAL REPORTS

Lauder, J.D., 2013. Phytoremediation of Mine Waste: Feasibility Assessment. Report to Rose Foundation and internal technical report. Sierra Streams Institute. Nevada City, CA.

PRESENTATIONS

Bell, A., **Lauder, J.D.** "Bioassessment on Deer Creek: Long Term and Site Specific Variation Using an IBI and Multivariate Method." presented at the California Bioassessment Workshop. UC Davis, Davis, CA. November 2012.

Lauder, J.D. "Citizen Science Characterizes Relationships Among Benthic Macroinvertebrates and Water Quality in a Western Sierra Stream." poster presented at the Society for Conservation Biology North American Congress for Conservation Biology. Oakland, CA. July 2012.

Lauder, J.D., Senock, R., Rogers, H. Forest Structure and Composition in a Geographically Isolated Lowland Tropical Forest, Papua New Guinea. Poster Presentation at CSU, Chico College of Natural Sciences Research Symposium. CSUC. May 2011

MEMBERSHIPS AND AFFILIATIONS

Society for Conservation Biology, Member

FINANCIAL SUPPORT

Lauder, Jeff. 2012. Terrestrial and Aquatic Sampling and Monitoring Equipment for Mammal Surveys and Water Quality Monitoring. Northrop Wildlife Foundation. $2,000.

RELEVANT SKILLS AND TECHNIQUES

- Software: ArcGIS, PC-ORD, HyperNiche, R, MS Office, Estimates, SAS, Trimble Pathfinder and associated software
- Field Water Quality Sampling, BMI collection, and Hab assessment following California Surface Water Ambient Monitoring Program (SWAMP) protocol
- Wildlife techniques:
  - Small mammal trapping, identification, and handling, remote camera traps, track plate design and building, mark-recapture, etc
  - Amphibian identification and handling experience. Yosemite Toad (*Bufo canorus*), Foothill Yellow-Legged Frog (*Rana boylii*), Sierra Nevada Yellow-Legged Frog (*Rana sierrae*), various Tree/Chorus Frog (*Pseudacris sp.*), California Red-Legged Frog (*Rana draytonii*), various Garter Snake (*Thamnophis sp.*)
  - Bird handling and banding: Northern Saw-Whet Owl (*Aegolius acadicus*).
- Botany: Plant identification using dichotomous keys (i.e. Jepson Manual), visual ID to family
- Wilderness First Responder (WFR) certified and practiced in wilderness medicine and backcountry safety
- Computer Hardware and IT: Network setup (Network+), Server management, A+ (Hardware maintenance)
- Extensive field/backcountry experience

SIERRA Streams INSTITUTE

Anne Wallace Principal/Certified Wildlife Biologist
www.ecobridges.net

Education

M.S.	Wildlife Science (1988)	Utah State University	Logan, UT
B.S.	Fisheries and Wildlife (1984)	Utah State University	Logan, UT

Employment History

2004 >>	Principal/Senior Biologist	EcoBridges Environmental	Grass Valley, CA
1995-2004	Principal/Senior Biologist	Ibis Environmental, Inc.	Grass Valley, CA
1990-1995	Wildlife Biologist	BioSystems Analysis, Inc.	Tiburon, CA
1989-1990	Natural Resource Specialist	Spectrum Sciences and Software	Logan, UT
1988-1989	Research Technician	USFS Intermountain Research Station	Logan, UT
1986-1987	Consultant	Bio/West, Inc.	Logan, UT
1986	Wildlife Biologist	U.S. Fish and Wildlife Service	Honolulu, HI
1984-1987	Graduate Assistant	Utah State University Foundation	Logan, UT
1983-1984	Biological Technician	Utah State University	Logan, UT
1983	Biological Technician	Utah Division of Wildlife Resources	Ogden, UT

Professional Summary

Principal of EcoBridges Environmental, formerly cofounder of Ibis Environmental, Inc. Ms Wallace is a certified wildlife biologist with 30 years of experience (23 years in CA) in a range of natural resource investigations including wildlife research, inventory, and survey techniques; trapping and tagging methods; and technical writing and editing. She specializes in endangered species surveys, habitat and impact assessment, and environmental compliance, having extensive experience with NEPA, CEQA, state/federal endangered species acts, and all other relevant local, state, and federal regulations.

Ms Wallace's primary focus has been on identification, biology, and distribution of birds, especially raptors and wetland/riparian species. She has: flown and piloted aerial surveys of waterfowl and white pelicans; ground-surveyed nesting waterfowl and shorebirds; trapped, banded, and counted migrating raptors; banded raptor nestlings; surveyed and banded nesting colonial seabirds; conducted USFWS breeding bird surveys and Christmas bird counts; located sandhill crane nests by helicopter; and spent countless hours surveying threatened and endangered birds. In addition, she has conducted many San Joaquin kit fox surveys; monitored small-mammal traplines; and trapped, tranquilized, and tagged American marten. She has surveyed many California sensitive wildlife, following approved protocols where appropriate, including red-legged frog; yellow-legged frog; tiger salamander; branchiopods; tricolored blackbird; valley elderberry longhorn beetle; least Bell's vireo; sandhill crane; San Francisco garter snake; pond turtle; raptors, such as burrowing owl, goshawk, Cooper's hawk, spotted owl, and Swainson's hawk; California clapper and black rail; salt-marsh harvest mouse; western snowy plover; willow flycatcher (including southwestern subspecies); blunt-nosed leopard lizard; an endangered butterfly; and others, including rare plants.

Much of Ms Wallace's experiential background has been in and around freshwater wetlands, wet meadows, salt marshes, riparian zones, and their associated uplands, particularly in northern California, but she has also worked extensively with species in the grasslands and foothills associated with the Central Valley. Her work has also taken her to a variety of riparian, desert, coastal, and mountain habitats in Oregon, Utah, Idaho, Montana, Wyoming, Colorado, New York, and Hawaii, working on projects such as pipelines, transmission lines, highways, recreation trails, mine-site reclamation, geothermal development, Air Force airspace actions, windfarms, FERC hydroelectric relicensing, marsh restoration, and many others. Clients include cities, counties, state agencies, federal agencies, utilities, private developers, and nonprofits.

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Anne Wallace

Selected Professional Amphibian Experience

- Pitfall trapping for California tiger salamanders for two private development projects, one in Pittsburg in Contra Costa Co (annual pitfall trapping for several years), and one near Santa Rosa in Sonoma Co.
- Baseline data collection on California tiger salamanders, western spadefoot toads, fairy shrimps, San Joaquin kit foxes, foothill yellow-legged frogs, and western pond turtles in appropriate habitats on portions of 47,000 acres of vernal pool grasslands in eastern Merced County for HCP.
- Aquatic sampling for vernal pool branchiopods and California tiger salamanders for a variety of projects in Solano and Sacramento counties.
- Protocol CTS surveys (old protocol) for new water pipeline along Crow Canyon Road, Alameda and Contra Costa counties.
- Habitat assessment and field surveys for California red-legged frogs in support of PG&E's relicensing efforts for the Mokelumne River Project. Surveys encompassed more than 60 sites in Amador and Calaveras counties along the Mokelumne River drainage.
- Habitat assessment and field surveys for California red-legged frogs in support of PG&E's relicensing of the Rock Creek/Cresta hydroelectric project. The project area includes about 100 miles of transmission line and the Feather River drainage above Lake Oroville.
- Ten years of clearing cattails by hand to protect California red-legged frogs and San Francisco garter snakes at West-of-Bayshore property, San Mateo County, San Francisco International Airport.
- Construction monitoring of California red-legged frogs and San Francisco garter snakes for canal-dredging operation, West-of-Bayshore, SF International Airport, as well as CRLF and SFGS monitoring for many other maintenance activities over a 12-year period.
- Permitting, formal/informal consultation, site assessments, field surveys for California red-legged frog and other special-status herps (San Francisco garter snake, foothill yellow-legged frog, California tiger salamander) on a variety of private and municipal projects: construction of a private bridge across a creek in Solano County; creek dredging in western Marin County for county flood control; bridge replacement over creek in City of Placerville; retail development near Grass Valley; casino construction adjacent to a creek in Tuolumne County; road wash-out repair in Nevada County; wastewater treatment plant expansion in Nevada County; new trail construction along Deer Creek in Nevada County; evaluation of water-supply alternatives for coastal golf course for impacts to CRLFs, San Francisco garter snakes, and their prey, San Francisco County; reservoir dredging project in Nevada County.
- Foothill yellow-legged frog and pond turtle surveys along Middle and South Stanislaus rivers for PG&E FERC relicensing project, in spring and early summer for egg masses, in mid to late summer for tadpoles, and in fall for metamorphs.
- Foothill yellow-legged frog surveys in six tributaries to the North Fork Feather River for PG&E hydroelectric relicensing project for juveniles and adults.
- Four-year study and monitoring of foothill yellow-legged frogs throughout the North Fork Mokelumne River for PG&E FERC hydroelectric relicensing. Spring/early summer surveys for egg masses included snorkeling. Also mid to late summer surveys for tadpoles, fall surveys for metamorphs, and juveniles and adults found throughout the season.
- Study to evaluate potential impacts of short-term power-generation water releases on foothill yellow-legged frog tadpoles in late summer for PG&E. Conducted pre-release, mid-release, and post-release tadpole surveys, and measured wetted perimeter changes for mid-release and post-release flows.
- Construction monitoring for giant garter snakes in Sutter, Yuba, and Sacramento counties for two transmission-line projects and one bridge-replacement project.

Appendix C. CNDDB (2006) results for the Nevada City 7.5' USGS quadrangle

QUAD NAME	ELM CODE	SCI NAME	COM NAME	FED STATUS	CAL STATUS	DFG STATUS	RARE PLANT RANK
Grass Valley	ABNME03041	*Laterallus jamaicensis coturniculus*	California black rail	-	T	FP	-
Grass Valley	ABNME03041	*Laterallus jamaicensis coturniculus*	California black rail	-	T	FP	-
Grass Valley	ARACF12100	*Phrynosoma blainvillii*	coast horned lizard	-	-	SSC	-
Grass Valley	PDCON040H0	*Calystegia stebbinsii*	Stebbins' morning-glory	E	E	-	1B.1
Grass Valley	PDFAB25101	*Lathyrus sulphureus var. argillaceus*	dubious pea	-	-	-	3
Grass Valley	PDMAL110R0	*Sidalcea stipularis*	Scadden Flat checker-bloom	-	E	-	1B.1
Grass Valley	PDONA05053	*Clarkia biloba* ssp. *brandegeeae*	Brandegee's clarkia	-	-	-	4.2
Grass Valley	PDSTE03030	*Fremonto-dendron decumbens*	Pine Hill flannelbush	E	R	-	1B.2
Grass Valley	PMCYP0N080	*Rhyncho-spora capitellata*	brownish beaked-rush	-	-	-	2.2
Grass Valley	PMJUN013E0	*Juncus digitatus*	finger rush	-	-	-	1B.1
Nevada City	AAABH01050	*Rana boylii*	foothill yellow-legged frog	-	-	SSC	-
Nevada City	ARACF12100	*Phrynosoma blainvillii*	coast horned lizard	-	-	SSC	-
Nevada City	NBMUS2C0H0	*Didymodon norrisii*	Norris' beard moss	-	-	-	2.2
Nevada	NBM	*Mielichho-*	elongate	-	-	-	2.2

City	US4Q022	*feria elongata*	copper moss				
Nevada City	PDONA05053	*Clarkia biloba* ssp. *brandegeeae*	Brandegee's clarkia	-	-	-	4.2
Nevada City	PDPOR04020	*Lewisia cantelovii*	Cantelow's lewisia	-	-	-	1B.2
Nevada City	PMCYP0N080	*Rhynchospora capitellata*	brownish beaked-rush	-	-	-	2.2
Nevada City	PMLIL0V060	*Fritillaria eastwoodiae*	Butte County fritillary	-	-	-	3.2
North Bloomfield	AAABH01022	*Rana draytonii*	California red-legged frog	T	-	SSC	-
North Bloom-field	AAABH01050	*Rana boylii*	foothill yellow-legged frog	-	-	SSC	-
North Bloom-field	ABNGA04010	*Ardea herodias*	great blue heron	-	-	-	-
North Bloom-field	ABNKC12060	*Accipiter gentilis*	northern goshawk	-	-	SSC	-
North Bloom-field	AMAJA03012	*Vulpes vulpes necator*	Sierra Nevada red fox	-	T	-	-
North Bloom-field	ARAAD02030	*Emys marmorata*	western pond turtle	-	-	SSC	-
North Bloom-field	PDONA05053	*Clarkia biloba* ssp. *brandegeeae*	Brandegee's clarkia	-	-	-	4.2
North Bloom-field	PDPOR04020	*Lewisia cantelovii*	Cantelow's lewisia	-	-	-	1B.2
North Bloom-field	PMCYP0N080	*Rhynchospora capitellata*	brownish beaked-rush	-	-	-	2.2
North Bloom-field	PMLIL0V060	*Fritillaria eastwoodiae*	Butte County fritillary	-	-	-	3.2
North Bloom-field	PPLYC03060	*Lycopodiella inundata*	inundated bog-clubmoss	-	-	-	2.2

* Status definitions:

Federal

E = Listed as Endangered under the federal Endangered Species Act.
T = Listed as Threatened under the federal Endangered Species Act.
C = Candidate for listing as either Threatened or Endangered under the Federal Endangered Species Act.
PE = Proposed for federal listing as endangered under the federal Endangered Species Act.
PT = Proposed for federal listing as threatened under the federal Endangered Species Act.
SC = Species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.
- = No listing.

State

E = Listed as Endangered under the California Endangered Species Act.
T = Listed as Threatened under the California Endangered Species Act.
R= Rare; although not presently threatened with extinction, it occurs in such small numbers throughout its range that it may become endangered if its present environment worsens.
SSC = Species of Special Concern in California.
- = No listing

Department of Fish & Game (DFG)

FP= Federally Proposed for listing
SSC= Species of Special Concern
- = No listing

California Native Plant Society

California Rare Plant Rank 1A = Plants presumed extinct in California.
California Rare Plant Rank 1B = Plants rare, threatened, or endangered in California and elsewhere; the majority are endemic to California.
California Rare Plant Rank 2 = Plants rare, threatened, or endangered in California, but more common elsewhere.
California Rare Plant Rank 3 = Plants about which we need more information – A review list.
California Rare Plant Rank 4 = Plants of limited distribution – A watch list.

