Southwest Sites Consulting
Engineering and Environmental Services

PA/SI
RED CLOUD MINE

Prepared for
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ACRONYMS AND ABBREVIATIONS

AA - Atomic adsorption
ADEQ- Arizona Department of Environmental Quality
ALM- Adult Lead Methodology
BLM - Bureau of Land Management
CERCLA- Comprehensive Environmental Response, Compensation, and Liability Act
COC - Contaminants of Concern
EPA - Environmental Protection Agency
HASP- Health and Safety Plan
HAZWOPER - Hazardous Waste Operations and Emergency Response
ICPAES - Inductively Coupled Plasma Atomic Emission Spectroscopy
IDW- Investigative-Derived Waste
IEUBK - Integrated Exposure Uptake Biokinetic model
IRIS - Integrated Risk Information System
NCP- National Contingency Plan
PA- Preliminary Assessment
SAP- Sampling and Analysis Plan
SHEDS - Stochastic Human Exposure and Dose Simulation
SI- Site inspection
XRF - X-Ray Fluorescence

ACKNOWLEDGMENTS

The Bureau of Land Management assisted Southwest Sites Consulting with introductory information, XRF training, and project guidance supporting the Preliminary Assessment and Site Inspection of the land surrounding Red Cloud Mine. We would like to thank our advisors Eric Zielske (BLM) and Dr. Bridget Bero of Northern Arizona University, for their insight and expertise that greatly assisted the progression of this document. We would also like to show our gratitude to Professor Jeff Heiderscheidt who aided in sample digestion and preparation of samples, and Jeff Propster who completed Atomic Absorption analyses of soil samples for our results.

1.0 Project Description

The Bureau of Land Management (BLM) tasked Southwest Sites Consulting to conduct a Preliminary Assessment/ Site Inspection (PA/SI) of Black Rock Wash located just south of Red Cloud Mine in Arizona's La Paz County. The Red Cloud Mine has been in operation since 1878 and has been used to mine silver, lead, and wulfenite, a gem made of lead and molybdenum. During the many years of mining, ore tailings were consolidated in a tailings pond located south of the mine site [2]. The main contaminant of concern (COC) located in the tailings pond is lead, which will be expanded upon in this report, with regard to its level, extent of migration, and associated risk to human health, flora, and fauna.

1.1 Site Location

The Red Cloud Mine is located in La Paz County, which is north of Yuma County in Southern Arizona, as seen in Figure 1.1 below. Currently, the mine consists of 20.66 acres of land encompassing the mine itself, and several hundred tons of mine tailings. These tailings, and their respective contaminants and hazardous materials, have been washed down Black Rock Wash, which is on land managed by the BLM. The mine itself, however, is located on private land and is currently being mined by the current owner for the gem wulfenite.

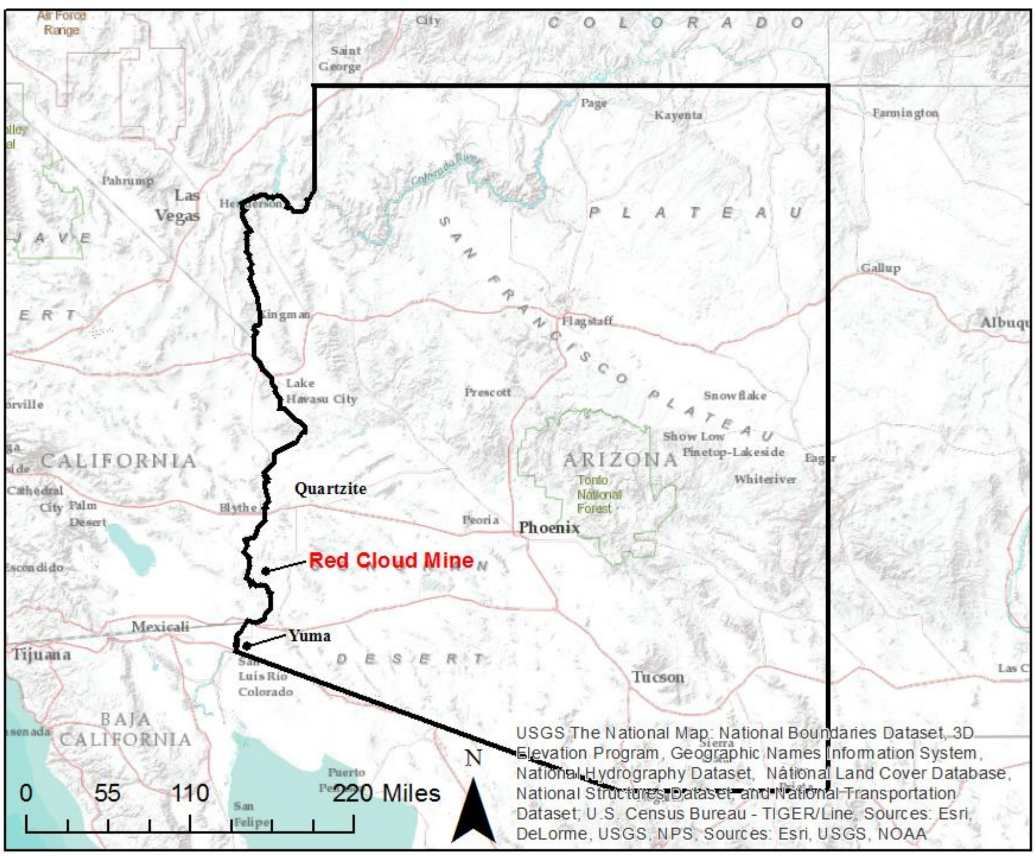

Figure 1.1: Location of Red Cloud Mine in La Paz County, AZ. (USGS)

The site is approximately 50 miles southwest of Quartzite and 23 miles north of Yuma. The site can be accessed by Red Cloud Road, a rough but maintained dirt road, off of Highway 95 in Yuma. The Colorado River is 5 miles west of the site and the Yuma Proving Ground military reserve is 2 miles east. Images showing the location of the mine in relation to nearby cities can be seen in Figure 1.2 and Figure 1.3 [1]

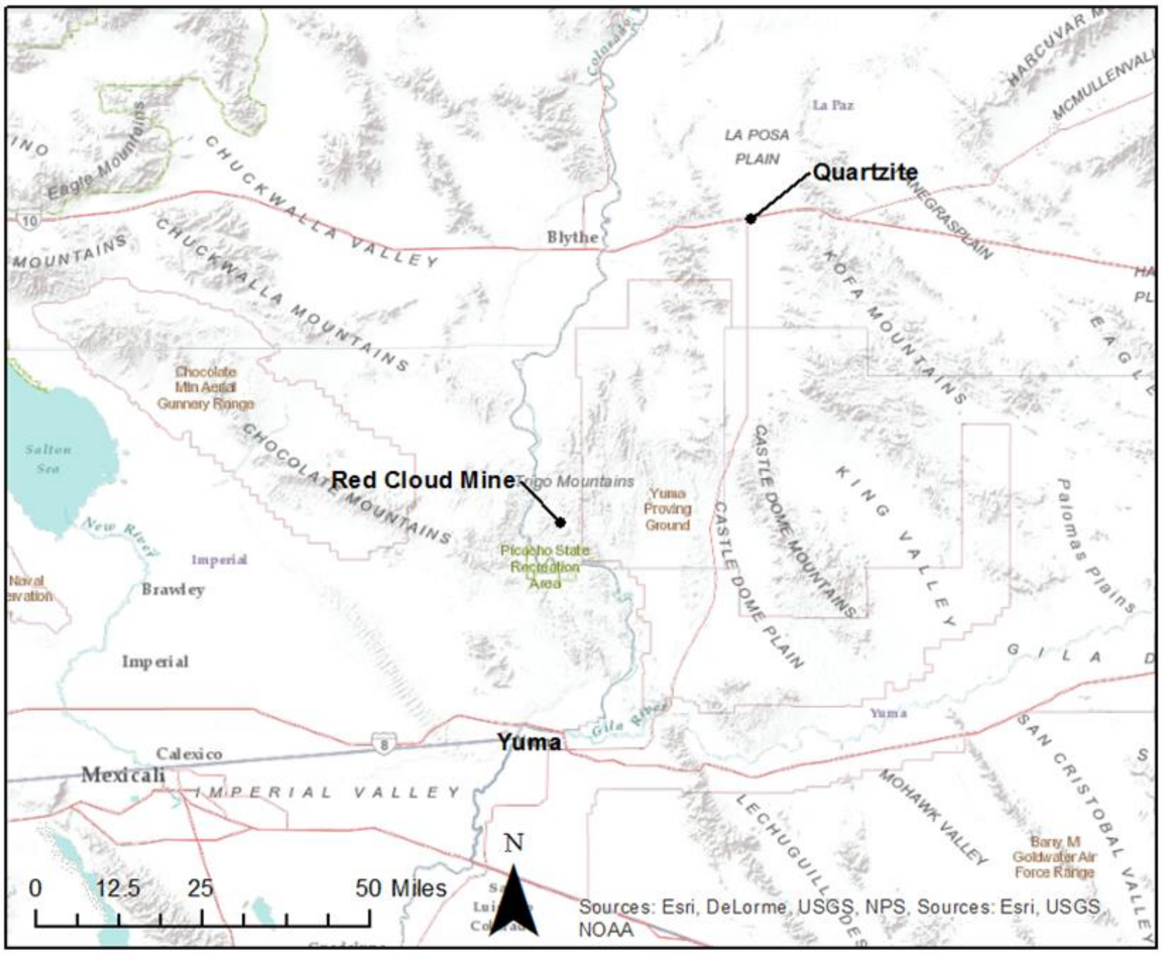

Figure 1.2: Red Cloud Mine is association to Quartzite and Yuma Arizona (USGS)

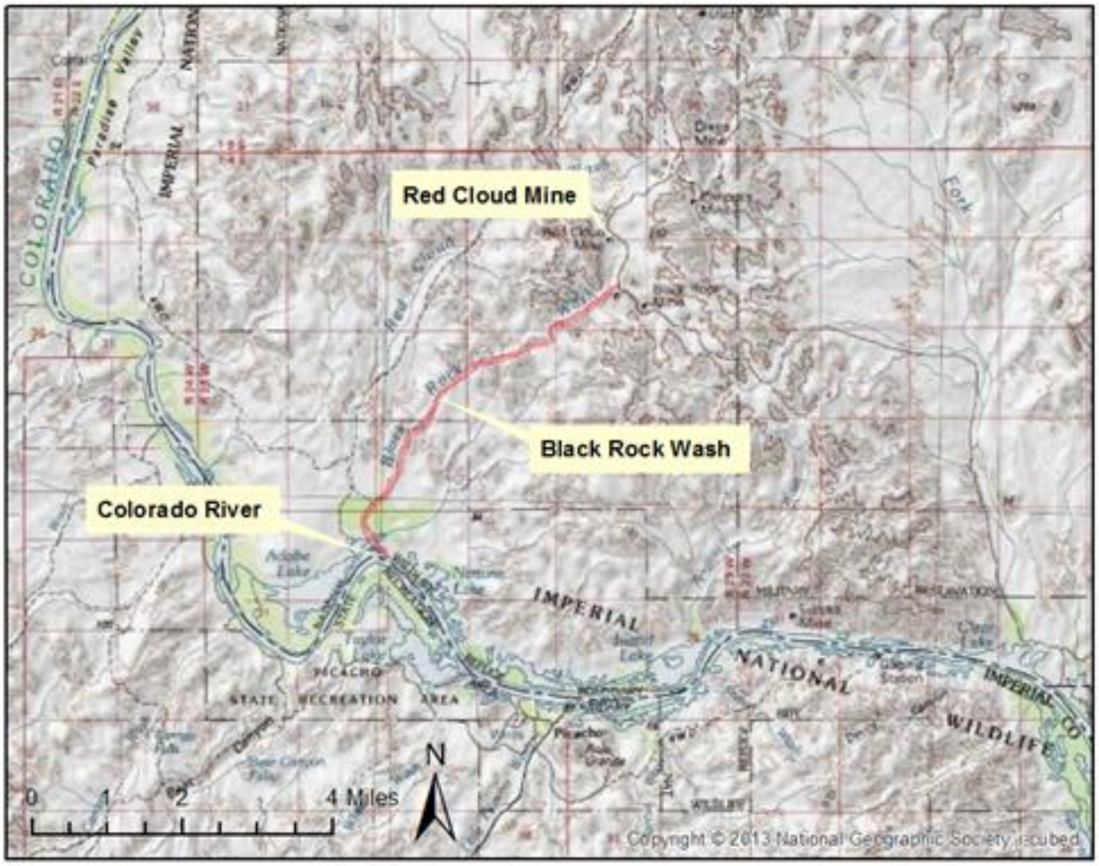

Figure 1.3: Map of Black Rock Wash feeding into the Colorado River and Red Cloud Mine (National Geographic)

1.2 Project Purpose

The public uses this BLM land, where Black Rock Wash is located, and tailings continue to disperse and migrate in the area. These tailings and possible contaminants pose a threat to the safety and health of humans, the environment, and other flora and fauna. Based on the sampling results obtained, Southwest Sites has evaluated potential contaminant exposure to recreational users (hikers, campers, off-highway vehicle users). The BLM will use this information and take any necessary steps towards containing further contamination.

2.0 Sampling

The Sampling and Analysis Plan (SAP), Health and Safety Plan (HASP) and Work Plan were completed in December 2015 (see Appendix A). The SAP details the sampling techniques used in the field and analysis techniques used in the lab to collect and analyze the soil samples. The HASP details the health and safety precautions taken in the field and in the lab. This document was written and followed in order to ensure all field and lab workers did not expose themselves to anything harmful and to implement response protocol if injury occurred. The Work Plan is a comprehensive document that outlines the SAP and the entire scope of the project. The site visit occurred January 28-29, 2016 (see Appendix A for field notes and photo gallery).

Sample collection procedures for the Red Cloud Mine Site Inspection followed the SAP entirely (see Appendix A for SAP). Figure 2.1 below shows dots that correspond to the locations where samples were collected during the site visit. Eighty grab samples were collected in Black Rock Wash on the nodes of the grid seen in Figure 2.2 below. Eleven grab samples were taken from hot spots in varying locations in Black Rock wash and in tributary washes near the tailings pile (see Figure 2.3). As per the Sampling Plan, hot spot collection locations were determined on site by Dr. Bridget Bero. These locations were chosen based on an assessment of the tailings pile and choosing locations in or around the wash where soil similar to the tailings was present or had potential to be present. In addition, three background grab samples were collected, the locations of which can be seen in Figure 2.1. Two grab samples were collected down the wash approximately a quarter mile from the bottom of the grid, which can also be seen in Figure 2.1 on the next page. Every sample was collected using a clean trowel and a fresh pair of gloves in order to prevent cross contamination.

Decontamination procedures of equipment and personnel followed the Sampling Plan and the Health and Safety Plan (see appendix A) and all students involved maintained proper PPE throughout the entire site visit and sample collection.

Special precaution was taken to ensure that samples were collected only on BLM land and that the team did not collect samples on private land. Upon the site visit it became apparent that the pile that was originally thought to be the tailings pile was actual a pile of overburden. The actual tailings pile is northeast of the overburden and its extent was difficult to determine. It appeared that, if a tailings pile existed in the area, they have largely been dispersed due to rain and wind events. It is estimated from the previous site investigation that approximately 1.3 acres at 680 feet deep of tailings were present at the site in 2009. No obvious evidence of these tailings were seen during the visit. As can be seen in Figure 2.1 on the next page, and more close up in Figure 2.4. This did not change the grid sample collection at all because the grid was placed in a way that the actual tailings pile was directly north of the grid.

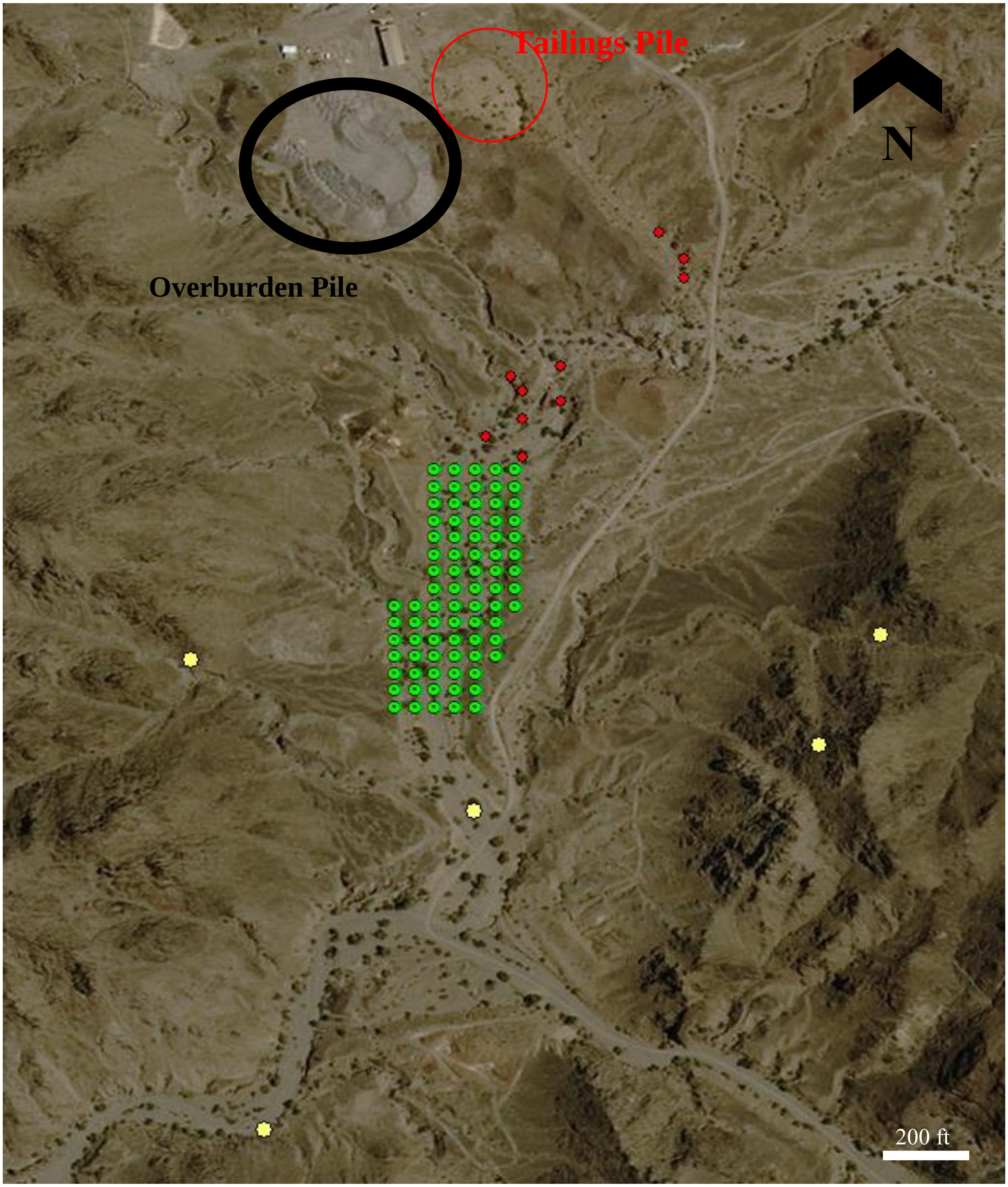

Figure 2.1: GIS map displaying sample collection locations, data labels and location of overburden and actual tailings pile. RED=hotspots GREEN=grid YELLOW=background and downwash.

Figure 2.2: GIS representation of the grid where Black Rock Wash samples were collected including sample numbers.

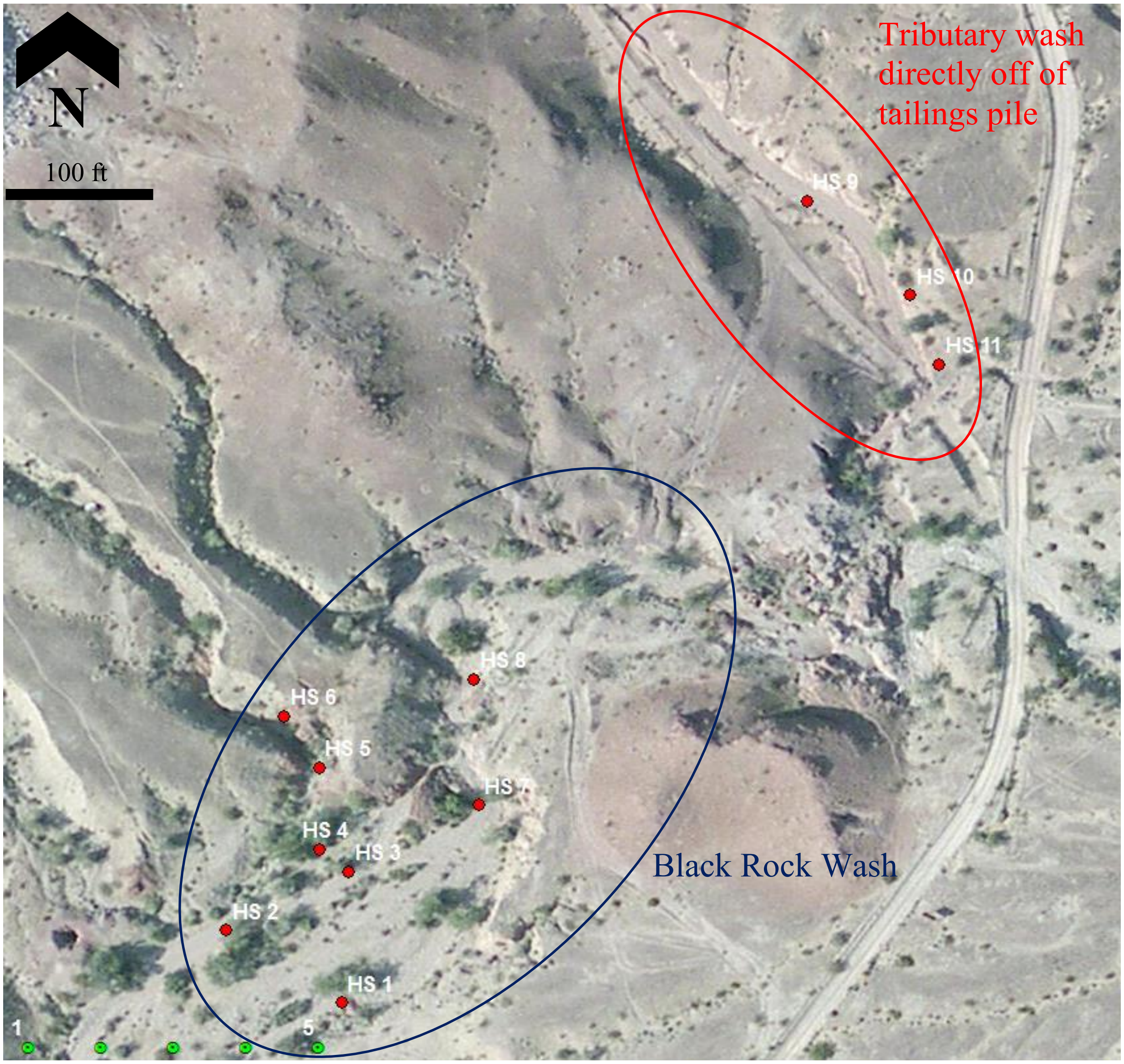

Figure 2.3: GIS representation of the collected hot spots north of Black Rock Wash.

Figure 2.4: GIS image displaying a close up of the actual tailings pile and the overburden pile. Directly north of the overburden pile is Red Cloud Mine.

3.0 Analyses

3.1 Methods

Analysis of the soil samples included: X-ray Fluorescence (XRF) and Atomic Absorption (AA). All necessary sample preparation for X-ray Fluorescence (XRF) and Atomic Absorption (AA) analysis were completed prior to testing.

3.2 Sample Preparation

Directly after in-situ sampling, preparation for XRF analysis was conducted in accordance with the SAP (EPA method 6200) [3]. Soil samples were removed from their gallon bags and poured into a sieve tower. These towers consisted of six sieves including: #4, #14, #20, #35, and #60 (see figure 3.1). The towers were placed in the sieve shaker for 10 minutes. After shaking, all of the soil that was passed through a no. 60 sieve was placed in a new gallon bag and was relabeled. This process assured better homogenization of the samples. All towers were then scrubbed with wire brushes, washed with soap and water, rinsed, and dried before each soil sample (see figure 3.2). The decontamination process (EPA Method 3050b) was performed to decrease the probability of cross contamination of samples [4].

Figure 3.1 Sieve stack in shaker.

Figure 3.2 Decontamination of sieves.

