PRELIMINARY ASSESSMENT/SITE INVESTIGATION (PA/SI) ON MINDY MILL

REVIVE AND RESTORE REMEDIATION

CENE 486C

MAY 1ST, 2026

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Figure 1: Revive and Restore Remediation at Undergraduate Symposium

PROJECT INTRODUCTION

Mindy Mill | Yucca, Arizona

34°49’15” N | 114°7’6” W

- Primarily processed silver ore with lead through crushing, grinding, and flotation
- October 1984 – August 1985
  - Evidence that alludes to the mill being opened previously given by client and found on site by Dr. Wilbert Odem
  - Limited documentation to confirm previous activities
- Client: Eric Zielske, Bureau of Land Management (BLM)

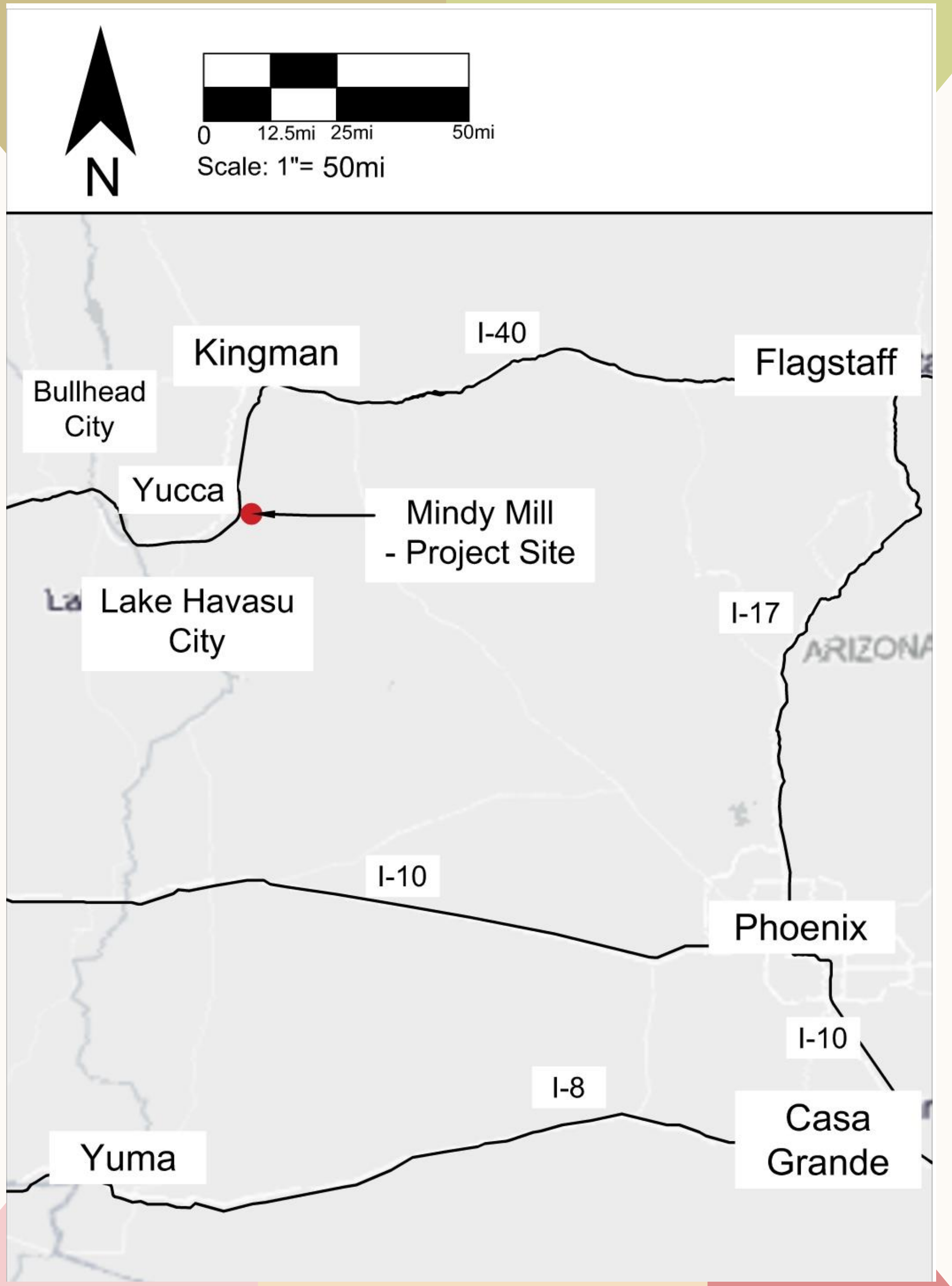


Figure 2: Location Map

WORK PLAN

Sample and Analysis Plan
- Planning for sample locations, sample types, and lab work to be completed

Health and Safety Plan
- Outlined all safety procedures in the field and the lab

Initial Plan: 85 Samples
- 9 Decision Units (DU)
- 42 Grid (DU 1,2,3, 4, 5, & 6), 7 Random (DU 7), 18 Transect (DU 8 & 9), 5 Hotspots, 4 Background, 9 Duplicates

Updated Plan: 66 samples
- 5 Decision Units
- 28 Grid (DU 1, 2), 3 Random (DU 6), 9 Transect (DU 9), 3 Background, 22 Hotspots (Site and DU 4), 4 Duplicates
- DU 4 was created from the hotspots (16) taken in the original DU 4 area and combines DU 6's random samples (3) taken for analysis purposes