Figure 1. Site location map for Providence Quartz Mill cleanup area, Nevada City, CA

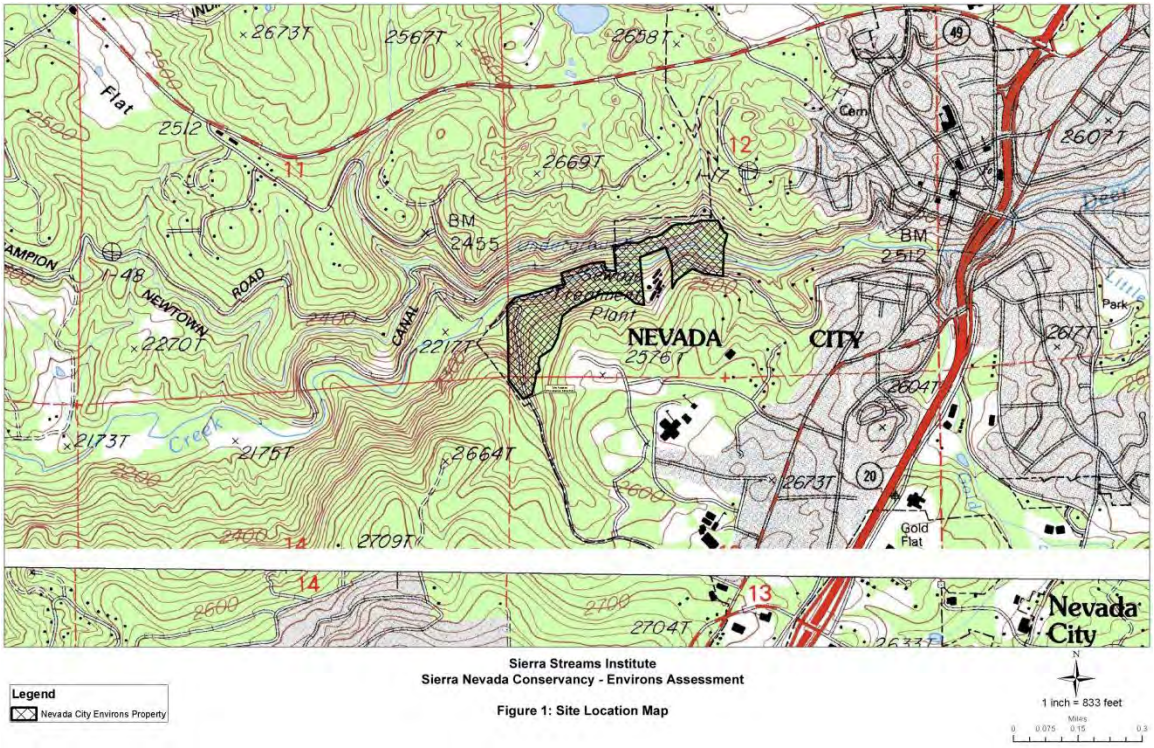

Figure 2. Map of the approximate Quartz Mill Brownfields site boundary and adjacent features of the Environs Property, Nevada City, CA

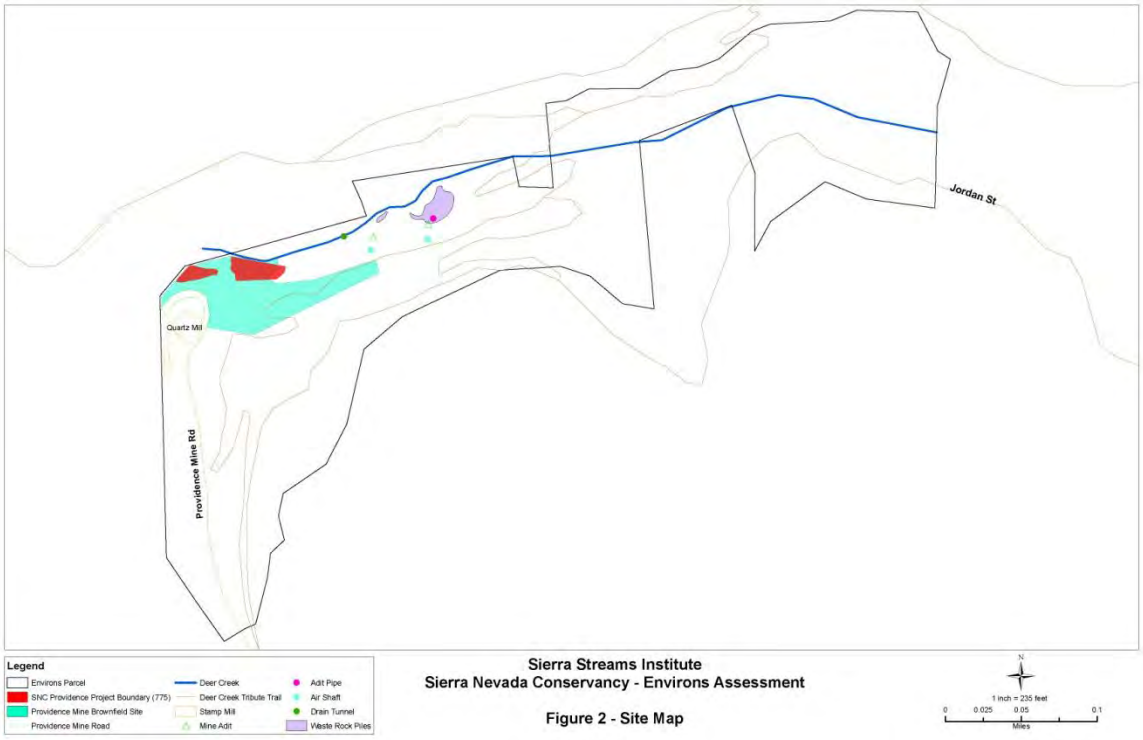

Figure 3. Providence Quartz Mill Soil Sample Location Map

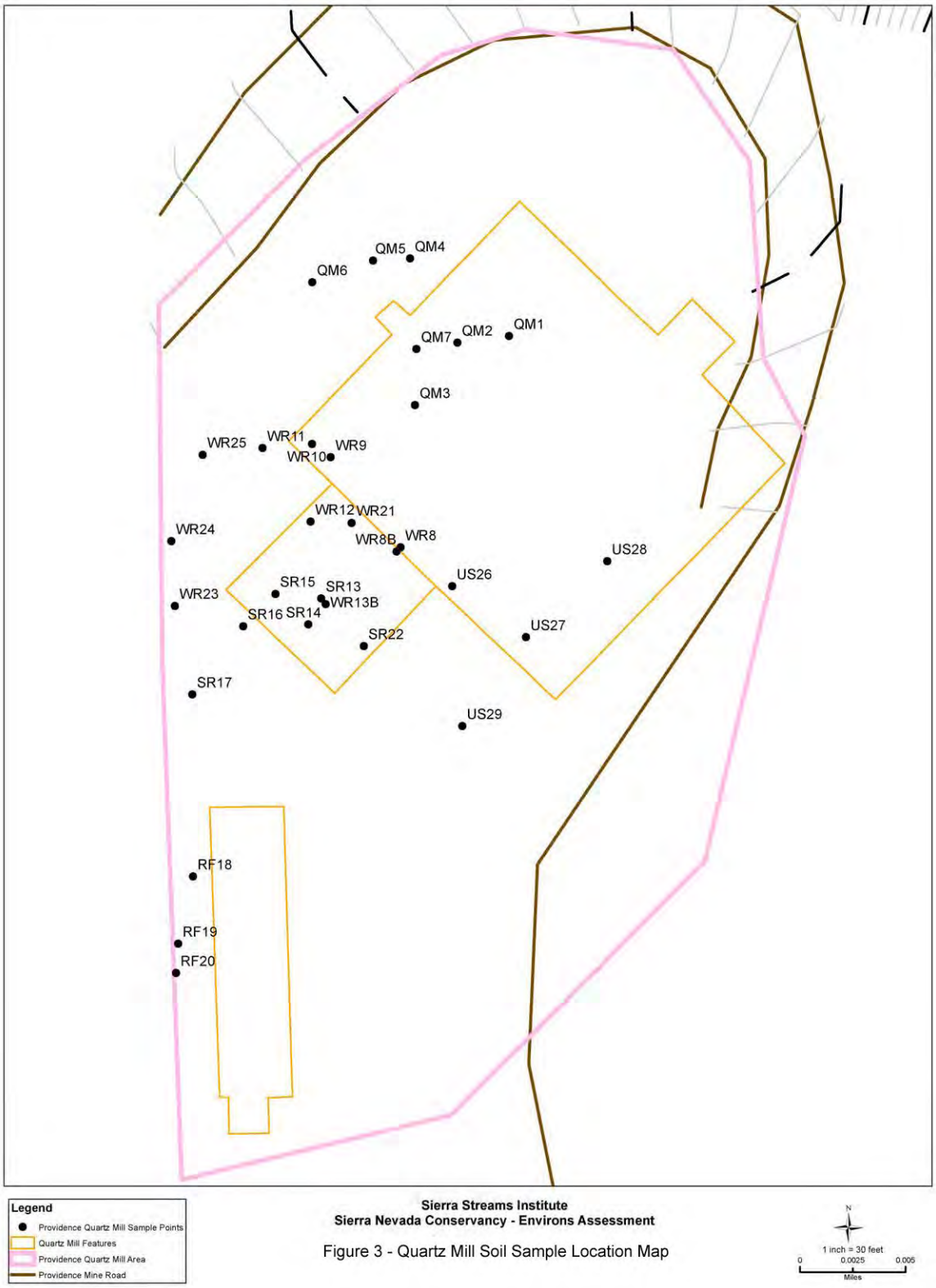

Figure 4. Conceptual Model of Potential Ecological Risk Pathways for Providence Quartz Mill Project

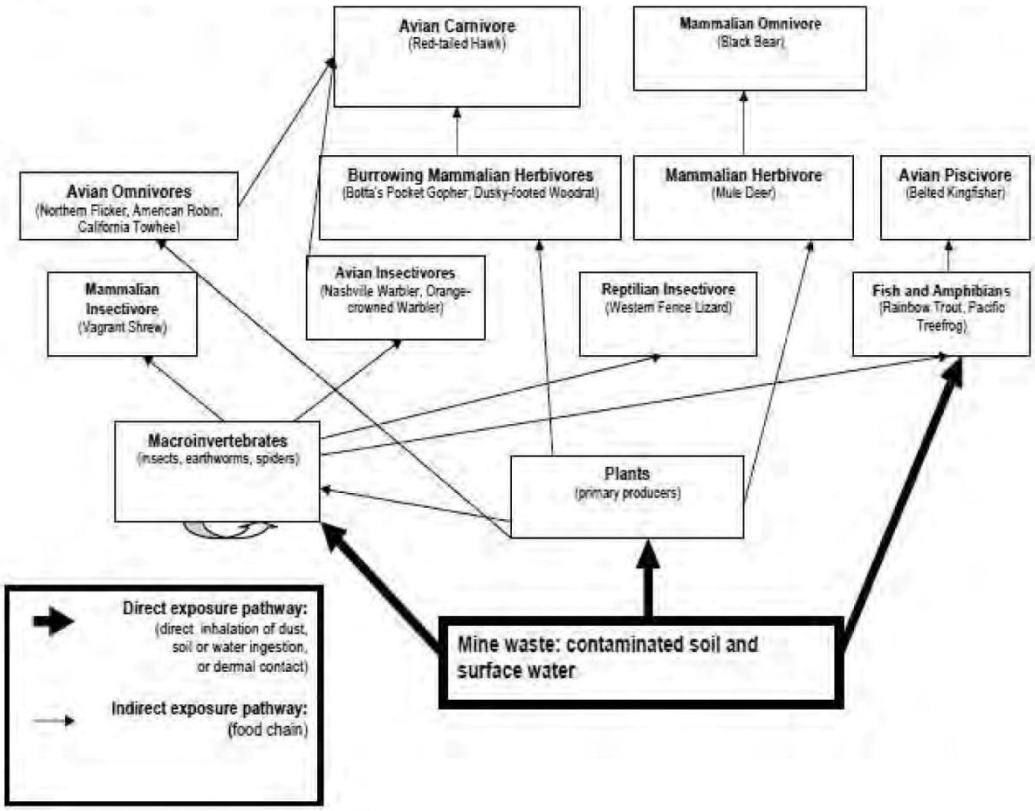

Table 1a. Special-Status plants potentially occurring in the vicinity of the Providence Mine site, Nevada City, CA				
Species	**Legal Status Federal/State CNPS List**	**Habitats**	**Occurrence in Nevada County**	**Potential for Occurrence in the Project Area**
Stebbins' morning-glory *Calystegia stebbinsii*	**E/E CNPS 1B.1**	**General habitat:** Chaparral; 607-2,394 feet elevation. **Microhabitat:** Soils of the Pine Hill gabbro formation (Eldorado Co), Rescue soil series gabbros (Nevada Co.), sometimes on serpentine. Blooms April-July	Known in Nevada County from only a few occurrences in McCourtney Road-Wolf Mtn-Deadman's Flat area chaparral, including disturbed area behind landfill	No potential; no suitable habitat present
Brandegee's clarkia *Clarkia biloba* subsp. *brandegeeae*	**--/--/ CNPS 1B.2**	**General habitat:** Chaparral, woodland, often on roadcuts 968-2,804 feet. **Microhabitat:** Often on roadcuts, open grassy slopes. Blooms May-July	Many documented occurrences in grassy woodland openings and road cuts at South Yuba, Middle Yuba corridors near Hwy 49, Indian Flat, Bear River near Hwy 49, Rollins Lake area, Edwards Xing, Purdon Rd, Cement Hill, Dog Bar and Mt Olive Roads, to Lake of the Pines and Alta Sierra. Historic collection near Rock Creek-McCourtney bridge	Moderate potential but not found.
Norris' beard-moss *Didymodon*	**--/-- CNPS 2.2**	**General habitat:** Cismontane woodland, lower montane conifer	Known in Nevada County from a single collection 3 mi west of Nevada City on Hwy 49	Moderate potential but not found.