After XRF analysis, 20 samples were selected for AA analysis and were prepped using EPA´s method 3050b for acid digestion as a reference [4]. Only reagent grade chemicals were used to conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society [4]. Crucibles of all soil samples were weighed and put it in the drying oven to determine the moisture content of all samples prepped for digestion. Then, 1.5 grams of soil were measured from each of the 20 selected samples and placed into flasks. Ten mL of 14.4 M nitric acid was then added to each flask, mixed, and covered for vapor recovery. Hot plates were set to 155 degrees Celsius, with the liquids heating to 90 degrees Celsius. Samples were kept at 90 degrees Celsius for ten minutes (without boiling), and then allowed to cool. Five mL of nitric acid was then added, the cover was replaced, and refluxed for 60 minutes. The samples were then allowed to cool. Two mL of DI water and 3 mL of hydrogen peroxide were added to each sample and reheated. In 1 mL increments, hydrogen peroxide was added to the samples until 10mL total had been added or until bubbling ceased. The samples were then reheated for an hour and allowed to cool (see figure 3.3). The samples were centrifuged and then filtered through coffee filter paper into a 100 mL volumetric flask and filled to the 100 mL line with DI water. The flasks were then sent to the NAU Chemistry lab for AA analysis by Jeff Propster.

Figure 3.3: Atomic Absorption Acid Digestion.

3.3 Testing

In order to perform a risk assessment for the site at Red Cloud Mine, accurate soil testing must be performed. This testing included X-ray fluorescence (XRF) and flame atomic absorption (FAA) spectrometry. XRF involves the use of a handheld XRF device which shoots x-rays at a sample which then produces secondary x-rays indicative of the concentrations of unique metals in the sample. Each bag after prepped per section was then divided into 9 quadrants creating a 3x3 grid (see figure 3.4). An XRF reading was taken at the center of each quadrant, with the XRF measuring low, medium, and high concentrations at 30 seconds each for a total of 90 seconds (see figure 3.5). Before each reading the bag was wiped clean and the quadrant and bag number was labeled and input into the XRF. After each reading, a marker was used to cross out the square, and after a bag was finished it was placed in a separate bag from the bags still needing analysis. Although XRF is relatively accurate, it cannot give exact values due to small envelopes of error in the machine. This is due to the fact that analyte's secondary x-rays may interfere with each other and the soil matrix may also add interferences. In order to get more accurate data, digested soil samples were sent to the NAU Environmental Chemistry Lab under Jeffrey Propster. AA analysis was performed on 20% of the samples, which resulted in 20 samples being tested. As outlined in the preparation section, the final digestate is in a pure liquid form nullifying any possible matrix interferences. A characteristic wavelength for lead when requested was then shot at each sample. All data gathered by the lab was then sent back to the team to be used as calibration for all the other samples and to ensure the accuracy of XRF data. XRF data can be found in Appendix B.

Figure 3.4: 3x3 Grid on sample bags for XRF.

Figure 3.5: Using the XRF.

3.4 XRF Results

The results from the XRF included 9 concentrations of lead per sample. Of these 9 concentrations, the minimum and maximum reading were deleted, and the remaining 7 concentrations were averaged to find an average lead concentration for the sample as a whole. The following tables display the average concentrations of each sample, organized by sample location – grid (GR), downwash (DW), background (BK), and hotspot (HS). Tables 3.4.1-3.4.4 show the soils concentration data from the XRF. Figures 3.6 and 3.7 display a gradient color scale to represent the concentration profile of the site. Form Table 3.4.1, it was found that 9% of the samples were between 400 and 800 ppm lead and 39% of the grid samples were above 800 ppm lead. These values are color coded in the following table to be easily identified.

Table 3.4.1: Lead Concentrations in Grid from XRF data (RED = >800 ppm, GREEN = 400-800 ppm lead, ORANGE = <400 ppm lead).

Sample	Avg. Conc. (ppm)	Sample	Avg. Conc. (ppm)	Sample	Avg. Conc. (ppm)
GR1	232.77	GR28	2856.36	GR55	1785.36
GR2	1325.22	GR29	307.48	GR56	1597.08
GR3	792.08	GR30	407.17	GR57	1750.16
GR4	2009.13	GR31	125.93	GR58	145.47
GR5	96.01	GR32	567.28	GR59	119.19
GR6	556.6	GR33	848.87	GR60	15.17
GR7	2407.42	GR34	424.16	GR61	1359.77
GR8	1935.99	GR35	158.85	GR62	2388.82
GR9	2084.28	GR36	106.11	GR63	726.41
GR10	280.68	GR37	1566.04	GR64	237.08
GR11	389.39	GR38	1183.58	GR65	139.07
GR12	1883.43	GR39	1273.08	GR66	22.22
GR13	273.15	GR40	115.69	GR67	1494.3
GR14	365.98	GR41	1142.02	GR68	186.34
GR15	288.84	GR42	1635.16	GR69	389.03
GR16	217.25	GR43	1236.47	GR70	89.56
GR17	1425.83	GR44	2929.9	GR71	48.23
GR18	1044.66	GR45	88.84	GR72	236.96
GR19	1171.09	GR46	69.65	GR73	748.52
GR20	200.28	GR47	283.91	GR74	203.85
GR21	135.14	GR48	121.61	GR75	99.18
GR22	1119.74	GR49	183.91	GR76	35.15
GR23	1392.35	GR50	1929.43	GR77	399.25
GR24	98.75	GR51	1755.99	GR78	2246.09
GR25	282.74	GR52	286.63	GR79	1002.29
GR26	116.91	GR53	99.43	GR80	143.39
GR27	138.46	GR54	93.17		

Table 3.4.2: Lead Concentrations in Down Wash from XRF data(RED = >800 ppm, GREEN = 400-800 ppm lead, ORANGE = <400 ppm lead).

Sample	Avg. Conc. (ppm)
DW81	1535.38
DW82	364.46

Table 3.4.3 Lead Concentrations in Background from XRF data (RED = >800 ppm, GREEN = 400-800 ppm lead, ORANGE = <400 ppm lead).

Sample	Avg. Conc. (ppm)
BK1	88.27
BK2	102.92
BK3	29.15

Table 3.4.4: Lead Concentrations in Hotspots from XRF data (RED = >800 ppm, GREEN = 400-800 ppm lead, ORANGE = <400 ppm lead).

Sample	Avg. Conc. (ppm)
HS1	2111.47
HS2	1424.83
HS3	651.99
HS4	1212.79
HS5	247.85
HS6	575.31
HS7	2996.69
HS8	309.30
HS9	5789.14
HS10	11360.38
HS11	14517.84

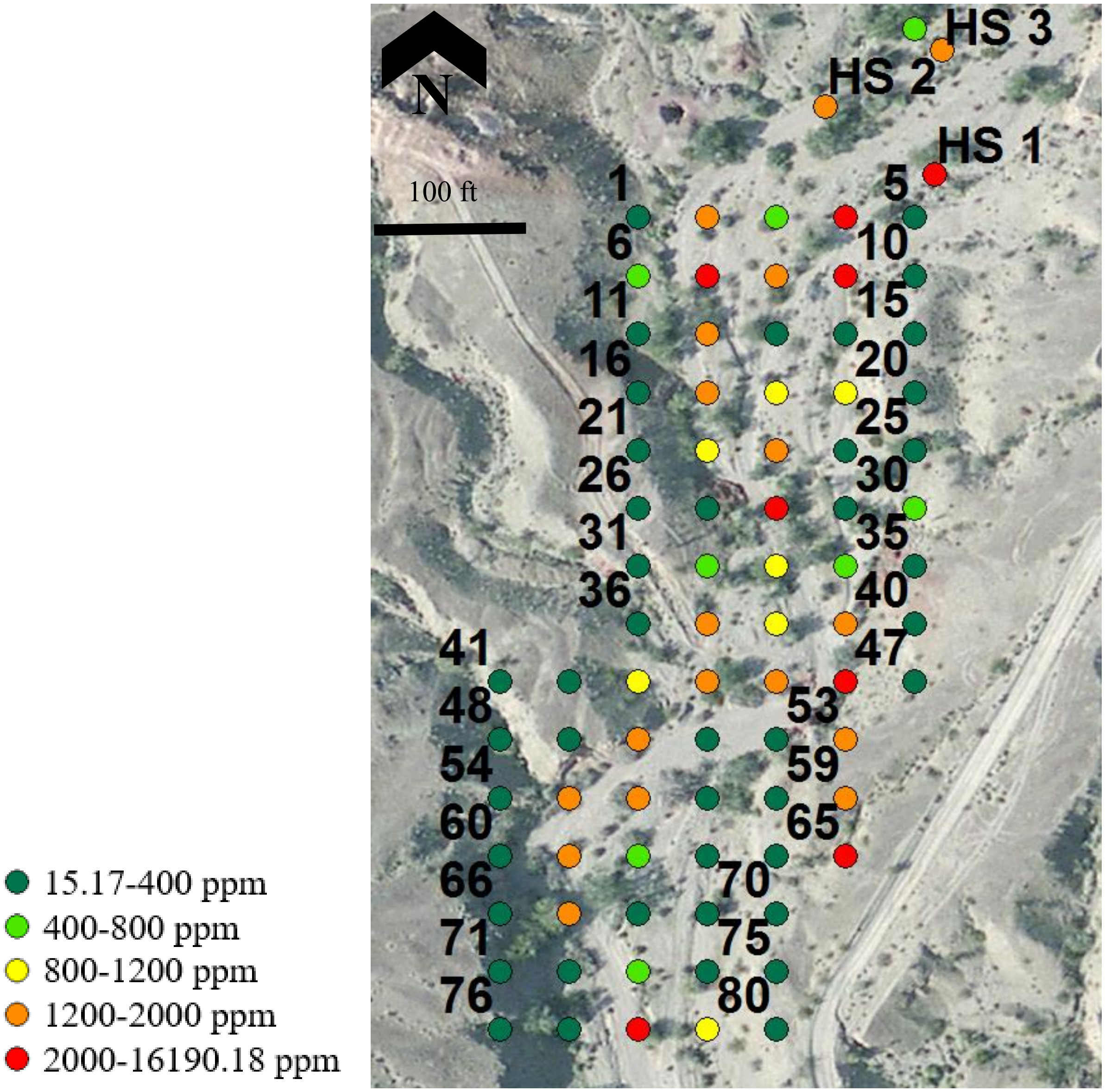

Figure 3.6: Gradient color scale representation of lead concentrations levels in Black Rock Wash.

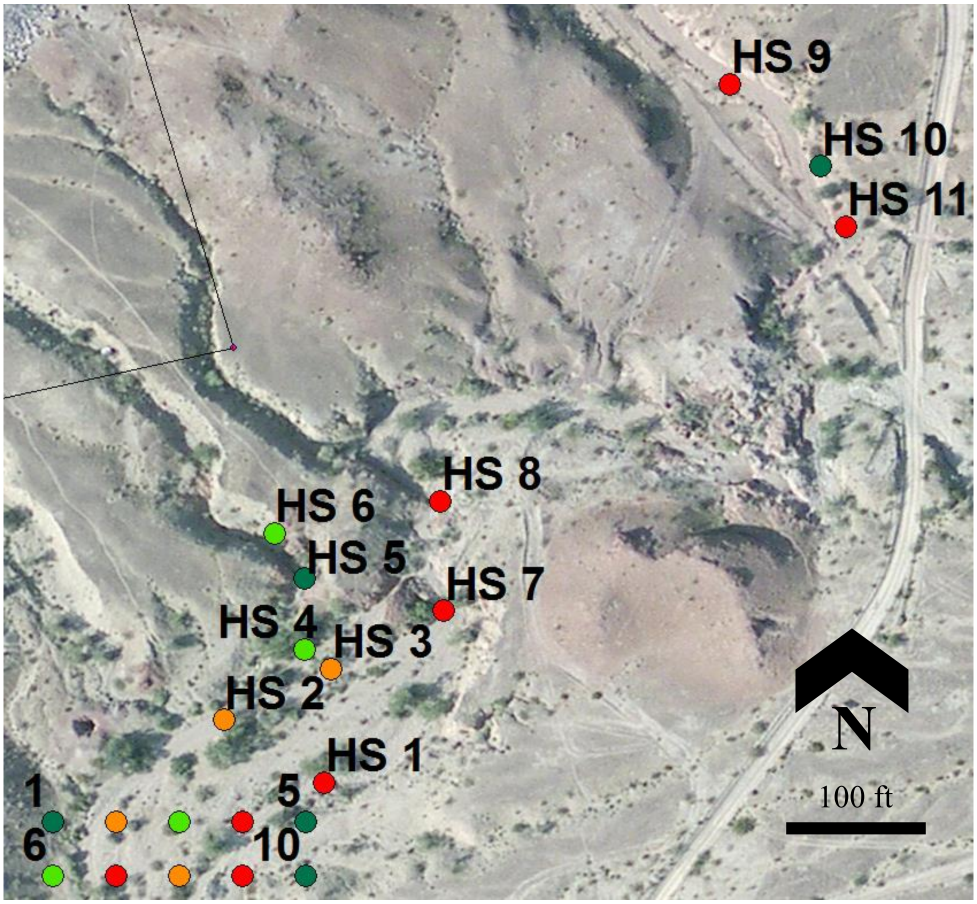

Figure 3.7: Gradient color scale representation of concentrations of lead in the hotspot samples.

Lead was determined to be the contaminant of concern because it was the only metal that the chemistry lab was able to test for through AA analysis in order to confirm the XRF findings. Other metals besides lead that were found in the samples are outlined in Table 3.4.5. The table lists every element present in every sample, the Arizona Soil Remediation Standard [5] for the stated metal and the highest concentration reported on the sample from XRF. The elements highlighted in red, Arsenic and Thallium, are the only metals that were above the AZ standards besides lead. The reason that these metals were not checked by AA to confirm concentration levels is because the Chemistry lab did not have the necessary standards and lamps to test for these elements. We therefore were unable to confirm these concentration levels. Southwest Sites recommends that the BLM further assess these metals in future site investigations, as they are highly toxic to humans.

Table 3.4.5: Other trace elements found in soil samples from XRF. (NS = No Standard, NA = Not Applicable)

Element	**AZ Soil Remediation Standard, Non-residential, ppm**	**Highest Concentration found in Red Cloud soil from XRF, ppm**	**Above/Below standard**
Antimony	410	163	BELOW
Arsenic	10	587	ABOVE
Bismuth	NS	36	NA
Cadmium	510	481	BELOW
Caesium	NS	175	NA
Calcium	NS	311,943	NA
Chromium	1,000,000	422	BELOW
Cobalt	13,000	7,938	BELOW
Copper	41,000	181	BELOW
Gold	NS	11	NA
Iron	NS	116,659	NA
Manganese	32,000	3,286	BELOW
Mercury	310	74	BELOW
Molybdenum	5,100	151	BELOW
Nickle	20,000	10,822	BELOW
Niobium	NS	91	NA
Palladium	NS	20	NA
Potassium	NS	39,503	NA
Rubdium	NS	916	NA
Scandium	NS	407	NA
Selenium	5,100	233	BELOW
Silver	5,100	337	BELOW
Strontium	610,000	476	BELOW
Sulfur	NS	7,261	NA
Tellenium	NS	256	NA
Thallium	67	9,890	ABOVE
Thorium	NS	82	NA
Tin	610,000	328	BELOW
Tungsten	NS	412	NA
Uranium	200	12	BELOW
Vanadium	1,000	166	BELOW
Zinc	310,000	64,211	BELOW
Zirconium	NS	720	NA

3.5 XRF/AA Correlation

Sample ID	AA data	XRF
BK2	84.96221	102.92
BK3	16.76913	29.15
DW81	1705.76	1535.38
GR6	517.928	556.6
GR8	2170.25	1935.99
GR10	326.9103	280.68
GR12	2361.483	1883.43
GR30	397.0971	407.17
GR32	702.9891	567.28
GR34	583.4995	424.16
GR55	2097.329	1785.36
GR62	1560.728	2388.82
GR67	2199.247	1494.3
GR73	945.5227	748.52
GR70	84.14031	89.56
GR77	529.516	399.25
HS2	2941.355	1424.83
HS5	1279.64	247.85
HS7	3536.676	2996.69
HS11	13353.81	14517.84

Table 3.5.1: XRF results and AA results.

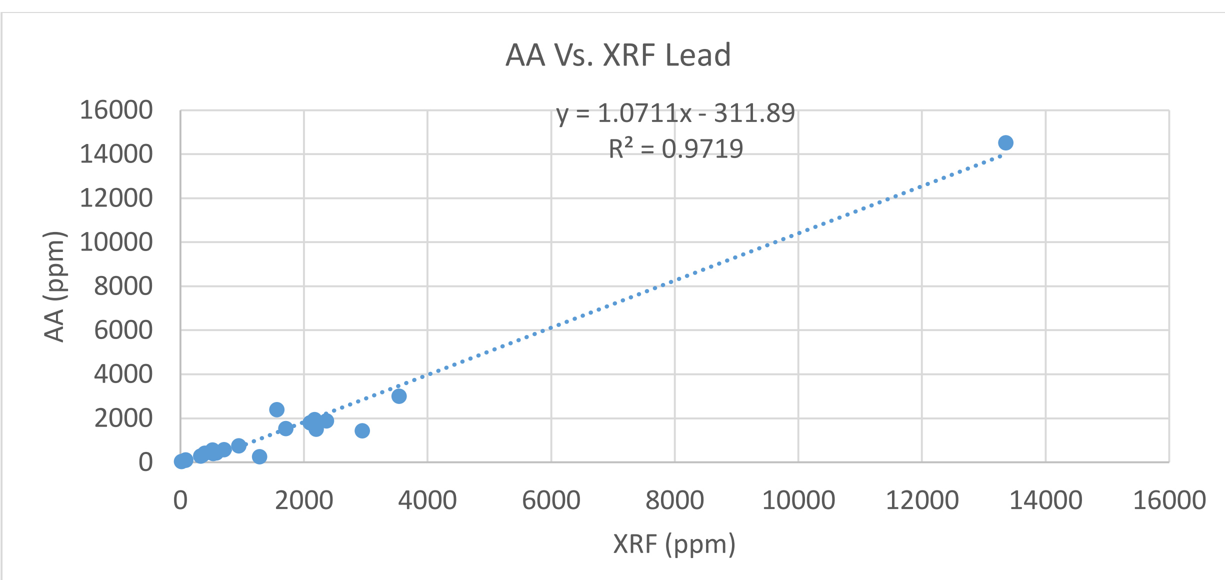

Figure 3.8: Correlation between the XRF results and the AA results.

The results of the AA analysis can best be seen in Table 3.5.1 and Figure 3.8 which are tabular and graphical representations of the AA data vs. the XRF data. The trend line associated with the graph and the R^2 Value confirm that the XRF and AA data are closely related which confirms that the XRF readings are verified and can be used as fair and representative data.

4.0 Risk Assessment

4.1 Human Health

4.1.1 Contaminants of Concern (COC's)

The contaminant of concern at Red Cloud Mine and in Black Rock Wash has been identified to be lead. The human risk assessment was performed using lead due to the fact that the XRF data was inconclusive on the concentrations of other highly toxic elements found in the samples, such as arsenic and thallium. The chemistry lab was unable to provide arsenic and thallium data to clarify the XRF data.

4.1.2 Toxicity Assessment and Exposure Scenarios

Due to the unique nature of lead, reference doses and hazard indexes are not utilized for human health risk assessments. This is due to the fact that detrimental effects can be seen at very low blood lead levels and so no dose is completely safe [6]. Instead, models are used to approximate the blood lead levels in adults and children, which are then compared to allowable limits. According to the EPA, there are no safe blood lead levels for children, but a reference limit of 5 mg lead/dl blood is used [6]. Soil lead concentrations found from the data analysis were then put into the Adult Blood Lead Model and the IEUBK model for children to approximate expected blood lead levels due to various exposure scenarios. These exposure scenarios where selected based off of what the team observed while sampling and the distance the site is to the city of Yuma. These exposure scenarios are summarized below in Table 4.1, all other inputs can be found in Appendix D. The Exposure Frequency is how many days per year a person in that scenario would be around the site, with an average of 8 hours/day of exposure.

Table 4.1.2.1.: Scenario Exposure Frequencies

Scenario	Exposure Frequency
Full Time Miner	330 days
Part Time Miner	150 days
Heavy Use Adult Recreational	20 days
Average Use Adult Recreational	6 days
Heavy Use Child Recreational	20 days
Average Use Child Recreational	6 days

The other important input for the risk scenarios is the soil lead concentrations on site. These concentrations where taken as the geometric mean and the geometric

95% levels for all the samples, the grid and downwash samples, and the hot spot samples respectively. Geometric means are a more accurate representation of logarithmic data. The team's soil data can be seen to be logarithmic in nature as shown by the graphs in Appendix E. The 95th percentile concentrations were found using the geometric means, the geometric standard deviations, and z scoring where z is equal to 1.645. Sample calculations can be found in Appendix F. The geometric mean and 95th percentiles can be seen below in Table 4.2.

Table 4.1.2.2.: Lead Concentrations for the Risk Scenarios.

Samples	Geometric 50th percentile	Geometric 95th percentile
All Samples	452.4 ppm	1680.8 ppm
Grid + Downwash Samples	401.3 ppm	1680.2 ppm
Hot Spot Samples	1679.6 ppm	2838.5 ppm

These concentrations where then ran for every scenario. Each scenario was evaluated at the 50th and 95th percentiles for the three sets of samples chosen.

4.1.3 Blood Lead Level Models

The adult lead model is derived from two sets of data, the Third National Health and Nutrition Examination Survey (NHANES III) and the National Health and Nutrition Examination Survey from 1999-2004 (NHANES 1999-2004) [7]. These surveys consist of thousands of adult blood lead data and their soil lead concentrations and are used to estimate adult blood lead data from other soil lead concentrations. The only inputs for the adult lead model are the soil concentrations and the exposure frequencies. For adults, their expected blood lead levels and the probability that their child would have blood lead levels above the standard of 5ug/dl [6] for fetuses can be seen in Appendix D with the model. The reference blood lead level for adults is 10ug/dl [6]. The most pertinent adult data can be seen below in Table 4.3. The miners live very close to the hot spots so those concentrations were ran in the model, and recreational users are most likely to encounter blood lead levels around the downwash and grid sample concentrations.

Table 4.1.3.1.: Adult Lead Model Data.

Scenario	NHANES 1999-2004		NHANES III	
	Expected Adult Blood Lead Level (ug/dl)	Probability That Fetal Blood Pb > Reference Limits	Expected Adult Blood Lead Level (ug/dl)	Probability That Fetal Blood Pb > Reference Limits
Full Time Miner Grid+Downwash 50th percentile	1.9	0.1%	2.4	1.9%
Full Time Miner Grid+Downwash 95th percentile	2.3	0.4%	2.8	3.1%
Full Time Miner Hot Spot 50th percentile	4.6	6.9%	5.1	15%
Full Time Miner Hot Spot 95th percentile	7.2	22.7%	7.7	30.8%
Heavy Use Adult Recreational Grid+Downwash 50th percentile	1.1	0%	1.6	0.4%
Heavy Use Adult Recreational Grid+Downwash 95th percentile	1.1	0%	1.6	0.4%
Heavy Use Adult Recreational Hot Spot 95th percentile	1.4	0%	1.9%	0.9%

The data for each scenario from the IEUBK model for children can be seen in Appendix D with the model, and the most pertinent data from this model can be seen below in Table 4.4. The reference blood Pb level is 5 ug/dl for children. In order to utilize the IEUBK model the soil concentrations were put into the model, and the consumption rate of soil by children was corrected for the fact that the model assumes a year-long exposure scenario. This was done by dividing the soil consumption rates by fifty-two to make the intake reflect a week of consumption during the whole year for the low use scenario or divided by fifty-two and multiplied by three to represent a three week consumption duration during the year.

Table 4.1.3.2: IEUBK model Results.

Scenario	Expected Blood Lead Level (ug/dl)						
Age Range	0.5-1 year	1-2 year	2-3 year	3-4 year	4-5 year	5-6 year	6-7 year
Heavy Use Child Recreational Grid and Downwash 95%	1.2	1.3	2	1.2	1	.9	.9
Heavy Use Child Recreational Grid and Downwash 50%	1.1	1.2	1.1	1	0.9	0.9	0.8
Heavy Use Child Recreational Hot Spot 95%	2.6	3	2.8	2.6	2.2	1.8	1.3
Heavy Use Child Recreational Hot Spot 50%	1.9	2.1	2	1.9	1.6	1.4	1.3

4.2 Ecological Risk Assessment

4.2.1 Species of Concern

The migration of mine tailings surrounding the Red Cloud Mine pose potential risks to ecological factors, such as flora and fauna, which exist in these areas. During the sampling investigation, field notes were recorded to document the presence of flora and fauna in Black Rock Wash as well as the surrounding landscape. The principal plant species of concern in this investigation include: the saghorn cactus, various desert grasses, and shrubs. Recorded fauna included: the desert cottontail, lizards, coyote, and desert big horn sheep.