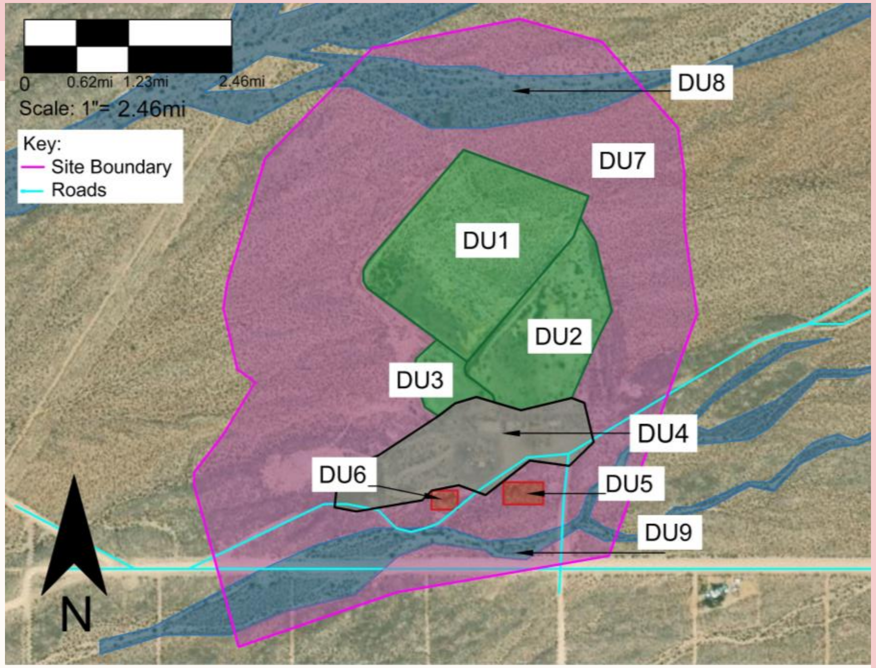


Figure 3: Original Sampling Analysis Map

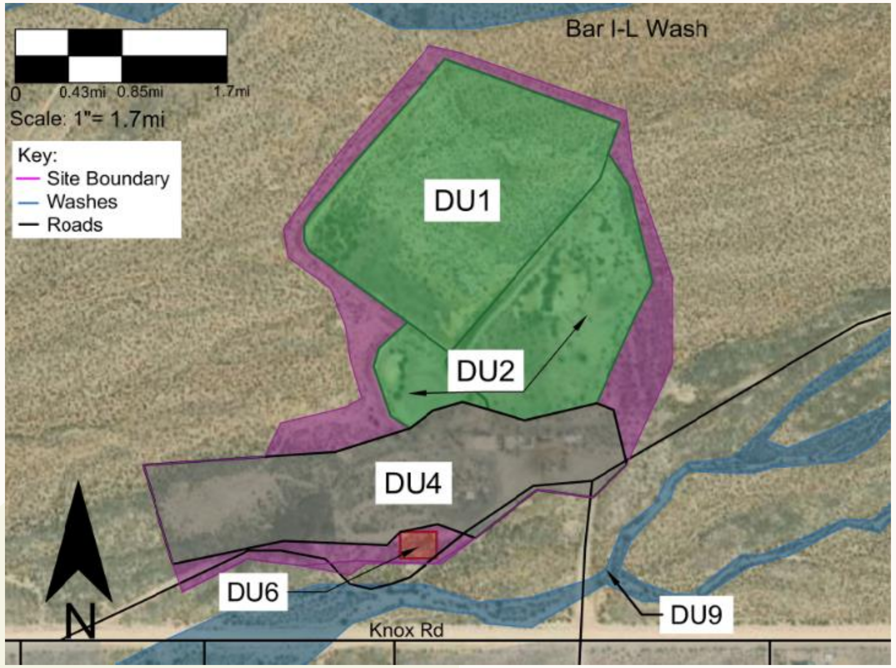


Figure 4: Final Sampling Analysis Map

IN-SITU PROCEDURES

- Soil Sampling Methods
  - Remove the top layer of soil, collect ½-¾ gallons of soil per location, use individual trowels for each individual sample and label accordingly (i.e DU 2-3)
- Perform In-Situ XRF (X-Ray Fluorescence) analysis (seen in Figure 5)
- Document all existing conditions (color, weather, etc.)
  - Survey local flora and fauna

Figure 5: In-Situ XRF Operation

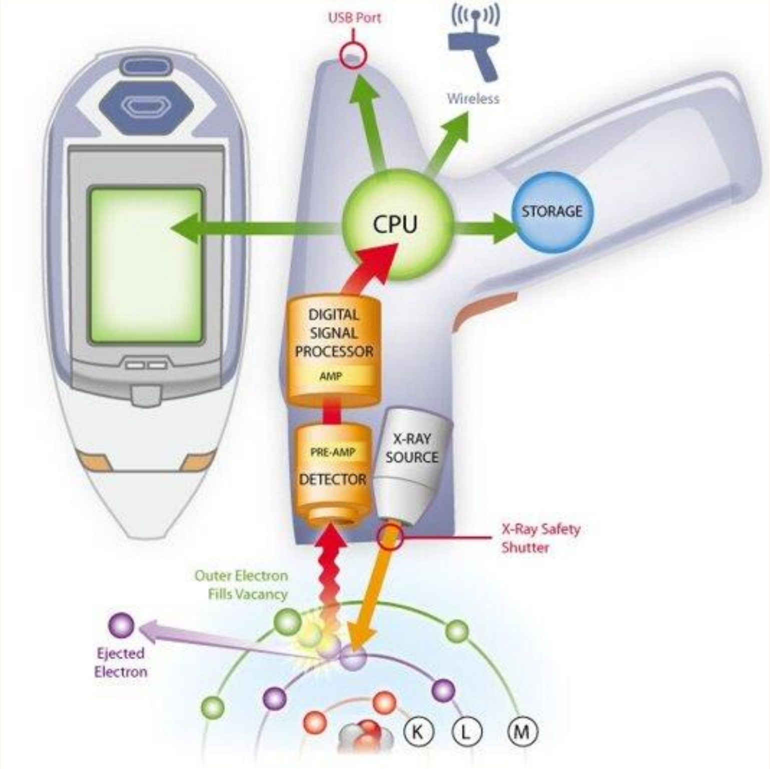


Figure 6: XRF Graphic [37], Thermo Fisher Scientific

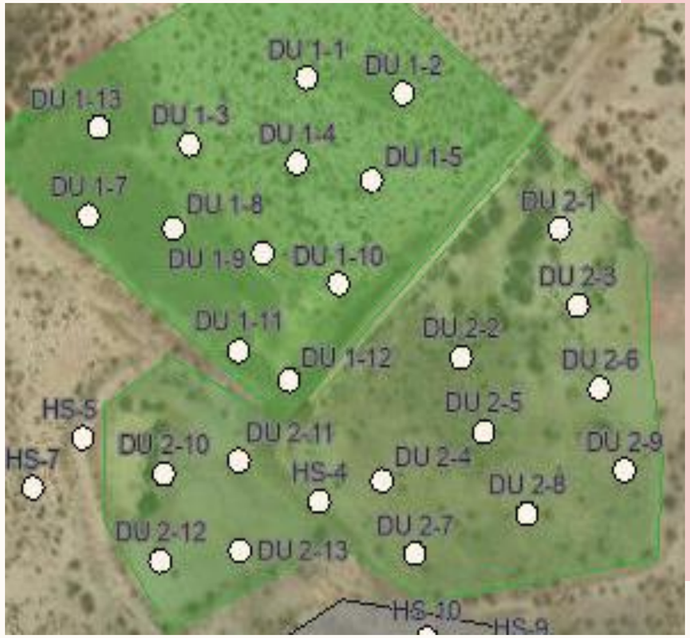


Figure 7: Grid Sample Example

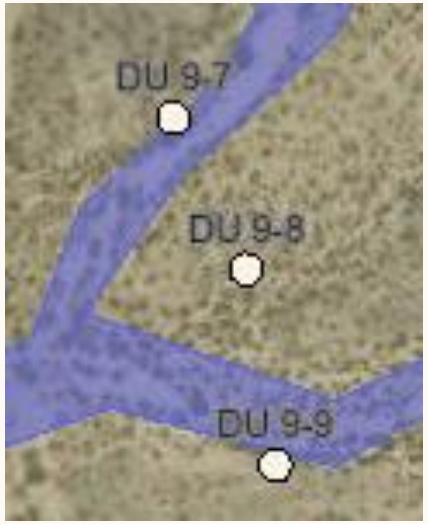


Figure 8: Transect Sample Example

EX-SITU LAB PROCEDURES

Figure 9: Sieving Set-up

- Moisture content
  - ASTM (American Society for Testing and Materials) 2216-98
- Sieving
  - #4, 10, 20, 40-50, 60
  - <75 micrometer particle size
- Sample cup preparation
  - 9 cups per sample
  - 567 cells to analyze
- XRF Screening
  - Niton XL3t GOLDD model
  - EPA (Environmental Protection Agency) Method 6200

Figure 10: Soil Troughs in Drying Oven

Figure 11: Gloria M. Completing Moisture Content Preparations

OUTSOURCED EX-SITU LAB PROCEDURES

Verification is recommended for EPA Method 6200 when the ratio of lead to arsenic is >10:1. With the help of the chemistry department, Dr. Ingram and Anna Shimkus, ICP (Inductively Coupled Plasma) verification was completed for Arsenic.