norrisii		forest, 1,312-5,576 feet **Microhabitat:** Intermittently mesic rock outcrops, generally open sunny sites such as volcanic fields, also fields, cliffs and runoff areas	in an ephemeral drainage in open foothill woodland	
Pine Hill Flannelbush *Fremontodendron decumbens*	**E/R CNPS 1B.2**	**General habitat:** Woodland, rocky ridges; gabbro or serpentine endemic, local occurrences on Secca soil series, gabbro soils and on Dubakella series serpentines; 1,394-2,493 feet. Blooms April-July	Known from fewer than 10 occurrences in Pine Hill area of El Dorado County and two in Nevada County	No potential; no suitable habitat present
Butte County fritillary *Fritillaria eastwoodiae*	**-/- CNPS 3.2**	**General habitat:** Chaparral, cismontane woodland, lower coniferous forest, 161-3,300 feet **Microhabitat:** Dry slopes, occasionally moist, generally filtered light. Throughout its range, occurs on a wide variety of soil types and depths	Four documented occurrences in Washington Ridge and North Bloomfield areas. New, large population recently found on Cement Hill	Low potential; habitat too rocky and weedy, or too densely shaded, and no vegetative or fruiting plants in genus *Fritillaria* found.
Humboldt lily *Lilium humboldtii* ssp. *humboldtii*	**-/- CNPS 4.2**	**General habitat:** Chaparral, cismontane woodland, lower montane coniferous forest, 295-3,6008 feet **Microhabitat:** forest or woodland edges or openings	Documented occurrences at Higgins Corners, near South Yuba River Xing, North San Juan (True 1973), American Ranch Hill, Condon Park, Banner Mtn, North Columbia (GANDA), Peardale (CNPS local chapter files, unpublished)	Moderate to high potential, but not found.
Scadden Flat checkerbloom *Sidalcea stipularis*	--/E/ CNPS 1B.1	**General habitat:** Marshes and swamps, wet montane marshes , 2,296-2,394 feet	Global distribution restricted to three occurrences in Grass Valley area; apparently endemic. Documented	Low potential; not found.

		Microhabitat: Fed by springs	occurrences near Scadden Flat, at headwaters of Squirrel Creek, and Peardale area	

* Status definitions:

Federal

E = listed as Endangered under the federal Endangered Species Act.
T = listed as Threatened under the federal Endangered Species Act.
C = Candidate for listing as either Threatened or Endangered under the Federal Endangered Species Act.
PE = proposed for federal listing as endangered under the federal Endangered Species Act.
PT = proposed for federal listing as threatened under the federal Endangered Species Act.
SC = species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.
-- = no listing.

State

E = listed as endangered under the California Endangered Species Act.
T = listed as threatened under the California Endangered Species Act.
Rare = although not presently threatened with extinction, it occurs in such small numbers throughout its range that it may become endangered if its present environment worsens.
SSC = species of special concern in California.
-- = no listing

California Native Plant Society

California Rare Plant Rank 1A = plants presumed extinct in California.
California Rare Plant Rank 1B = plants rare, threatened, or endangered in California and elsewhere; the majority are endemic to California.
California Rare Plant Rank 2 = plants rare, threatened, or endangered in California, but more common elsewhere.
California Rare Plant Rank 3 = plants about which we need more information – A review list.
California Rare Plant Rank 4 = plants of limited distribution – A watch list.

Table 1b. Special-Status animals potentially occurring in the vicinity of the Providence Mine site, Nevada City, CA			
Species	**Legal Status State/Fed**	**Habitat Requirements**	**Potential for Occurrence**
Birds			
Cooper's Hawk *Accipiter cooperi*	SSC/-	Nests primarily in riparian forests dominated by deciduous species, and in densely canopied forests of oak woodland to ponderosa pine forests	Low; limited suitable habitat present in the project area
Sharp-shinned Hawk *Accipiter striatus*	SSC/-	Densely canopied ponderosa pine or mixed conifer forest and riparian habitats	Low; potential winter visitor; unlikely to nest in project area
White-tailed kite *Elanus leucurus*	SSC	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	Low; limited suitable habitat present in the project area
California Black Rail *Laterallus jamaicensis coturniculus*	T/C1	In Sierra foothills, occurs in open habitats in freshwater marsh dominated by cattails with scattered willows	None; no suitable wetlands in the project area; no nearby records
Willow flycatcher *Empidonax traillii*	E/--	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	Low; very limited suitable riparian habitat present in the project area
California Yellow Warbler *Dendroica petecia brewsteri*	SSC/--	Nests in riparian areas dominated by willows, cottonwoods, or in mature chaparral; may also use oaks, conifers, and urban areas near streamcourses	Low; limited suitable riparian habitat in the project area
Yellow-breasted Chat *Icteria virens*	SSC/--	Nests in low, dense riparian vegetation consisting of willow, blackberry, and wild grape. Forages and nests within 10 feet of ground	Moderate; some suitable riparian habitat
Tricolored Blackbird *Agelaius tricolor*	SSC/--	Nests in dense colonies in emergent marsh vegetation; or upland project areas with blackberries, nettles, thistles, or grainfields	Low; some suitable upland habitat; no wetlands in the project area; no nearby records
Reptiles/Amphibians			
California Horned Lizard *Phrynosoma coronatum*	SSC/--	Lowlands along sandy washes with scattered low bushes; needs	None; no suitable serpentine habitat

frontale		open areas for sunning, loose soil for burial and abundant supply of ants and other insects; in Nevada County, typically associated with serpentine soils/McNab cypress	present in the project area
Northwestern Pond Turtle *Clemmys marmorata marmorata*	SSC/--	Aquatic habitats such as ponds, marshes, or streams, with rocky or muddy bottoms	Low; limited suitable wetland habitat present in the project area
California Red-legged Frog *Rana aurora draytonii*	SSC/T	Still, slow-moving waters with dense, shrubby emergent and subemergent vegetation and riparian species; elevational range up to 4500 feet	None; no suitable wetland habitat present in the project area
Foothill Yellow-legged Frog *Rana boylii*	SSC/FS	Creeks or rivers in woodland or forests with rock and gravel substrate and low overhanging vegetation up to 6000 feet	Low; limited suitable habitat present on Deer Creek in the project area
Mammals			
Pale Townsend's Big-Eared Bat *Plecotus townsendii pallescens*	SSC/--	Mesic habitats; gleans insects from brush or trees and feeds along habitat edges; dependent on caves or mines for roosts; and sometimes found in bridges	Low; potential habitat in the project area; however, no historical or current records in region
Greater Western Mastiff Bat *Eumops perotis californicus*	SSC/--	Roosts and breeds in deep, narrow rock crevices; may also use crevices in trees, buildings, and tunnels; rarely or never uses mines, not known to use bridges	None; project area does not provide suitable habitat
Spotted Bat *Euderma maculatum*	SSC/--	Ponderosa pine forest, deserts and open forests set in rocky terrain; rarely or never uses mines to roost	None; Project area does not provide suitable habitat
Pacific Fisher *Martes pennanti*	SSC/C1	Mid-elevation (4,000 – 7,000 feet) forests; dens in late successional hardwood and coniferous forests with dense canopy cover; forages in varied forest types	None; Project area does not provide suitable habitat; geographic gap of 270 miles exists between northern Sierra Nevada/Cascades population and southern Sierra Nevada population (McCamman 2010)
Fish			
Delta Smelt *Hypomesus transpacificus*	T/T	Adults live in saltwater-freshwater interface, spawn in shallow, fresh or slightly brackish river channels and tidally influenced backwater sloughs	None; use only tidally influenced stream habitat; any potential for upstream migration to site prohibited by dam on Deer Creek, approximately 15

			miles downstream of project site
Central Valley Steelhead *Oncorhyncus mykiss*	T/T	Migrate from ocean to spawn in freshwater streams in California's Central Valley between December and April; optimal migrating stream temperature of 46 – 52 ^{o}F	None; Upstream migration to site prohibited by dam on Deer Creek, approximately 15 miles downstream of project site
Central Valley Spring-run Chinook Salmon *Oncorhyncus tshawytscha*	T/T	While immature, migrate from freshwater to ocean in spring; hold through summer in deep cold pools at high elevations, then spawn in early fall; juveniles migrate to sea in spring or the following autumn	None; Upstream migration to site prohibited by dam on Deer Creek, approximately 15 miles downstream of project site
Winter-run Chinook Salmon *Ocorhynchus tshawytscha*	E/E	Adults migrate from ocean to fresh water in winter; hold through summer in deep cold pools at high elevations, then spawn in late summer/early fall; juveniles migrate to sea in spring or the following autumn	None; Upstream migration to site prohibited by dam on Deer Creek, approximately 15 miles downstream of project site
Invertebrates			
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus*	--/T	Elderberry shrubs in riparian areas and in elderberry savanna	None; Project area does not provide suitable habitat – no elderberries present

Status Codes:

T = Threatened

E = Endangered

PE = Proposed Endangered

C1 = Candidate Category 1 for U.S. Fish and Wildlife Service Endangered or Threatened status

FS = Considered a sensitive species by the U.S. Forest Service, Region 5

SSC = Considered a species of special concern by the California Department of Fish and Game

Table 2. Environs Property Soil Sample Analytical Results

Environs Soil Sample Analyical Results

Environs Mine Waste Piles				
Sample number	As (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Cd (mg/kg)
CHHSL	0.07	80	18	1.7
TTLC	500	1000	20	100
WR1-S1	40	530	0.52	3.5
WR1-S2	11	400	0.43	3.0
WR1-S3	17	410	1.4	2.1
WR2-S1	<1.0	23	<0.1	6.6
WR2-S2	11	59	0.29	1.6
WR2-S3	23	170	0.45	1.8
WR2-S4	4.9	64	0.51	1.8
WR2-S5	20	330	0.57	2.8
WR2-S6	16	170	0.47	3.0
WR2-S7	24	330	0.27	3.3
WR2-S8	3.7	53	0.2	1.3
WR2-S9	<1.0	7.3	<0.1	<1.0
WR2-S10	<1.0	12	<0.1	<1.0
WR2-S11	<1.0	15	0.13	<1.0
WR2-S12	4.4	52	0.21	2.1
WR2-S13	<1.0	30	<0.1	<1.0
WR2-S14	<1.0	13	0.12	<1.0
WR2-S15	<1.0	7.5	<0.1	<1.0
WR2-S16	24	21	0.43	<1.0
WR2-S17	15	64	0.41	1.5
WR2-S18	24	16	0.61	<1.0

Providence Stamp Mill Area				
Sample number	As (mg/kg)	Pb (mg/kg)	Hg (mg/kg)	Cd (mg/kg)
CHHSL	0.07	80	18	1.7
TTLC	500	1000	20	100
QM-1	20	430	14	2.8
QM-2	13	98	1.5	<1.0
QM-3	13	190	3.8	1.4
QM-4	13	89	0.74	1.8
QM-5	15	89	0.86	2.7
QM-6	17	140	3.5	3.3
QM-7	11	74	1.4	2.1
WR-8	91	1800	44	5.8
WR-8B	57	1400	100	6.9
WR-9	56	1000	15	11
WR-9-.75'	53	1500	26	13
WR-9-1.5'	52	1400	26	10
WR-10	21	340	7.5	6.1
WR-11	38	750	11	8.1
WR-12	21	580	9.7	8.9
WR-21	250	20000	11	5.5
WR-21-1'	210	19000	19	6
WR-23	40	790	9.7	5.5
WR-24	43	930	19	8.4
WR-25	16	150	1.7	2.7
SR-13	40	1000	23	19
WR-13B	36	970	14	19
SR-14	19	150	2.2	<1.0
SR-15	18	800	6.1	11
SR-16	15	180	3.2	1.0
SR-17	11	93	1.1	<1.0
SR-22	68	740	4.5	11.0
RF-18	22	270	6.4	<1.0
RF-19	19	240	10	<1.0
RF-20	22	350	18	1.4

Surrounding Property				
Sample number	As (ppm)	Pb (ppm)	Hg (ppm)	Cd (ppm)
US-26	14	15	ND <0.10	1.1
US-27	12	12	ND <0.10	ND <1.0
US-28	12	15	ND <0.10	ND <1.0
US-29	7.8	14	ND <0.10	ND <1.0

Table 3. Assessment of Potentially Complete Exposure Pathways by Representative Foraging Guilds for Providence Mine						
Habitat Type[1]	**Representative Species (Receptor Guilds)**	**Chemicals of Potential Ecological Concern**	**Contaminated Media**	**Direct Exposure Pathways**	**Food Web Exposure**	**Complete Exposure Pathway**
PP, AG, OW, SCW, RW	Plants (primary producers)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Plant uptake of COPECs from soil	Plant uptake of COPECs from soil	Yes
PP, AG, OW, SCW, RW	Macroinvertebrates (herbivores, carnivores, omnivores)	Cd, Cr, Co, Pb, Ni, Hg	Soil, surface water	Incidental soil ingestion, dermal contact	Direct exposure via soil, and possibly surface water	Yes
PP, OW, AG, RO, SCW, RW	Red-tailed Hawk (carnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of soil or plant material by herbivores or omnivores by the hawk	Yes
PP, OW, RW	Northern Flicker (omnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plant material or macroinvertebrates (herbivores, carnivores, or omnivores) by the flicker	Yes
RW	Belted Kingfisher (picivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil, surface water	Incidental soil ingestion, dermal contact	Consumption of fish or amphibians that have had dermal contact with surface water	Yes
PP	Steller's Jay (omnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plant material or macroinvertebrates (herbivores, carnivores, or omnivores) by the jay	Yes
PP, OW, AG, RW, SCW	American Robin (omnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plant material or macroinvertebrates (herbivores, carnivores, or omnivores) by the robin	Yes

OW, SCW	California Towhee (omnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plant material or macroinvertebrates (herbivores, carnivores, or omnivores) by the towhee	Yes
RW	Pacific Treefrog (carnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil, ingestion of surface water	Incidental soil ingestion, dermal contact	Consumption of plant material or macroinvertebrates (herbivores, carnivores, or omnivores) by the frog	Yes
RO	Western Fence Lizard (carnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plant material or macroinvertebrates (herbivores, carnivores, or omnivores) by the lizard	Yes
AG, RW	Vagrant Shrew (Insectivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion	Consumption of insects by the shrew	Yes
AG	Botta's Pocket Gopher (herbivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plants by the gopher	Yes
OW, SCW	Dusky-footed Woodrat (herbivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plants by the woodrat	Yes
PP, AG, OW, SCW, RW	Mule Deer (herbivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plants by the deer	Yes
PP, AG, OW, SCW, RW	Black Bear (Omnivore)	Cd, Cr, Co, Pb, Ni, Hg	Soil	Incidental soil ingestion, dermal contact	Consumption of plant material, vertebrates, or macroinvertebrates (herbivores, carnivores, or omnivores) that are predated by the bear	Yes

1- Habitat types: Ponderosa Pine (PP), Oak Woodland (OW), Annual Grassland (AG), Rock Outcrop (RO), Serpentine Chaparral-Woodland (SCW), Riparian Woodland (RW).