4.2.2 Toxicity Assessment

Figure 4.1 demonstrates the migration of the tailings and the potential exposure paths to the observed flora and fauna. The main exposure of concern is the ingestion of contaminated soil by fauna due to its high potential concentrations of lead.

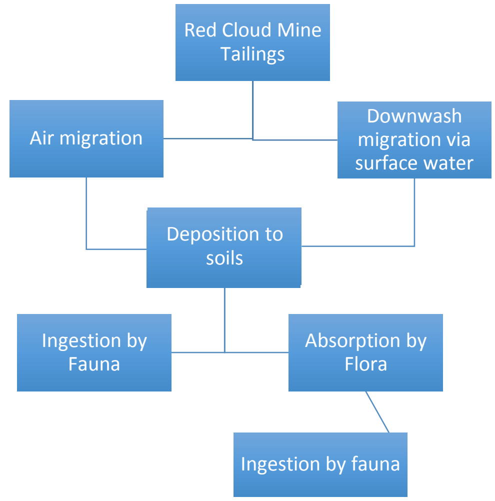

Figure 4.1: Exposure Pathways.

4.2.3 Qualitative Assessment

Table 4.5 shows potential effects of lead on the various flora and fauna as well the basis for measurement which summarizes the importance of this species with respect to its ecosystem and risk level [8]. Most of these species plays a larger role in the food chain as a critical ecosystem function, and for these reasons they should be assessed.

Table 4.2.3.1: Effect of lead and basis for measurement.

Species	Routes	Effect	Basis for Measurement
Saghorn Cactus	Absorption-roots	Decreased growth, reduction of photosynthesis, reduced biomass, decrease in protein, reduced plant height, lack of enzyme activity, decreased water absorption	Food Chain - Ecosystem function
Desert Grasses	Absorption-roots		Food Chain - Ecosystem function, potential grazing
Shrubs	Absorption-roots		Food Chain - Ecosystem function
Desert Cottontail	Ingestion, inhalation	Tumors, damage to nerve cells	Food Chain - Ecosystem function
Lizards	Ingestion, inhalation	Changes in Body Weight	Susceptible to heavy metals
Coyote	Ingestion, inhalation	Tumors, affects gene expression	Food Chain - Ecosystem function
Desert Big Horn Sheep	Ingestion, inhalation	Tumors, affects gene expression	Previously Endangered Species

Table 4.6 explains the hazard risk levels associated with these species, the frequency of area use near to the Red Cloud Mine, and food ingestion by these species [8].

Table 4.2.3.2: Hazard risk levels, area use, and food ingestion.

Species	Hazard Risk Level	Area Use	Food Ingestion
Saghorn Cactus	500-1000 ppm	constant	Photosynthesis, minimal water
Desert Grasses	500-1000 ppm	constant	Photosynthesis, minimal water
Shrubs	500-1000 ppm	constant	Photosynthesis, minimal water
Desert Cottontail	more than 40 µg/dl - observable symptoms, 2-8 mg of lead per kilogram of body weight per day, over an extended period of time, will cause death in most animals	occasional	Constant consumption of brush and grass
Lizards		majority	Constant consumption- insects and few plants
Coyote		occasional	Constant consumption- mostly animals and also plants
Desert Big Horn Sheep		occasional	Constant consumption- mainly grasses, need minimal water

Similarly, to the human health risk assessment and data analysis, the geometric mean of the grid data and down wash data was used for ecological risk assessment. The geometric mean of lead concentration in the soil used in these calculations is approximately 401.3 ppm. This number is representative of this general area and can reflect exposure scenarios with soils in the wash. According to the research hazard risk level for plants, at this contamination level, the Saghorn cactus, desert grasses, and shrubs will experience minimal risk. However, if these plants are located near hot spots, in which contamination levels average 1679.65 ppm these plants species will experience severe risk to their ecological health.

Ecological risk was evaluated based on multiple sources, assumed averages for body weights, soil ingestion, food ingestion rate, etc. These risk evaluations are estimates and will vary greatly depending on varying body weights and ingestion rates. Tables 4.7 - 4.10 demonstrate the calculations for overall risk to these species based on average body weight, the food ingestion rate, and the soil fraction of this ingestion.

Table 4.2.3.3: Risk level Desert Cottontail.

Parameter	Definition	Receptor : Desert Cottontail	
		Value	**Reference**
BW	v	1220	Arithmetic mean of means, adult, both sexes [9]
NIR	$(g.g_{bw}^{-1}.d^{-1})$ Normalized food ingestion rate	0.2	[10]
Pf	Plant fraction of diet	0.94	Exclusively herbivorous [9]
Af	Animal fraction of diet	0	Assumed 0
Sf	Soil fraction of diet	0.063	Assumed comparable to black-tailed jack rabbit [11]
NIRw	$(g.g_{bw}^{-1}.d^{-1})$ Normalized water ingestion rate	0.097	[9]
HR	Home range (ha)	3.1	[9]
TUF	Temporal use factor	1	Assumed to be year-round
	Risk Level	**5.05**	**mg of lead/ kilogram of body weight /day**

Table 4.2.3.4: Risk level Lizard.

Parameter	Definition	Receptor : Lizard	
		Value	**Reference**
BW	Body weight (g)	5	[9]
NIR	$(g.g_{bw}^{-1}.d^{-1})$ Normalized food ingestion rate	0.05	[10]
Pf	Plant fraction of diet	.094	[9]
Af	Insect fraction of diet	.9	Majority
Sf	Soil fraction of diet	0.0063	[11]
NIRw	$(g.g_{bw}^{-1}.d^{-1})$ Normalized water ingestion rate	.02	[9]
HR	Home range (ha)	7.28	[9]
TUF	Temporal use factor	1	Assumed to be year-round
	Risk Level	**.129**	**mg of lead/ kilogram of body weight /day**

Table 4.2.3.5: Risk Level Desert Bighorn Sheep.

Parameter	Definition	Receptor : Desert Bighorn Sheep	
		Value	**Reference**
BW	Body weight (g)	130000	[12]
NIR	Normalized food ingestion rate (kg/d)	1.5	[12]
Pf	Plant fraction of diet	.8	Assumed
Af	Animal fraction of diet	0	Assumed 0
Sf	Soil fraction of diet	.2	Assumed comparable to cattle or sheep grazing
NIRw	Normalized water ingestion rate	unknown	None
HR	Home range (ha)	5180	[12]
TUF	Temporal use factor	1	Assumed to be year-round
	Risk Level	**.926**	**mg of lead/ kilogram of body weight /day**

Table 4.2.3.6: Risk level Coyote.

Parameter	Definition	Receptor : Desert coyote	
		Value	**Reference**
BW	Body weight (g)	13608	[13]
NIR	Normalized food ingestion rate (kg/d)	1.909	[9]
Pf	Plant fraction of diet	.2	Assumed
Af	Animal fraction of diet	.7	Assumed Majority
Sf	Soil fraction of diet	.1	Assumed
NIRw	Normalized water ingestion rate (L/d)	1.004	[8]
HR	Home range (ha)	2071	[13]
TUF	Temporal use factor	1	Assumed to be year-round
	Risk Level	**5.63**	**mg of lead/ kilogram of body weight /day**

Based on these calculations, the desert cottontail and coyote are experiencing the largest ecological risk. Their risk level is well within the 2-8 mg of lead per kilogram of body weight per day that can cause death in animals. The basis of this risk however, is prolonged exposure over an extended period of time. The cottontail rabbit will be most at risk because it has a smaller home range and will be exposed over a longer period of time. Although the coyote will also be exposed, its range is must greater and may be exposed less frequently to higher contaminated soil levels. All of these calculations were based on the average soil contamination lead level of 401 ppm that was recorded for Black Rock Wash.

5.0 Conclusion and Recommendations

Levels of lead in the soil down gradient of the mine are elevated above Non-Residential soil remediation standards as determined accurately by XRF. This contamination is possibly being caused by water migration of the tailings pile down the wash and by wind dispersion of the tailings in the surrounding areas. The background sample concentrations of lead indicate that dispersal throughout the valley may be occurring. Red Cloud Road, because it crosses the wash, may have received tailings and further dispersion of contaminated tailings due to vehicles driving along the road and crossing the wash.

Although blood lead levels for children never exceeded the reference levels, the EPA states that there are no safe blood lead limits for children. Therefore, the area should be designated with signs or another method to show that elevated lead exposure could occur by regular recreational activity in the area. As seen in the hot spot scenarios, long term exposure to the hot spots could result in very serious blood lead levels and likely cause children and fetal blood lead levels to go above reference limits. Due to this, immediate actions to be taken by the BLM should include possibly capping or removing what is left of the tailings pile, as well as signage indicating that the area is contaminated and recreational use poses a risk to humans. Further sampling in the valley, especially on the road near the hotspots, is recommended in order to fully characterize the area and the potential risk to users.

6.0 References

[1] BKERSHAW, "Bureau of Land Management Protection and Response Information System Live Site Summary Report," Bureau of Land Management, Yuma, Arizona, 2003

[2] "Arizona's Classic Red Cloud Mine," Treasure Mountain Mining. November 30, 2011. From: http://www.treasuremountainmining.com/index.php?route=pavblog/blog&id=20

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APPENDIX A: WORK PLAN/ SAMPLING AND ANALYSIS PLAN (SAP)/ HEALTH AND SAFTEY PLAN (HASP)

WORK PLAN

1.0 INTRODUCTION

Southwest Sites Consulting has prepared this Work Plan for site characterization activities to take place at the Red Cloud Mine. This Work Plan has been prepared in accordance with the criteria established under the National Contingency Plan (NCP). The purpose of this document is to provide the U.S. Bureau of Land Management, Arizona State Office information on the procedures the team will use to successfully meet the BLM's needs.

2.0 PROJECT MANAGEMENT

2.1 Project Management Approach

Dani Halloran will serve as the client contact for all communications. Dr. Bridget Bero will serve as the NAU supervisor. Eric Zielske will be the BLM supervisor for site work.

2.2 Project Procedures

Project procedures will be performed according to the Sampling and Analysis Plan (SAP) and Health and Safety Plan (HASP), found in Appendix A and B respectively.

2.3 Quality Management

Quality management for all site work will be performed according to the SAP in Appendix A Sections 4.0 and 8.0.

2.4 Sub-contract Management

Northern Arizona University´s chemistry laboratory services will be subcontracted for wet chemistry analyses.

3.0 SITE BACKGROUND INFORMATION

The Red Cloud mine originally opened in 1878, and was mainly used to mine silver ore until it's closing in the 1890s. After the 1890s the mine's ownership became complex, seeing many different owners until the start of World War I when a high demand for lead arose. This need ultimately prompted the United States government to subsidize mine activities during the war due to the mines high lead content (BKERSHAW, 2003). Since the 1950's, the site has been closed and reopened as a specimen mine for wulfenite crystals, a lead molybdate. During this time, the tailings have also been reworked for lead, zinc and silver. Wayne Thompson owned the mine in 1995 but today a man from Kansas owns the mine and is keeping it open for mineral collectors.

For the purpose of this project it is important to note that the Red Cloud Mine is on private mineral patented land. However, mine tailings have migrated onto BLM-administered public land. The migrated ore tailings were consolidated in a tailings pond located south of the mine site [2]. The main contaminants of concern (COC) located in the tailings pond are lead, zinc, molybdenum, and iron.

3.1 Site Location

The Red Cloud Mine is located in La Paz County, which is North of Yuma County in Southern Arizona, as seen in Figure 3.1 below. Currently, the mine consists of 20.66 acres of land encompassing the mine itself, and several hundred tons of mine tailings. These tailings, and their respective contaminants and hazardous materials, have been washed down Black Rock Wash, which is on land managed by the Bureau of Land Management (BLM). The mine itself however is located on private land and is currently not being mined by the current owner, but instead kept open for mineral collectors.

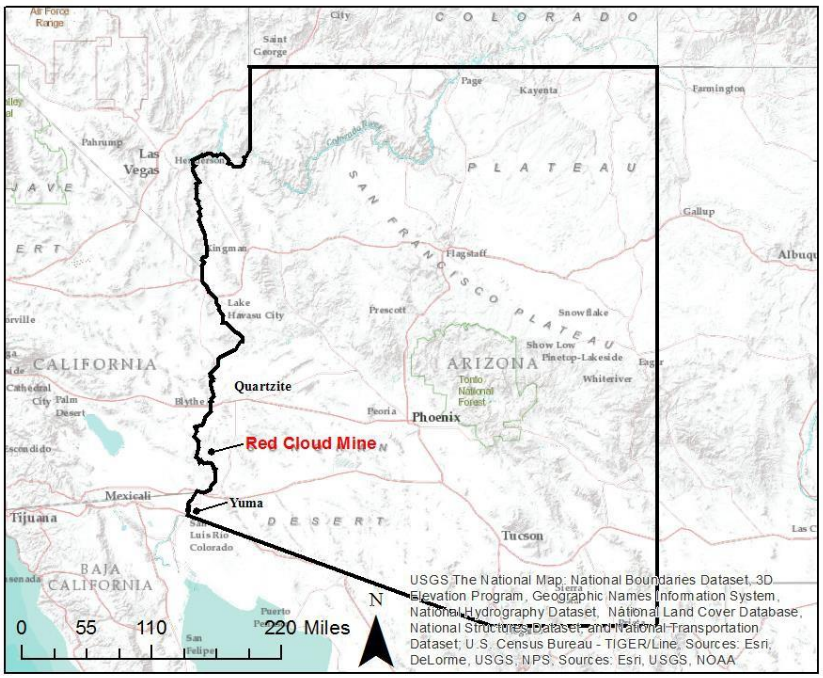

Figure A1.3.1: Location of Red Cloud Mine in La Paz County, AZ. (USGS)

The site is approximately 50 miles south of Quartzite and 23 miles north of Yuma. The site can be accessed by Red Cloud Road, a rough but maintained dirt road, off of Highway 95 in Yuma. The Colorado River is 5 miles south of the site and the Yuma Proving Ground military reserve is 2 miles west. Images showing the location of the mine in relation to nearby cities can be seen in Figure 3.2 and Figure 3.3 [1]

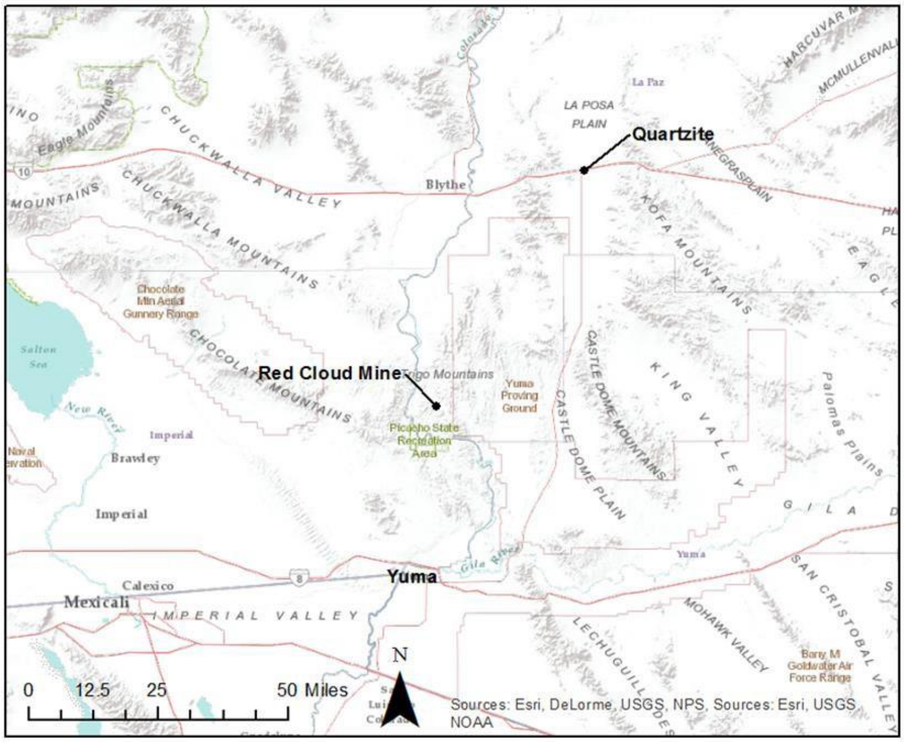

Figure A1.3.2: Red Cloud Mine is association to Quartzite and Yuma Arizona (USGS)

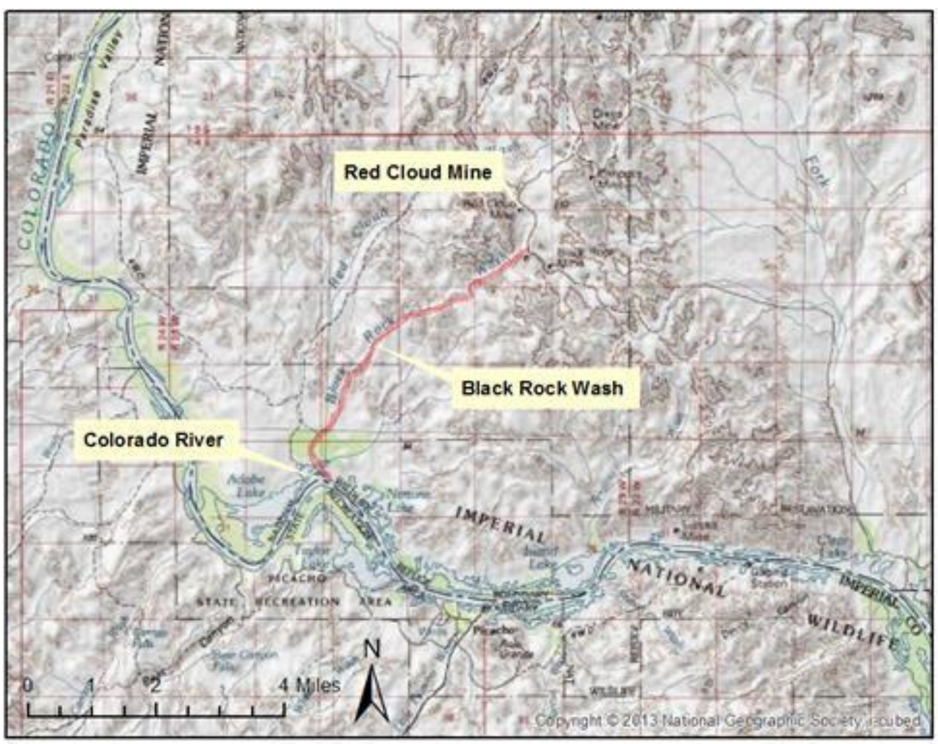

Figure A1.3.3: Map of Black Rock Wash feeding into the Colorado River and Red Cloud Mine (National Geographic)

3.2 Site Description

The public uses this BLM land, where Black Rock Wash is located, and tailings continue to disperse and migrate in the area. These tailings and possible contaminants pose a threat to the safety and health of humans, the environment, and other flora and fauna. In order to characterize the extent of the risk associated with the contaminants at Red Cloud Mine, it is necessary to perform a preliminary assessment (PA) and site inspection (SI). Based on the sampling results, the team will evaluate potential contaminant exposure to recreational users (hikers, campers, off-highway vehicles). If the risk is deemed unacceptable, the team will evaluate options to reduce the risk, such as consolidating and capping the tailings in an on-site repository.

3.3 Previous Operations and Investigation

Several investigations by the BLM have been conducted at Red Cloud Mine and have provided background information on the tailings, with respect to location, size, characteristics, and the compaction of the mine tailings. Additionally, investigative information was provided by the BLM for the minerals and estimates of heavy metal concentrations on site. The only metals tested for were lead and zinc. These concentrations can be seen in Table 3.1.

Table A1.3.1: Concentration a level of contaminants from samples taken in 2003.

Contaminant	**Concentration in tailings pile (mg/kg)**	**Concentration in Black Rock Wash (mg/kg)**	**Background Concentrations (mg/kg)**
Lead	8,090 - 12,397	4,428	99
Zinc	37,197 - 62,259	24,794	215

Previous work at the site in 2003 indicates that the tailings piles contain high concentrations of heavy metals including lead, iron, and zinc. The tailings themselves are highly compacted and are a fine to medium grained bright red material. The tailings pond has been documented to be a rough trapezoidal shape spanning a 1.3-acre area. The tailings piles get deeper as they get closer to the wash, where they appeared, at the time of the investigation, to be 10-12 feet deep. The Black Rock Wash follows the tailing pile on the north-northeastern side of the wash for 376 feet. The previous investigations also showed there was significant water migration from the tailings pile into the wash [1]

Table A1.3.2: Arizona Soil Remediation Standard

Contaminant	Residential Risk (Non-carcinogen) (mg/kg)	Non-residential Risk Non-carcinogen (mg/kg)
Lead	400	800
Zinc	23,000	310,000
Silver	390	5100
Molybdenum	390	5100

A reconnaissance geochemical survey was completed at the Red Cloud Mine in order to determine the mineral potential of the area. Soil was collected in washes around the mine, and the samples were tested for heavy metal concentrations, which were determined to be the following: silver (up to 70 mg/kg), lead (up to 5,000 mg/kg), zinc (up to 7,000 mg/kg), and molybdenum (up to 200 mg/kg). Table 3.2 details the concentration standards which must be met for each contaminant set forth by the Arizona Department of Environmental Quality (ADEQ) for a BLM site to be deemed safe for human use. The BLM has been delegated under the Comprehensive Environmental Response, Compensation, and Liability act (CERCLA) to respond to hazardous substances on public land. Therefor ADEQ is not responsible for the tailings on public land. The BLM uses the non-residential risk to determine screening levels for the investigation of contaminates on public land. The BLM would evaluate safe concentration levels of the contaminant, based on site exposure assumptions parallel with the public land use.

As seen from comparing the sampling results with Table 3.2, the lead concentrations are exceeded.

4.0 INVESTIGATIVE APPROACH

In order to properly perform an inspection of the Red Cloud Mine, an investigation to determine the extent and the toxicity of the mine tailings will be conducted in Black Rock Wash. A map showing the planned sampling grid is found in the SAP, Figure 2.1 (Appendix A).

4.1 Site Investigation Objectives

The objective of sampling will be to determine possible migration of the tailings into Black Rock Wash. The sampling will take place on January 30th to February 1st, 2016. The samples will then be taken from the field to Northern Arizona University where analyses will be completed to determine the toxicity of the contaminants present in the soil samples.

4.2 Site Investigation General Approach

A grid approach will be used to ensure spatial variation of the data. Samples from obvious hot spots will also be obtained. All samples will be surface samples. No cores will be obtained. A more detailed sampling explanation is given in the SAP located in Appendix A.

5.0 FIELD INVESTIGATION MATHODS AND PROCEDURES

Field investigation methods and procedures will be performed in accordance with the SAP in Appendix A, Section 4.0.

6.0 INVESTIGATIVE-DERIVED WASTE MANAGEMENT

Investigative-derived wastes (IDW) are wastes that are produced during a site investigation and cannot be easily disposed of without creating a health hazard to the environment or people. All IDW produced will be disposed of in accordance to the SAP, Appendix A. Section 5.0.

7.0 SAMPLE COLLECTION PROCEDURES AND ANAYSIS

Procedures for sample collection and analysis will be performed according to the procedures detailed in the SAP in Appendix A. Analyses will consist of x-ray fluorescence (XRF) sample testing, followed by Atomic Absorption (AA) testing of subsets. These tests will be performed in order to obtain correlation curves to evaluate XRF accuracy.

7.1 Sample Containers and Storage

Samples will be put in labeled containers for storage from the Red Cloud Mine site to Northern Arizona University for analysis. The procedures for sample containers and storage will be followed in accordance with Section 6.0 in the SAP in Appendix A.

7.2 Sample Documentation and Shipment

Samples will be documented by field notes, logbooks, and photographs. Additionally, all samples will be explicitly labeled and chain of custody will be documented. All sample documentation and shipment procedures will be followed in accordance with Section 7.0 in the SAP in Appendix A.

7.3 Field Quality Assurance and Quality Control

Quality Assurance and Quality Control will be maintained in the field by subdividing the work into sampling, recording data, identifying sample locations, and decontaminating. Background sampling will take place and compared to known background concentrations to ensure the sampling technique did not introduce COC´s. Additional quality assurance and control procedures will be followed in accordance with Section 8.0 of the SAP in Appendix A.