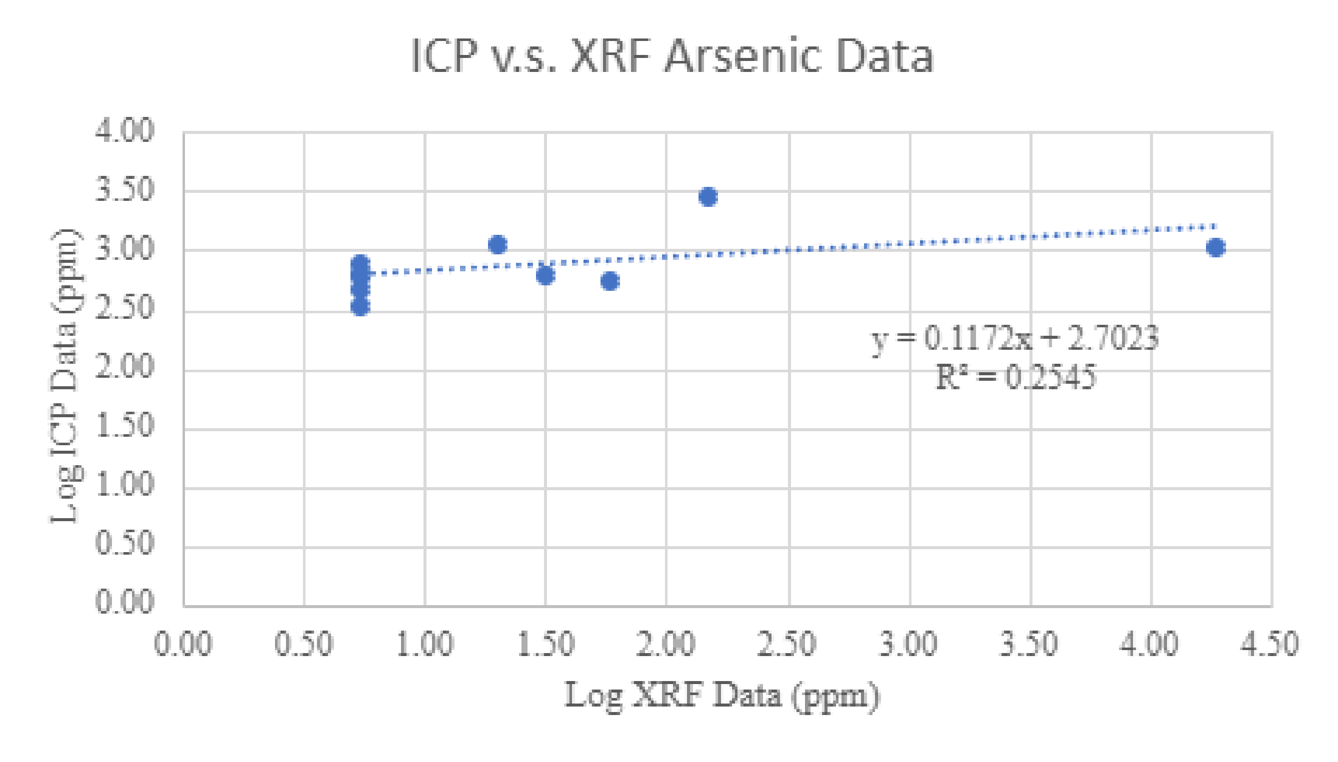


Figure 12: ICP v.s XRF Analysis

- Previous plans for Western Technologies, Inc. for $1,400
- Plans had to change for time challenges
- New plans, Anna completed more at a comparable price ($1,500)

Equation 1: XRF Arsenic Correction Equation

$$y = 10^{(0.1172 \times \log(x) + 2.7023)}$$

Where:
y = Corrected Arsenic Concentration, ppm
x = XRF Arsenic Uncorrected Concentration, ppm

OUTSOURCED EX-SITU LAB PROCEDURES

With the help of Northern Arizona University's Environmental Health and Safety, Michael Joseph Kelly, a Toxicity Characteristic Leaching Procedure (TCLP) was completed

- Results confirm the soil as Hazardous Waste and now falls under the Resource Conservation and Recovery Act (RCRA)
- Minimal leaching overall, with significant lead mobility

Table 1: TCLP Results

Sample ID	Contaminant	Value	Units
Hotspot 12	Lead	1300	mg/L
	Cadmium	0.1	mg/L
Blank 1	Lead	No Detection	N/A
	Cadmium	No Detection	N/A

COC IDENTIFICATION – HUMAN HEALTH (HH)

Table 2: Arizona Regional Screening Levels (RSLs) [1]

AZ RSLs	Pb, ppm
Residential	400
Nonresidential	800

Table 3: 50% and 95% Exposure Point Concentrations (EPCs for Lead (Pb))

DU	Contaminant	n	Mean (50% EPC) (mg/kg)	Standard Deviation	t-value	95% EPC (mg/kg)
1	Pb	12	4,189	2,742	2.20	5,931
2	Pb	13	6,000	2,559	2.18	7,547
4	Pb	19	82,492	221,067	2.10	189,043
9	Pb	9	1,958	1,474	2.31	3,091

Equation 2: Arithmetic Mean Equation

$$50\%EPC = \frac{X_1 + X_2 + \ldots + X_n}{n}$$

Where:
EPC = Exposure Point Concentration
X = Lead or arsenic readings (ppm)
n = Number of readings

COC IDENTIFICATION – HUMAN HEALTH

Table 4: Arizona Regional Screening Levels (RSLs) [1]

AZ RSLs	As, ppm
Residential	10
Nonresidential	10

Table 5: 50% and 95% EPCs for Arsenic (As)

DU	Contaminant	n	Geomean (50% EPC) (mg/kg)	Mean Ln	Standard Deviation Ln	z-value	95% EPC (Cox) (mg/kg)
1	As	12	766	6.64	95.3	1.65	811
2	As	13	634	6.45	50.5	1.65	657
4	As	19	799	6.68	341	1.65	928
9	As	9	624	6.44	23.3	1.65	637