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SOIL MANAGEMENT PLAN

for

REMEDIAL ACTION

at

Providence Quartz Mill Site

Nevada City, California

Prepared By:

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SOIL MANAGEMENT PLAN

INTRODUCTION

The Soil Management Plan is an element of the Removal Action Workplan (RAW) for remedial action at the Providence Quartz Mill Site (Site) located in Nevada City, California. The site is located on a portion a property owned by the City of Nevada City known as the Environs Property which has an assessor's parcel number (APN) 05-100-87. The RAW describes procedures for excavation and off- site disposal of soil and mine waste with elevated concentrations of metals exceeding hazardous waste levels and excavation and on-site placement of soil with elevated metals concentrations exceeding cleanup goals but below hazardous levels.

Approximately 32 cubic yards of soil from the central portion of the Site is to be excavated and off hauled to a Hazardous Waste Landfill (possibly Kettleman Hills Landfill). Approximately 350 cubic yards of soil and non-hazardous mine waste rock is to be excavated from areas surrounding the Hazardous Waste excavation area, consolidated and placed as fill in a deed-restricted placement location. The fill placement area and other areas with elevated metals concentrations exceeding remedial goals will be covered with clean soil and re-vegetated. This Soil Management Plan provides recommendations for soil management during the excavation, handling and off-site transportation process. Protocol for reducing dust emissions during excavation and/or handling is presented in the Dust Mitigation Plan included as Appendix F to the RAW.

PURPOSE

The mine waste to be excavated and disposed of off-site or placed as covered fill on-site contains concentrations of metals, notably lead and mercury which are elevated above hazardous waste levels and arsenic which is elevated above background concentrations. The source of the high concentrations of metals was processed mine waste originating from the adjacent Providence Mine Site and processed at the Quartz Mill at the Site. Although the lead and arsenic in mine waste rock is naturally occurring in mineralized, gold bearing veins, past mining activity resulted in deposition of the mineralized soil and rock at the ground surface. Mercury was used in the ore processing and a portion was lost to the environment. Exposure to the soil (ingestion, dermal contact or inhalation of soil dust) presents a cancer risk and chronic health hazard. Thus, the exposed soil which exceeds cleanup goals is to be disposed of off-site or buried on-site to limit exposure. Specific soil management procedures such as dust control are recommended to reduce the chance of human exposure to the metals concentrations.

HAZARDOUS SOIL EXCAVATION

An approximately 30 by 50 foot diameter area where near surface soil with hazardous levels of lead and mercury (more than 1000 mg/kg and 20 mg/kg respectively) has been identified, will be delineated in the field prior to excavation. Soil exceeding hazardous waste levels (approximately 75 cubic yards) will be excavated to a depth of up to 18 inches bgs and stockpiled on site. Verification soil sampling (described below) will be performed to confirm that the lateral extent of soil containing lead over 1000 mg/kg and mercury over 20 mg/kg have been removed. Additional excavation and sampling will be

performed as needed to meet remedial goals. The excavation will be backfilled with consolidated nonhazardous soil and covered with clean imported fill as soon as remedial goals are met.

Soil excavation methods will include mechanical excavation using rubber-tired or track-mounted backhoe excavators and loaders. Excavated soil will be temporarily stockpiled adjacent to the excavation and characterized for disposal. During excavation and loading onto loaders for on-site transport and onto trucks for off-site transport, soil in the affected areas will be moistened as necessary to reduce dust generation using water trucks or hoses. Before removing the mine waste and impacted soil, vegetation in the areas to be excavated will be cut off at the ground surface, segregated, and removed from the work area. Removal of vegetation is to be performed using hand-held mechanical equipment to minimize disturbance of soil before removal.

TRANSPORTATION TO OFF-SITE LANDFILL

Affected soil exceeding hazardous waste thresholds is to be transported off-site to appropriately permitted waste disposal facilities. Class I waste will be transported to and disposed at a yet to be determined landfill facility such as the Chem Waste Management facility in Kettleman Hills, California.

Transportation and disposal of waste from the site is to be conducted in accordance with applicable local, state and federal regulations. Safe work practices and traffic control measures are to be employed during the remediation. Truck drivers will have Class A licenses. The proposed staging area for truck loading is to be located along Providence Mine Road at the staging area along the northern edge of the site, immediately north of the excavation area. The staging area for waste to be transported off-site is accessible by a gated entrance to the southern portion of Providence Mine Road, which is a paved road extending from Zion Street to the project site.

Based on the volume of soil to be removed, approximately 4 truck loads will be removed from the site, in closed-top bins. SSI anticipates that off-haul of mine waste and impacted soil from the Site will take one working day. The soil will be loaded into trucks on-site. During loading, trucks shall be parked on Providence Mine Road adjacent to the on-site staging areas and shall not inhibit traffic on public roads. After loading and before leaving the site, the trucks and loading equipment will be decontaminated by removing visible soil, especially from the tires, using brooms, brushes and shovels according to the provisions of the DMP presented in Appendix F. Manifest records will be maintained for transportation and disposal of the waste.

The trucks used for off-haul will exit the site via Providence Mine Road (a gated public/private roadway with single lanes in each direction) which becomes publicly accessible approximately 1 mile south of the site. The trucks will turn right from Providence Mine Road onto Zion Street, then turn left at the next intersection onto Gold Flat Road then right onto State Highway 20/49 south towards Auburn. SSI does not anticipate adverse impacts to the level of service at the listed intersections due to site remediation activities.

NON HAZARDOUS SOIL EXCAVATION

Areas of soil and mine waste at the Site that exceeds the lead cleanup goal of 270 mg/kg based on Phase II soil sample results, will be delineated in the field prior to excavation. Soil surrounding one sample location (Sample 37) will also be excavated in the Roasting Furnace area. These areas will be excavated to a depth of 12 inches bgs and placed as fill in the hazardous waste excavation as described below. Based on results of verification soil sampling, additional excavation and sampling may be performed as needed to meet remedial goals. The excavations will be backfilled with clean imported fill after remedial goals are met. Alternatively, areas remaining with lead concentrations exceeding remedial goals may be covered with at least 8-inches of clean imported fill as described below.

Best management practices (BMPs) including coir fiber rolls or reinforced silt fencing will be in place below all excavation areas and maintained during excavation activities. Areas around the root mass of larger trees left in place will be protected. Mine waste and impacted soil will be excavated and temporarily stockpiled in the staging area on-site.

ON SITE WASTE PLACEMENT

An estimated 350 cubic yards (cy) of Non-hazardous soil and mine waste are to be placed as fill and compacted in the hazardous waste excavation and surrounding areas. Fill will be placed as described below in accordance with the recommendations in the geotechnical engineering recommendations for the Providence Mine Site (Holdrege and Kull, 2013). Figure 4 of the RAW depicts the location of the on-site placement areas.

A portion of the excavated mine waste may be placed as compacted fill in the sloped area along the north side of the excavation area. This fill shall have a maximum steepness of 1.5:1, H:V. Fill will be placed in relatively horizontal, 8-inch thick loose lifts and compacted to at least 90 percent of the maximum dry density per ASTM D1557. The existing slope face will be benched during fill placement to destroy the interface between the existing slope and fill to be placed.

Fill will be compacted in accordance with the recommendations in the geotechnical engineering recommendations. Based on volume estimates included in the RAW, it is anticipated that the hazardous waste excavation will be filled and the remaining soil will be gently sloped at a slope of 5:1, H:V, or flatter to match existing grade.

Placement and compaction of the mine waste and soil are to be performed in general accordance with the specifications presented below. The mine waste and impacted soil are to be covered with a minimum of 8 inches of fill soil similar to native site soil that will be imported from a clean fill source.

The placement areas will require a land use covenant (LUC) agreement and operation and maintenance plan (OMA). The LUC agreement is intended to protect public health and the environment by: 1) preventing inappropriate land use, 2) increasing the probability that the public will have information about residual contamination, 3) disclosing information for real estate transactions about residual contamination, and 4) ensuring that subsequent owners (although non area anticipated) assume responsibility for preventing exposure to contamination.

IMPORTED COVER SOIL PLACEMENT

Imported fill soil will be used to cover exposed areas of mine waste exceeding remedial goals in the excavation and backfill areas as defined during the VSP procedures. Imported cover soil will be selected from a local source and will be similar to the existing site topsoil. Imported fill will be tested in accordance with DTSC's October 2001, *Information Advisory, Clean Imported Fill Material.* Fill will be placed in maximum 8-inch loose lifts to achieve a soil cover with a minimum compacted thickness of 8 to 12-inches. Aggregate base will be placed as cover over any excavated areas in the on-site staging area. Aggregate base placed on the Site will be compacted to a minimum 90% relative compaction. Imported cover soil placed in re-vegetation areas will be lightly compacted to allow vegetation growth and stabilization.

RECOMMENDED SOIL MANAGEMENT PROCEDURES

The following soil management practices should be followed during excavation, on site transport, loading for off-site transport, fill and cover soil placement.

<u>Soil Handling Procedures</u>

Per the Dust Mitigation Plan, maintain moisture content in soil to prevent generation of visible dust during preparation, placement and compaction.

Avoid contact with soil.

After placement, mine waste is to be covered in a minimum of 8-inches of clean imported fill soil and revegetated with native plants.

Implement institutional controls so that no future excavation or disturbance will be permitted in the soil placement area

<u>Erosion Control</u>

Exposed fill surfaces and disturbed areas will be planted with California Native container plants and/or hand-seeded with an appropriate seed mixture compatible with the soil and climate conditions of the site as recommended by the project horticulturist.

Coir fabric, jute netting, tackifiers and/or binding agents shall be placed on the seeded slopes to retain the seed on the slope.

Fiber rolls shall be installed along the down gradient perimeter of all disturbed areas in accordance with the project plans. Additional fiber rolls shall be placed on slopes steeper than 5:1, H:V, with a maximum spacing of 5 vertical feet. Fiber rolls shall be installed along the same contour elevation.

Best Management Practices

Best management practices shall be implemented to reduce the chance of potential sediment discharges from excavated areas or stockpiled soil prior to backfill and cover soil placement. Best management practice types are described below.

Reinforced Silt Fencing: Reinforced silt fencing shall be installed below each area of excavation. Silt fencing shall be reinforced with metal T stakes placed 4 foot on center or closer. Silt fencing shall be inspected regularly during excavation activities and repaired or reinforced as needed to prevent down slope migration of sediment.

Fiber Rolls: Fiber rolls (wattles) shall be installed on fill slopes. Fiber rolls shall be anchored with wood stakes placed 4 feet on center or closer. Fiber rolls placed on slopes should be trenched 2 to 4 inches into the soil. Additional wattles may be stored on-site during the rainy season in the event that the installed wattles are filled with sediment. Prior to fiber roll installation, the subgrade shall be prepared by removing local surface irregularities and larger rock or debris that would inhibit contact of the fiber roll with the subgrade. A contoured key trench shall be excavated 2 to 4 inches deep along the proposed installation route. Soil excavated from the key trench shall be placed on the up slope side of the fiber roll to reduce the chance of surface water undercutting the roll. When more than one fiber roll is placed in a row, the rolls shall be abutted securely to one another to provide a tight joint, not overlapped. Split, torn, unraveling or slumping fiber rolls shall be repaired or replaced. Fiber rolls shall be observed for damage when rain is forecasted, following rain events, and periodically as needed during prolonged rainfall. Fiber rolls typically do not require removal and can be abandoned in place, once permanent erosion control is established.

HEALTH AND SAFETY

The mine waste at the site contains elevated concentrations of metals, particularly lead and arsenic. Exposure to metals in the soil may occur through exposure routes such as ingestion of soil or soil dust, inhalation of soil dust, and dermal contact with soil or soil dust. Application of water to the affected soil is essential to control fugitive dust emissions. Exposure may be reduced by the use of personal protective equipment such as boots, long-sleeved clothing, gloves and dust mask or respirator. Proper decontamination is important to remove contaminants prior to leaving the affected areas and to limit exposure. A health and safety plan prepared for SSI employees is included in Appendix H of the RAW.

DUST MITIGATION PLAN

for

REMEDIAL ACTION

at

Providence Quartz Mill Site

Nevada City, California

February 2017

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1 INTRODUCTION

This Dust Mitigation Plan (DMP) describes material handling protocols to reduce the release of metals into the atmosphere during remediation activities. The DMP is an element of the Removal Action Workplan (RAW) for soil remediation of mine waste at the Providence Quart Mill Site (site) located in Nevada City, California. The assessor's parcel number (APN) for the property is APN 05-100-87. The RAW describes procedures for excavation and offsite disposal of lead and mercury impacted soil exceeding Hazardous Waste levels. Approximately 75 cubic yards of lead and mercury impacted soil exceeding Hazardous Waste levels will be excavated, stockpiled, characterized and off-hauled from the site to a licensed landfill facility. Approximately 435 cubic yards of soil to be imported to the site and placed as cover material over exposed areas of the mine waste to be left in place in a deed-restricted location.