8.0 DEVIATIONS FROM THE WORK PLAN

It is likely that deviations from the work plan will occur in the field as unexpected situations or constraints may occur. Any and all deviations, discussed with the client, will be documented in the field noted in accordance with the SAP, Appendix A. Section 7.1.1

9.0 PA/SI REPORTING

A detailed report of the Preliminary Assessment and Site Inspection will be provided as outlined in Section 7.0 of the SAP (see Appendix A). The PA/SI report will also include the results of the lab analysis which will provide the concentration levels of lead in each sample. With this information, a risk assessment will be performed.

10.0 REFERENCES

[1] BKERSHAW, "Bureau of Land Management Protection and Response Information System Live Site Summary Report," Bureau of Land Management, Yuma, Arizona, 2003

[2] “Arizona’s Classic Red Cloud Mine,” Treasure Mountain Mining. November 30, 2011. From: http://www.treasuremountainmining.com/index.php?route=pavblog/blog&id=20

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SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) is for site sampling and characterization activities to be performed for the Red Cloud Mine tailings project. This SAP will identify the work needed to perform a site investigation; this includes identifying the extent of contamination, as well collecting additional data and making observations that will determine whether removal action is necessary.

2.0 SAMPLING RATIONAL

Due to the unknown nature of the exact areas of contamination a combination of grid and hot spot sampling methods will be used. Only soil sampling will be performed for this project. Prior sampling work has been done in the Red Cloud Mine area but the samples fail to reference where they were taken. Utilizing a grid will allow effective characterization of the wash and immediate surrounding areas. Background samples will be taken from undisturbed areas where minimal contamination should be present in order to obtain data on background contaminant levels. Hot spot samples will also be included to assure data is collected where obvious tailings exist. Approximately 80 grid samples, 30 hot spot, and 10 background samples will be collected.

2.1 Selection of Sampling Locations

No samples can be taken at Red Cloud Mine due to the fact that it is located on private land. The BLM owns the land around Red Cloud Mine, including Black Rock Wash which runs adjacent to the tailings pond where the mine tailings where consolidated in the past. The wash is the primary zone of concern for this project as it is on public land and sampling by the BLM in 2003 showed high concentrations of lead and zinc in and around the wash [1]. In order to comprehensively characterize the contamination in the wash a sampling grid will be overlaid on the wash. Samples will be taken at each corner of the squares within and around the grid. The grid will be located as close to the tailing pond as possible and will cover the wash and the immediate soils around the wash. The background samples and hot spot samples will be selected visually. Figure 2.1 below shows the grid sampling locations on a map of Black Rock Wash. The first point will be found using the long./lat. coordinates of the top right corner sampling location to the west and south as needed to find the other sampling locations.

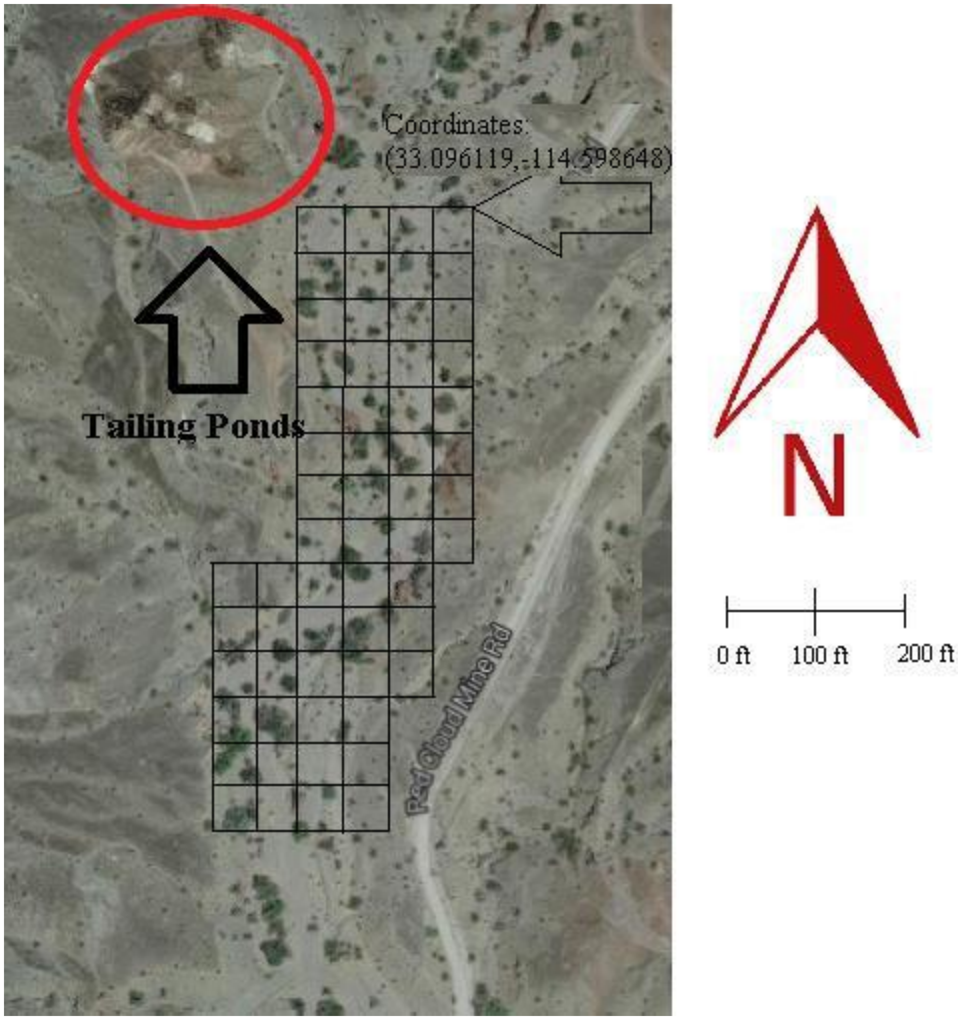


Figure A2.2.1 Map of Grid Sampling Locations

2.2 Selection of Samples for Laboratory Analysis

Thirty percent of the samples will be sent to the NAU Chemistry Lab for atomic absorption spectrometry analyses. These samples will be selected based on the range of contaminant levels observed via XRF analysis.

2.3 Selection of Target Metals

The target metals are lead, zinc, molybdenum and iron. High levels of lead and zinc were measured in and around the wash by the BLM in 2003 [1]. Molybdenum and iron are also expected to have high concentration levels as Red Cloud was mined for molybdenum compounds and iron in the past.

3.0 REQUEST FOR ANALYSIS

The following section will discuss the analytical support for the project. The analyses requested, analyses of concern, turnaround time, and available resources will all be outlined.

3.1 Analysis Narrative

Analysis will include X-ray fluorescence (XRF) and atomic absorption (AA). All necessary sample preparation will be done prior to testing. This includes drying and sieving of the samples, labeling, and acid digestion. XRF analysis will take place in the NAU Environmental Engineering Lab. Thirty percent of these will undergo acid digestion and sent to the NAU chemistry lab for AA analysis.

3.1.1 Drying and Sieving

Drying and Sieving for XRF analysis will be done in accordance to EPA method 6200. Soil samples will be removed from their gallon bags and placed on a large tray. The soil will be crushed by mortar and pestle and placed in ceramic pots for 2-4 hours of heating at 150 degrees C. These portions of soil will then be poured onto the #60 sieve. The sieve will be placed in the sieve shaker for 10 minutes [3]. All soil that passes to the bottom container will then be collected and placed in a new gallon bag until the whole soil sample has been processed. This process will assure better homogenization of the sample. Guidance in Section 6.0 of EPA Method 3050b will be followed for cleaning procedures to prevent cross-contamination. [4]

3.1.2 X-ray Fluorescence (XRF)

XRF sampling will be performed according to BLM protocol. The bag will be sub-divided into 9 quadrants by marker with each quadrant undergoing XRF testing. The high and low readings will be excluded and the remaining readings will be averaged to obtain an average for each specific sample. EPA Method 6200 Section 9.0 provides all quality control procedures required during XRF operation [3].

3.1.3 *Atomic Absorption (AA) Preparation*

Each soil sample sent to the NAU Chemistry Lab for AA analysis must first undergo acid digestion by EPA method 3050b. Only reagent grade chemicals shall be used which conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society [4]. One gram of dry soil will be collected from the chosen sample. Five mL of hydrochloric acid and 10 mL of deionized water are pre-added to the sample. The sample is then be heated to 95 C in reflux for five minutes. Reflux refers to heating the solution with an attached condenser to prevent reagents from escaping. The digestate will then be filtered through Whatman No. 41 filter paper or equivalent and collected in a 100 mL volumetric flask. The flask will be filled with deionized water and sent to the NAU Chemistry Lab for testing [4].

3.1.4 Atomic Absorption

Atomic Absorption will be sub-contracted to the NAU chemistry lab.

3.2 Analytical Laboratory

The NAU Chemistry Lab is located in building 17–Science Lab Facility, on the NAU campus. A trained lab technician provides all analytic services for the AA analysis. The NAU chemistry lab QA/QC protocols for AA will be compared to EPA method 7000 section 9.0 (Quality Control) to ensure confidence in their laboratory results [5]. All measurements will be recorded by the team in a log.

4.0 FIELD METHODS AND PROCEDURES

4.1 Field Equipment

4.1.1 List of Field Equipment

Table 4.1 presents all of the equipment to be used in the field for documentation, sampling, transport, and decontamination.

Table A2.4.1: Field and Sampling Equipment

Equipment	Description	Quantity	Purpose
Digital Camera	document sampling	1	Documentation
Camera Extra Battery	document sampling	1	Documentation
Field Notebook	sampling notes	1	Documentation
Disposable Gloves	to take samples	4 boxes (100/box)	Sampling
Trowels	to take samples	8	Sampling
Gallon Ziploc Bags	to contain samples	150	Sampling
Shovels	to take samples	2	Sampling
Tape roller	locating samples	2	Sampling
Dust masks	to take samples	8	Sampling
GPS	ID location	1	Sampling
Flags	ID location	30	Sampling
Boxes	store samples	4	Transport
Heavy Duty Tape	seal samples	4 rolls	Transport
Bubble Wrap	protect samples	1 roll	Transport
Sharpies	permanent, black	4	Transport
Backpacks	50L or more	5	Transport
Distilled Water	for cleaning	30 gallons	Decontamination
Plastic Bags	for disposable equipment	20	Decontamination
Water containers	hold water	30 gallons	Decontamination
Cleaning Brushes	for cleaning	4	Decontamination
Paper Towels	for cleaning	3	Decontamination
Biodegradable soap	for cleaning	3	Decontamination
5-gallon Buckets	for cleaning	3	Decontamination

4.1.2 QA/QC of Field Equipment

Before on site sampling, the team will be familiar with all the operations and trouble-shooting procedures of the GPS equipment. The GPS will be calibrated and prepared and tested for functionality. All electronics including the digital camera and GPS will be charged prior to the site visit. Additional batteries will also be included for back up.

4.2 Soil Sample Collection and Preparation

Approximately 9” x 9” areas of surface soil will be collected as grab samples (independent, discrete samples) from the ground surface. Surface soil samples will be collected using a stainless steel hand trowel. Samples will be collected in gallon Ziploc™ bags and will be filled to approximately 75% full. See Section 6.0 for shipping procedures and Section 7.0 for labeling samples.

4.3 Soil Sample Location Identification and Measurement

At each sampling location, all samples will be labeled according to procedures (Section 7.2). Additionally, locations will be documented through field notes, GPS locations, and photography of each sample site (Section 7.1).

Soil sampling location will be determined before sampling based on a grid mapping, provided in the work plan. Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

Additional soil sampling locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., visible tailings), and topographical features which may indicate the location of hazardous substance disposal or “hotspots.” Soil sample locations will be recorded in the field logbook as sampling is completed. A sketch of the sample location will be entered into the logbook and any physical reference points will be labeled. If possible, distances to the reference points will be given.

4.4 Flora and Fauna Data Collection

In sampling locations, data will be collected on any present plant or animal species. All details of visible flora or fauna will be recorded in the logbook with reference to its location and description of the plant or animal.

4.5 Decontamination

Decontamination procedures of sampling equipment must be conducted consistently to assure the quality of samples collected. All equipment that comes into contact with potentially contaminated soil will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur after each use of a piece of equipment. All sampling devices

used, including trowels, will also be cleaned and decontaminated.
The following, to be carried out in sequence, is a recommended procedure for the decontamination of sampling equipment

- Non-phosphate detergent and tap water wash, with brushes as needed
- Tap-water rinse
- Deionized/distilled water rinse

Equipment will be decontaminated in a predestinated area, and clean bulky equipment will be stored in 5- gallon buckets for transport to other sampling locations. Cleaned small equipment will be stored in plastic bags.

5.0 DISPOSAL OF RESIDUAL MATERIAL

In the process of collecting environmental samples, the sampling team will generate different types of potentially contaminated investigation-derived wastes (IDW) that include the following:

• Used personal protective equipment (PPE)

• Disposable sampling equipment

• Decontamination fluids

The EPA's National Contingency Plan (NCP) requires that management of IDW generated during sampling comply with all applicable or relevant and appropriate requirements (ARARs) to the extent practicable. The sampling plan will follow the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (May 1991), which provides the guidance for the management of IDW. In addition, other legal and practical considerations that may affect the handling of IDW will be considered.

Listed below are the procedures that should be followed for handling the IDW. The procedures have enough flexibility to allow the sampling team to use its professional judgment as to the proper method for the disposal of each IDW sample generated at the location.

- Used PPE and disposable equipment will be double bagged and placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill.

- Decontamination fluids that will be generated in the sampling event will consist of distilled water, residual contaminants, and water with biodegradable detergent. The volume and concentration of the decontamination fluid will be sufficiently low to allow disposal at the site or sampling area. The water, and the water with biodegradable detergent, will be poured onto the ground or into a storm drain. All cleaning will take place over plastic sheeting.

6.0 SAMPLE CONTAINERS, PRESERVATION, AND SHIPMENT

The types and number of sampling containers can be seen in Table 4-1. This section will discuss the sample containers, preservation, and storage of all soil samples obtained in the field. Soil samples will not be chilled and no preservatives will be used.

6.1 Packaging and Shipping

All Ziploc™ bags containing sample will be placed in strong outside plastic boxes for shipment. Five large plastic boxes will be brought to hold all the samples. The following outlines the packaging procedures that will be followed for all samples.

1. The bottom of the plastic boxes will be lined with bubble wrap to prevent breakage during shipment.
2. Heavy-duty gallon Ziploc™ bags will be secured with clear tape to ensure a tight seal.
3. Samples will be labeled with Sharpie™ directly onto the bag. Clear tape will be applied on top of the label to ensure the label will not rub off of the bag.
4. Empty space in the plastic boxes will be filled with bubble wrap to prevent movement and breakage during shipment.
5. Each plastic box will be securely taped shut with heavy-duty tape.

7.0 SAMPLE DOCUMENTATION AND SHIPMENT

7.1 Field Notes

Record keeping will be performed in the field through a combination of logbooks, preprinted forms, photographs, sample labels, and chain-of-custody documentation.

7.1.1 Field Logbooks

Field logbooks will be used to document where, when, how, and from whom any vital project information was obtained. Logbook entries should be complete and accurate enough to permit reconstruction of field activities. A separate logbook for each sampling event or project will be maintained. Logbooks should have consecutively numbered pages. All entries should be legible, written in black ink, and signed by the individual making the entries. Factual and objective language will be utilized.

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

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances
- Sampler's name(s)
- Date and time of sample collection
- Type of sample (soil, sediment or water)
- Field instrument readings and calibration
- Field observations and details related to analysis or integrity of samples (e.g., weather conditions, noticeable odors, colors, etc.)
- Lot numbers of the sample containers, sample identification numbers and any explanatory codes, and chain-of-custody form numbers

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling.

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with tribal, contractor, or federal agency personnel
- Deviations from sampling plans and site safety plans
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection
- Field observations of all plant life in area
- Field notes of any observed wildlife

7.1.2 Photographs and Locator Marking

Photographs and GPS coordinates will be obtained at all sampling locations and at other areas of interest on the site or sampling area. They will serve to verify information entered in the field logbook. For each photograph taken, the following information will be written in the logbook or recorded in a separate field photography log:

- Time, date, location, and weather conditions
- Description of the subject photographed
- Name of person taking the photograph
- GPS coordinates

7.2 Sample Labels

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. A copy of the sample label is included in

Figure 7-1. The samples will have identifiable and unique numbers. At a minimum, the sample labels will contain the following information: sample ID number, sample type, time of collection, name of sampler, site name and sample location. The site ID number format for node samples will be: RC- month- day- GR- year-node location # - duplicate # (if necessary). One sample will be taken at each node and labeled accordingly. The site ID number format for hot spot samples will be: RC- month- day- year- HS- sample #- duplicate # (if necessary).

Site ID NO:

Figure A2.7.1 Sample Label Southwest Sites Consulting

RC -________-_________-_________-___________-____________________- ( )

(MO.) (DAY) (YEAR) (GR or HS) (NODE # or sample #) (DUPLICATE #)

Sample Type: ________________________

Time Collected:_____________________ Site Location: ___________________________________

Sampler: ___________________________

7.3 Sample Chain-of-Custody Procedures

All sample shipments for analyses will be accompanied by a chain-of-custody record. A copy of the form is found in Figure 7-2. Form(s) will be completed and sent with the samples for each laboratory and each shipment (i.e., each day). If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler. The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone’s custody if it is either in someone’s physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of Southwest Sites Consulting. The sampling team leader or designee will sign the chain-of-custody form in the “relinquished by” box and note date and time. A self-adhesive custody seal will be placed across the lid of each sample. The shipping containers in which samples are stored be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated. Figure A2.7.2: Chain of Custody Record

Figure A2.7.2 Chain of Custody Record

<table>
<tr><th colspan="3">Chain of Custody Record</th></tr>
<tr><td>Project No.</td><td rowspan="3">Project Title</td><td rowspan="4">Organization

Contact
Address</td></tr>
<tr><td></td></tr>
<tr><td>Shipping Container No.</td></tr>
<tr><td colspan="2">Field Samplers: print signature</td></tr>
<tr><td colspan="2">Sample ID</td><td>Remarks</td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td>Relinquished by (print and signature):</td><td>Received by (print and signature):</td><td>Comments</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

8.0 QUALITY CONTROL

All quality control and quality assurance procedures will be followed as referenced by this SAP and as summarized in the following sections.

8.1 Field Quality Control

When taking samples in the field, the team will have a starting point based off of the land geography acquired from maps and observations once the team arrives on site. Compass and GPS systems will be utilized to ensure the chosen sampling spots are accurate. The team will also take detailed notes that can be referenced throughout the SI and in further analysis.

8.2 Laboratory Analysis Quality Control

The Northern Arizona University Chemical Laboratory analysis QA/QC procedures will be evaluated according to the EPA standards for analysis. Procedures may include but are not limited to: testing duplicates, using blanks, and assessing limits of detection.

REFERENCES

[1] Person, Carl, “Field Sampling Plan and Quality Assurance Project Plan, Red Cloud Mine Tailings,” U.S Department of Interior Bureau of Land Management., Yuma., AZ. Feb, 2009.

[2] National Statistical Service. *Sample Size Calculations.* [Online]. Retrieved from http://www.nss.gov.au/nss/home.nsf/pages/Sample+size+calculator

[3] Environmental Protection Agency, “Method 6200,” in *Test Methods for Evaluating Solid Waste, Physical/Chemical Method,* Alexandria, VA: NTIS, 2007, pp. 6200-1-6200-32

[4] Environmental Protection Agency. *Method 3050b Acid Digestion of Sediments, Sludges, and Soils.* [Online]. Retrieved November 13, 2015 from: http://www3.epa.gov/epawaste/hazard/testmethods/sw846/pdfs/3050b.pdf

[5] Environmental Protection Agency. *Method 7000B Flame Atomic Absorption Spectrophotometry.* [Online]. Retrieved October 3, 2015 from: http://www3.epa.gov/epawaste/hazard/testmethods/sw846/pdfs/7000b.pdf

[6] Environmental Protection Agency. *Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry.* [Online]. Retrieved October 3, 2015 from: http://www2.epa.gov/sites/production/files/documents/6010b.pdf

HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

The Health and Safety Plan will go over safety protocol and procedures for the Red Cloud Mine site inspection. Table 1.1 below indicates the names and contact information of all team members and supervisors that will be performing the site inspection. Table 1.2 shows the address of the nearest hospital to the job site.

Table A3.1.1: Site Workers names and information

Emergency Contact			
Title	**Name**	**Organization**	**Phone Number**
Site Supervisor	Bridget Bero	Northern Arizona University Capstone Advisor	928-607-2516
Client Contact	Eric Zielske	Bureau of Land Management AZ State Office	602-417-9223
Emergency Response	Police		911
Student	Kelsey Hammond	Northern Arizona University Capstone Team	805-256-4735
Student	Dani Halloran	Northern Arizona University Capstone Team	602-762-1149
Student	Taylor Oster	Northern Arizona University Capstone Team	928-853-5838
Student	Robert Reny	Northern Arizona University Capstone Team	626-652-8762
Student	Haley Michael	Northern Arizona University Capstone Team	602-501-802

Table A3.1.2: Nearest Hospital to job site.

Emergency Medical Facility		
Yuma Regional Medical Center	2400 S Avenue A, Yuma, AZ 85364	See Figure 1 for location details

2.0 DIRECTIONS TO HOSPITAL FROM RED CLOUD MINE

The nearest hospital is Yuma Regional Medical Center, 51 miles away in Yuma, AZ. Directions from the sampling site are as follows:

- Head **southeast** on *Red Cloud Mine Road*. Turn **left** to stay on *Red Cloud Mine Road.* Continue onto *Wildlife Refuge Road*. Turn **left** onto *Martinez Lake Road.* Turn **right** onto *US-95S.* Turn **left** onto *S. Pacific Ave*. Turn **Right** onto *E. 24th Street*. Turn **left** onto *S. Avenue A*.

Figure 2.1 shows the directions from the sampling site to the Yuma Regional Medical center explicitly.

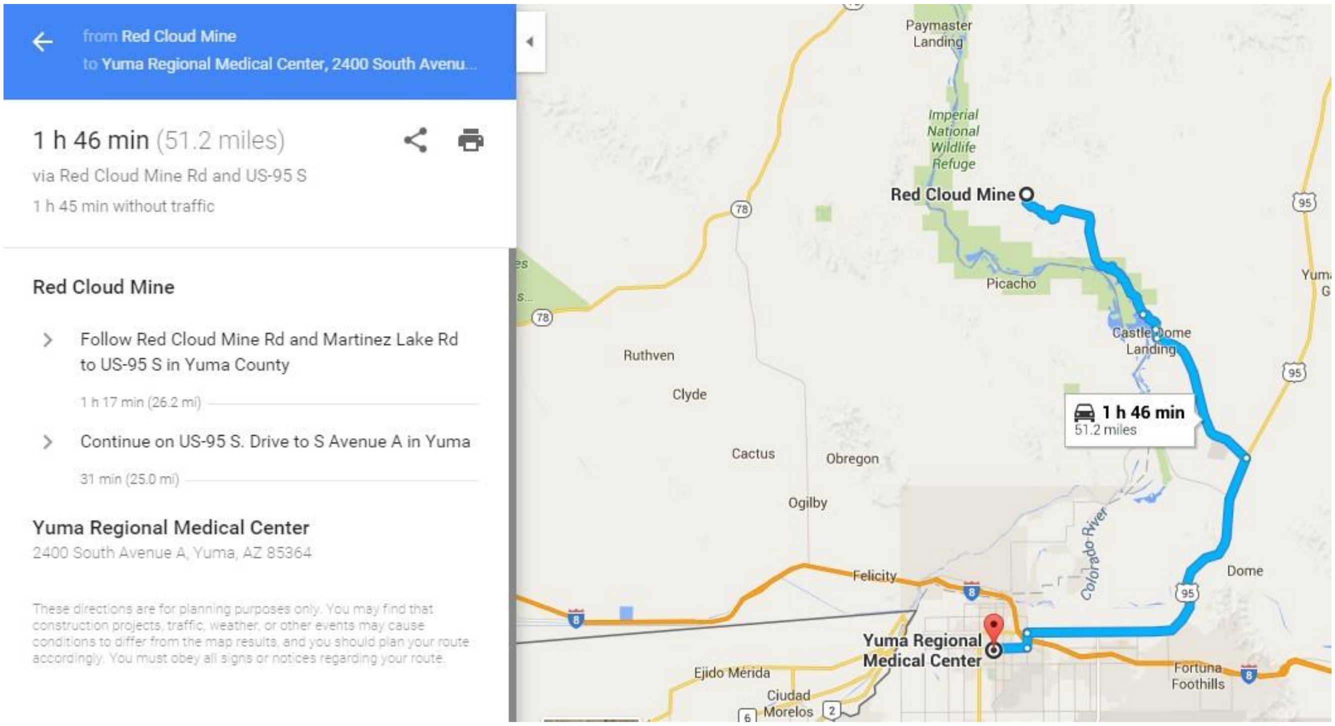


Figure A3.2.1: Directions from Red Cloud Mine to Yuma Regional Medical Center.