Equation 3: Geometric Mean Equation

$$50\%EPC = \sqrt[n]{(X_1 * X_2 * \cdots * X_{n)}}$$

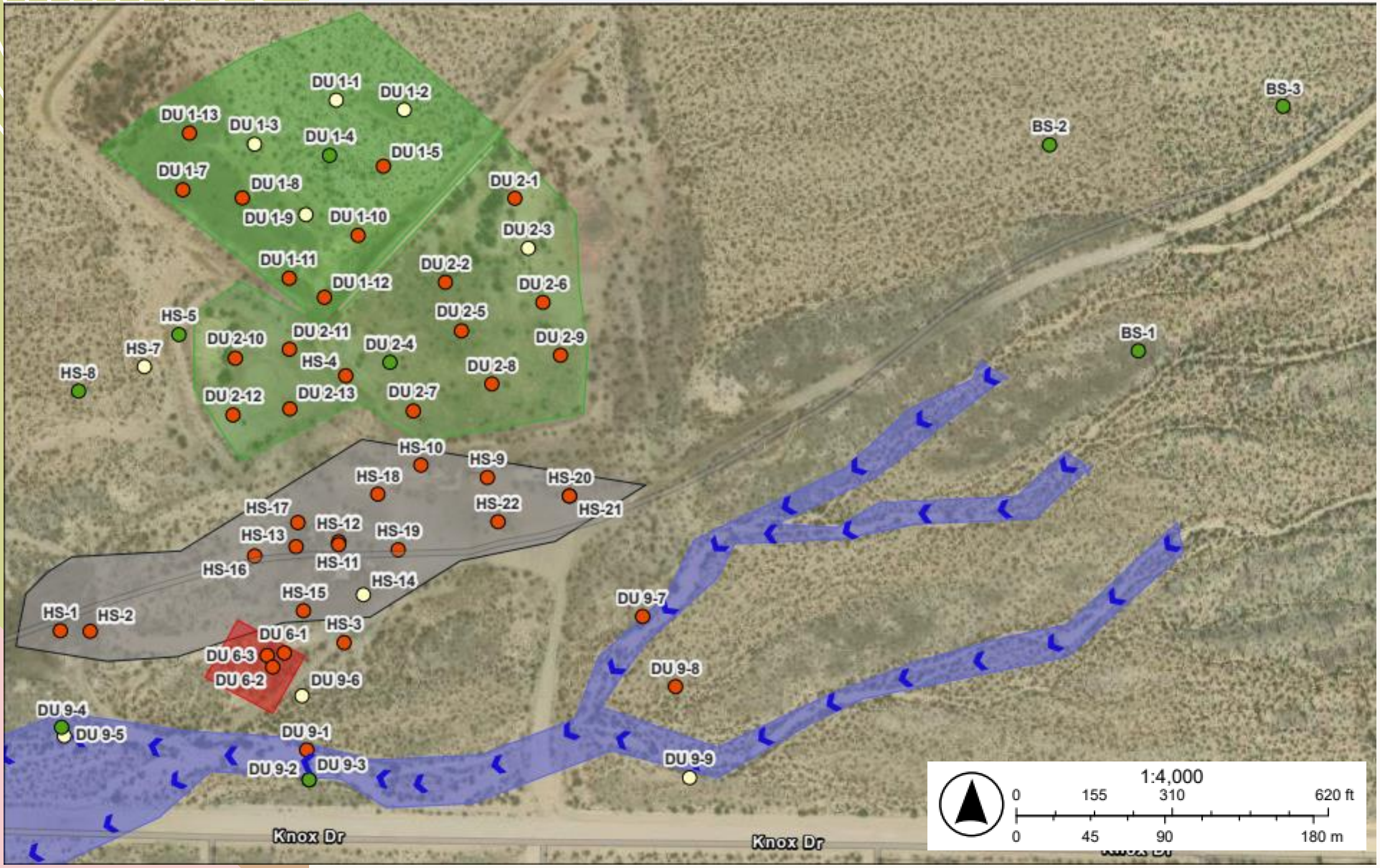
Where:
EPC = Exposure Point Concentration
X = Lead or arsenic readings (ppm)
n = Number of readings

Equation 4: Cox Equation

$$95\%EPC = 50\%EPC + \frac{S^2}{2} + 1.645\sqrt{\frac{S^2}{n} + \frac{S^4}{2(n-1)}}$$

Where:
EPC = Exposure Point Concentration
S = Standard deviation
n = Number of readings

EX-SITU COC MAPPING, LEAD

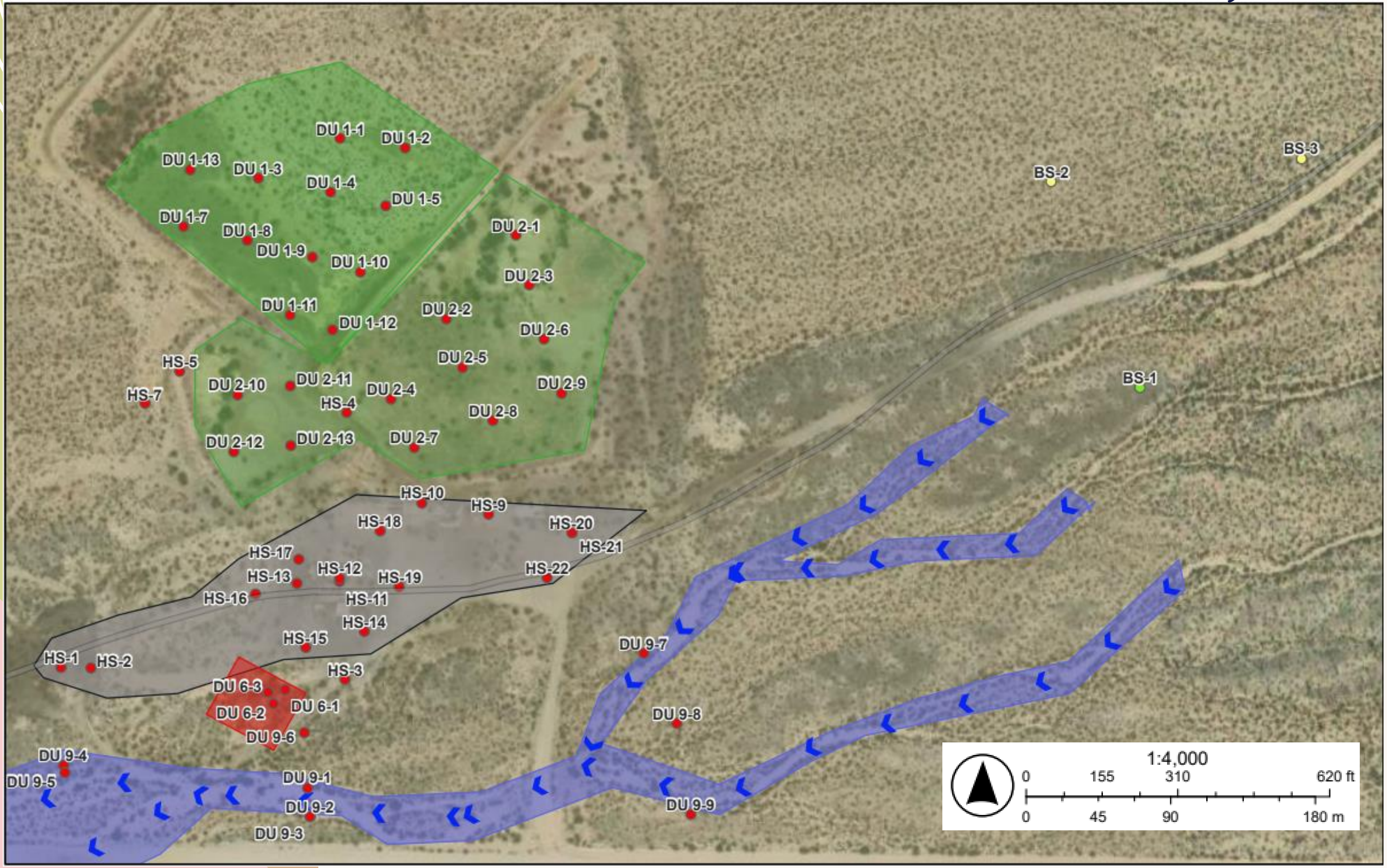


Lead Key (ppm):