2 PURPOSE

The purpose of this DMP is to:

1. Outline engineering controls to be implemented during remediation activities, including fugitive dust prevention, track-out prevention, surface and stockpile protection, ingress/egress development, vehicle movement, and implementation of best management practices (BMPs).

2. Outline protocol for confirming that engineering controls, as designed, are implemented during mechanical soil disturbance, including site clearing, site grading, underground utility work, transportation, and disposal activities.

3. Outline post-remediation stabilization controls to be implemented after excavation and onsite placement of mine waste and affected soil, and burial of other site mine waste in a deed-restricted location.

3 NOTIFICATION OF COMMENCEMENT OF GRADING

The City of Nevada City Engineering and Public Works Department and California Environmental Protection Agency Department of Toxic Substances Control (DTSC) shall be notified at least ten days in advance of commencement of grading. Contact information is provided below:

Bryan McAlister
City Engineer
317 Broad Street
Nevada City, California 95959
(530) 265-2496 x126
bryan.mcalister@nevadacityca.gov

Mr. Dean Wright, P.G., Project Manager
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826
(916) 255-6528
Dwright@dtsc.ca.gov

4 ENGINEERING CONTROLS

Engineering controls and dust control measures apply to all mechanical soil disturbances in affected soil areas on the site. Construction activities are defined in this document as any mechanical soil disturbance in the affected soil areas. Mechanical soil disturbance may result from activities such as clearing, grading, excavation, stockpiling, loading, fill placement, compaction, and movement of equipment over unprotected surfaces.

4.1 SUMMARY OF GENERAL CONTROLS

The engineering controls described below shall be implemented during any mechanical soil disturbance associated with the proposed remediation activities. Alternate engineering controls proposed by the contractor that are not included in this DMP must be approved by the California Department of Toxic Substances Control (DTSC) prior to commencement of any soil disturbance.

4.1.1 Area of Disturbance

The areas of disturbance should be delineated by staking or marking prior to commencement of construction activity, including vertical extent of excavation and fill placement.

4.1.2 Track Out Prevention

No soil is allowed to leave the work areas through vehicle track-out or any other means. Track-out controls shall be implemented as follows:

▪ The ingress and egress route is to be developed prior to construction. If more than one ingress/egress route is used, track-out prevention protocol shall be maintained at each location.

▪ Vehicles and equipment shall be visually inspected for soil or mud accumulation, and shall be washed or brushed down as necessary at the ingress/egress location before leaving the property.

▪ A gravel pad or metal screen may be used to clean tires at the ingress/egress locations. The gravel pad should be composed of gravel at least 1-inch or larger, with a silt content of less than 5 percent. The gravel pad, if used, is to be maintained in good condition, and repaired as necessary to maintain the integrity of the pad.

▪ BMPs shall be implemented at the ingress/egress location. BMPs shall be adhered to during road wetting and rinsing of vehicles.

4.1.3 Soil Stockpiles

Soil stockpiles shall be protected by sufficient wetting with water spray, application of chemical dust suppressant, or by tarp or plastic covering.

▪ Active stockpiles are to be adequately wetted or covered with tarps.

▪ Inactive stockpiles (stockpiles that will remain inactive for more than seven days) shall be protected by:

(1) Keeping the surface adequately wetted;
(2) Applying chemical dust suppressants or stabilizers according to manufacturer's directions; or
(3) Covering with tarps.

4.1.4 Traffic Control

Proposed travel routes, parking areas, and staging areas must be established prior to commencement of grading.

▪ Maximum vehicle speed for any vehicle or equipment on the site and on Providence Mine Road to and from the site shall be 15 miles per hour. Slower vehicle speeds may be necessary to reduce soil disturbance or dust generation.

▪ Vehicular and equipment travel should be limited to designated areas.

▪ Only vehicles and equipment directly involved with site grading and utility work, including refueling and maintenance vehicles, should be allowed in the designated work area during excavation and grading activities. All other vehicles and equipment shall remain parked in a designated clean area on-site.

▪ Access routes within the site must be stabilized by watering or applying chemical dust suppressants, according to manufacturer's directions, as necessary to control fugitive dust emissions.

▪ The remediation contractor is responsible for traffic control on-site and on public roadways.

4.1.5 Earthmoving Activities

Dust mitigation measures shall be initiated prior to commencement of remediation activities, and should continue until confirmation that waste and affected soil has been removed from the site. Recommendations to be implemented during site excavation and grading are provided below.

▪ Prior to and during any ground disturbance, water shall be sprayed to sufficiently wet areas of disturbance and stockpiled soil. The contractor shall supply a water truck of adequate size and capacity for this purpose or secure sufficient water from an onsite source. Wetting should fully extend to the anticipated depths of the excavation. All soil/rock material shall be adequately wetted such that no visible dust emissions occur. Sufficient moisture may be determined by the field test described below.

▪ Grading operations shall be suspended when, despite application of dust mitigation measures, wind speeds are high enough to result in fugitive dust emissions.

▪ BMPs shall be implemented during construction activities. All water that could potentially contain affected soil shall be retained on-site. All sediment collected shall be retained on-site.

4.1.6 Field Determination of Moisture

Field testing for determination of sufficient moisture content will be conducted as follows:

1. A one-quart soil sample shall be taken from the top 3 inches of the disturbed area or stockpile;

2. The sample shall be poured from a height of 4 feet above a clean hard surface; and

3. The material will be considered adequately wetted if no observable dust is emitted when the material is dropped.

4.1.7 Off-Site Trucking

Hauled material must be placed in sealed containers or adequately wetted to prevent dust from blowing out of the trucks. Additionally, the loads must be contained within cargo compartments that are covered with tarps, or loaded so that the material does not touch the front, back, or sides of the cargo compartment at any point less than 6 inches from the top of the compartment.

4.1.8 Air Monitoring

At this time, air monitoring will not be required for the project unless visible dust emissions are observed. The lead agency or local enforcement agency may require air monitoring at any time during the project. If conditions arise such that air monitoring is required, air monitoring shall be conducted in accordance with this DMP. All results of air monitoring shall be reported to DTSC within 48 hours of their collection during the first two weeks of sampling, and within 72 hours of collection for subsequent weeks.

4.2 ENGINEERING CONTROLS BY TASK

The engineering controls noted below are provided to assist in task planning. Engineering controls shall be modified, if necessary, based on observation of fugitive dust emission or air sampling results.

4.2.1 Site Preparation

Prior to commencement of any mechanical disturbance at the site, the following engineering controls should be in place:

▪ Proposed areas of disturbance, including the vertical extent of excavation and fill placement, should be clearly delineated.

▪ Ingress/egress and wheel-wash areas should be constructed prior to commencement of grading. The ingress/egress and wheel-wash areas are to be maintained throughout all phases of the project.

▪ BMP features such as jute mats, fiber rolls, basins, or silt traps should be installed.

▪ Parking areas should be clearly defined outside the area of disturbance.

4.2.2 Clearing and Grubbing

The following engineering controls shall be implemented prior to and during clearing and grubbing:

▪ Prior to commencement of clearing and grubbing activities, vegetation and soil surfaces within the areas to be cleared should be sufficiently pre-wetted to prevent generation of fugitive dust from clearing activities. A sufficient amount of water should be used and allowed to soak into the subsurface. No soil disturbance, including removal of vegetation, may occur in any area that has not been sufficiently pre-wetted. Note that pre-wetting may need to occur over a period of days during dry weather, and that pre-wetting may also be necessary during or following periods of rainy weather.

▪ Water application should continue throughout clearing operations. Water spraying should be fanned over the site, and directed at specific activities, as appropriate. Proposed routes of site access should be sprayed with an amount of water sufficient to prevent generation of visible dust from equipment travel.

4.2.3 Grading

Prior to any soil disturbance, the area of proposed disturbance must be sufficiently and repeatedly wetted, so that no fugitive dust is generated by the activities.

▪ No soil disturbance may occur in any area that has not been sufficiently pre-wetted. Areas to be excavated should be sufficiently wetted to the depths of the excavation, so that no dust is generated by the excavation.

▪ Any soil disturbance that results in generation of dust must cease immediately until the area has been sufficiently wetted to a depth necessary to prevent generation of fugitive dust.

▪ Disturbed areas are to be maintained in accordance with this DMP.

4.2.4 Fill Placement

The following engineering controls shall be implemented prior to and during fill placement:

▪ Fill material and areas where fill is to be placed should be adequately wetted so that no fugitive dust is generated during fill placement.

▪ The soil shall be sufficiently wetted prior to placement and throughout the work day, as necessary. At the end of each work day, the material should be wetted to enable crusting of the surface, or covered with plastic sheeting.

5 ADMINISTRATIVE CONTROLS

5.1 OCCUPATIONAL SAFETY & HEALTH ACT

The contractor and crew shall maintain current OSHA certification. Personal air monitoring equipment may be required by the lead agency.

5.2 DMP COMPLIANCE MONITORING

DMP compliance monitoring is to be conducted during any mechanical soil disturbance activity. The contractor shall provide adequate advance notice and information to the lead agency, local enforcement agency, and SSI about site activities so that they may perform the following tasks:

▪ Confirm implementation of engineering controls such as ingress/egress areas, wheel wash areas, and parking areas outside the area of construction.

▪ Confirm that sufficient water is available and applied so that no visual evidence of fugitive dust is observed beyond the site boundaries.

▪ Confirm on-site travel and wheel-wash protocols are regularly implemented.

▪ Coordinate air sampling with the air monitoring contractor, if air monitoring and/or sampling is required.

▪ Confirm that the proper transportation protocol is observed by the contractor.

▪ Confirm that affected soil is contained on-site and stockpiled according to the DMP specifications.

▪ Confirm construction activities are in compliance with the guidelines of the DMP.

5.3 AIR MONITORING PROTOCOL

At this time, air monitoring is not required at the site. However, air monitoring may be required by DTSC at any time. If required, air monitoring and sampling is to be performed in accordance with the protocol described below.

▪ Ambient air sampling should be conducted to establish base line values for ambient airborne PM10 concentrations upwind and downwind of the project site.

▪ Air sampling and monitoring should be conducted according to a schedule determined by DTSC.

▪ Air sampling results shall be submitted to DTSC within 48 hours of their collection during the first two weeks of sampling, and within 72 hours of collection for subsequent weeks. Engineering controls shall be modified, if necessary, based on the air sampling results.

▪ Air sampling should continue until monitoring results indicate that the environmental controls are sufficient to ensure that OSHA Permissible Exposure Levels are not exceeded, or until the termination of site activities.

VERIFICATION SAMPLING AND ANALYSIS PLAN for REMEDIAL ACTION at Providence Quartz Mill Site Nevada City, California

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1 INTRODUCTION

This Verification Sampling and Analysis Plan (VSAP) is an element of the draft Removal Action Work Plan (RAW) for cleanup of lead and mercury impacted soil at the Providence Quartz Mill Site (the Site) located in Nevada City, California. The assessor's parcel numbers (APN) for the site is 05-100-87. The RAW describes procedures for excavation of lead and mercury impacted soil at the Site with lead and mercury concentrations exceeding Hazardous Waste levels, and lead, mercury and arsenic impacted soil in other areas of the Site exceeding a lead cleanup goal of 270 mg/kg.

Approximately 50 cubic yards of soil are to be removed from the site and disposed at a Class I solid waste facility. The objective of verification sampling is to confirm the removal of soil that contains lead and mercury at concentrations which exceed the remediation goals.

2 PERFORMANCE STANDARDS AND GUIDELINES

Sampling and analysis will be performed in accordance with applicable guidance and requirements set forth pursuant to the Comprehensive Environmental Response Compensation Liability Act (CERCLA) as amended by the Superfund Amendment and Reauthorization Act (SARA); the National Contingency Plan (NCP); and local, state, and federal practices in effect at the time of performance of the work.

3 DESIGN AND PLACEMENT OF SAMPLING GRID

Systematic verification will be performed within the soil removal areas to distribute sample locations uniformly over the perimeters of the areas of excavated soil. Systematic sampling will be implemented by establishing a sample frequency of a minimum of one sample per 15 feet of excavation perimeter or a minimum of three samples per excavation for smaller excavation areas.

The former location of the Quartz Mill and sulphuret room, containing elevated soil lead and mercury concentrations, comprises approximately 400 square feet. Within this area, soil has been identified that contains lead at concentrations exceeding 1,000 milligrams per kilogram (mg/kg) and mercury at concentrations exceeding 20 mg/kg. Soil containing lead concentrations exceeding 1,000 mg/kg and mercury concentrations exceeding 20 mg/kg is to be removed from the Site and disposed at a Class I landfill (Kettleman Hills Landfill in Kettleman City, California, or Clean Harbors Grassy Mountain Landfill in Grantsville, Utah).

Other areas of the surrounding Quartz Mill where soil samples have exceeded 270 mg/kg lead will be excavated in a minimum six foot radius surrounding the sample location and all areas between samples exceeding 270 mg/kg lead.

Verification sampling and analysis is to be performed to verify the lateral extent of the excavations for offhaul (soil lead concentrations greater than 1,000 mg/kg; mercury concentrations greater than 20 mg/kg) and the extent of the excavation for on-site soil management (soil lead concentrations greater than 270 mg/kg).

Verification samples will be obtained from the perimeters of the excavations at a frequency of one sample per 15 linear feet of excavation perimeter. Verification samples will also be obtained at the base of the excavations at a rate of one sample per 200 square feet of footprint area or a total of two samples per discrete excavation whichever is greater. Based on a review of previous sample locations exceeding remedial goals, samples and the sampling frequency described above, an estimated 48 samples will be obtained from approximately 600 feet of excavation perimeter and 24 samples will be obtained from approximately 4,000 square feet of excavation base.

In total, an estimated 48 verification soil samples will be obtained from the perimeter of the excavation areas and 24 samples will be obtained from the base of the excavations for a total of approximately 72 verification samples. An additional 8 samples (10 percent of the total number of samples) will be obtained as field duplicates.