3.0 SITE SUPERVISOR

As required by *29 CFR 1910.120(b)(2)(i)(A)*, Bridget Bero and Eric Zielske are the Site Supervisors and are responsible for directing all hazardous waste operations. All other site personnel report directly to the Site Supervisor unless otherwise noted. The site supervisor is directly responsible for:

3.1.1 Ensuring the pre-entry briefing and/or tailgate-safety meeting held prior to initiating any site activity, and the such other times as necessary to ensure that employs are apprised of site hazards

3.1.2 Ensuring that all work activities conducted with this Health And Safety Plan (HASP) and making any modifications as necessary

3.1.3 Verifying all Job Hazards Analyses and ensuring that ongoing Hazard Analysis is conducted at this site

3.1.4 Overseeing the training program and ensuring that employees are trained for all tasks or operations they are asked to perform

3.1.5 Updating the Site Control Program as needed

3.1.6 Granting site workers site and zone access approval

3.1.7 Registering all site visitors

3.1.8 Establishing and maintaining security measures for this site
3.1.9 Directing how each work zone is adjusted
3.1.10 Notified when any hazardous-substance spill occurs
3.1.11 Monitoring site activities as they pertain to health and safety at this site
3.1.12 Stopping any unsafe acts that pose an immediate or imminent health and safety hazard to anyone at this site
3.1.13 Ensuring that all elements of this HASP are followed and correctly implemented
3.1.14 Ensuring all personnel are apprised of their responsibilities and are fulfilling their requirements
3.1.15 Updating the Site Health and Safety Supervisor and other applicable personnel as to changes or work progress reports that may pertain to health and safety functions at this site

4.0 HAZARD ANALYSIS

Table 4.1 below outlines the job hazard analysis of the aforementioned Red Cloud Mine Site Inspection. Table 4.2 provides additional information.

Table A4.1.1: Job Hazard Analysis Worksheet

Job Hazard Analysis			
Phase Description	Site Characterization		
Task or Operation	Sampling surface soil		
Specific Location	Red Cloud Mine tailings pile and Black Rock Wash, La Paz County, AZ		
Task or Operation Start Date	January 29-31 2016	**Task or Operation Duration**	3 days
Job Hazard Analysis Developed by	Kelsey Hammond		
Job Hazard Analysis Reviewed by	Bridget Bero and Eric Zielske		
Potential Hazards During this Operation			
Chemical	**Physical**	**Bioloigical**	**Radiological**
Lead Contamination	Dehydration	Insects	
	Fatigue		
	Sunburn		
	Scratches		
	Falls		
Hazard Measure Controls Used During this Operation			
Administrative Controls	Team safety meeting prior to going in field. The buddy system will be used		
Engineering Controls	Secured decontamination area		

PPE Description	Boots		
	Long Pants, Long Sleeves		
	Gloves, Hats		
Required Permits	None		

Table A4.1.2: Additional Hazard Analysis

Item	Issues	These Issues Have Been Considered Before Work	What additional Actions are Necessary Before Beginning Work?
Personnel Management			
1	Has an effort been made to secure at least a two-person team for this fieldwork? If only one person is making the field visit has that decision been approved by the project Principal or Partner?	Yes	
2	Has someone been designated as the field crew leader to supervise the field activity?	Yes	
3	Does the team have instructions on where to park safely and is the most appropriate location for site entry determined?	No	Parking will be determined upon arrival at site per BLM instruction
4	Has Southwest Sites Consulting notified the site that an Southwest Sites representative will be on site so that entry and security issues are addressed and a site map is provided, if available?	Yes	
5	Is there a system in place to ensure that Southwest Sites Consulting is informed of any unique hazards of this site, to supplement the types of risks mentioned in Southwest Sites Consulting’s Task Hazardous Analysis Sheet?	Yes	
Field Communication			
1	Do team members have a reliable means of contacting another Southwest Sites Consulting team member in event of an emergency? (such as cell phone, two-way radio)	Yes	

2	Is there a system in place to ensure that the team leader contacts each field team member at least at mid-day and communicate that all team members have safely left the site at the end of the day?	Yes	
3	Has a plan been developed on how to address or deal with any unauthorized people encountered on or near the site?	Yes	
Field Safety			
1	Are the required PPE determined and their use planned? At least: -Sturdy Work Boot (Steel toed shoes if crushing or puncture wound potentiall) -Long pants: (Long sleeves to combat poison or pest bite/sunburn) -Safety glasses (if potential for physical damage or windblown particulate) -Chemical resistant gloves if specifically required -Hard hat, when working on an industrial site or if any head injury from falling objects or other agents as possible	Not Required Required Required Nitrile gloves required Not Required	
2	Is there a process in place to ensure awareness of need for foul weather gear?	Yes	
3	Have plans been made to have extra water available while on site?	Yes	
4	Have you considered and addressed the need for a first aid kit? If the site is remote from available medical support, then a first aid kit should be taken in the car or personal backpack.	Yes	
5	Is the team aware of any local plants or pests that could cary disease or cause harm? Have applicable repellents, netting, clothing, and other protections been acquired?	No	

In order to avoid getting lost, the buddy system will be used. No student will leave the group unless accompanied by another student. Sunscreen and long sleeved shirts and pants will be worn to avoid sunburn. If someone falls, the severity of the injury will first be accessed by the site supervisor, who will determine if the wound can be properly cleaned and bandaged with the supplied first aid kit.

5.0 TRAINING PROGRAM

The Training Program is consistent with the requirements of 29 CFR 1910.120(e) and addresses the following site-specific information:

3.1.1 Initial HAZWOPER training will be completed by every team member prior to the site visit.

3.1.2 Required Supervised Field Experience will be handled by the site supervisor who is skilled in this field of inspection.

6.0 CONTAMINATION CONTROL

The soil containing the primary hazardous chemical at this site (lead) will be properly contained in plastic bags. The bags will be wiped and kept in a cooler with the lid closed to ensure no contamination of the vehicle or workers. PPE that can be washed will be kept is a bag after use, all other PPE will be disposed of in a proper manner. PPE will be removed before entering the vehicle and put on before entering the contaminated area. Decontamination of the team members clothing and containers holding the sample will take place before leaving the hazardous area. Fresh clothes will be worn each day. Work boots will be stored in a box to avoid contaminating the vehicle.

7.0 EMERGENCY RESPONSE PLAN

None of the team members that are working at this hazardous site have any pre-existing health conditions. No specific emergency response will be necessary. Sufficient amounts of food and water will be brought to the site to ensure no one gets dehydrated or faints. The nearest hospital, Yuma Regional Medical Center, is where anyone who experiences an injury will be taken. A first aid kit will be available on site. Bridget Bero will be immediately contacted if anything goes wrong as she is the Site Supervisor.

For an exposed worker, treatment will take place at the hospital where the doctor will decide the severity of contamination and if treatment is necessary.

8.0 REFERENCES

[1] HASP Online "Health and Safety Plan." Agoura Hills, CA From: htttp://www.hasponline.com/HASP_Online_Example.pdf

APPENDIX B: RAW XRF DATA

Table B1.1: Raw XRF DATA

SAMPLE	Time	Type	Duration	Units	**Pb**	**Pb Error**
BK1-1	42426.59514	Soil	90	ppm	85.88	8.96
BK1-2	42426.59653	Soil	90	ppm	88.01	7.18
BK1-3	42426.59792	Soil	90	ppm	86.84	7.14
BK1-4	42426.59861	Soil	0.15	ppm	<LOD	95.3
BK1-5	42426.60278	Soil	90	ppm	91.33	7.32
BK1-6	42426.60347	Soil	90	ppm	86.11	6.94
BK1-7	42426.60556	Soil	90	ppm	91.44	7.31
BK1-8	42426.60694	Soil	90	ppm	83.37	7.08
BK1-9	42426.60833	Soil	90	ppm	105.69	7.79
BK2-1	42430.70208	Soil	90	ppm	105.13	7.69
BK2-2	42430.70347	Soil	90	ppm	99.42	7.49
BK2-3	42430.70486	Soil	90	ppm	95.48	7.32
BK2-4	42430.70625	Soil	90	ppm	104.76	7.79
BK2-5	42430.70764	Soil	90	ppm	97.83	7.45
BK2-6	42430.70903	Soil	90	ppm	101.94	7.53
BK2-7	42430.71042	Soil	90	ppm	104	7.63
BK2-8	42430.71181	Soil	90	ppm	107.35	7.86
BK2-9	42430.71319	Soil	90	ppm	112.78	7.98
BK3-1	42430.78194	Soil	90	ppm	25.29	4.56
BK3-2	42430.78333	Soil	90	ppm	33.73	4.97
BK3-3	42430.78472	Soil	90	ppm	31.15	4.85
BK3-4	42430.78611	Soil	90	ppm	27.39	4.63
BK3-5	42430.78819	Soil	90	ppm	26.84	4.56
BK3-6	42430.79028	Soil	90	ppm	32.85	4.93
BK3-7	42430.79167	Soil	90	ppm	29.99	4.68
BK3-8	42430.79306	Soil	90	ppm	30.51	4.81
BK3-9	42430.79375	Soil	90	ppm	24.77	4.53
DW81-1	42431.62986	Soil	90	ppm	1516	28.67
DW81-1	42431.63125	Soil	90	ppm	1443.01	28.26
DW81-2	42431.63264	Soil	90	ppm	1505.18	28.32
DW81-3	42431.63403	Soil	90	ppm	1425.95	27.52
DW81-4	42431.63542	Soil	90	ppm	1694.11	30.33
DW81-5	42431.63681	Soil	90	ppm	1575.8	29.01
DW81-6	42431.63819	Soil	90	ppm	1591.79	29.52
DW81-7	42431.63958	Soil	90	ppm	1574.22	29.13
DW81-8	42431.64097	Soil	90	ppm	1516.09	28.59
DW81-9	42431.64236	Soil	90	ppm	1560.93	29.2
DW82-1	42425.64653	Soil	90	ppm	445.83	15.66
DW82-2	42425.64792	Soil	90	ppm	362.99	13.56
DW82-3	42425.65069	Soil	90	ppm	316.88	12.13
DW82-4	42425.65208	Soil	90	ppm	338.78	13.13

DW82-5	42425.65347	Soil	90	ppm	217.11	9.95
DW82-6	42425.65417	Soil	90	ppm	379.95	14.27
DW82-7	42425.65556	Soil	90	ppm	412.05	14.88
DW82-8	42425.65694	Soil	90	ppm	325.43	12.66
DW82-9	42425.65833	Soil	90	ppm	415.11	15.09
GR 1-1	42424.66528	Soil	90	ppm	349.67	13.18
GR 1-2	42424.66736	Soil	90	ppm	322.65	12.28
GR 1-3	42424.66875	Soil	90	ppm	232.77	10.18
GR 1-4	42424.67153	Soil	90	ppm	331.72	12.75
GR 1-5	42424.67361	Soil	90	ppm	359.13	13.51
GR 1-6	42424.675	Soil	90	ppm	313	12.29
GR 1-7	42424.67708	Soil	90	ppm	340.29	12.93
GR 1-8	42424.67917	Soil	90	ppm	347.42	13.14
GR 1-9	42424.68056	Soil	90	ppm	367.66	13.52
GR 10-1	42427.68681	Soil	90	ppm	247.69	11.06
GR 10-2	42427.68819	Soil	90	ppm	224.08	10.7
GR 10-3	42427.68889	Soil	90	ppm	293.63	12.3
GR 10-4	42427.69028	Soil	90	ppm	270.22	11.74
GR 10-5	42427.69167	Soil	90	ppm	250.49	11.24
GR 10-6	42427.69306	Soil	90	ppm	301.25	12.49
GR 10-7	42427.69444	Soil	90	ppm	299.14	12.29
GR 10-8	42427.69514	Soil	90	ppm	316.3	12.82
GR 10-9	42427.69653	Soil	90	ppm	302.37	12.17
GR 11-1	42430.72847	Soil	90	ppm	376.03	13.46
GR 11-2	42430.72986	Soil	90	ppm	405.01	14.14
GR 11-3	42430.73125	Soil	90	ppm	428.03	14.52
GR 11-4	42430.73264	Soil	90	ppm	383.79	13.88
GR 11-5	42430.73403	Soil	90	ppm	424.4	14.41
GR 11-6	42430.73542	Soil	90	ppm	391.76	13.9
GR 11-7	42430.73681	Soil	90	ppm	360.78	13.24
GR 11-8	42430.73819	Soil	90	ppm	383.98	13.73
GR 11-9	42430.73958	Soil	90	ppm	324.08	12.27
GR 12-1	42429.72361	Soil	90	ppm	1853.11	31.42
GR 12-2	42429.72639	Soil	90	ppm	1817	31.35
GR 12-3	42429.72847	Soil	90	ppm	1890.41	31.37
GR 12-4	42429.73056	Soil	90	ppm	1926.72	32.24
GR 12-5	42429.73125	Soil	90	ppm	1987.58	33.14
GR 12-6	42429.73542	Soil	90	ppm	1892.87	31.95
GR 12-7	42429.73681	Soil	90	ppm	1902.58	32.09
GR 12-8	42429.73819	Soil	90	ppm	1865.26	31.75
GR 12-9	42429.73958	Soil	90	ppm	1853.05	31.96
GR 13-1	42429.89375	Soil	90	ppm	241.4	9.84
GR 13-2	42429.89444	Soil	90	ppm	276.3	11.37
GR 13-3	42429.89583	Soil	90	ppm	396.03	13.11

GR 13-4	42429.89722	Soil	90	ppm	267.19	11.21
GR 13-5	42429.89861	Soil	90	ppm	291.96	11.78
GR 13-6	42429.9	Soil	90	ppm	301.67	11.9
GR 13-7	42429.90139	Soil	90	ppm	98.16	5.65
GR 13-8	42429.90278	Soil	90	ppm	278.52	11.09
GR 13-9	42429.90347	Soil	90	ppm	255.01	10.58
GR 14-1	42429.88056	Soil	90	ppm	225.88	8.86
GR 14-2	42429.88194	Soil	90	ppm	298.78	10.86
GR 14-3	42429.88333	Soil	90	ppm	353.42	11.68
GR 14-4	42429.88472	Soil	90	ppm	395.45	13.55
GR 14-5	42429.88611	Soil	90	ppm	379.6	13.46
GR 14-6	42429.8875	Soil	90	ppm	392.94	13.43
GR 14-7	42429.88889	Soil	90	ppm	373.75	13.05
GR 14-8	42429.89028	Soil	90	ppm	388.52	13.54
GR 14-9	42429.89167	Soil	90	ppm	374.84	13.2
GR 15-1	42430.48125	Soil	90	ppm	330.53	12.35
GR 15-2	42430.48264	Soil	90	ppm	346.84	13.13
GR 15-3	42430.48403	Soil	90	ppm	234.99	9.5
GR 15-4	42430.48611	Soil	90	ppm	328.99	12.43
GR 15-5	42430.48681	Soil	90	ppm	311.89	11.88
GR 15-6	42430.48819	Soil	90	ppm	319.65	12.09
GR 15-7	42430.48958	Soil	90	ppm	184.62	8.18
GR 15-8	42430.49097	Soil	90	ppm	240.02	9.45
GR 15-9	42430.49236	Soil	90	ppm	255.79	10.39
GR 16-1	42430.81111	Soil	90	ppm	312.44	15.82
GR 16-2	42430.81181	Soil	90	ppm	225.3	9.69
GR 16-3	42430.81319	Soil	90	ppm	253.07	11.03
GR 16-4	42430.81458	Soil	90	ppm	162.73	7.81
GR 16-5	42430.81597	Soil	90	ppm	191.22	8.72
GR 16-6	42430.81736	Soil	90	ppm	240.97	10.5
GR 16-7	42430.81806	Soil	90	ppm	188.48	8.6
GR 16-8	42430.81944	Soil	90	ppm	190.63	8.51
GR 16-9	42430.82083	Soil	90	ppm	231.07	10.77
GR 17-1	42424.72917	Soil	90	ppm	1392.9	26.96
GR 17-2	42424.73611	Soil	90	ppm	1441.05	27.83
GR 17-3	42424.73819	Soil	90	ppm	1381.44	26.86
GR 17-4	42424.73958	Soil	90	ppm	1376.58	26.85
GR 17-5	42424.74167	Soil	90	ppm	1528.12	28.02
GR 17-6	42424.74306	Soil	90	ppm	1355.21	26.58
GR 17-7	42424.74514	Soil	90	ppm	1453.14	27.61
GR 17-8	42424.74722	Soil	90	ppm	1459.66	27.69
GR 17-9	42424.74861	Soil	90	ppm	1476.02	27.86
GR 18-1	42431.83958	Soil	90	ppm	942.19	22.14
GR 18-2	42431.88403	Soil	90	ppm	907.71	21.25

GR 18-3	42431.88681	Soil	90	ppm	948.04	21.91
GR 18-4	42431.88819	Soil	90	ppm	805.6	19.97
GR 18-5	42431.88958	Soil	90	ppm	910.38	21.73
GR 18-5	42431.89306	Soil	90	ppm	860.47	20.9
GR 18-6	42431.89444	Soil	90	ppm	869.2	20.91
GR 18-7	42431.89583	Soil	90	ppm	874.37	21.08
GR 18-8	42431.89792	Soil	90	ppm	820.18	20.43
GR 18-9	42431.89931	Soil	90	ppm	993.84	22.16
GR 19-1	42430.45486	Soil	90	ppm	1042.39	21.32
GR 19-2	42430.45625	Soil	90	ppm	1147.69	23.15
GR 19-3	42430.45764	Soil	90	ppm	941.23	20.48
GR 19-4	42430.45903	Soil	90	ppm	1149.26	23.68
GR 19-5	42430.46042	Soil	90	ppm	1373.85	26.83
GR 19-6	42430.46181	Soil	90	ppm	1243.67	25.75
GR 19-7	42430.46319	Soil	90	ppm	1278	26.49
GR 19-8	42430.46458	Soil	90	ppm	1208.59	25.7
GR 19-9	42430.46597	Soil	90	ppm	1128	24.32
GR 2-1	42427.64653	Soil	90	ppm	1285.51	32.19
GR 2-2	42427.64792	Soil	90	ppm	1316.69	28.01
GR 2-3	42427.64931	Soil	90	ppm	1149.01	25.26
GR 2-4	42427.65069	Soil	90	ppm	1292.32	27.27
GR 2-5	42427.65208	Soil	90	ppm	1310.61	27.2
GR 2-6	42427.65347	Soil	90	ppm	1259.15	26.83
GR 2-7	42427.65486	Soil	90	ppm	1533.32	30.07
GR 2-8	42427.65625	Soil	90	ppm	1552.95	30.42
GR 2-9	42427.65764	Soil	90	ppm	1278.91	27.23
GR 20-1	42430.67153	Soil	90	ppm	175.17	9.5
GR 20-2	42430.67431	Soil	90	ppm	193.51	9.97
GR 20-3	42430.67569	Soil	90	ppm	189.75	10.16
GR 20-4	42430.67708	Soil	90	ppm	173.6	9.48
GR 20-5	42430.67847	Soil	90	ppm	196.29	10.03
GR 20-6	42430.67986	Soil	90	ppm	197.58	10.11
GR 20-7	42430.68125	Soil	90	ppm	207.87	10.41
GR 20-8	42430.68264	Soil	90	ppm	241.8	11.41
GR 20-9	42430.68403	Soil	90	ppm	248.6	11.53
GR 21-1	42425.66042	Soil	90	ppm	120.97	8.2
GR 21-2	42425.66181	Soil	90	ppm	133.55	8.4
GR 21-3	42425.66319	Soil	90	ppm	140.51	8.7
GR 21-4	42425.66458	Soil	90	ppm	128.6	8.39
GR 21-5	42425.66528	Soil	90	ppm	137.19	8.65
GR 21-6	42425.66736	Soil	90	ppm	135.34	8.45
GR 21-7	42425.66806	Soil	90	ppm	137.75	8.5
GR 21-8	42425.66944	Soil	90	ppm	133.06	8.39
GR 21-9	42425.67083	Soil	90	ppm	148.06	9.05

GR 22-1	42431.71736	Soil	90	ppm	1135.8	23.37
GR 22-2	42431.71875	Soil	90	ppm	985.56	21.45
GR 22-3	42431.72014	Soil	90	ppm	1097.88	22.85
GR 22-4	42431.72153	Soil	90	ppm	1150.59	24.18
GR 22-5	42431.72222	Soil	90	ppm	1025.68	21.63
GR 22-6	42431.72361	Soil	90	ppm	1106.74	23.16
GR 22-7	42431.725	Soil	90	ppm	1163.25	24.36
GR 22-8	42431.72639	Soil	90	ppm	1259.34	25.16
GR 22-9	42431.72778	Soil	90	ppm	1158.24	24.32
GR 23-1	42430.75694	Soil	90	ppm	1421.58	27.18
GR 23-2	42430.75833	Soil	90	ppm	1364.59	26.34
GR 23-3	42430.75903	Soil	90	ppm	1402.41	26.81
GR 23-4	42430.77222	Soil	90	ppm	1255.54	24
GR 23-5	42430.77361	Soil	90	ppm	1410.62	26.75
GR 23-6	42430.775	Soil	90	ppm	1356.42	25.81
GR 23-7	42430.77639	Soil	90	ppm	1379.81	26.05
GR 23-8	42430.77778	Soil	90	ppm	1427.95	26.85
GR 23-9	42430.77917	Soil	90	ppm	1410.99	27.18
GR 24-1	42430.46875	Soil	90	ppm	92.18	7.45
GR 24-2	42430.46944	Soil	90	ppm	94.95	7.45
GR 24-3	42430.47153	Soil	90	ppm	102.29	7.62
GR 24-4	42430.47292	Soil	90	ppm	97.8	7.53
GR 24-5	42430.47431	Soil	90	ppm	96.17	7.32
GR 24-6	42430.475	Soil	90	ppm	100.03	7.53
GR 24-7	42430.47639	Soil	90	ppm	102.29	7.6
GR 24-8	42430.47778	Soil	90	ppm	105.58	7.59
GR 24-9	42430.47917	Soil	90	ppm	97.75	7.35
GR 25-1	42429.76528	Soil	90	ppm	278.61	11.27
GR 25-2	42429.76667	Soil	90	ppm	288.16	11.64
GR 25-3	42429.76875	Soil	90	ppm	277.31	11.35
GR 25-4	42429.76944	Soil	90	ppm	272.53	11.38
GR 25-5	42429.77083	Soil	90	ppm	295.66	12.05
GR 25-6	42429.77222	Soil	90	ppm	274.92	11.58
GR 25-7	42429.77361	Soil	90	ppm	286.58	11.81
GR 25-8	42429.775	Soil	90	ppm	291.96	11.85
GR 25-9	42429.77639	Soil	90	ppm	281.65	11.54
GR 26-1	42430.43958	Soil	90	ppm	128.27	7.69
GR 26-2	42430.44097	Soil	90	ppm	153.41	9.05
GR 26-3	42430.44236	Soil	90	ppm	119.78	7.43
GR 26-4	42430.44444	Soil	90	ppm	145.68	8.31
GR 26-5	42430.44583	Soil	90	ppm	137.34	8.05
GR 26-6	42430.44722	Soil	90	ppm	56.96	4.57
GR 26-7	42430.44931	Soil	90	ppm	89.68	5.95
GR 26-8	42430.45139	Soil	90	ppm	54.04	4.48