- 0-800
- 800-2,400
- >2,400

Figure 13: Ex-Situ Lead Data Map, Featuring Map Key (Right)

EX-SITU COC MAPPING, ARSENIC

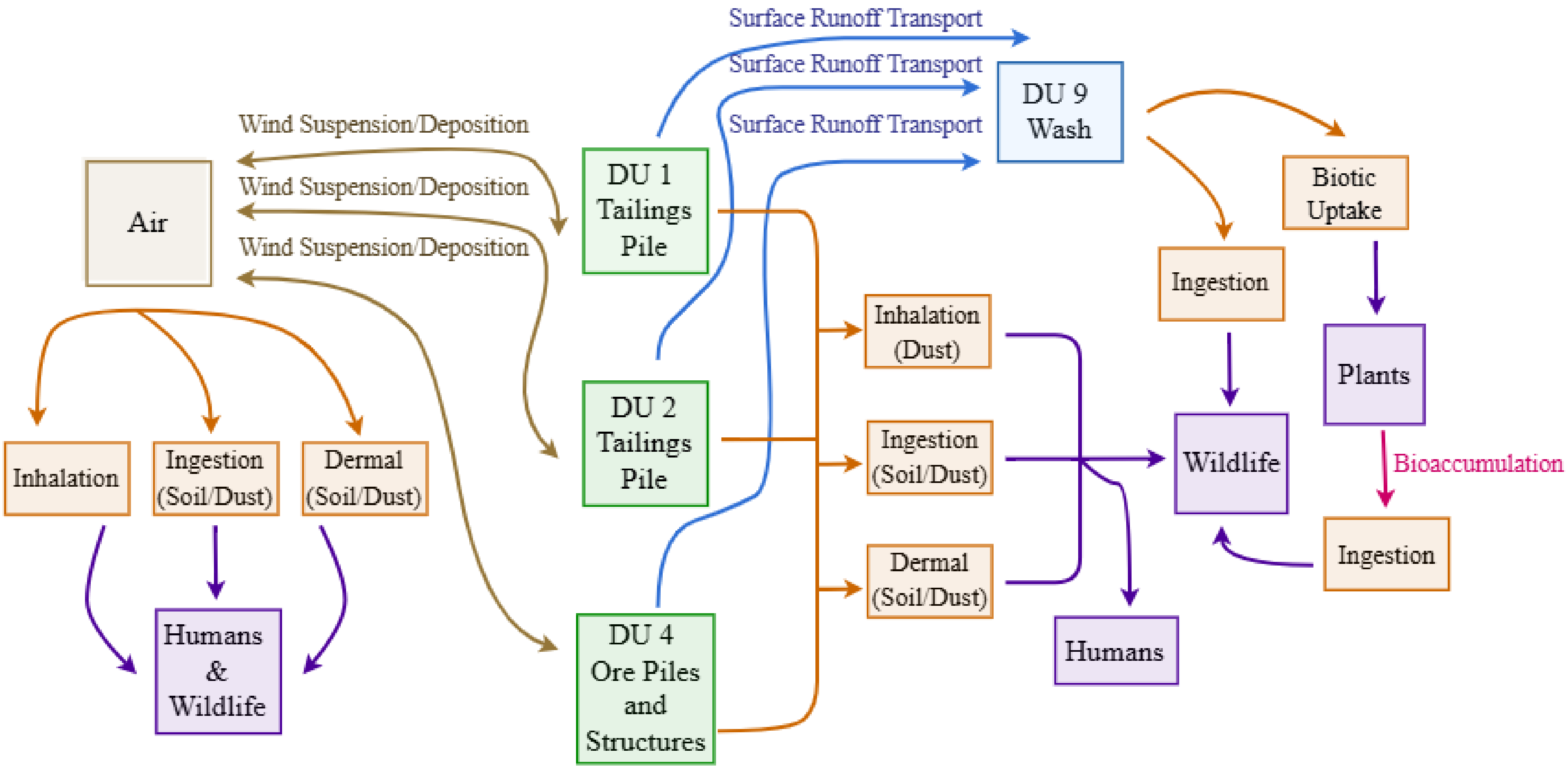


Arsenic Key (ppm):

- 0-10
- 10-30
- >30

Figure 14: Ex-Situ Arsenic Data Map, Featuring Map Key (Right)

CONCEPTUAL SITE MODEL



Legend:

- Air Transport
- Water Transport
- Migration Pathways
- Receptors

Figure 15: Conceptual Site Model for Mindy Mill, Featuring Key (Right)

EXPOSURE SCENARIOS

Table 6: 50% and 95% EPCs for Arsenic

Sample ID	50% EPC (mg/kg)	95% EPC (mg/kg)
DU 1	766	811
DU 2	634	657
DU 4	799	928

- Exposure scenarios assessed were worker and recreational (referred to as camper) scenarios for arsenic
- The exposure routes assessed were ingestion and dermal exposure, inhalation not assessed due to lack of site data
- Carcinogenic and non-carcinogenic intakes were calculated
- Carcinogenic effects on humans: lung and bladder cancer with links to kidney, liver, and prostate cancer [3]
- Non-carcinogenic effects on humans: vomiting, diarrhea, abdominal cramps, tingling and numbness in the extremities and in severe cases death [4]

WORKER SCENARIO – INGESTION

Table 7: Parameters for Worker Scenario – Ingestion

Parameters for Worker Scenario - Ingestion	
Contact Rate (mg soil/day)	100
Exposure Frequency (hours/day)	8
Exposure Duration (days) (1yrs*5day/week*52 week/yr)	260
Average Body Weight (kg)	80
Non-Carcinogenic Averaging Time (yrs)	1
Carcinogenic Averaging Time (yrs)	70

Equation 5: Chronic Daily Intake Ingestion Equation

$$CDI = \frac{C \times CF \times CR \times EF \times ED}{BW \times AT}$$

Where:

CDI : Chronic Daily intake (mg COC/kg of body weight-day)

C : Concentration at Exposure Points (mg COC/kg soil)

CF : Conversion Factor of 10^{-6} mg to kg conversion

CR : Contact Rate (mg soil/day

EF : Exposure Frequency (hours/day)

ED : Exposure Duration (days)

BW : Body Weight (kg)

AT : Averaging Time (yrs)

WORKER SCENARIO - INGESTION

Table 8: Ingestion Daily Intakes of Arsenic for Workers

Worker Scenario - Ingestion				
Sample ID	50% EPC Carcinogenic Intake Dose (mg/kg-day)	50% EPC Non-Carcinogenic Intake Dose (mg/kg-day)	95% EPC Carcinogenic Intake Dose (mg/kg-day)	95% EPC Non-Carcinogenic Intake Dose (mg/kg-day)
DU 1	3.24E-06	2.27E-05	3.44E-06	2.41E-04
DU 2	2.68E-06	1.88E-05	2.79E-06	1.95E-04
DU 4	3.38E-06	2.37E-05	3.94E-06	2.75E-04

WORKER SCENARIO – DERMAL

Table 9: Parameters for Worker Scenario - Dermal

Parameters for Worker Scenario - Dermal	
Skin Exposed (cm^2)	3300
Dust Adherence (mg dust/cm^2)	0.2
Absorption Factor (unitless)	0.03
Exposure Frequency (events/day)	4
Exposure Duration (days)	260
Average Body Weight (kg)	80
Non-Carcinogenic Averaging Time (years)	1
Carcinogenic Averaging Time (years)	70