The samples from the Site will be analyzed for total lead and mercury. COPC evaluation and remediation goals are summarized in Section 2 of the RAW.

The lateral and as warranted vertical extent of the proposed excavations shall be increased locally to facilitate removal of soil that contains metals concentrations which exceed the target cleanup levels. If the initial results of verification soil sampling indicate that further excavation is warranted, additional verification soil sampling will be required to confirm the effectiveness of the additional excavation. If the excavation is enlarged, additional samples will be obtained as needed to achieve the minimum sample frequency.

As discussed in the RAW, excavation will be extended laterally to the extent necessary to achieve remedial goals. The vertical extent of excavation may also be extended to a depth greater than one foot bgs in order to achieve remedial goals. However, budgetary limits of the Grant may not allow significantly large additional volumes of excavated and disposed of soil. DTSC will be consulted if any soil which exceeds the remedial goals is to be left in place at a depth greater than one foot bgs, or if additional excavation and verification sampling will be required.

4 SAMPLING PROCEDURES

Following soil removal activities, equidistant perimeter sample locations will be identified using a graduated tape measure and a fixed site feature (generally the northernmost point of the excavation) as the control point for reference. Perimeter locations will be

identified by wood stakes or wire flags placed around the perimeter of the excavation. Each sample point will be identified with a sequential alphanumeric numbering system referring to the excavation number and a sequential number referring to the perimeter sample beginning at the northern reference point and continuing in a clockwise manner around the excavation perimeter. (A-1, A-2, A-3, etc.), (B-1, B-2, B-3 etc.).

One verification soil sample will be collected from each perimeter location. Samples will be collected from a depth of 0-6-inches below ground surface. Sample locations and the number of samples may be adjusted in the field if necessary.

The following is a summary of equipment that may be used during verification soil sampling activities:

- Hand trowel
- Pick
- Wash buckets with tap water
- Rinse buckets with tap water
- Distilled or deionized water
- Disposable scoops
- Measuring tape
- Re-sealable plastic bags or 4-ounce laboratory-supplied glass sample jars
- Paper towels
- Personal protective equipment
- Pre-moistened towelettes
- Insulated transport/storage container and appropriate packing supplies
- Buckets, brushes and laboratory-grade soap for equipment decontamination
- Sample labels
- Chain-of-custody forms
- Sample collection log, sub-area field map
- Water-resistant ink pen
- Daily field report forms

Verification sampling will be conducted according to the procedures described below. A pre-cleaned trowel or single-use disposable plastic scoop will be used to collect approximately four ounces of soil from each sampling point. The soil will be placed directly into a new re-sealable plastic bag or a clean 4-ounce glass container provided by the laboratory. Sample containers will be sealed, labeled and placed in a container for shipment to the laboratory.

5 DECONTAMINATION AND SAMPLE HANDLING PROCEDURES

The sample collection equipment, if not pre-cleaned, will be cleaned with a brush and laboratory grade soap and tap water solution and rinsed with distilled or deionized water between sample locations. Used sampling materials and personal protective equipment (i.e., spent decontamination towelettes, gloves, paper towels, etc.) will be properly disposed off-site.

As stated above, sample containers will be sealed, labeled and placed in a container for transport to the project analytical laboratory under chain-of-custody protocol. The samples will be identified using a numbering system which will consist of the cell identification and the date the sample was collected. Samples will be identified with a label affixed to the sample container, or by writing directly on the container. The following information will be specified on each container:

- Project name;
- Project number;
- Date and time of sample collection; and
- Sample identification number.

Samples will be transported to the laboratory by courier or the Project Manager and will be accompanied by signed chain-of-custody forms. The forms will accompany every sample shipment to the analytical laboratory to document sample possession from the time of collection. The form will contain the following information:

- Sample identification number;
- Signature of collector;
- Date and time of collection;
- Site name and project number;
- Sample matrix;
- Sample container description;
- Analyses requested;
- Special analytical procedures requested (if applicable);
- Remarks (expected interferences, hazards, unusual events at the time of sampling), if applicable;
- Preservatives added (if any);
- Special sample preparation (if applicable);
- Destination of samples (laboratory name);
- Signature of persons involved in chain of possession (relinquished by and received by); and
- Date and time of sample receipt at laboratory.

The chain-of-custody form will be placed in a water-tight plastic bag which will be taped to or placed in the cooler for transport.

When transferring samples, the individuals relinquishing and receiving the samples will sign, date, and record the time on the chain-of-custody form. A separate chain-of-custody form will accompany each sample shipment. The method of shipment and courier name(s) will be entered on the chain-of-custody form.

Daily field activities will be recorded in a dedicated field notebook that indicate the date and time of field observations made by field personnel. All field forms will be signed by field personnel.

Information pertinent to soil sampling will be recorded in water-resistant ink in a dedicated field notebook. Entries in the field book will include the following information:

- Location of sampling site (cell coordinates);
- Names and affiliations of all sampling team members;
- Surface lithology;
- Date and time of sample collection;
- Description of deviations from sampling plan (if any);
- Sample destination (e.g., name of laboratory); and
- Signature of personnel responsible for sampling (daily).

Original data recorded in field logbooks, chain-of-custody forms, and on other forms will be written in water-resistant ink. Original record documents (field logs and chain-of-custody forms) will not be destroyed or discarded, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on a document assigned to one individual, that individual will make corrections by drawing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information should not be obliterated. If possible, any subsequent error(s) discovered on a document will be corrected by the person who made the entry.

6 LABORATORY PROCEDURES

Samples will be analyzed by a laboratory that is certified by the California Department of Health Services for performing the analyses requested. The verification soil samples will be analyzed for total lead and mercury, using U.S. EPA Test Method 6010B and 7471A. The laboratory reporting limits for lead and arsenic are to be less than half of value of the corresponding cleanup goal.

Sample handling procedures used by the laboratory may vary from the procedures specified herein as long as they fulfill the objective of maintaining sample integrity and traceability.

7 CHAIN OF CUSTODY PROCEDURES

The sample custodian at the laboratory will accept custody of delivered samples and verifies the following information:

1. All samples are present;

2. All samples are in good condition;

3. All samples are accompanied by a properly completed chain-of-custody form;

4. The sample identification is complete and corresponds to the chain-of-custody form; and

5. The condition of custody seals and temperature of the ice chest interior.

If sample integrity is questionable, the sample custodian will notify the laboratory's project administrator, who in turn will notify the Sierra Streams Institute Project Manager. Arrangements can then be made for replacement samples to be obtained and transported to the laboratory. The sample custodian will document the sample condition on the sample custody log and sign the chain-of-custody form.

a. Logging of Laboratory Samples

After chain-of-custody procedures are complete and acceptable, the sample custodian will assign laboratory identification numbers to the samples. Laboratory sample identification numbers may be written on the chain-of-custody form for tracing purposes. The custodian will transfer the samples to the proper analyst(s) or store the samples in an appropriate secure area.

Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted. Data sheets and laboratory records are retained as part of the permanent documentation for at least three years.

b. Sample Preparation and Analysis

Samples collected from each grid will be thoroughly homogenized to ensure sample uniformity. Homogenization will be performed by thoroughly mixing the sample prior to obtaining a portion for digestion. Homogenization will be verified by the laboratory by

analysis of duplicate samples. Duplicate samples will be obtained at a frequency of 10% of the total number of samples.

c. Sample Storage

Samples and extracts are retained by the analytical laboratory for up to 30 days after the data are reported by the laboratory. Unless notified by the program managers, excess or unused samples will be disposed by the laboratory in a manner consistent with appropriate government regulations.

d. Alternate Field Analysis by XRF

On-site field analyses for metals in soil may be conducted using portable X-ray fluorescence (XRF) equipment in accordance with USEPA Method 6200 in lieu of laboratory analysis. Initial and continuing calibration should be conducted in accordance with the manufacturer's instructions.

XRF operators should possess a Radioactive Materials License issued by the California Department of Health Services, and should be trained to operate the specific equipment used.

Provided that samples are well-homogenized, sieving and grinding for sample preparation are optional. Moisture content above 20% may interfere with analysis, and samples should be sufficiently dried to obtain an acceptable correlation coefficient as described below.

For data validation, laboratory analysis will be performed on a minimum of 30 percent (not less than 7) of the samples field-analyzed by XRF. Confirmatory soil samples should be split from the well-homogenized sample material. Confirmatory soil samples should be selected from the lower, middle and upper ranges measured using XRF. Results of least-squares regression of field and laboratory data must demonstrate a correlation coefficient (r^2) value of at least 0.8 for the XRF data to be considered valid.

8 REMEDIAL MEASURES CRITERIA

The goal of the remediation is to reduce the potential human health risk associated with metals in mine waste and affected soil. Target cleanup concentrations for COPCs are summarized below and in Section 2 of the RAW.

Proposed Cleanup Goals for Child Routine Visitation Land Use

- Lead: 270 mg/kg, a risk based cleanup goal. The 95% Upper Confidence Limit (UCL) on the arithmetic mean of lead soil values in the cleanup area must meet this cleanup goal.

Proposed Cleanup Goals for On-Site Placement and Deed Restriction

- Lead: 1,000 mg/kg, the Total Threshold Concentration Limit (TTLC).
- Mercury: 20 mg/kg, the Total Threshold Concentration Limit (TTLC).

9 QUALITY ASSURANCE

a. Data Quality Objectives

SSI adopted data quality objectives (DQOs) to address the level of uncertainty in data that will be used to address the study question and support the decision. The DQOs are to be used as measurement performance criteria for new data and as acceptance criteria for the inclusion of existing data. Laboratory quality control procedures address data quality indicators (DQIs) such as precision, bias and accuracy. DQIs such as representativeness and comparability are addressed in the Quality Control section below. Completeness will be assessed based on comparison of the number of valid measurements completed with the minimum frequencies set forth in the VSAP. Sensitivity is governed by the laboratory practical quantitation limits (PQLs), as discussed below.

PQLs, or laboratory reporting limits (RLs), for lead in soil are to be no higher than 2 mg/kg, and to be no higher than 0.10 mg/kg for mercury. The DQOs are based on laboratory PQLs, which are lower than the corresponding remediation goals. SSI anticipate that the PQLs will be appropriate for the purposes of the VSAP.

b. Special Training/Certifications

Personnel working on the project site shall be certified under OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910). Analytical laboratories will be certified by the State of California.

c. Documentation and Records

The project manager will distribute the VSAP to the project staff. Project staff is to review the pertinent sections of the RAW and VSAP prior to performing the relevant tasks.

Global Positioning System (GPS) data, chain-of-custody documentation, field maps and photographs will be maintained at SSI's Nevada City office for a period of five years following the investigation.

Sample location maps, sample collection methodology and quality control procedures, laboratory reports and chain of custody documentation will be included in the closure report. Approved documents, including the PEA Report, RAW, and closure report, are to be retained at DTSC's Sacramento office.

d. Quality Control

The following quality control procedures will be employed:

- Duplicate soil samples will be obtained at a frequency of 10% of the total number of samples to assess comparability, precision and representativeness.
- The laboratory will perform laboratory quality control procedures such as method blanks and matrix spike samples to assess accuracy and bias.
- Laboratory analysis of samples analyzed in the field by XRF will be performed at a frequency of 30% of field-analyzed samples to validate the XRF results.

e. Data Validation

Data will be validated based on an estimate of the potential cumulative error from field, laboratory, and data manipulation. Data will be evaluated with regard to the DQIs (precision, bias, accuracy, representativeness, comparability, completeness, and sensitivity). Based on the evaluation results, data will be accepted, accepted with qualification, or rejected.

Data review will be performed to assess the accuracy of data recording, processing and transmittal. Field and laboratory quality control data will be reviewed for completeness. Sample preservation and holding times will be verified.

SITE SAFETY PLAN

for

REMEDIAL ACTION

at

Providence Quartz Mill Site

Nevada City, California

February 2017

Sierra Streams Institute
www.friendsofdeercreek.org

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1 INTRODUCTION

Sierra Streams Institute (SSI) prepared this Site Safety Plan (SSP) for services to be performed by SSI in the vicinity of mine waste and other impacted soil associated with historical mining activities at the Providence Quartz Mill Site (Site) located in Nevada City, California. The SSP was prepared in accordance with guidelines set forth in the California Hazardous Waste Operations Standard, Section 5192 of Title 8 of the Code of California Regulations (8 CCR 5192); the Hazardous Communications Standard, 8 CCR 5194; OSHA's Safety and Health Standard of Title 29 of the Code of Federal Regulations (29 CFR 1910.120, 29 CFR 1926).

The purpose of this SSP is to establish safe procedures and practices for SSI employees engaged in field activities associated with excavation, grading and restoration activities at the site. This SSP is for employees of SSI. However, it will be read and signed by site visitors and subcontractors prior to work associated with site remediation and sampling.

The health and safety guidelines and requirements presented herein are based on a review of available information and an evaluation of potential hazards. The plan describes the health and safety procedures and equipment required for excavation and soil sampling in order to minimize the potential for exposures to field personnel. Should circumstances during the course of field work be extraordinarily different than anticipated, field work shall be temporarily stopped, so that potential hazards can be evaluated and appropriate health and safety precautions implemented.

It is not possible in advance to discover, evaluate and protect against all possible hazards which may be encountered. Adherence to the requirements of this SSP will significantly reduce, but not eliminate, the potential for occupational injury and illness at the project site.

The provisions of this SSP will be implemented by SSI personnel. All contractors, subcontractors and other visitors are responsible for their own health and safety. However, all SSI subcontractors are to comply with the requirements of this SSP at a minimum. Subcontractors are to develop their own SSP which addresses all anticipated hazards associated with their scope of work.

Section 2 of this SSP describes the site location and field activities. Section 3 presents the key personnel for this task. Section 4 provides a description of the known site hazards and procedures for protecting workers. Section 5 specifies routine and special training for this task. Section 6 discusses the levels of personal protection. Section 7 discusses medical surveillance requirements. Section 8 discusses the delineation of work areas and site access control. Section 9 contains the decontamination procedures. Section 10 presents references.