GR 26-9	42430.45278	Soil	90	ppm	140.67	7.96
GR 27-1	42429.74167	Soil	90	ppm	105.11	6.65
GR 27-2	42429.74375	Soil	90	ppm	147.22	8.73
GR 27-3	42429.74583	Soil	90	ppm	144.75	8.63
GR 27-4	42429.75069	Soil	90	ppm	147.09	8.45
GR 27-5	42429.75278	Soil	90	ppm	147.84	8.73
GR 27-6	42429.75972	Soil	90	ppm	131.77	8.15
GR 27-7	42429.76111	Soil	90	ppm	141.48	8.51
GR 27-8	42429.7625	Soil	90	ppm	132.28	8.23
GR 27-9	42429.76389	Soil	90	ppm	124.61	8.12
GR 28-1	42430.49444	Soil	90	ppm	2869.57	39.92
GR 28-2	42430.49583	Soil	90	ppm	2847.51	39.38
GR 28-3	42430.49653	Soil	90	ppm	2829.12	38.92
GR 28-4	42430.49792	Soil	90	ppm	2892.92	39.96
GR 28-5	42430.50069	Soil	90	ppm	2841.28	39.63
GR 28-6	42430.50208	Soil	90	ppm	2134.14	30.88
GR 28-7	42430.50347	Soil	90	ppm	2936.3	40.79
GR 28-8	42430.50486	Soil	90	ppm	2842.04	39.61
GR 28-9	42430.50694	Soil	90	ppm	2872.09	40.55
GR 29-1	42431.90278	Soil	90	ppm	296.1	11.72
GR 29-2	42431.90486	Soil	90	ppm	225.07	9.55
GR 29-3	42431.90625	Soil	90	ppm	296.93	11.71
GR 29-4	42431.90833	Soil	90	ppm	289.66	11.73
GR 29-5	42431.90972	Soil	90	ppm	313.03	12.12
GR 29-6	42431.91111	Soil	90	ppm	248.3	10.25
GR 29-7	42431.9125	Soil	90	ppm	352.15	12.94
GR 29-8	42431.91389	Soil	90	ppm	356.19	12.5
GR 29-9	42431.91597	Soil	90	ppm	432.11	14.12
GR 3-1	42424.68542	Soil	90	ppm	811.6	19.99
GR 3-2	42424.6875	Soil	90	ppm	829.23	20.61
GR 3-3	42424.68889	Soil	90	ppm	769.24	19.51
GR 3-4	42424.69028	Soil	90	ppm	739.12	19.11
GR 3-5	42424.69236	Soil	90	ppm	769.92	19.55
GR 3-6	42424.69375	Soil	90	ppm	791.73	20.05
GR 3-7	42424.69583	Soil	90	ppm	831.88	20.37
GR 3-8	42424.69792	Soil	90	ppm	786.01	19.99
GR 3-9	42424.69931	Soil	90	ppm	786.85	19.94
GR 30-1	42429.85417	Soil	90	ppm	418.63	14.18
GR 30-2	42429.85556	Soil	90	ppm	398.13	13.48
GR 30-3	42429.85694	Soil	90	ppm	415.48	13.96
GR 30-4	42429.85833	Soil	90	ppm	384.39	13.39
GR 30-5	42429.85972	Soil	90	ppm	396.84	13.64
GR 30-6	42429.86111	Soil	90	ppm	427.95	14.43
GR 30-7	42429.86181	Soil	90	ppm	409.34	14.07

GR 30-8	42429.86389	Soil	90	ppm	427.41	14.26
GR 30-9	42429.86528	Soil	90	ppm	376.29	12.93
GR 31-1	42424.61667	Soil	90	ppm	137.81	8.53
GR 31-2	42424.62014	Soil	90	ppm	123.61	8.11
GR 31-3	42424.62222	Soil	90	ppm	133.45	8.35
GR 31-4	42424.62431	Soil	90	ppm	123.58	8.19
GR 31-5	42424.62569	Soil	90	ppm	119.74	8.12
GR 31-6	42424.62778	Soil	90	ppm	128.27	8.38
GR 31-7	42424.62917	Soil	90	ppm	122.64	8.1
GR 31-8	42424.63056	Soil	90	ppm	117.49	8.08
GR 31-9	42424.63264	Soil	90	ppm	130.23	8.32
GR 32-1	42429.86736	Soil	90	ppm	598.64	16.97
GR 32-2	42429.86944	Soil	90	ppm	615.52	17
GR 32-3	42429.87083	Soil	90	ppm	1077.42	24.09
GR 32-4	42429.87222	Soil	90	ppm	274.48	10.01
GR 32-5	42429.87361	Soil	90	ppm	378.11	13.15
GR 32-6	42429.875	Soil	90	ppm	785.92	19.31
GR 32-7	42429.87639	Soil	90	ppm	127.36	7.52
GR 32-8	42429.87708	Soil	90	ppm	820.33	18.49
GR 32-9	42429.87847	Soil	90	ppm	497.95	15.51
GR 33-1	42429.77917	Soil	90	ppm	901.01	18.87
GR 33-2	42429.78125	Soil	90	ppm	1940.17	35.25
GR 33-3	42429.78264	Soil	90	ppm	1461.1	28.92
GR 33-4	42429.78403	Soil	90	ppm	752.34	18.99
GR 33-5	42429.78542	Soil	90	ppm	679.59	17.96
GR 33-6	42429.78681	Soil	90	ppm	1038.34	23.32
GR 33-7	42429.78819	Soil	90	ppm	658.61	17.52
GR 33-8	42429.78889	Soil	90	ppm	451.12	15.23
GR 33-9	42429.79028	Soil	90	ppm	353.91	12.67
GR 34-1	42430.65694	Soil	90	ppm	458.75	15.59
GR 34-2	42430.65972	Soil	90	ppm	454.48	15.25
GR 34-3	42430.66111	Soil	90	ppm	208.06	9.79
GR 34-4	42430.6625	Soil	90	ppm	412	14.44
GR 34-5	42430.66389	Soil	90	ppm	431.49	14.86
GR 34-6	42430.66528	Soil	90	ppm	407.47	14.7
GR 34-7	42430.66667	Soil	90	ppm	533.86	16.43
GR 34-8	42430.66806	Soil	90	ppm	389.48	14.24
GR 34-9	42430.66944	Soil	90	ppm	415.45	14.72
GR 35-1	42437.80764	Soil	90	ppm	147.92	8.55
GR 35-2	42437.80972	Soil	90	ppm	175.83	9.33
GR 35-3	42437.81111	Soil	90	ppm	167.82	9.03
GR 35-4	42437.8125	Soil	90	ppm	158.76	8.88
GR 35-5	42437.81389	Soil	90	ppm	162.55	8.89
GR 35-6	42437.81528	Soil	90	ppm	147.4	8.61

GR 35-7	42437.81667	Soil	90	ppm	150.56	8.69
GR 35-8	42437.81806	Soil	90	ppm	163.63	8.91
GR 35-9	42437.81944	Soil	90	ppm	160.7	9.1
GR 36-1	42432.53125	Soil	90	ppm	106.2	7.62
GR 36-2	42432.53264	Soil	90	ppm	118.83	7.93
GR 36-3	42432.53403	Soil	90	ppm	109.62	7.59
GR 36-4	42432.53542	Soil	90	ppm	96.99	6.8
GR 36-5	42432.53681	Soil	90	ppm	111.09	7.68
GR 36-6	42432.53819	Soil	90	ppm	107.52	7.53
GR 36-7	42432.53958	Soil	90	ppm	112.41	7.68
GR 36-8	42432.54167	Soil	90	ppm	93.12	6.47
GR 36-9	42432.54306	Soil	90	ppm	98.97	6.77
GR 37-1	42431.70417	Soil	90	ppm	1529.76	28.24
GR 37-2	42431.70556	Soil	90	ppm	1540.1	28.62
GR 37-3	42431.70694	Soil	90	ppm	915.35	18.53
GR 37-4	42431.70764	Soil	90	ppm	1522.29	28.49
GR 37-5	42431.70972	Soil	90	ppm	1582.45	28.75
GR 37-6	42431.71111	Soil	90	ppm	1607.03	29.23
GR 37-7	42431.7125	Soil	90	ppm	1639.2	29.27
GR 37-8	42431.71389	Soil	90	ppm	1566.13	29.02
GR 37-9	42431.71528	Soil	90	ppm	1614.52	29.67
GR 38-1	42432.49306	Soil	90	ppm	795.81	16.52
GR 38-2	42432.49375	Soil	90	ppm	1566.8	28.04
GR 38-3	42432.49514	Soil	90	ppm	1188.54	21.93
GR 38-4	42432.49653	Soil	90	ppm	610.98	13.86
GR 38-5	42432.49792	Soil	90	ppm	1348.03	24.21
GR 38-6	42432.49931	Soil	90	ppm	1213.04	22.32
GR 38-7	42432.5	Soil	90	ppm	291.19	9.15
GR 38-8	42432.50139	Soil	90	ppm	1561.83	28
GR 38-9	42432.50278	Soil	90	ppm	1632.23	28.35
GR 39-1	42437.69792	Soil	90	ppm	1184.9	24.72
GR 39-2	42437.69931	Soil	90	ppm	1031.83	22.17
GR 39-3	42437.70069	Soil	90	ppm	1021.52	21.9
GR 39-4	42437.70208	Soil	90	ppm	1152.21	24.23
GR 39-5	42437.70347	Soil	90	ppm	1051.6	22.53
GR 39-6	42437.70486	Soil	90	ppm	1103.86	23.9
GR 39-7	42437.70625	Soil	90	ppm	1068.34	23.55
GR 39-8	42437.70764	Soil	90	ppm	1116.17	23.7
GR 39-9	42437.70903	Soil	90	ppm	1114.48	23.06
GR 4-1	42427.66042	Soil	90	ppm	1432.53	27.71
GR 4-2	42427.66111	Soil	90	ppm	1986.16	34.96
GR 4-3	42427.6625	Soil	90	ppm	1857.79	33.44
GR 4-4	42427.66458	Soil	90	ppm	1241.03	25.31
GR 4-5	42427.66597	Soil	90	ppm	2151.63	36.58

GR 4-6	42427.66736	Soil	90	ppm	2169.59	36.68
GR 4-7	42427.66875	Soil	90	ppm	2359.22	38.41
GR 4-8	42427.66944	Soil	90	ppm	2224.57	37.48
GR 4-9	42427.67083	Soil	90	ppm	2241.67	36.58
GR 40-1	42437.82292	Soil	90	ppm	96.24	6.67
GR 40-2	42437.82431	Soil	90	ppm	75.94	5.68
GR 40-3	42437.82639	Soil	90	ppm	53.34	4.6
GR 40-4	42437.82778	Soil	90	ppm	121.69	7.65
GR 40-5	42437.82917	Soil	90	ppm	106.96	7.26
GR 40-6	42437.83125	Soil	90	ppm	86.6	5.98
GR 40-7	42437.83472	Soil	90	ppm	129.03	8.1
GR 40-8	42437.83611	Soil	90	ppm	113.57	7.27
GR 40-9	42437.8375	Soil	90	ppm	93.12	6.36
GR 41-1	42436.89514	Soil	90	ppm	1208.46	22.62
GR 41-2	42436.89653	Soil	90	ppm	649.76	14.51
GR 41-3	42436.89792	Soil	90	ppm	1332.13	24.52
GR 41-4	42436.89931	Soil	90	ppm	1450.8	26.05
GR 41-5	42436.90069	Soil	90	ppm	1165.99	22.09
GR 41-6	42436.90139	Soil	90	ppm	1057.12	20.32
GR 41-7	42436.90278	Soil	90	ppm	980.52	19.05
GR 41-8	42436.90417	Soil	90	ppm	1008.48	19.22
GR 41-9	42436.90556	Soil	90	ppm	1241.45	22.85
GR 42-1	42436.84653	Soil	90	ppm	1621.74	36.24
GR 42-2	42436.84792	Soil	90	ppm	1542.12	27.96
GR 42-3	42436.84931	Soil	90	ppm	1766.72	30.07
GR 42-3	42436.88403	Soil	90	ppm	1727.36	38.11
GR 42-4	42436.88611	Soil	90	ppm	1606.59	29.36
GR 42-5	42436.8875	Soil	90	ppm	1693.25	29.27
GR 42-6	42436.88819	Soil	90	ppm	1563.5	27.69
GR 42-7	42436.88958	Soil	90	ppm	1711.2	29.87
GR 42-8	42436.89097	Soil	90	ppm	1232.23	22.84
GR 429	42436.89236	Soil	90	ppm	1707.75	29.85
GR 43-1	42432.54514	Soil	90	ppm	1663.48	28.93
GR 43-2	42432.54653	Soil	90	ppm	1810.91	30.97
GR 43-3	42432.54792	Soil	90	ppm	1692.73	29.09
GR 43-4	42432.54931	Soil	90	ppm	481.34	12.48
GR 43-5	42432.55069	Soil	90	ppm	958.59	19.18
GR 43-6	42432.55208	Soil	90	ppm	1141.55	21.08
GR 43-7	42432.55347	Soil	90	ppm	880.95	17.83
GR 43-8	42432.55486	Soil	90	ppm	1171.5	22.13
GR 43-9	42432.55625	Soil	90	ppm	1146.5	21.88
GR 44-1	42436.9375	Soil	90	ppm	2953.51	41.44
GR 44-2	42436.93889	Soil	90	ppm	2949.78	41.68
GR 44-3	42436.94028	Soil	90	ppm	3016.77	41.16

GR 44-4	42436.94236	Soil	90	ppm	2962.22	41.78
GR 44-5	42436.94583	Soil	90	ppm	2757.21	39.41
GR 44-6	42436.94722	Soil	90	ppm	2934.9	41.18
GR 44-7	42436.94861	Soil	90	ppm	2935.49	40.75
GR 44-8	42436.95	Soil	90	ppm	2691.5	38.68
GR 44-9	42436.95139	Soil	90	ppm	3016.18	41.39
GR 45-1	42437.77361	Soil	90	ppm	90.23	7.03
GR 45-2	42437.775	Soil	90	ppm	88.92	7
GR 45-3	42437.77708	Soil	90	ppm	84.71	6.71
GR 45-4	42437.77847	Soil	90	ppm	87.68	6.92
GR 45-5	42437.77986	Soil	90	ppm	91.21	6.92
GR 45-6	42437.78194	Soil	90	ppm	91.22	7
GR 45-7	42437.78264	Soil	90	ppm	87.94	6.85
GR 45-8	42437.78472	Soil	90	ppm	99.4	7.36
GR 45-9	42437.78681	Soil	90	ppm	81.77	6.78
GR 46-1	42432.575	Soil	90	ppm	68.16	6.37
GR 46-2	42432.57639	Soil	90	ppm	70.83	6.46
GR 46-3	42432.57778	Soil	90	ppm	68.9	6.45
GR 46-4	42432.57917	Soil	90	ppm	66.89	6.31
GR 46-5	42432.58056	Soil	90	ppm	69.04	6.3
GR 46-6	42432.58194	Soil	90	ppm	71.94	6.41
GR 46-7	42432.58264	Soil	90	ppm	73.37	6.56
GR 46-8	42432.58403	Soil	90	ppm	70.07	6.3
GR 46-9	42432.58542	Soil	90	ppm	68.58	6.33
GR 47-1	42433.65833	Soil	90	ppm	286.93	11.9
GR 47-2	42433.65972	Soil	90	ppm	277.23	11.79
GR 47-3	42433.66111	Soil	90	ppm	286.58	11.87
GR 47-4	42433.6625	Soil	90	ppm	296.4	12.25
GR 47-5	42433.66389	Soil	90	ppm	276.96	11.85
GR 47-6	42433.66528	Soil	90	ppm	299.9	12.13
GR 47-7	42433.66667	Soil	90	ppm	260.8	11.41
GR 47-8	42433.66736	Soil	90	ppm	280.21	11.84
GR 47-9	42433.66875	Soil	90	ppm	283.05	11.84
GR 48-1	42436.95625	Soil	90	ppm	116.04	8.62
GR 48-2	42436.95764	Soil	90	ppm	124	8.05
GR 48-3	42436.95903	Soil	90	ppm	122.22	7.83
GR 48-4	42436.96111	Soil	90	ppm	125.31	8.07
GR 48-5	42436.9625	Soil	90	ppm	123	7.96
GR 48-6	42436.96597	Soil	90	ppm	118.54	7.7
GR 48-7	42436.96667	Soil	90	ppm	116.02	7.87
GR 48-8	42436.96875	Soil	90	ppm	127.69	7.9
GR 48-9	42437.69583	Soil	90	ppm	122.13	7.77
GR 49-1	42437.72569	Soil	90	ppm	180.1	9.67
GR 49-2	42437.72639	Soil	90	ppm	173.09	9.46

GR 49-3	42437.72847	Soil	90	ppm	199.82	10.13
GR 49-4	42437.72986	Soil	90	ppm	180.94	9.75
GR 49-5	42437.76458	Soil	90	ppm	152.65	8.23
GR 49-6	42437.76597	Soil	90	ppm	181.57	9.56
GR 49-7	42437.76736	Soil	90	ppm	193.28	10
GR 49-8	42437.76806	Soil	90	ppm	178.57	9.15
GR 49-9	42437.76944	Soil	90	ppm	202.78	10.15
GR 5-1	42427.67292	Soil	90	ppm	100.87	7.76
GR 5-2	42427.67431	Soil	90	ppm	83.84	6.94
GR 5-3	42427.67569	Soil	90	ppm	92.26	7.23
GR 5-4	42427.67708	Soil	90	ppm	90.73	7.36
GR 5-5	42427.67847	Soil	90	ppm	93.25	7.38
GR 5-6	42427.67986	Soil	90	ppm	103.19	7.65
GR 5-7	42427.68125	Soil	90	ppm	84.45	7.16
GR 5-8	42427.68264	Soil	90	ppm	107.3	7.9
GR 5-9	42427.68403	Soil	90	ppm	114.21	8.09
GR 50-1	42436.92292	Soil	90	ppm	2246.28	36.17
GR 50-2	42436.92431	Soil	90	ppm	1912.38	32.54
GR 50-3	42436.92569	Soil	90	ppm	1942.08	33.55
GR 50-4	42436.92708	Soil	90	ppm	2181.53	35.36
GR 50-5	42436.92847	Soil	90	ppm	1773.55	30.2
GR 50-6	42436.92986	Soil	90	ppm	1703.45	30.21
GR 50-7	42436.93125	Soil	90	ppm	1829.85	31.93
GR 50-8	42436.93264	Soil	90	ppm	1942.29	32.83
GR 50-9	42436.93403	Soil	90	ppm	1924.31	32.41
GR 51-1	42432.61597	Soil	90	ppm	1811.76	29.06
GR 51-2	42432.61667	Soil	90	ppm	1305.63	22.51
GR 51-3	42432.61806	Soil	90	ppm	1574.24	52.9
GR 51-4	42432.61944	Soil	90	ppm	2049.98	33.44
GR 51-5	42432.62083	Soil	90	ppm	2092.46	34.08
GR 51-6	42432.62222	Soil	90	ppm	1861.03	30.86
GR 51-7	42432.62361	Soil	90	ppm	1824.68	29.57
GR 51-8	42432.62431	Soil	90	ppm	1864.62	30.69
GR 51-9	42432.62569	Soil	90	ppm	1230.66	22.03
GR 52-1	42437.71181	Soil	90	ppm	269.96	10.69
GR 52-2	42437.71389	Soil	90	ppm	275.17	10.97
GR 52-3	42437.71458	Soil	90	ppm	312.56	12.01
GR 52-4	42437.71597	Soil	90	ppm	290.27	11.53
GR 52-5	42437.71736	Soil	90	ppm	265.77	10.69
GR 52-6	42437.71875	Soil	90	ppm	292.95	11.43
GR 52-7	42437.72014	Soil	90	ppm	307.13	11.68
GR 52-8	42437.72153	Soil	90	ppm	160.19	7.46
GR 52-9	42437.72292	Soil	90	ppm	305.16	11.3
GR 53-1	42430.57569	Soil	90	ppm	64.03	5.65

GR 53-2	42430.57708	Soil	90	ppm	99.33	7.16
GR 53-3	42430.57847	Soil	90	ppm	105.13	7.51
GR 53-4	42430.58125	Soil	90	ppm	91.53	6.58
GR 53-5	42430.58264	Soil	90	ppm	83.35	6.55
GR 53-6	42430.58333	Soil	90	ppm	109.44	7.76
GR 53-7	42430.58472	Soil	90	ppm	105.31	7.5
GR 53-8	42430.58611	Soil	90	ppm	101.89	7.35
GR 53-9	42430.5875	Soil	90	ppm	114.73	7.86
GR 54-1	42432.74861	Soil	90	ppm	89.52	7
GR 54-2	42432.75069	Soil	90	ppm	92.24	7.13
GR 54-3	42432.75278	Soil	90	ppm	94.2	7.12
GR 54-4	42432.75417	Soil	90	ppm	77.89	6.71
GR 54-5	42432.75625	Soil	90	ppm	89.97	7.08
GR 54-6	42432.75764	Soil	90	ppm	99.63	7.21
GR 54-7	42432.75903	Soil	90	ppm	97.57	7.3
GR 54-8	42432.76042	Soil	90	ppm	91.29	7.1
GR 54-9	42432.76181	Soil	90	ppm	97.37	7.29
GR 55-1	42432.76528	Soil	90	ppm	1696.5	28.09
GR 55-2	42432.76667	Soil	90	ppm	1824	30.21
GR 55-3	42432.76806	Soil	90	ppm	1667.87	28.46
GR 55-4	42432.76944	Soil	90	ppm	2005.41	32.86
GR 55-5	42432.77083	Soil	90	ppm	1984.75	32.32
GR 55-6	42432.77361	Soil	90	ppm	1624.03	27.37
GR 55-7	42432.775	Soil	90	ppm	2027.88	33.11
GR 55-8	42432.77639	Soil	90	ppm	1694.95	28.47
GR 55-9	42432.77708	Soil	90	ppm	1108.24	20.51
GR 56-1	42432.73194	Soil	90	ppm	1410.86	26.47
GR 56-2	42432.73333	Soil	90	ppm	1694.86	30.33
GR 56-3	42432.73472	Soil	90	ppm	1390.27	25.59
GR 56-4	42432.73681	Soil	90	ppm	1850.96	31.86
GR 56-5	42432.73819	Soil	90	ppm	1534.22	28.49
GR 56-6	42432.74028	Soil	90	ppm	1613.15	29.46
GR 56-7	42432.74167	Soil	90	ppm	1518.66	27.08
GR 56-8	42432.74375	Soil	90	ppm	1736.84	30.23
GR 56-9	42432.74514	Soil	90	ppm	1670.95	30.36
GR 57-1	42432.71389	Soil	90	ppm	871.53	17.71
GR 57-2	42432.71667	Soil	90	ppm	1782.83	30.81
GR 57-3	42432.71806	Soil	90	ppm	1742.25	29.59
GR 57-4	42432.72014	Soil	90	ppm	1848.82	31.46
GR 57-5	42432.72153	Soil	90	ppm	1951.09	32.01
GR 57-6	42432.72292	Soil	90	ppm	1811.11	30.96
GR 57-7	42432.725	Soil	90	ppm	1667.69	29.28
GR 57-8	42432.72639	Soil	90	ppm	1769.15	30.51
GR 57-9	42432.72917	Soil	90	ppm	1629.24	28.59

GR 58-1	42432.51667	Soil	90	ppm	146.29	8.22
GR 58-2	42432.51806	Soil	90	ppm	141.84	8.32
GR 58-3	42432.51944	Soil	90	ppm	102.11	6.54
GR 58-4	42432.52083	Soil	90	ppm	145.35	8.42
GR 58-5	42432.52222	Soil	90	ppm	157.42	8.93
GR 58-6	42432.52361	Soil	90	ppm	119.35	7.3
GR 58-7	42432.525	Soil	90	ppm	165.02	9.1
GR 58-8	42432.52639	Soil	90	ppm	163.05	9.09
GR 58-9	42432.52778	Soil	90	ppm	144.98	8.66
GR 59-1	42432.50486	Soil	90	ppm	122.65	8.18
GR 59-2	42432.50625	Soil	90	ppm	129.89	8.25
GR 59-3	42432.50764	Soil	90	ppm	119.59	7.87
GR 59-4	42432.50833	Soil	90	ppm	115.99	7.85
GR 59-5	42432.50972	Soil	90	ppm	118.72	7.93
GR 59-6	42432.51111	Soil	90	ppm	76.43	5.89
GR 59-7	42432.5125	Soil	90	ppm	121.44	8.1
GR 59-8	42432.51389	Soil	90	ppm	113.31	7.9
GR 59-9	42432.51528	Soil	90	ppm	122.64	8.19
GR 6-1	42426.61181	Soil	90	ppm	538.78	16.29
GR 6-2	42426.61319	Soil	90	ppm	549.05	16.44
GR 6-3	42426.61458	Soil	90	ppm	541.06	16.37
GR 6-4	42426.61597	Soil	90	ppm	576.12	16.66
GR 6-5	42426.63194	Soil	90	ppm	547.44	15.83
GR 6-6	42426.63333	Soil	90	ppm	576.37	16.98
GR 6-7	42426.63542	Soil	90	ppm	567.41	16.76
GR 6-8	42426.63681	Soil	90	ppm	589.45	17.15
GR 6-9	42426.63819	Soil	90	ppm	529.24	16.29
GR 60-1	42436.90833	Soil	90	ppm	17.4	4.1
GR 60-2	42436.90972	Soil	90	ppm	13.22	3.83
GR 60-3	42436.91111	Soil	90	ppm	14.56	3.83
GR 60-4	42436.9125	Soil	90	ppm	15.47	4
GR 60-5	42436.91389	Soil	90	ppm	13.81	3.83
GR 60-6	42436.91597	Soil	90	ppm	17.39	4.07
GR 60-7	42436.91736	Soil	90	ppm	16.62	4.03
GR 60-8	42436.91875	Soil	90	ppm	13.79	3.85
GR 60-9	42436.92014	Soil	90	ppm	14.55	3.95
GR 61-1	42431.95	Soil	90	ppm	1587.84	28.24
GR 61-2	42431.95139	Soil	90	ppm	1827.85	32.1
GR 61-3	42431.95347	Soil	90	ppm	1782.04	32.15
GR 61-4	42431.95486	Soil	90	ppm	1429.54	26.27
GR 61-5	42431.95625	Soil	90	ppm	1865.73	32.15
GR 61-6	42431.95833	Soil	90	ppm	898.27	18.97
GR 61-7	42431.95972	Soil	90	ppm	815.94	17.18
GR 61-8	42431.96181	Soil	90	ppm	1029.91	21.26