Equation 6: Chronic Daily Intake Dermal Equation

$$CDI = \frac{C \times CF \times S \times DA \times AF \times EF \times ED}{BW \times AT}$$

Where:

CDI = Chronic Daily intake (mg COC/kg of body weight-day)

C = Concentration at Exposure Point (mg COC/kg soil)

CF = Conversion Factor of 10^{-6} mg to kg conversion

S = Skin Exposed (cm^2)

DA = Dust Adherence (mg dust/cm^2)

AF = Absorption Factor (unitless)

EF = Exposure Frequency (events/day)

ED = Exposure Duration (days)

BW = Body Weight (kg)

AT = Averaging Time (days)

WORKER SCENARIO – DERMAL

Table 10: Dermal Daily Intakes of Arsenic for Workers

Worker Scenario - Dermal				
Sample ID	50% EPC Carcinogenic Intake Dose (mg/kg-day)	50% EPC Non-Carcinogenic Intake Dose (mg/kg-day)	95% EPC Carcinogenic Intake Dose (mg/kg-day)	95% EPC Non-Carcinogenic Intake Dose (mg/kg-day)
DU 1	7.71E-06	5.40E-04	8.17E-06	5.72E-04
DU 2	6.38E-06	4.47E-04	6.62E-06	4.64E-04
DU 4	8.05E-06	5.64E-04	9.35E-06	6.55E-05

CAMPER SCENARIO - INGESTION

Table 11: Parameters for Camper Scenario - Ingestion

Parameters for Camper Scenario - Ingestion		
	Adult	Child
Contact Rate (mg soil/day)	100	200
Exposure Frequency (days/year)	14	14
Exposure Duration (years)	30	5
Average Body Weight (kg)	80	31.8
Non-Carcinogenic Averaging Time (yrs)	30	5
Carcinogenic Averaging Time (yrs)	70	70

Table 12: Ingestion Daily Intakes of Arsenic for Campers

Camper Scenario - Ingestion				
	50% EPC Carcinogenic Intake Dose (mg/kg-day)	50% EPC Non-Carcinogenic Intake Dose (mg/kg-day)	95% EPC Carcinogenic Intake Dose (mg/kg-day)	95% EPC Non-Carcinogenic Intake Dose (mg/kg-day)
DU 4 Adult	1.82E-07	4.25E-07	2.11E-07	4.94E-07
DU 4 Child (6-11)	9.18E-07	1.28E-05	1.06E-06	1.49E-05

CAMPER SCENARIO – DERMAL

Table 13: Parameters for Camper Scenario - Dermal

Parameters for Camper Scenario - Dermal		
	Adult	Child
Skin Exposed (cm^2)	5700	2800
Dust Adherence (mg dust/cm^2)	0.2	0.2
Absorption Factor	0.03	0.3
Exposure Frequency (events/day)	4	4
Exposure Duration (days/year)	14	14
Exposure Duration (years)	30	5
Average Body Weight (kg)	80	31.8
Non-Carcinogenic Averaging Time (yrs)	30	5
Carcinogenic Averaging Time (yrs)	70	70

Table 14: Dermal Daily Intakes of Arsenic for Campers

Camper Scenario - Dermal				
	50% EPC Carcinogenic Intake Dose (mg/kg-day)	50% EPC Non-Carcinogenic Intake Dose (mg/kg-day)	95% EPC Carcinogenic Intake Dose (mg/kg-day)	95% EPC Non-Carcinogenic Intake Dose (mg/kg-day)
DU 4 Adult	7.49E-07	1.74E-06	8.69E-07	1.77E-06
DU 4 Child (6-11)	9.25E-06	1.30E-04	1.07E-05	1.50E-04

TOXICITY ASSESSMENT – ARSENIC

Equation 7: Risk Equation

$$Risk = I_c \times SF$$

Where:
IC = Carcinogenic Intake Dose (mg CoC/kg of body weight-day)
SF = Slope Factor (mg/(kg-day))-1

Equation 8: Hazard Index Equation

$$HI = \frac{I_N}{RfD}$$

Where:
HI = Hazard Index (unitless)
I_N = Non-carcinogenic intake dose (mg/kg of body weight-day)
RfD = Reference Dose (mg/kg-day)

- From the EPA's Integrated Risk Information System (IRIS)
- Slope Factor (SF) is the risk of developing cancer per unit intake dose
- Reference dose (RfD) is lowest dose that can be ingested before toxic effects are observed

Table 15: Toxicity Data for Arsenic

	Slope Factor $(mg/(kg\text{-}day))^{-1}$	Reference Dose (mg/kg-day)
Arsenic	32	6.00 E-05

TOXICITY ASSESSMENT – ARSENIC

Table 16: Calculated Ingestion Risk

Ingestion Risk				
	Carcinogenic Risk		Non-Carcinogenic	
	50%	95%	50%	95%
Worker (DU 1)	1.04E-04	1.10E-04	3.78	4.01
Worker (DU 2)	8.60E-05	8.91E-05	3.13	3.25
Worker (DU 4)	1.08E-04	1.26E-04	3.95	4.59
Camper Adult (DU 4)	5.84E-06	6.78E-06	0.007	0.008
Camper Child (DU 4)	2.93E-05	3.41E-05	0.21	0.24

- Values highlighted in red show elevated carcinogenic risk, $> 10^{-6}$ chance of cancer developing
- For non-carcinogenic risk, hazard index > 1 means elevated risk and are highlighted in red

TOXICITY ASSESSMENT – ARSENIC

Table 17: Calculated Dermal Risk

Dermal Risk				
	Carcinogenic Risk		Non-Carcinogenic	
	50%	95%	50%	95%
Worker (DU 1)	2.47E-04	2.62E-04	9.00	9.53
Worker (DU 2)	2.04E-04	2.21E-04	7.45	7.72
Worker (DU 4)	2.58E-04	2.99E-04	9.39	10.90
Camper Adult (DU 4)	2.40E-05	2.79E-05	0.02	0.02
Camper Child (DU 4)	2.96E-04	3.44E-04	2.19	2.50

- Values highlighted in red show elevated carcinogenic risk, $>10^{-6}$ chance of cancer developing
- For non-carcinogenic risk, hazard index >1 means elevated risk and are highlighted in red

ADULT LEAD MODEL (ALM)

Table 18: ALM Results

Calculated Parameter	Worker Scenario	2-Week Camping Scenario
Probability $PbB_{fetal} > PbB_{t}$ (%)	73.9%	0.0%

- Pregnant workers have a 73.9% chance of birthing children with blood lead levels above 800 ppm (regulatory limit)

INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL (IEUBK)

- Used to get the probability of children that will exceed the 5 micrograms of lead per deciliter of blood concentration
- Modal is set up to evaluate residential scenarios; EPCs were adjusted since no residential scenarios are being evaluated
- Values were adjusted using the exposure frequency and exposure duration

Table 19: Original and Adjusted EPCs

	Original Value	Adjusted Value
50% EPC (mg/kg)	82492	1055
95% EPC (mg/kg)	189043	2417

Table 20: Blood Lead Levels at Each EPC

	50% EPC Blood Lead Level (µg/dL)	95% EPC Blood Lead Level (µg/dL)
72-84 months (6-7 years)	4.7	8.9