2 BACKGROUND AND SETTING

Relic features associated with historical mining activity were identified as part of a Sierra Nevada Conservancy grant-funded Assessment and Phase 2 Investigation of the site. Identified abandoned mine features are associated primarily with hard rock gold mining. Remedial activities have been proposed for mine waste and other impacted soil at the site.

2.1 FIELD ACTIVITIES

The proposed work includes observation of excavation of lead and mercury impacted soil, verification and landfill characterization soil sampling, on-site placement and site restoration activities. Excavation, grading, and placement activities will include the use heavy equipment as described in the Removal Action Workplan (RAW).

3 KEY PERSONNEL AND RESPONSIBILITY

3.1 CHAIN OF COMMAND

Kyle Leach is the Project Manager. Justin Wood will act as site safety officer (SSO). Other SSI staff may also perform observation and site restoration activities. The Project Manager and SSO have the authority to monitor and correct health and safety problems as noticed on site. The project field staff have completed 40 hours of comprehensive health and safety training which meets the requirements of 8 CCR 5192 and 29 CFR 1910.120. The Project Manager and/or SSO will make this SSP available to each member of the SSI field team, subcontractors and site visitors.

The project staff is responsible for ensuring that all data acquisition is performed in accordance with the project workplan and SSP, and that deviations from the plans are based upon field conditions encountered and are well documented in the field notes. The field team's health and safety responsibilities include:

1. Following the SSP;
2. Reporting any unsafe conditions or practices to the Project Manager or SSO;
3. Reporting all facts pertaining to incidents which result in injury or exposure to toxic materials to the Project Manager or SSO;
4. Reporting equipment malfunctions or deficiencies to the Project Manager or SSO.

The Project Manager and SSO have on-site responsibility for ensuring that all field team members, including SSI personnel, comply with the SSP. It is the their responsibility to inform the subcontractors and other field personnel when chemical and physical hazards arise. Additional Project Manager and SSO responsibilities include:

1. Providing site safety briefing for team members;
2. Updating equipment or procedures to be used on site based on new information gathered during the site investigation;
3. Inspecting all personal protective equipment (PPE) to be used by SSI or subcontractors to SSI;
4. Documenting compliance with the SSP by completing employee and subcontractor SSP acknowledgment forms (Appendix A);
5. Evaluating the effectiveness of field decontamination procedures for personnel, personal protective equipment, sampling equipment and containers, and heavy equipment and vehicles;
6. Discussing with SSI personnel the location and route to the nearest medical facility and arranging for emergency transportation to the nearest medical facility;

7. Discussing with SSI personnel the telephone numbers of local public emergency services (e.g., police and fire);
8. Reporting injuries and/or illnesses using the accident report form (Appendix B); and
9. Stopping operations that threaten the health and safety of the field team and/or surrounding populace.

3.2 SUBCONTRACTOR PERSONNEL RESPONSIBILITIES

All subcontractors are responsible for their own SSP. A written SSP must be available for DTSC or City of Nevada City to review if requested.

3.3 VISITORS

Visitors to the work areas are responsible for their own health and safety, but will be provided with a copy of this SSP to read and sign. Following is a list of project contacts.

Kyle Leach, P.G. (SSI) Project Manager	Office: 530-265-6090 Mobile: 530-575-5605
Justin Wood (SSI) Project Scientist/SSO	Office: 530-265-6090
Grant Eisen Nevada County Department of Environmental Health Local Enforcement Agency (LEA) representative	Office: 530-265-1469
Dean Wright, P.E. California Department of Toxic Substances Control Lead Agency representative	Office: 916-255-6528

4 HAZARD EVALUATION

The potential hazards to personnel working at this site have been identified as chemical and physical. Each potential hazard relative to the potential for exposure is described below.

4.1 CHEMICAL HAZARDS

The soil to be excavated contains elevated concentrations of metals. Exposure to metals in the mine waste and affected soil may occur through the following exposure routes:

- Ingestion of soil or soil dust;
- Inhalation of soil dust and;
- Dermal contact with soil.

Application of water to the affected soil is essential to control fugitive dust emissions. Exposure may be reduced by the use of PPE such as boots, long-sleeved clothing, gloves and dust mask or respirator. Proper decontamination is important to remove contaminants

prior to leaving the affected areas and to limit exposure. Table 4-1 presents general information for potential chemical hazards that could possibly be encountered during excavation and sampling. The information includes exposure limit recommendations, routes of exposure, and typical signs and systems of exposure. Contaminants other than those listed in Table 4-1 may be encountered.

4.2 PHYSICAL HAZARDS

Physical hazards associated with this project include working near heavy equipment (e.g., excavator and loader), heavy lifting, physical strain, pinching/cutting/crushing associated with use of mechanical sampling devices and hand tools, slip/trip/fall due to uneven ground surface or mine excavation, potential soil instability near excavations, weather conditions, venomous insects, poison oak and noise.

4.2.1 General

Uneven ground surface and/or debris may increase risk of injuries. Personnel shall wear appropriate footwear while on site. Personnel shall wear hard hats, brightly colored (orange/yellow) vests or equivalent, and shall be aware of equipment activities at all times. Personnel shall keep within view of operators and out of the vicinity of heavy equipment unless required for a specific task. On-site personnel need to be aware of the position and movement of heavy equipment at all times. Adequate clearance from the equipment will be maintained at all times. Eye contact will be maintained by personnel with the equipment operator prior to passing in front of the equipment.

Based on the site characterization results, the limited number of days anticipated for site excavation (approximately 25 working days), and required application of water for dust suppression during soil excavation, airborne levels of metals are expected to be low. During excavation no respiratory protection is required and operations will be performed wearing normal work uniforms with disposable gloves and coveralls (modified Level D personal protection), and dust masks. During the remedial activities, soil moisture content will be maintained to reduce the potential for dust generation.

If, during the excavation or screening process, the Project Manager, site safety officer or any site worker observes fugitive dust emissions from the excavation or stockpiled material, water will be applied to the soil. If sufficient soil moisture cannot be maintained, the Project Manager or site safety officer will stop work and evaluate the appropriateness of additional personal protection measures (Level C), or resumption of work under more favorable conditions.

4.2.2 Noise

Noise levels around heavy equipment can exceed a comfortable range; ear plugs are recommended. Use of hearing protective devices (HPDs) is required whenever the noise level equals or exceeds 85 dBA. In the absence of noise monitoring equipment, an elevated noise level will be defined as a situation where a person cannot be heard above equipment

noise while speaking in a normal voice from a distance of two feet. If this condition occurs, the SSO will require that personnel affected by the noise hazard use HPDs.

4.2.3 Equipment Safety

Standard operating safety procedures will be followed by SSI and its subcontractors working around mechanical equipment. Equipment shall be in good operating condition and used in accordance with manufacturer's specifications. Rags, towels or other absorbent materials will be available to clean up any incidental spills that may occur. No hazardous materials in excess of reportable quantities will be brought on-site by SSI personnel.

4.2.4 Sunburn

Working outdoors on sunny days for extended periods of time can cause sunburn to the skin. Excessive exposure to sunlight is associated with the development of skin cancer. Field personnel should take precautions to minimize the risk of sunburn by using sun-screen lotion of at least 15 SPF and/ or wearing hats and long-sleeved garments.

4.2.5 Venomous Insects, Arachnids and Snakes

The project site provides potential habitat for rattlesnakes, and venomous insects and arachnids. Field personnel will wear boots and long pants to reduce potential bite exposure areas. Care should be taken in approaching and accessing areas where snakes and insects may be hidden. Personnel should periodically check clothing, hair and skin during the workday for the presence of ticks.

4.2.6 Poison Oak

The project site provides potential habitat for poison oak, which commonly causes itching skin lesions when contacted. All field personnel should be able to identify poison oak and avoid contact with it during site work. In addition, personnel will wear long pants to minimize incidental contact with poison oak plants. If contact is unavoidable, additional protective clothing such as disposable coveralls should be worn to reduce potential transfer of plant oils to clothing and skin.

5 TRAINING REQUIREMENTS

All SSI personnel working on-site have completed training in hazard recognition and basic health and safety issues as required by OSHA regulations contained in 8 CCR 5192 and 29 CFR 1910.120 (e). In addition, each SSI employee working on site and each subcontractor will be familiar with the requirements of this task-specific SSP, and will participate in site activity and safety briefings. The Project Manager or SSO will document site safety activities and implementation of this plan. Prior to new field activities, SSI and subcontractor personnel will conduct a tailgate safety briefing in the field.

6 PERSONAL PROTECTIVE EQUIPMENT

Based on the chemical information and hazard analysis, Level D protection will be initially required for excavation activities and sampling activities. If excessive dust is generated during excavation, dust masks will be required.

Level D protection consists of steel-toed boots, long pants, hard hat, hearing protection, safety glasses or goggles, and gloves if in contact with mine waste and/or contaminated soil.

7 MEDICAL SURVEILLANCE REQUIREMENTS

Medical surveillance of SSI employees is to be conducted which meets the requirements of 8 CCR 5192 and 29 CFR 1910.120 (f). There are no identified additional medical surveillance requirements associated with this project.

8 SITE CONTROL MEASURES

The potential chemical and physical hazards have been identified in this SSP; however, should site specific or unexpected conditions arise, the Project Manager or SSO will stop all work at the site. Work will not be completed until the SSP has been revised or re-evaluated accordingly.

Break or eating areas shall be located away from the work zone and upwind. In the instance where work is continued to the next day, the work site shall be secured prior to leaving the site. Communication between field team members will consist of verbal communication and hand signals if necessary.

8.1 DAILY START-UP AND SHUTDOWN PROCEDURES

The following protocol will be followed prior to daily start-up and shutdown during field activities:

1. The Project Manager or SSO will review site conditions with respect to modification of work and the task specific SSP;
2. Field personnel will be briefed and updated on safety procedures;
3. The Project Manager or SSO will ensure that first aid equipment is readily available;
4. At the shutdown of daily operations, and in between individual field events, all reusable equipment will be decontaminated and secured.

8.2 WORK ZONES FOR EXCAVATION ACTIVITIES

Designated work zones will be established as appropriate for exclusionary work areas, contamination reduction, and support. The primary means of maintaining site control and reducing the potential for migration of hazardous materials into uncontaminated areas

during sampling activities will be by the use of disposable sampling equipment and decontamination of reusable equipment between each sampling event.

8.3 TRAFFIC CONTROL

Approximately 75 cubic Yards (cy) of lead and mercury impacted soil is proposed to be removed from the site. We anticipate that approximately 435 cubic yards of fill soil will be imported to the site. We anticipate that importing soil will take up to 3 working days and that between approximately 5 to 10 truckloads per day will be required. The trucks will enter the site from State Highway 49/20 eastbound, Gold Flat exit, turn left on Gold Flat Road, turn right on Zion Street, turn left on Providence Mine Road, turn left through gate (gate code to be provided to authorized personnel) continuing on Providence Mine Road to end at the site. Trucks exiting the site will reverse the above order and ultimately turn right onto Highway 49/20.

Safe work practices and traffic control measures are to be employed during the project. The contractor will use radio or cell phone communication to direct traffic. Due to the limited truck volume we do not anticipate use of a flagman will be required. During truck hauling of equipment and soil, contractors are to use reasonable precautions to avoid damaging the road. Precautions such as operating trucks at a speed of 15 miles per hour or less while traveling on Providence Mine Road, Zion Street and Gold Flat Road, staying on the pavement and avoiding tire contact on the pavement edge, and avoiding hard braking are to be used.

8.4 WORK PRACTICES

Safe work practices for this project are listed below:

1. Set-up, assemble, and check all equipment for integrity and proper function before starting work activities.
2. Do not use faulty or suspect equipment.
3. Use only new and intact protective clothing. Change gloves, etc., if they tear.
4. Do not use hands to wipe sweat away from face. Use a clean towel or paper towels.
5. Practice contamination avoidance at all times.
6. Do not smoke, eat, or drink within the excavation and sampling areas.
7. Wash hands, face and arms at all breaks and prior to leaving the site at the end of the work day.
8. Perform decontamination procedures completely as required.
9. Notify the Project Manager immediately if there is an accident that causes an injury or illness.

8.5 EMERGENCY MEDICAL TREATMENT

In the event that non-emergency medical treatment is necessary, the nearest medical facility is Sierra Nevada Memorial Hospital at 155 Glasson Way in Grass Valley, California. The hospital phone number is 530-274-6000.

Directions to the hospital are as follows:
From the site go left on Providence Mine Road
Continue through automatic gate right on Providence Mine Road.
Turn right on Zion Street
Turn left on Gold Flat Road
Turn right at freeway on ramp onto State Highway 49S/20W
Exit Dorsey Drive exit off highway right
Turn right on Dorsey Drive
Turn left on Catherine Lane.
Turn left on Glasson Way. The hospital is on the right.

In the event of a medical emergency, local rescue agencies should be contacted by calling 911.

9 DECONTAMINATION

Decontamination procedures associated with excavation activities will take place prior to leaving all work areas and/or prior to reusing equipment at a new sampling location, as set forth in the scope of work.

10 REFERENCES

10.1 FEDERAL HEALTH AND SAFETY REQUIREMENTS

EPA Order 1440.1- Respiratory Protection

EPA Order 1440.3- Health and Safety

NIOSH Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. June 1994.

OSHA Safety and Health Standards 29 CFR 1910 (General Industry), U.S. Department of Labor, Occupational Safety and Health Administration.

OSHA 29 CFR 1910.120 Hazardous waste Operations and Emergency Response, Final Rule, U.S. Department of Labor, Occupational Safety and Health Administration.

OSHA Safety and Health Standards 29 CFR 1926 (Construction Industry), U.S. Department of Labor, Occupational Safety and Health Administration.

Standard Operating Safety Guidelines, USEPA, Environmental Response Branch, Hazardous Response Support Division, Office of Emergency Response.

10.2 STATE HEALTH AND SAFETY REQUIREMENTS

California Code of Regulations, Title 8, Chapter 4, Subchapter 4, Construction Safety Orders.
California Code of Regulations, Title 8, Chapter 4, Subchapter 5, Electrical Safety Orders.