GR 61-9	42431.96319	Soil	90	ppm	962.96	19.13
GR 62-1	42432.78194	Soil	90	ppm	2302.56	34.26
GR 62-2	42432.78333	Soil	90	ppm	2324.92	35.72
GR 62-3	42432.78472	Soil	90	ppm	2299.3	35.62
GR 62-4	42432.78542	Soil	90	ppm	1895.36	29.15
GR 62-5	42432.78681	Soil	90	ppm	2589.24	38.42
GR 62-6	42432.78819	Soil	90	ppm	2505.08	37.52
GR 62-7	42432.78958	Soil	90	ppm	2452.39	36.49
GR 62-8	42432.79097	Soil	90	ppm	2359.95	35.42
GR 62-9	42432.79236	Soil	90	ppm	2477.52	37.44
GR 63-1	42432.62778	Soil	90	ppm	694.35	17.27
GR 63-2	42432.62986	Soil	90	ppm	771.19	18.61
GR 63-3	42432.63056	Soil	90	ppm	847.41	19.8
GR 63-4	42432.63194	Soil	90	ppm	576.29	14.67
GR 63-5	42432.63333	Soil	90	ppm	789.84	18.45
GR 63-6	42432.63472	Soil	90	ppm	716.04	17.42
GR 63-7	42432.63611	Soil	90	ppm	503.49	13.26
GR 63-8	42432.6375	Soil	90	ppm	766.59	18.45
GR 63-9	42432.63889	Soil	90	ppm	770.55	18.67
GR 64-1	42432.69792	Soil	90	ppm	266.37	10.35
GR 64-2	42432.7	Soil	90	ppm	179.71	8.02
GR 64-3	42432.70139	Soil	90	ppm	224.05	9.83
GR 64-4	42432.70347	Soil	90	ppm	294.71	11.31
GR 64-5	42432.70486	Soil	90	ppm	267.47	10.6
GR 64-6	42432.70625	Soil	90	ppm	251.36	10.2
GR 64-7	42432.70903	Soil	90	ppm	270.14	10.62
GR 64-8	42432.71042	Soil	90	ppm	200.49	8.41
GR 64-9	42432.71111	Soil	90	ppm	172.67	7.86
GR 65-1	42432.65069	Soil	90	ppm	133.63	8.28
GR 65-2	42432.65208	Soil	90	ppm	135.91	8.31
GR 65-3	42432.65347	Soil	90	ppm	136.47	8.31
GR 65-4	42432.65486	Soil	90	ppm	119.7	7.37
GR 65-5	42432.65625	Soil	90	ppm	141.98	8.49
GR 65-6	42432.65694	Soil	90	ppm	144.72	8.66
GR 65-7	42432.65833	Soil	90	ppm	136.89	8.35
GR 65-8	42432.65972	Soil	90	ppm	150.53	8.81
GR 65-9	42432.66111	Soil	90	ppm	143.87	8.47
GR 66-1	42432.46597	Soil	90	ppm	22.8	4.36
GR 66-2	42432.46667	Soil	90	ppm	24.28	4.4
GR 66-3	42432.46806	Soil	90	ppm	19.25	4.09
GR 66-4	42432.46944	Soil	90	ppm	19.69	4.19
GR 66-5	42432.47083	Soil	90	ppm	22.62	4.39
GR 66-6	42432.47292	Soil	90	ppm	31.95	4.47
GR 66-7	42432.47431	Soil	90	ppm	21.55	4.12

GR 66-8	42432.47569	Soil	90	ppm	16.97	3.94
GR 66-9	42432.47708	Soil	90	ppm	25.34	4.28
GR 67-1	42432.43889	Soil	90	ppm	1429.35	25.55
GR 67-2	42432.44028	Soil	90	ppm	1760.83	30.57
GR 67-3	42432.44167	Soil	90	ppm	1673.59	29.76
GR 67-4	42432.44306	Soil	90	ppm	1502.24	26.4
GR 67-5	42432.44375	Soil	90	ppm	1686.03	30.18
GR 67-6	42432.44514	Soil	90	ppm	1665.82	29.49
GR 67-7	42432.44653	Soil	90	ppm	57.91	4.26
GR 67-8	42432.44792	Soil	90	ppm	1444.72	27.12
GR 67-9	42432.44931	Soil	90	ppm	1058.33	19.96
GR 68-1	42433.64306	Soil	90	ppm	188.28	9.5
GR 68-2	42433.64444	Soil	90	ppm	191.43	9.77
GR 68-3	42433.64583	Soil	90	ppm	183.59	9.45
GR 68-4	42433.64931	Soil	90	ppm	187.31	9.45
GR 68-5	42433.65069	Soil	90	ppm	171.53	9.24
GR 68-6	42433.65208	Soil	90	ppm	197.99	9.79
GR 68-7	42433.65347	Soil	90	ppm	178.24	9.34
GR 68-8	42433.65486	Soil	90	ppm	177.51	9.29
GR 68-9	42433.65625	Soil	90	ppm	202.94	9.96
GR 69-1	42437.78958	Soil	90	ppm	410.31	14.07
GR 69-2	42437.79097	Soil	90	ppm	385.35	13.65
GR 69-3	42437.79236	Soil	90	ppm	395.31	13.84
GR 69-4	42437.79444	Soil	90	ppm	404.04	13.9
GR 69-5	42437.79861	Soil	90	ppm	346.36	12.27
GR 69-6	42437.8	Soil	90	ppm	380.65	13.58
GR 69-7	42437.80069	Soil	90	ppm	394.85	13.59
GR 69-8	42437.80208	Soil	90	ppm	384.7	13.3
GR 69-9	42437.80347	Soil	90	ppm	378.31	13.23
GR 7-1	42424.70694	Soil	90	ppm	2549.6	40.64
GR 7-2	42424.71042	Soil	90	ppm	2626.37	41.48
GR 7-3	42424.7125	Soil	90	ppm	2053.74	35.31
GR 7-4	42424.71597	Soil	90	ppm	2535.91	40.85
GR 7-5	42424.71736	Soil	90	ppm	2482.24	40.01
GR 7-6	42424.72014	Soil	90	ppm	2208.16	37.87
GR 7-7	42424.72222	Soil	90	ppm	2338.35	38.43
GR 7-8	42424.72431	Soil	90	ppm	2240.04	37.81
GR 7-9	42424.72569	Soil	90	ppm	2497.67	40.29
GR 70-1	42430.71528	Soil	90	ppm	88.48	7.14
GR 70-2	42430.71667	Soil	90	ppm	94.39	7.24
GR 70-3	42430.71806	Soil	90	ppm	88.38	6.96
GR 70-4	42430.71944	Soil	90	ppm	90.35	7.19
GR 70-5	42430.72083	Soil	90	ppm	93.8	7.19
GR 70-6	42430.72222	Soil	90	ppm	86.47	7.05

GR 70-7	42430.72361	Soil	90	ppm	89	7.1
GR 70-8	42430.725	Soil	90	ppm	82.4	6.86
GR 70-9	42430.72639	Soil	90	ppm	90.45	7.15
GR 71-1	42431.76806	Soil	90	ppm	51.36	5.76
GR 71-2	42431.76944	Soil	90	ppm	45.18	5.49
GR 71-3	42431.77153	Soil	90	ppm	48.89	5.59
GR 71-4	42431.77292	Soil	90	ppm	50.61	5.71
GR 71-5	42431.77431	Soil	90	ppm	47.35	5.52
GR 71-6	42431.77569	Soil	90	ppm	45.54	5.53
GR 71-7	42431.77708	Soil	90	ppm	45.94	5.54
GR 71-8	42431.77917	Soil	90	ppm	47.93	5.52
GR 71-9	42431.78056	Soil	90	ppm	53.07	5.53
GR 72-1	42431.67431	Soil	90	ppm	224.92	10.45
GR 72-2	42431.675	Soil	90	ppm	238.45	10.75
GR 72-3	42431.67639	Soil	90	ppm	225.08	10.52
GR 72-4	42431.67778	Soil	90	ppm	252.57	11.02
GR 72-5	42431.67917	Soil	90	ppm	246	10.9
GR 72-6	42431.68056	Soil	90	ppm	239.72	10.91
GR 72-7	42431.68194	Soil	90	ppm	220.65	10.46
GR 72-8	42431.68333	Soil	90	ppm	231.99	10.58
GR 72-9	42431.68472	Soil	90	ppm	261.8	11.19
GR 73-1	42431.68958	Soil	90	ppm	771.32	19.18
GR 73-2	42431.69097	Soil	90	ppm	737.64	18.65
GR 73-3	42431.69236	Soil	90	ppm	726.91	18.21
GR 73-4	42431.69375	Soil	90	ppm	761.41	19.04
GR 73-5	42431.69514	Soil	90	ppm	708.56	17.85
GR 73-6	42431.69583	Soil	90	ppm	747.7	18.85
GR 73-7	42431.69722	Soil	90	ppm	783.7	19.27
GR 73-8	42431.69931	Soil	90	ppm	748.36	18.91
GR 73-9	42431.70069	Soil	90	ppm	746.33	19.22
GR 74-1	42431.60069	Soil	90	ppm	218.58	10.49
GR 74-2	42431.60208	Soil	90	ppm	192.6	9.94
GR 74-3	42431.60347	Soil	90	ppm	189.39	9.85
GR 74-4	42431.60486	Soil	90	ppm	199.23	10.09
GR 74-5	42431.60625	Soil	90	ppm	224.95	10.69
GR 74-6	42431.60764	Soil	90	ppm	204.19	10.14
GR 74-7	42431.60903	Soil	90	ppm	214.63	10.45
GR 74-8	42431.61042	Soil	90	ppm	197.59	10.03
GR 74-9	42431.61181	Soil	90	ppm	200.13	10.15
GR 75-1	42432.45069	Soil	90	ppm	91.08	6.89
GR 75-2	42432.45208	Soil	90	ppm	99.42	7.36
GR 75-3	42432.45347	Soil	90	ppm	89.63	6.69
GR 75-4	42432.45556	Soil	90	ppm	101.42	7.34
GR 75-5	42432.45694	Soil	90	ppm	99.83	7.49

GR 75-6	42432.45833	Soil	90	ppm	98.45	7.3
GR 75-7	42432.46042	Soil	90	ppm	105.97	7.63
GR 75-8	42432.46181	Soil	90	ppm	102.85	7.61
GR 75-9	42432.46389	Soil	90	ppm	101.21	7.53
GR 76-1	42432.47917	Soil	90	ppm	41.91	5.09
GR 76-2	42432.48056	Soil	90	ppm	38.41	5.24
GR 76-3	42432.48194	Soil	90	ppm	30.12	4.51
GR 76-4	42432.48472	Soil	90	ppm	28.61	4.38
GR 76-5	42432.48611	Soil	90	ppm	46.81	5.58
GR 76-6	42432.4875	Soil	90	ppm	36.75	5.06
GR 76-7	42432.48889	Soil	90	ppm	35.28	5.07
GR 76-8	42432.48958	Soil	90	ppm	33.83	4.94
GR 76-9	42432.49097	Soil	90	ppm	29.77	4.69
GR 77-1	42432.68056	Soil	90	ppm	408.37	13.7
GR 77-2	42432.68333	Soil	90	ppm	316.38	11.31
GR 77-3	42432.68472	Soil	90	ppm	355.35	12.33
GR 77-4	42432.68681	Soil	90	ppm	336.07	11.93
GR 77-5	42432.68819	Soil	90	ppm	426.77	13.79
GR 77-6	42432.68958	Soil	90	ppm	468.66	14.67
GR 77-7	42432.69097	Soil	90	ppm	438.66	14.08
GR 77-8	42432.69236	Soil	90	ppm	416.27	13.78
GR 77-9	42432.69375	Soil	90	ppm	413.28	13.66
GR 78-1	42431.73056	Soil	90	ppm	2226.11	34.95
GR 78-2	42431.73125	Soil	90	ppm	1971.49	31.52
GR 78-3	42431.73264	Soil	90	ppm	2049.68	32.28
GR 78-4	42431.73403	Soil	90	ppm	2358.55	36.32
GR 78-5	42431.73542	Soil	90	ppm	1658.5	27.06
GR 78-6	42431.73681	Soil	90	ppm	2383.02	36.07
GR 78-7	42431.73819	Soil	90	ppm	2396.58	36.38
GR 78-8	42431.73958	Soil	90	ppm	2337.18	36.46
GR 78-9	42431.74097	Soil	90	ppm	2411.21	36.23
GR 79-1	42430.79722	Soil	90	ppm	953.86	21.31
GR 79-2	42430.79861	Soil	90	ppm	845.17	19.2
GR 79-3	42430.8	Soil	90	ppm	891.92	20.07
GR 79-4	42430.80139	Soil	90	ppm	1045.88	23.17
GR 79-5	42430.80278	Soil	90	ppm	996.9	22.33
GR 79-6	42430.80417	Soil	90	ppm	1057.37	23.5
GR 79-7	42430.80486	Soil	60.97	ppm	1087.93	23.61
GR 79-8	42430.80694	Soil	90	ppm	1175.49	24.64
GR 79-9	42430.80833	Soil	90	ppm	982.2	22.59
GR 8-1	42430.68958	Soil	90	ppm	1754.18	31.59
GR 8-2	42430.69097	Soil	90	ppm	2033.89	34.37
GR 8-3	42430.69236	Soil	90	ppm	1653.69	30.2
GR 8-4	42430.69375	Soil	90	ppm	2039.99	34.58

GR 8-5	42430.69444	Soil	90	ppm	2070.25	34.41
GR 8-6	42430.69583	Soil	90	ppm	2034.5	34.09
GR 8-7	42430.69722	Soil	90	ppm	1827.03	31.82
GR 8-8	42430.69861	Soil	90	ppm	1967.78	33.44
GR 8-9	42430.7	Soil	90	ppm	1894.57	33.11
GR 80-1	42431.75347	Soil	90	ppm	117.05	7.27
GR 80-2	42431.75486	Soil	90	ppm	134.52	7.74
GR 80-3	42431.75694	Soil	90	ppm	125.75	7.57
GR 80-4	42431.75833	Soil	90	ppm	148.3	8.55
GR 80-5	42431.76042	Soil	90	ppm	148.45	8.49
GR 80-6	42431.76181	Soil	90	ppm	151.82	8.81
GR 80-7	42431.76319	Soil	90	ppm	152.24	8.83
GR 80-8	42431.76458	Soil	90	ppm	146.47	8.34
GR 80-9	42431.76597	Soil	90	ppm	148.4	8.68
GR 9-1	42425.62917	Soil	90	ppm	1928.44	34.06
GR 9-2	42425.63125	Soil	90	ppm	1940.57	33.53
GR 9-3	42425.63264	Soil	90	ppm	2247.51	37.38
GR 9-4	42425.63403	Soil	90	ppm	2399.63	38.81
GR 9-5	42425.63611	Soil	90	ppm	1825.74	33.18
GR 9-6	42425.6375	Soil	90	ppm	2089.47	35.38
GR 9-7	42425.63958	Soil	90	ppm	2029.31	34.57
GR 9-8	42425.64097	Soil	90	ppm	1993.28	34.18
GR 9-9	42425.64306	Soil	90	ppm	2361.4	37.05
HS03-1	42437.84097	Soil	90	ppm	448.21	15.37
HS03-2	42437.84236	Soil	90	ppm	424.75	14.98
HS03-3	42437.84375	Soil	90	ppm	557.02	16.52
HS03-4	42437.84514	Soil	90	ppm	375.05	13.82
HS03-5	42437.84653	Soil	90	ppm	591.97	17.32
HS03-6	42437.84792	Soil	90	ppm	1289.99	28.76
HS03-7	42437.84931	Soil	90	ppm	573.29	17.39
HS03-8	42437.85069	Soil	90	ppm	1067.55	25.64
HS03-9	42437.85208	Soil	90	ppm	901.17	22.86
HS04-1	42431.92222	Soil	90	ppm	1177.04	24.29
HS04-2	42431.92431	Soil	90	ppm	1190.83	24.65
HS04-3	42431.92639	Soil	90	ppm	1332.81	25.94
HS04-4	42431.93542	Soil	90	ppm	1247.79	25.09
HS04-5	42431.93681	Soil	90	ppm	1205.53	24.49
HS04-6	42431.93819	Soil	90	ppm	1153.52	24.02
HS04-7	42431.94028	Soil	90	ppm	1178.09	24.43
HS04-8	42431.94167	Soil	90	ppm	1261.66	25.11
HS04-9	42431.94653	Soil	90	ppm	1228.62	32.19
HS05-1	42437.87014	Soil	90	ppm	459.98	15.28
HS05-2	42437.87222	Soil	90	ppm	177.25	9.81
HS05-3	42437.87361	Soil	90	ppm	290.81	12

HS05-4	42437.875	Soil	90	ppm	211.77	10.46
HS05-5	42437.87639	Soil	90	ppm	256.74	11.59
HS05-6	42437.87778	Soil	90	ppm	265.48	11.93
HS05-7	42437.87917	Soil	90	ppm	315.77	12.87
HS05-8	42437.88056	Soil	90	ppm	165.16	9.48
HS05-9	42437.88194	Soil	90	ppm	217.14	10.78
HS1-1	42431.58472	Soil	90	ppm	2117.96	34.16
HS1-2	42431.58681	Soil	90	ppm	2145.45	34.33
HS1-3	42431.58819	Soil	90	ppm	2066.97	33.83
HS1-4	42431.58958	Soil	90	ppm	2160.79	34.53
HS1-5	42431.59097	Soil	90	ppm	2172.37	35.11
HS1-6	42431.59236	Soil	90	ppm	2053.06	33.88
HS1-7	42431.59375	Soil	90	ppm	2235.67	35.37
HS1-8	42431.59514	Soil	90	ppm	1876.19	31.94
HS1-9	42431.59583	Soil	90	ppm	2063.69	33.65
HS10-1	42431.96667	Soil	90	ppm	7153.69	66.34
HS10-1	42431.96944	Mining	90	ppm	7260.08	81.32
HS10-2	42431.97222	Mining	90	ppm	12663.84	153.55
HS10-3	42431.97431	Mining	90	ppm	8728.34	97.16
HS10-4	42431.97569	Mining	90	ppm	10688.88	124.24
HS10-5	42431.97847	Mining	90	ppm	14372.71	175.73
HS10-6	42431.98194	Mining	90	ppm	14699.58	181.26
HS10-7	42431.98403	Mining	90	ppm	12692.84	155.62
HS10-8	42431.98542	Mining	90	ppm	13115.97	160.81
HS10-9	42431.98681	Mining	90	ppm	5687.63	62.4
HS11-1	42431.61458	Soil	90	ppm	17264.36	146.31
HS11-2	42431.61667	Soil	90	ppm	16711.29	141.66
HS11-3	42431.61806	Soil	90	ppm	14871.61	132.11
HS11-4	42431.61944	Soil	90	ppm	16183.33	138.08
HS11-5	42431.62083	Soil	90	ppm	16435.17	139.75
HS11-6	42431.62222	Soil	90	ppm	15230.99	133.53
HS11-7	42431.62361	Soil	90	ppm	15757.99	133.58
HS11-8	42431.625	Soil	90	ppm	18027.12	148.02
HS11-9	42431.62639	Soil	90	ppm	15748.15	134.36
HS11-M1	42431.64722	Mining	90	ppm	14738.97	197.71
HS11-M2	42431.64931	Mining	90	ppm	12885.22	168.82
HS11-M3	42431.65069	Mining	90	ppm	13506.19	178.21
HS11-M4	42431.65208	Mining	90	ppm	14663.09	196.18
HS11-M5	42431.65347	Mining	90	ppm	15307.09	204.68
HS11-M6	42431.65486	Mining	90	ppm	14393.59	190.89
HS11-M7	42431.65625	Mining	90	ppm	14818.26	195.95
HS11-M8	42431.65764	Mining	90	ppm	15209.21	201.14
HS11-M9	42431.65903	Mining	90	ppm	14295.58	187.49
HS2-1	42432.56111	Soil	90	ppm	1762.67	31.37