INTEGRATED EXPOSURE UPTAKE BIOKINETIC MODEL (IEUBK)

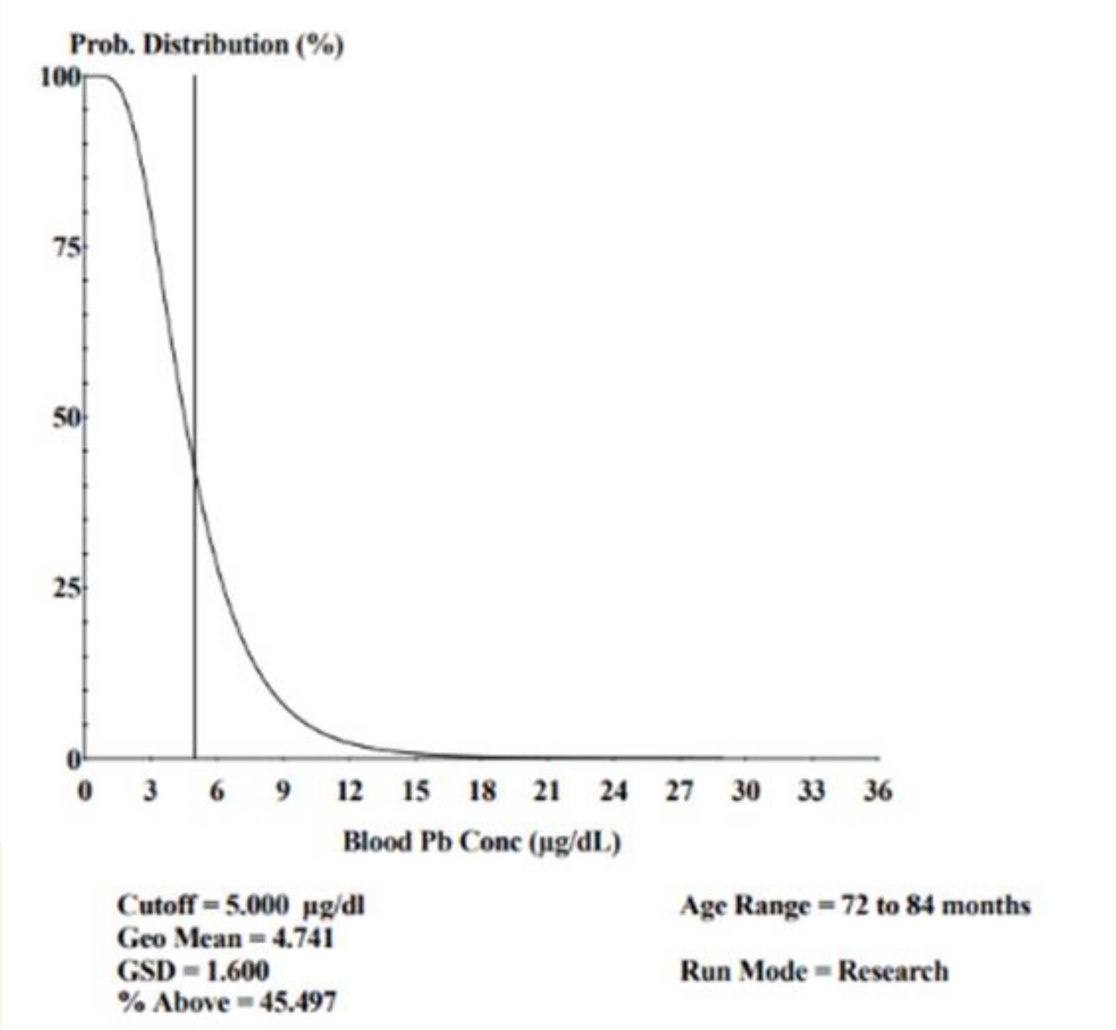


Figure 16: Distribution Curve for 50% EPC

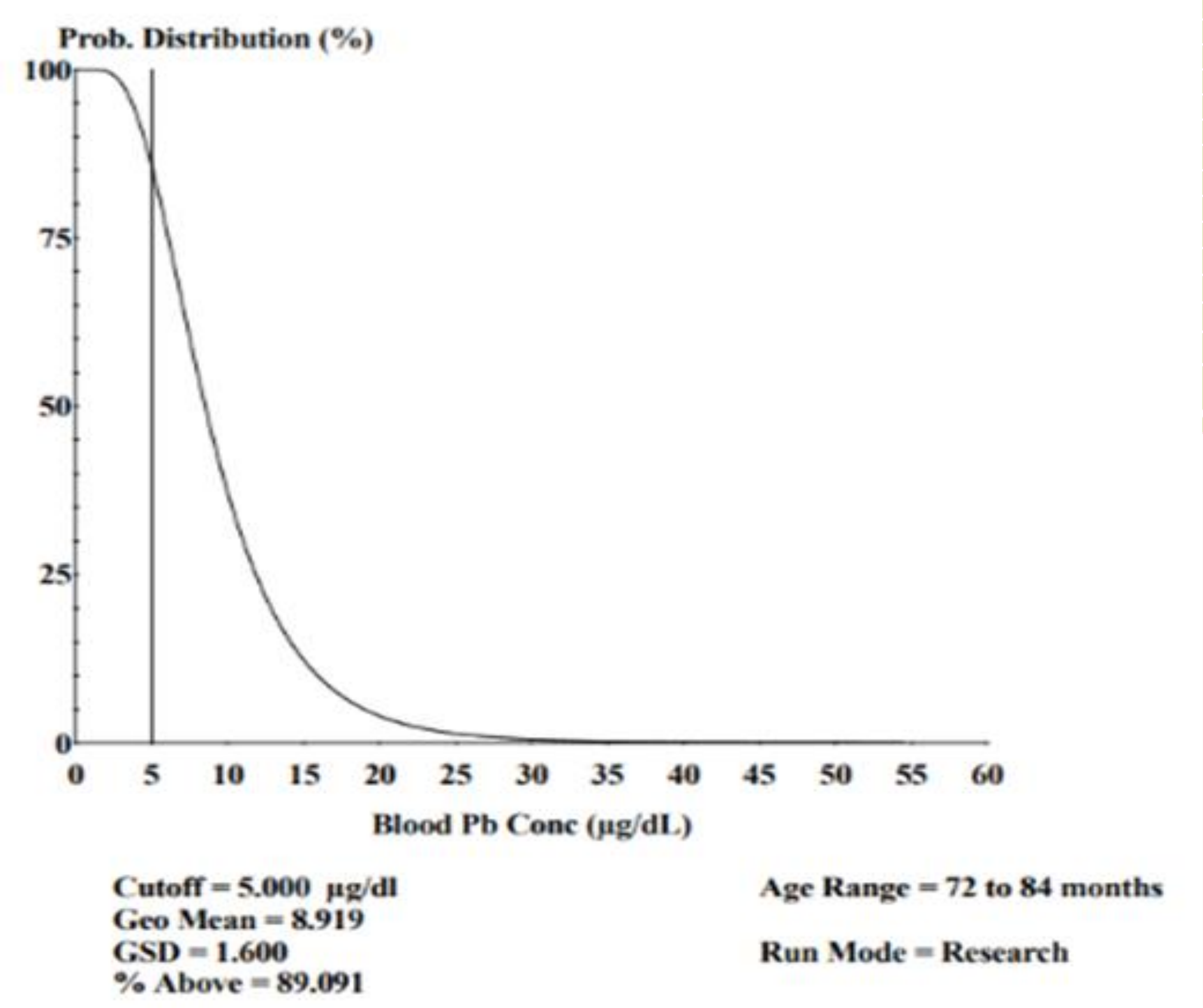


Figure 17: Distribution Curve for 95% EPC

ECOLOGICAL RISK ASSESSMENT

AVIAN EPA ECO-SSL (ECOLOGICAL SOIL SCREENING LEVELS)