California Code of Regulations, Title 8, Chapter 4, Subchapter 7, commencing with Section 3200, CAL/ OSHA General Industry Safety Orders.

California Code of Regulations, Title 22, Division 4, Chapter 30, commencing with Section 66000, California Department of Health Services, Toxic Substances Control Program.

Table 4-1 – Potential Chemical Hazards
Providence Mine Property RAW

Chemical Name	NIOSH Recommended Exposure Limit (REL)	OSHA Permissible Exposure Limit (PEL)	IDLH Level	Routes of Exposure	Symptoms of Exposure	Ionization Potential/ Flammable Limits
Arsenic (organic)	none	0.5 mg/m^3 TWA	Not determined	Inhalation, ingestion, contact	In animals: irritation skin, possible dermatitis; respiratory distress; diarrhea; kidney damage; muscle tremor, convulsions; possible gastrointestinal tract, reproductive effects; possible liver damage	n/a
Lead	0.050 mg/m^3 TWA	0.050 mg/m^3 TWA	100 mg/m^3 (as Pb)	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	n/a
Mercury (colloidal or metallic)	0.05 mg/m^3 TWA	0.1 mg/m^3 TWA	10 mg/m^3	Inhalation, skin and eye contact, absorption, ingestion	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	n/a
Title 22 Metals	Varies depending on specific metal—see NIOSH guide for specific REL	Varies depending on specific metal—see NIOSH guide for specific PEL	Varies depending on specific metal	Inhalation, skin absorption and contact, ingestion	Varies depending on specific metal	n/a

APPENDIX

Health and Safety Plan Acknowledgment Form

Accident Report Form

Hospital Route Map

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT FORM

The undersigned acknowledges that he/she has received a copy of the Task Specific Health and Safety Plan for the Providence Quartz Mill Site RAW and that he/she has read and understands the contents of the plan.

Name Company

Signature Date

Name Company

Signature Date

Name Company

Signature Date

Name Company

Signature Date

Name Company

Signature Date

Name Company

Signature Date

Name Company

Signature Date

Name Company

Signature Date

ACCIDENT REPORT FORM

This form should be completed in the event of an accident on-site which involves SSI, subcontractor, LEA or client personnel resulting in illness or injury.

Date_____

Project Name _____

Project Location_____

Accident Location_____

Personnel Involved _____

_____

Description of Incident _____

_____

_____

_____

_____

Action Taken _____

_____

_____

_____

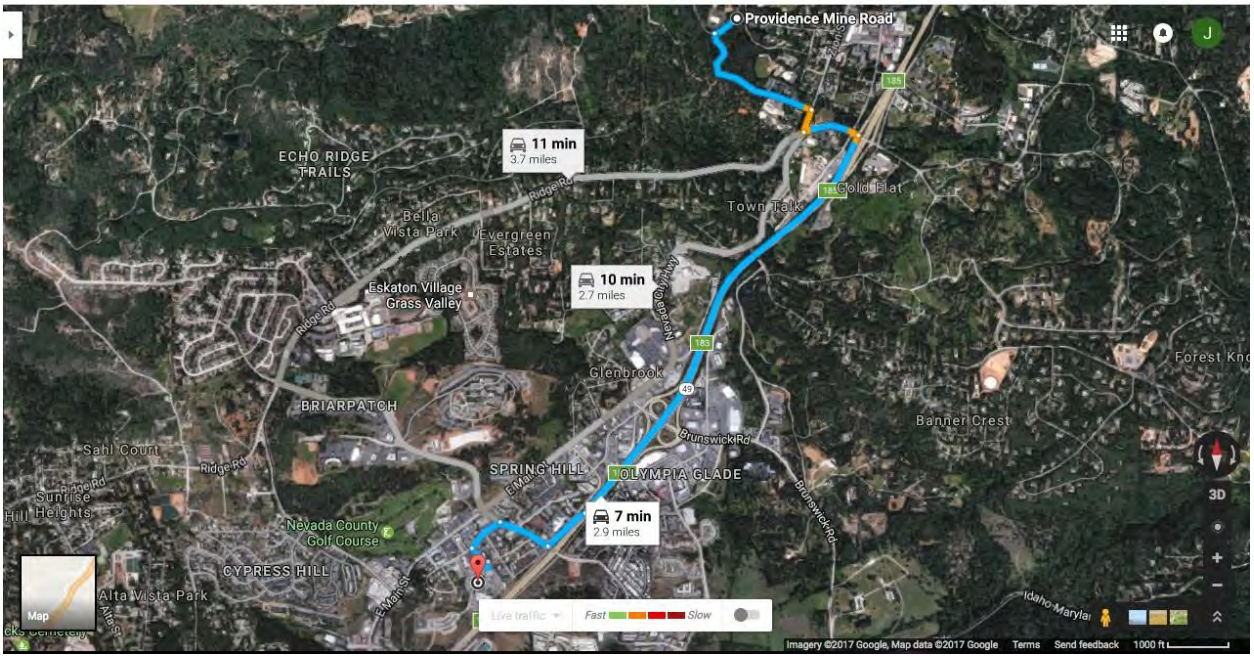
Results _____

_____

SSO notified? Yes_____ No_____

If not, why? _____

Sierra Streams Institute
Brownfields Clean Up - Providence Quartz Mill
Hospital Route Map



Community Profile
ENVIRONS PROPERTY AND PROVIDENCE QUARTZ MILL SITE
Nevada City, California

Site Location and Size

The site is located in the northwestern portion of the approximately 37.99-acre property known as the Environs Property which comprises Nevada County assessor's parcel number (APN) 05-100-87. The site is located on Providence Mine Road in an undeveloped forested area approximately one mile downstream of downtown Nevada City.

The subject site is located in the southwest quarter of the southwest quarter of Section 12, Township 16 North, Range 8 East based on the Nevada City Quadrangle map (United States Geological Survey, provisional edition 1995). Site elevations range from approximate 2260 feet to approximately 2360 feet MSL.

Figures 1, 2 and 3 of the Removal Action Work Plan (RAW) report show the site and surrounding area. Figure 1 shows the approximate site location and property boundaries. Figure 2 and 3 are site maps showing key site features.

Description of the Property

The Quartz Mill site on the Environs property is located in a forested area of steep topography adjacent to the south side of Deer Creek approximately one mile downstream of downtown Nevada City. Surface topography at the site generally slopes toward the north towards Deer Creek.

The nearest perennial surface water to the site is Deer Creek located along the northern edge of the property. Deer Creek generally flows toward the west to its confluence with the Yuba River approximately 18 miles downstream of the site. Surface topography at the site generally slopes toward the north to Deer Creek, which is located along the northern property boundary. The site elevation ranges from approximately 2260 feet to approximately 2360 feet above mean sea level. The site is generally vegetated by fir, oak, cedar and pine trees and various underbrush including honeysuckle, Himalayan blackberry and poison oak. Rock outcrop was observed on the site.

The property is currently undeveloped, except for the abandoned mining features and the unpaved trail extending through the Environs Property from west to east. Current use of the

property includes routine recreational trail use from the nearby Tribute Trail. The surrounding land use includes undeveloped rural residential property to the north, west, southwest and southeast, the Nevada City Waste Water Treatment Plant to the east and a light industrial campus to the south. The site is zoned OS: Open Space by the Nevada City Planning Department.

Description of Surrounding Land Uses

The subject property is bordered by Deer Creek and undeveloped rural properties to the north, by undeveloped property to the west and by the undeveloped City owned Environs Property to the east and south. The Environs Property is bordered by light industrial property to the south.

Visibility of the Site to Neighbors

The mine features on the site are generally not visible from neighboring properties.

PROJECT DESCRIPTION

Proposed Site improvements

As of the date of this community profile, no proposed project plans have been prepared for the site. The Removal Action Workplan details proposed remedial actions at the site.

Potential Environmental Concerns

The site is situated at the historic location of the Providence Mine, a large hard rock gold mine, which operated between 1860 and 1920. A total of approximately $20 Million in gold was produced from the mine. A 40-stamp quartz mill, sulphuret room, and a roasting furnace were formerly located west of Providence Mine Road, in an area which was re-graded during construction of Providence Mine Road in the 1960s. The structures are no longer present at the Site. Mine waste including waste rock dumps are depicted on the historic maps and identified in the documents that were reviewed. Hardrock gold mining waste including impacted soil and waste rock associated with the historic Providence Quartz Mill has been identified in areas surrounding and down slope of the former Quartz Mill site.

To date, approximately 50 samples of mine waste rock, and soil from quartz mill site and surrounding property have been collected for chemical analysis. Total lead, mercury, and arsenic concentrations were detected in samples at concentrations exceeding typical local

background values and in a limited area exceeding Hazardous Waste levels for lead and mercury. Arsenic, mercury, and lead were detected at concentrations exceeding the California Human Health Screening Level (CHHSL) for residential soil.

Elevated soil metals concentrations present a potential human health risk resulting from exposure pathways including incidental soil ingestion, dust inhalation, and dermal contact. Metals of potential concern include arsenic, lead and mercury.

Status of Environmental Investigation

The community profile was prepared for California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) review as part of a Removal Action Workplan (RAW) pursuant to a signed Voluntary Cleanup Agreement between the site owner and DTSC. Site investigations to date have included sampling of mine waste and native soil.

Location of Nearby CalEPA and U.S. EPA Projects

SSI recently completed a Brownfields Cleanup project on the Stiles Mill site in 2013, located approximately one mile east of the subject site, and at the Providence Mine Site located east and across Providence Mine Road from the subject site. SSI is not aware of any other current EPA projects being performed or recently completed on nearby properties.

LOCAL AWARENESS AND INTEREST

Community Demographics

The site is located within the Nevada City limits in Nevada County, California. To our knowledge, there are no specific language considerations for the subject site vicinity. The population is primarily white middle/working class. Demographic information listed on the U.S. Census Bureau website for the 2010 census is attached to this community profile.

Community Contact

Community members or groups that have expressed interest in the subject property include The Sierra Fund, South Yuba River Citizens League, and the Nevada City Rancheria Nisenan Tribe. To SSI's knowledge, no other citizens or groups have shown formal interest in the project.

Community Interaction

Sierra Stream Institute co-led a field trip to the Environs Property during The Sierra Fund two Mining Conferences in May 2012. SSI has also discussed the Providence Mine site in periodic Nevada City Council Meetings and City of Nevada City staff. In addition, SSI staff has led field trips to the site during the past two years as part of a California Naturalist course offered by SSI in Nevada City.

To SSI's knowledge, no other public meetings have taken place regarding the subject property. A variety of public awareness groups in the Nevada City area maintain web sites to discuss local environmental issues, schedule public meetings, and discuss local developments. These groups include South Yuba River Citizens League (SYRCL), The Sierra Fund, Rural Quality Coalition, Champion Mine Property Owners Association. These organizations could be contacted by phone or e-mail in the event that community outreach activities become necessary as a part of the RAW process. Their contact information is included in the Key Contact List presented below.

Media Coverage

The following Media Coverage has been documented regarding the Environs Property and Providence Mine:

April 23, 2010 Grass Valley Union Newspaper Article: "Nevada City Lands $600K to Mop up Mine Mess" Link:
http://www.theunion.com/article/20100423/NEWS/100429879&parentprofile=search

KQED Radio Health Dialogues May 2010 Program included interviews and discussion of Nevada city Brownfields sites. Link: http://www.californiareport.org/archive/R201005202000:

EPA Press Release May 21, 2010 announcing Nevada City Brownfields Cleanup Award, Link:
http://yosemite.epa.gov/opa/admpress.nsf/2dd7f669225439b78525735900400c31/77e8a037cf870e3c8525770c005a9fb0!OpenDocument

EPA Press Release (undated 2008?) Link:
http://www.epa.gov/region9/waste/features/nevada-city/

July 25, 2013 Grass Valley Union Newspaper Article "2 toxic sites poised for cleanup" link:
http://www.theunion.com/news/7441473-113/mine-leach-site-clean

June 14, 2016 Union Newspaper Article: "Nevada City, Sierra Streams Institute continue cleanup of abandoned mine sites". A link to the article is provided below:

http://www.theunion.com/news/local-news/nevada-city-sierra-streams-institute-continue-cleanup-of-abandoned-mine-sites/

Government Involvement

The City of Nevada City, US EPA and DTSC are the agencies involved with the project at this time. Nevada County agencies are likely to be involved with the project in the future, including Nevada County Department of Environmental Health (NCDEH). Government contacts are included in the Key Contact List below.

KEY CONTACT LIST

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South Yuba River Citizens League (SYRCL)
313 Railroad Avenue, Suite 101
Nevada City, CA 95959
(530) 265-5961

The Sierra Fund
103 Providence Mine Rd #101
Nevada City, CA 95959

(530) 265-8454

Champion Mine Property Owners Association
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Genesis Engineering
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Marysville, Ca 95901
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KEY ISSUES AND CONCERNS

Historical research and field investigation has identified the potential for impacts resulting from past mining activity at the site. Based on the results of SSI's sampling to date, the metals of concern identified in onsite soil occur at concentrations lower than California hazardous levels in all sampled areas of the site with the exception of an approximately 1,000 ft^2 area identified within the former Quartz Mill and sulphuret room location on the site. In this area hazardous levels of lead and mercury will be excavated and removed from the site. A possible exposure pathway to nearby residents would be dust raised during excavation and grading activities. SSI staff anticipates that dust generation will be minimal due to the ambient soil moisture content. Water will be used to wet soil and limit dust generation during excavation and grading activities if excessively dry soil conditions are encountered.

We are not aware of special interest groups expressing concern regarding environmental conditions. We anticipate that concern from local neighbors and interest groups regarding the proposed recreational site development may focus on:

- Traffic and congestion
- Wildlife preservation
- Proposed land use

We anticipate that community and interest groups can be informed of issues regarding the subject site via postal mail or e-mail.

RECOMMENDED PUBLIC PARTICIPATION

Appropriate community outreach activities will be performed for each phase of the project as determined by DTSC. Community outreach should be performed prior to site mitigation as part of RAW preparation.