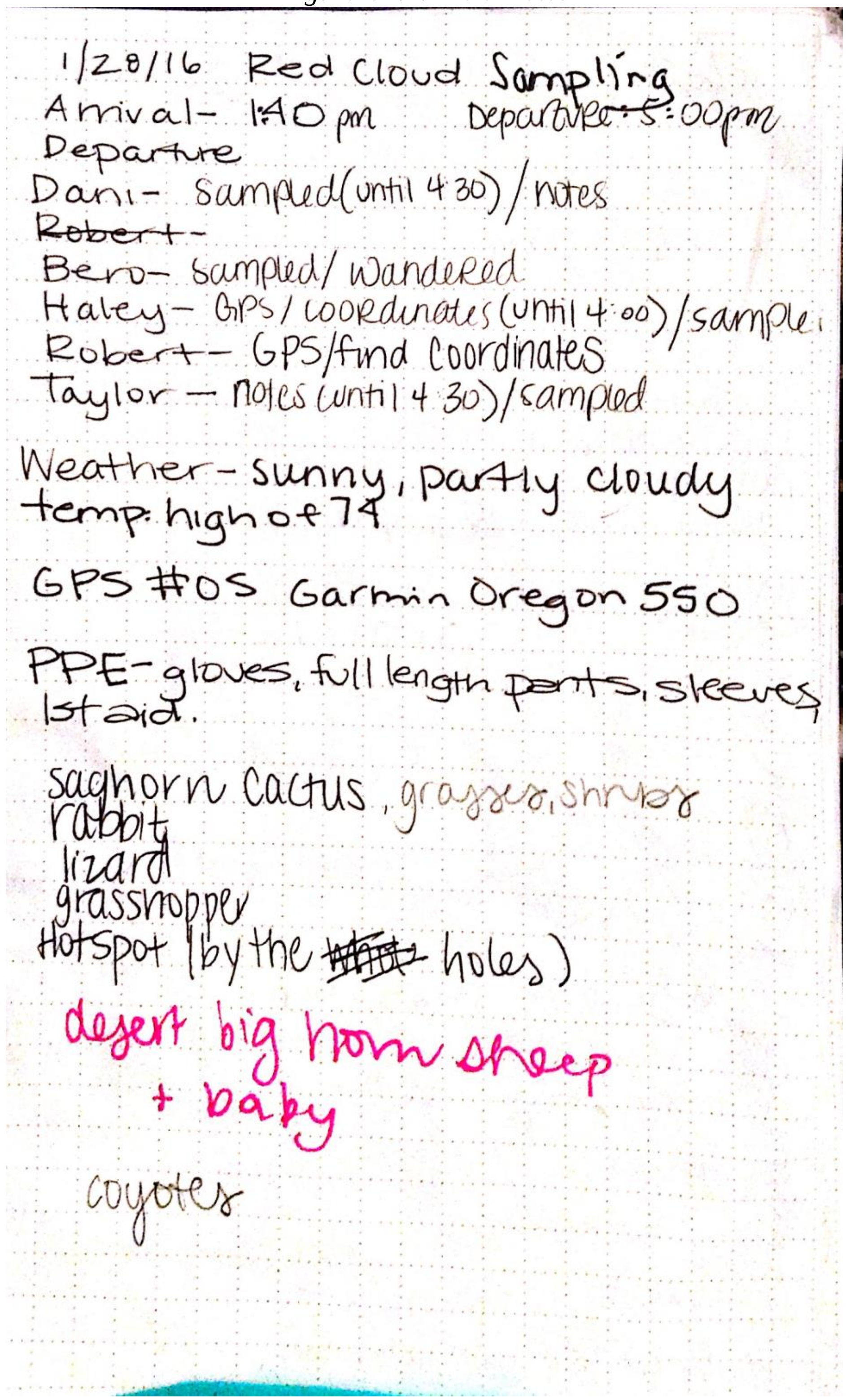
HS2-2	42432.5625	Soil	90	ppm	1965.99	33.14
HS2-3	42432.56389	Soil	90	ppm	1096.83	21.88
HS2-4	42432.56528	Soil	90	ppm	1165.41	21.56
HS2-5	42432.56667	Soil	90	ppm	1965.58	32.8
HS2-6	42432.56806	Soil	90	ppm	1295.11	24.79
HS2-7	42432.56944	Soil	90	ppm	1101.02	21.08
HS2-8	42432.57083	Soil	90	ppm	1117.89	22.12
HS2-9	42432.57222	Soil	90	ppm	1566.12	27.95
HS6-1	42430.58958	Soil	90	ppm	506.52	16.23
HS6-2	42430.59097	Soil	90	ppm	608.01	18.1
HS6-3	42430.59236	Soil	90	ppm	826.35	21.06
HS6-4	42430.63958	Soil	90	ppm	561.57	16.4
HS6-5	42430.64097	Soil	90	ppm	506.64	15.03
HS6-6	42430.64236	Soil	90	ppm	568.28	15.71
HS6-7	42430.64375	Soil	90	ppm	737.27	19.03
HS6-8	42430.64444	Soil	90	ppm	538.91	16.17
HS6-9	42430.64583	Soil	90	ppm	447.71	13.72
HS7-1	42431.66111	Soil	90	ppm	2832.85	40.7
HS7-2	42431.6625	Soil	90	ppm	2986.4	41.69
HS7-3	42431.66389	Soil	90	ppm	2985.54	42.19
HS7-4	42431.66528	Soil	90	ppm	2929.08	41.23
HS7-5	42431.66667	Soil	90	ppm	3027.8	41.94
HS7-6	42431.66806	Soil	90	ppm	3035.88	42.21
HS7-7	42431.66944	Soil	90	ppm	2970.65	41.42
HS7-8	42431.67083	Soil	90	ppm	3164.38	43.5
HS7-9	42431.67222	Soil	90	ppm	3041.47	42.39
HS8-1	42431.78403	Soil	90	ppm	325.51	12.6
HS8-2	42431.82847	Soil	90	ppm	373.22	13.18
HS8-3	42431.82986	Soil	90	ppm	5.18	2.19
HS8-4	42431.83125	Soil	90	ppm	329.93	12.39
HS8-5	42431.83194	Soil	90	ppm	347.05	12.58
HS8-6	42431.83333	Soil	90	ppm	224.05	9.75
HS8-7	42431.83542	Soil	90	ppm	365.95	13.22
HS8-8	42431.83611	Soil	90	ppm	285.28	11.37
HS8-9	42431.8375	Soil	90	ppm	287.33	10.97
HS9-1	42424.63542	Soil	90	ppm	6202.4	68.36
HS9-2	42424.64444	Mining	90	ppm	5762.39	75.36
HS9-3	42424.64653	Mining	90	ppm	5907.42	76.63
HS9-4	42424.64792	Mining	90	ppm	6279	82.42
HS9-5	42424.65	Mining	90	ppm	5368.34	70.84
HS9-6	42424.65208	Mining	90	ppm	5990.17	76.81
HS9-7	42424.65347	Mining	90	ppm	5623.86	71.54
HS9-8	42424.65556	Mining	90	ppm	5857.06	75.91
HS9-9	42424.65764	Mining	90	ppm	5327.9	68.24

Table B1.2: XRF vs AA DATA

Sample ID	AA data	XRF
BK2	84.96221	102.92
BK3	16.76913	29.15
DW81	1705.76	1535.38
GR6	517.928	556.6
GR8	2170.25	1935.99
GR10	326.9103	280.68
GR12	2361.483	1883.43
GR30	397.0971	407.17
GR32	702.9891	567.28
GR34	583.4995	424.16
GR55	2097.329	1785.36
GR62	1560.728	2388.82
GR67	2199.247	1494.3
GR73	945.5227	748.52
GR70	84.14031	89.56
GR77	529.516	399.25
HS2	2941.355	1424.83
HS5	1279.64	247.85
HS7	3536.676	2996.69
HS11	13353.81	14517.84

APPENDIX C: FIELD NOTES AND PHOTO LOG

Figure C1.1: Field Notes



1/28/16 Red Cloud Sampling
Arrival- 1:40 pm Departure: 5:00pm
Departure
Dani- sampled (until 4 30) / notes
~~Robert-~~
Bero- sampled / wandered
Haley- GPS / coordinates (until 4:00) / sample
Robert- GPS / find coordinates
Taylor - notes (until 4 30) / sampled

Weather - sunny, partly cloudy
temp: high of 74

GPS #05 Garmin Oregon 550

PPE - gloves, full length pants, sleeves
1st aid.

saghorn cactus, grasses, shrubs
rabbit
lizard
grasshopper
Hotspot (by the holes)
desert big horn sheep
+ baby

coyotes

#2 should be under the tree (just south)

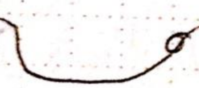
1-13 all wash

wash- large rocks removed
14 side of wash more silty
not a lot of veg.
wild burros - feces / tracks
(15) on top of ridge pretty rocky
(16) " pretty rocky
(17) in wash
(18) in wash
(19) in wash
(20) Big pile of rocks, on hillside of wash - super rocky (tay)
(21) on top of Ridge - next to Road
(22) In wash
(23) in wash ~~[illegible]~~
(24) in wash
(25) to the side - in a side wash

(26) on top of hillside - rocky

(27) on hillside

Labeling HS-Hotspot BK-background
GR-GRID
Arrive Leave
1/29/16 Day 2 815 330
30,35,40,45 soil is slightly damp all on
hill side of wash



Haley & Robert → Finishing grid
Kelsey → note taking and pictures
Tay & Dani → bagging samples
Bero → bagging samples, identifying
hotspots

(28) Middle of wash, more organics
3 twn 2 trees

(27) onhillside, Rocky

(34) middle of wash, near Burro scat.

(29) under a tree, sidewash

(39) sidewash,
9:15

30?
35?
40?

(31) in a side ~~wash~~ drainage, small Rocks

(32) side of wash, in drainage spot

(33) middle of wash

(36) in side drainage into wash

(37) middleish of wash, small rocks

(38) Under tree, damp soil, middle of wash

(41) side of hill, rocky,

(42) Middle of wash, btwn trees

(43) Rocky, middle wash

(44) Silty/clayey, side wash ****see notes**

(47) Top of hillside 4/5.?

(49) Top of hillside, extremely rocky

(48) side gulch on hill

(46) on hillside of gulch next to wash

(81) & (82) Down the wash, off grid

(51) in wash (50) middle of water(?) wash

(52) bank top soil Rocky-fine underneath

(50) →

(53) on the bank

(54) middle of steep bank

(55) side of wash under tree next to hill

(56) in middle of wash

(57) bush a little west - slightly rocky

(58) in wash

(59) rocky, top of hill by road

(60) ~~on~~ low bank

(61) in wash

(62) } in wash
(63)

(64) behind dead tree - silty

(65) on bank towards top

(66) } in wash
(67)
(68)

(69) in wash

(70) on bank

(71) @ base of cliff Rocks/soil falling off

(72) in the wash.

(73) under a bush (1pm R)

(74) in the wash. (1pm Dr. B)
silty.

(75) next to road, covered in rocks

(76) crazy on ledge - soil/water coming off

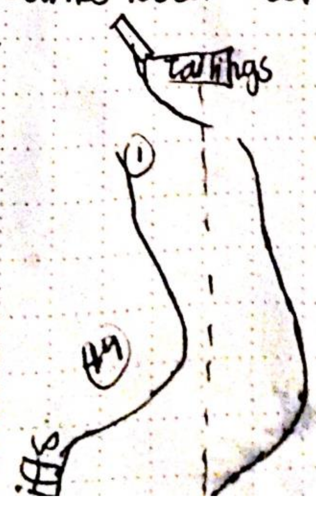
(77)

(78)

(79) middle of wash very rocky

(80)

* wash comes straight down from tailings (1-44) and then curves to lookers (at tailings) Right. Banks back left → then straight North @ 60.



HS 1 N 33° 5.773' W 114° 35.917'
Kels in the wash, close to source, water may pool
HS2 N 5.783' W 35.932'
Dani middle of ~~stream~~ wash by a bend.
HS3 N 5.791 W 35.915
Kels " "
HS 4 N 5.~~7~~94 W 35.919
Taylor 1:30
HS5 N 5.805' W .919
Dani (Rocky) cliffs on all sides, narrow toward top of wash
HS 6 N 5.812 W .924
Kels, further up the narrow wash by the pilings
HS 7 N 5.800 W 35.897
TAY more moist soil, further up in a little dip
HS 8 N .817 W .898
Dani two primary drains from tailings pile in corner
HS 9 N .882 W .85.3
K very close to tailings
HS 10 N ·33°5.869 W 114° 35.839

HS 11 N 33°05.86 W 114° 35.835
composite of middle + side of wash
HS 12 N W

104

Figure C1.2: Photo Log

Black Rock Wash PA/SI Photo log - Grid Samples (GR)		**Location: Black Rock Wash, AZ**
Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

GR 1

GR 2

GR 3

GR 4

Location: Black Rock Wash, AZ
Date Photos Taken: Jan 30, 2016 Photographer: Haley Michael
Camera: Canon PowerShot

GR 5

GR 6

GR 7

GR 8

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael


GR 9


GR 10


GR 11


GR 12

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 13

GR 14

GR 15

GR 16

Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

GR 17

GR 18

GR 19

GR 20

Black Rock Wash PA/SI Photo log - Grid Samples (GR) | **Southwest Sites Consulting**

Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

GR 21

GR 22

GR 23

GR 24

Black Rock Wash PA/SI Photo log - Grid Samples (GR) | **Southwest Sites Consulting**

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 25

GR 26

GR 27

GR 28

Location: Black Rock Wash, AZ	Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016 Photographer: Haley Michael	

GR 29

GR 30

GR 31

GR 32

Black Rock Wash PA/SI Photo log - Grid Samples (GR)

Location: Black Rock Wash, AZ

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 33

GR 34

GR 35

GR 36

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 37

GR 38

GR 39

GR 40

Black Rock Wash PA/SI Photo log - Grid Samples (GR)

Location: Black Rock Wash, AZ

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael


GR 41


GR 42


GR 43


GR 44

Black Rock Wash PA/SI Photo log - Grid Samples (GR) **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 45

N/A

GR 46

GR 47

GR 48

Black Rock Wash PA/SI Photo log - Grid Samples (GR) **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 49

GR 50

GR 51

GR 52

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 53

GR 54

GR 55

GR 56

Black Rock Wash PA/SI Photo log - Grid Samples (GR)	**Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 57

GR 58

GR 59

GR 60

Black Rock Wash PA/SI Photo log - Grid Samples (GR) **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

GR 61

GR 62

GR 63

GR 64

Black Rock Wash PA/SI Photo log - Grid Samples (GR) | **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ | Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016 | Photographer: Haley Michael

GR 65


GR 66


GR 67

GR 68

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

GR 69

GR 70

N/A

GR 71

GR 72

Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

 GR 73	 GR 74
GR 75	 GR 76

Black Rock Wash PA/SI Photo log - Grid Samples (GR) **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

GR 77

GR 78


GR 79

GR 80

Black Rock Wash PA/SI Photo log -Hot Spot Samples (HS) **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ

Camera: Canon PowerShot

Date Photos Taken: Jan 30, 2016

Photographer: Haley Michael

HS 1

HS 2

HS 3

HS 4

Location: Black Rock Wash, AZ		Camera: Canon PowerShot
Date Photos Taken: Jan 30, 2016	Photographer: Haley Michael	

HS 5

HS 6

HS 7

N/A

HS 8

Location: Black Rock Wash, AZ
Date Photos Taken: Jan 30, 2016
Photographer: Haley Michael
Camera: Canon PowerShot

HS 9

HS 10

HS 11

NONE

Black Rock Wash PA/SI Photo log -Down Wash Samples (DW) **Location: Black Rock Wash, AZ**

Location: Black Rock Wash, AZ
Date Photos Taken: Jan 30, 2016 Photographer: Robert Reny
Camera: Iphone

DW 1

DW2

Location: Black Rock Wash, AZ

Camera: Iphone

Date Photos Taken: Jan 30, 2016

Photographer: Robert Reny

 BK 1	**N/A** BK 2
 BK 3	

APPENDIX D: LEAD MODEL DATA

Table D1.1: Grid and Downwash Model Data

		NHANES 1999-2004		NHANES III Phase 1 and 2
Scenario	**PbB geometric mean (ug/dL)**	**Probability that fetal PbB > PbBt, assuming lognormal distribution**	**PbB geometric mean (ug/dL)**	**Probability that fetal PbB > PbBt, assuming lognormal distribution**
Adult Worker				
Roger (330 days)				
95% (2048 ppm)	5.4	11.20%	5.9	20.00%
50% (401 ppm)	1.9	10.00%	2.4	1.90%
Other (150)				
95% (2048 ppm)	1.4	0.00%	1.9	90.00%
50% (401 ppm)	1.6	0.90%	1.6	0.90%
Adult Recreational				
High use (20 days)				
95% (2048 ppm)	1.3	0.00%	1.8	70.00%
50% (401 ppm)	1.1	0.00%	1.6	40.00%
Average Use (6 days)				
95% (2048 ppm)	1.1	0.00%	1.6	40.00%
50% (401 ppm)	1	0.00%	1.5	0.40%
Child Data from IEUBK model				
High use (20 days)				
95% (2048 ppm)				
.5-1 year	11			

1-2 year	3			
2-3 year	7.1			
3-4 year	8.1			
4-5 year	3.6			
5-6 year	1.7			
6-7 year	1.4			
50% (401 ppm)				
.5-1 year	1.1			
1-2 year	1.2			
2-3 year	1.1			
3-4 year	1			
4-5 year	0.8			
5-6 year	0.8			
6-7 year	0.8			
Average Use (7 days)				
95% (2048 ppm)	1.3			
.5-1 year	1.4			
1-2 year	1.5			
2-3 year	1.4			
3-4 year	1.3			
4-5 year	1.1			
5-6 year	1			
6-7 year	1			
50% (401 ppm)	1.25			
.5-1 year	0.9			
1-2 year	1			
2-3 year	0.9			
3-4 year	0.9			
4-5 year	0.8			
5-6 year	0.8			
6-7 year	0.7			

Table D1.2: Hot spot Model Data

		NHANES 1999		NHANES Phase III		
Scenario	**PbB geometric mean (ug/dL)**	**Probability that fetal PbB > PbBt, assuming lognormal distribution**	**PbB geometric mean (ug/dL)**	**Probability that fetal PbB > PbBt, assuming lognormal distribution**		
Adult Worker						
Roger						
95%	26.5	93.00%	27	88.40%		
50%	2	20.00%	2.5	2.20%		
Other (150)						
95%	12.6	58.40%	13.1	58.70%		
50%	2.7	0.70%	3.2	4.50%		
Adult Recreational						
High use (20 days)						
95%	2.5	0.60%	3	4.10%		
50%	1.2	0.00%	1.7	0.60%		
Average Use (6 days)						
95%	1.5	0.00%	2	1.00%		
50%	1.1	0.00%	1.6	0.40%		
Child Data from IEUBK model						
High use (20 days)						
95%						
.5-1 year	7.4					
1-2 year	8.6					
2-3 year	8.1					

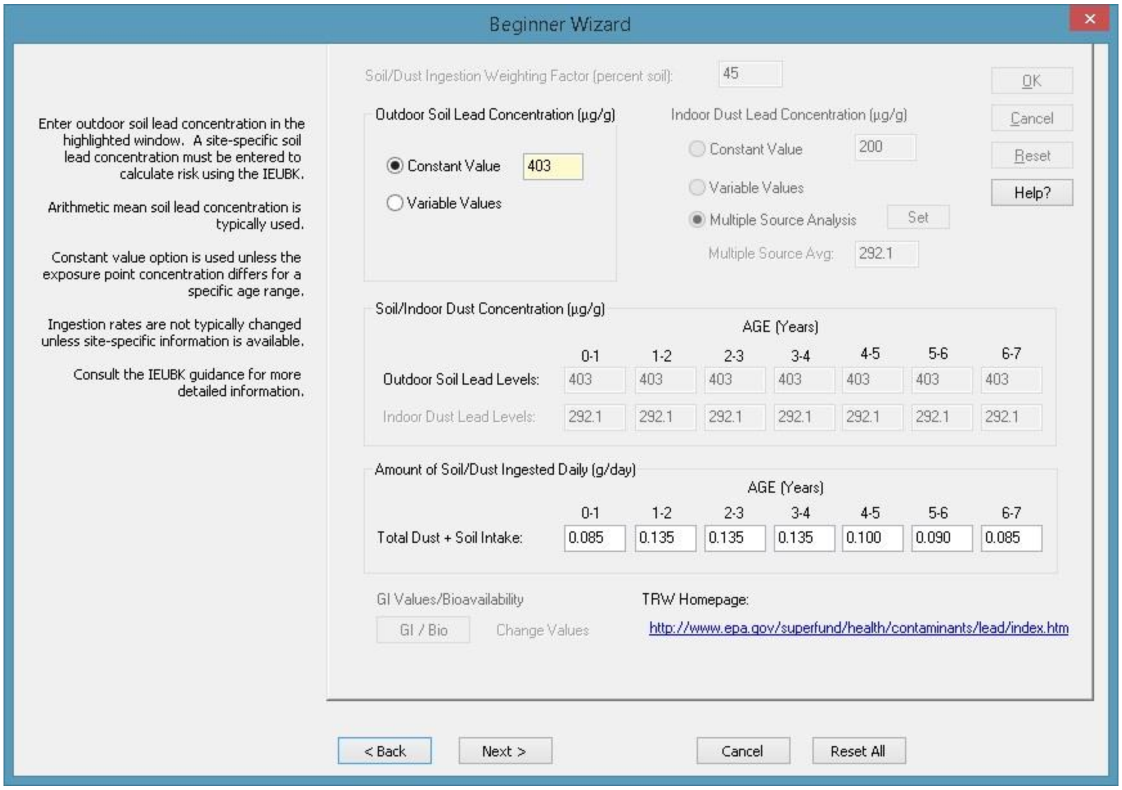
3-4 year	7.7					
4-5 year	6.4					
5-6 year	5.2					
6-7 year	4.5					
50%						
.5-1 year	1.9					
1-2 year	2.1					
2-3 year	2					
3-4 year	1.9					
4-5 year	1.6					
5-6 year	1.4					
6-7 year	1.3					
Average Use (7 days)						
95%						
.5-1 year	1.3					
1-2 year	1.3					
2-3 year	1.3					
3-4 year	1.2					
4-5 year	1					
5-6 year	0.9					
6-7 year	0.9					
50%						
.5-1 year	3.7					
1-2 year	4.1					
2-3 year	14.4					
3-4 year	7.1					
4-5 year	3					
5-6 year	2.5					
6-7 year	2.3					

Table D1.3: All Model Data

Scenario	PbB geometric mean (ug/dL)	Probability that fetal PbB > PbBt, assuming lognormal distribution	PbB geometric mean (ug/dL)	Probability that fetal PbB > PbBt, assuming lognormal distribution	
Adult Worker					
Roger (330 days)					
95%	10.5	45.90%	11	49.20%	
50%	2.2	1.90%	2.2	1.90%	
Other (150)					
95%	5.3	10.40%	4.05	10.20%	
50%	1.4	0.00%	5.8	19.00%	
Adult Recreational					
High use (20 days)					
95%	1.6	0.00%	2.1	1.20%	
50%	1.1	0.00%	1.6	0.40%	
Average Use (6 days)					
95%	1.2	0.00%	1.7	0.50%	
50%	1	0.00%	1.6	0.40%	
Child Data from IEUBK model					
High use (20 days)					
95%					
.5-1 year	3.5				
1-2 year	4.1				
2-3 year	3.8				
3-4 year	3.6				
4-5 year	3				

5-6 year	2.4				
6-7 year	2.2				
50%					
.5-1 year	1.2				
1-2 year	1.2				
2-3 year	1.1				
3-4 year	1				
4-5 year	0.8				
5-6 year	0.8				
6-7 year	0.8				
Average Use (7 days)					
95%					
.5-1 year	2				
1-2 year	2.1				
2-3 year	2				
3-4 year	1.9				
4-5 year	1.5				
5-6 year	1.4				
6-7 year	1.3				
50%					
.5-1 year	1				
1-2 year	1				
2-3 year	0.9				
3-4 year	0.9				
4-5 year	0.8				
5-6 year	0.8				
6-7 year	0.7				

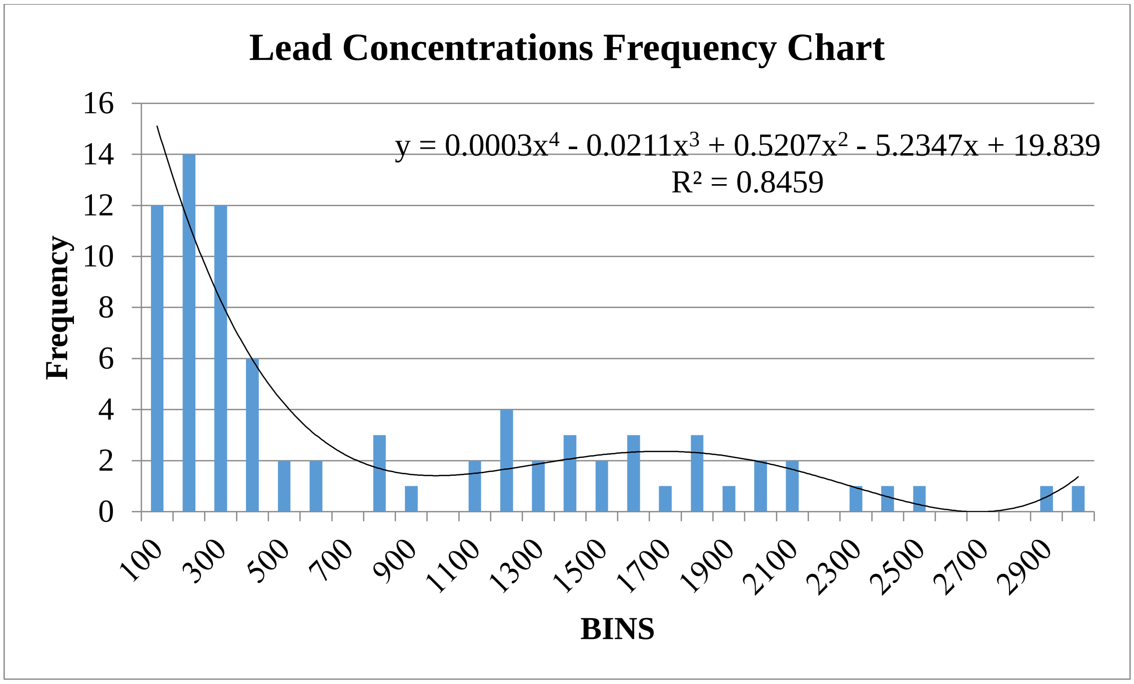
Figure D1.1: Child Lead Model



Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	ug/g or ppm	407	407
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	2.1
PbB_0	Baseline PbB	ug/dL	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	150	330
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.4**	**2.4**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.3	7.3
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.0%**	**1.9%**

APPENDIX E: LEAD CONCENTRATION FREQUENCY CHART

Figure E1.1: Lead Concentrations Frequency Lead Model



APPENDIX F: LEAD 50TH AND 95TH CONCENTRATIONS

Grid Samples	Geometric mean	401 ppm
Z score	Standard deviation	777.6 ppm
x=zs+u	x=	1680.234024 ppm
z=1.645 for 95%	Where x=(777.65*1.645)+401	
	95th percentile=	1680.234024 ppm
Grid and Downwash Samples	Geometric mean	407.50 ppm
	Standard Deviation	773.9787584 ppm
	x=	1680.695058 ppm
	95th percentile	1680.695058 ppm
Hot Spot Samples	Geometric Mean	1679.60 ppm
	Standard Deviation	4867.21632 ppm
	x=	9686.170846 ppm
	95th percentile	11751.80721 ppm
ALL	Geometric Mean	452.40 ppm
	Standard Deviation	1984.678615 ppm
	x=	3717.196321 ppm
	95th percentile	4358.406692 ppm

Figure F1.1: Lead 50th and 95th Concentrations