Table 21: Avian ECO-SSL Comparison

Contaminant	Avian Wildlife, ppm	Highest, ppm
Arsenic (As)	43	1813
Cobalt (Co)	120	507
Chromium (III) (Cr)	26	67
Copper (Cu)	28	10853
Manganese (Mn)	4300	21788
Nickel (Ni)	210	177
Lead (Pb)	11	898121
Selenium (Se)	1	99
Vanadium (V)	8	146
Zinc (Zn)	46	37163

Summary: High Ecological Risk

Table 22: CoC Effects on Avian Species

As	Reduces growth, reproduction, and feeding behavior [19]
Co	Causes weight loss and tissue damage in animals [20]
Cr	May cause defects in development in chicks, increase chick mortality, reduces growth [21]
Cu	Reduced body weight, may cause diarrhea and anorexia [22]
Mn	May cause behavioral effects, hemorrhage and micromelia in eggs [23]
Ni	Reduces body weight, impairs immune system and may bioaccumulate [24]
Pb	Increases mortality, decreases weight, negative behavioral effects [18]
Se	An antioxidant in low doses, high doses cause reproduction disorders [25]
V	May cause intestinal hemorrhage, changes blood chemistry, and oxidative stress [26]
Zn	May cause weight loss, anemia, diarrhea, neurologic effects, and cyanosis [27]

MAMMAL EPA ECO-SSL

Table 23: Mammal ECO-SSL Comparison

Contaminant	Mammals, ppm	Highest, ppm
Arsenic	46	1813
Cobalt	230	507
Chromium (III)	34	67
Copper	49	10853
Manganese	4000	177
Nickel	130	177
Lead	56	898121
Selenium	1	99
Vanadium	280	146
Zinc	79	37163

Figure 18: Cow Tracks (Above)

Summary: High Ecological Risk

Table 24: CoC Effects on Mammals (Below)

Arsenic	May cause depression, anorexia, diarrhea, partial paralysis, trembling, and coldness of limbs [28]
Cobalt	May cause cytotoxic, apoptosis and even necrosis with inflammatory [29]
Chromium	May cause abdominal pain, hemorrhage, vomiting [30]
Copper	May cause vomiting, diarrhea, stomach cramps, liver damage, decrease in growth, decrease in survival [15]
Manganese	May cause hypocalcemia, weakness, and cardiac arrhythmia [31]
Nickel	May reduce growth, disrupts food intake, disrupts thyroids, and cause pneumonia [20]
Lead	May cause depression, anorexia, diarrhea, anemia and blindness [17]
Selenium	May cause vomiting, tetanic spasms, congestion of the liver, and death from respiratory failure [32]
Vanadium	Potentially a neurotoxin, with hepatoxic and leukoctotoxic components [33]
Zinc	Vomiting, diarrhea, anorexia, kidney injury, reproductive issues [34]

SOIL INVERTEBRATES EPA ECO-SSL

Table 25: Soil Invertebrates ECO-SSL

Contaminant	Soil Invertebrates, ppm	Highest, ppm
Copper	80	10853
Manganese	450	21788
Nickel	280	177
Lead	1700	898121
Selenium	4	99
Zinc	120	37163

Summary: High Ecological Risk

Table 26: CoC Effects on Soil Invertebrates

Copper	Reduces growth, development and reproduction [15]
Manganese	Reduces development, survival and cardiac function in larva and reduce survivability in adults [16]
Nickel	Reduces growth and survivability [17]
Lead	Reduces survivability and reproduction [18]
Selenium	Reduces growth and reproduction
Zinc	Reduces growth and reproduction

PLANT EPA ECO-SSL

Table 27: Plant ECO-SSL Comparison

Contaminant	Plants, ppm	Highest, ppm
Arsenic (As)	18	1813
Cobalt (Co)	13	507
Copper (Cu	70	10853
Manganese (Mn)	220	21788
Nickel (Ni)	38	177
Lead (Pb)	120	898121
Selenium (Se)	1	99
Zinc (Zn)	160	37163

Summary: High Ecological Risk

Figure 19: Teddy Bear Cholla

Figure 20: Brittle Bush

Table 28: CoC Effects on Plants (Below)

As	Reduction in growth attributes, gas exchange attributes, chlorophyll content [5]
Co	Essential nutrient, excess causes leaf damages and iron deficiency [6]
Cu	Essentia nutrient, excess damages cells and reduces nutrient uptake [7&8]
Mn	Essential micronutrient, excess disrupts photosynthesis and enzymes [9&10]
Ni	Essential, excess reduces growth and cause tissue damage [11]
Pb	Inhibits growth, photosynthesis and disrupts metabolic processes [12]
Se	Beneficial in low doses, toxic at elevated levels which causes oxidative stress [13]
Zn	Essential, excess reduces growth, causes chlorosis, and death [14]

REMEDIAL ACTION OBJECTIVES (RAO)

- Reduce Pb and As in soil to below background levels, focusing on hotspot areas and DU 4
- Prevent contaminated soil movement via wind and runoff into nearby wash (DU 9)
- Limit exposure at localized hot spots to reduce risk and improve long-term site stability
- Reduce ecological risk by lowering contaminant concentrations and limiting exposure pathways for wildlife and vegetation

REMEDIATION ALTERNATIVES

ALTERNATIVE 0

<u>No Remedial Action</u>

- Utilized as a baseline comparison
- Soils will continue to pose a significant risk to human and ecological health
- No capping, excavation, or treatment will occur
- All existing site conditions will remain the same
- No resource recovery potential

ALTERNATIVE 1

<u>Capping Based Containment</u>

- Reduces exposure via containment
- Engineered caps will be installed over DU1, DU2,and DU4
- Layers will include:
  - Vegetative Layer
  - Drainage Layer
  - Low – Permeability Layer
- Includes small scale excavation if needed to support cap installation
- Negligible resource recovery potential

REMEDIATION ALTERNATIVES

ALTERNATIVE 2

Targeted Excavation with Capping and Soil Washing

- Selective excavation and soil washing of excavated soil
- Washed soil used for backfill and engineered caps
- Aims to reduce contamination in high-risk areas
- Reduce exposure and mitigate risk
- Provides moderate resource recovery

ALTERNATIVE 3

Enhanced Excavation and Consolidation with Capping

- Excavation of all hotspots, and some other impacted soils
- Excavated materials are relocated to a containment area
- Covered with an engineered cap
- Remaining unexcavated zones will be capped as well
- This alternative has minimal resource recovery

ALTERNATIVE SELECTION AND MATRIX

Table 29: Decision Matrix

Alternative #	Alternative Description	Criterion				Total
		Effectiveness	Implementability	Cost	Long-term Effectiveness	
0	No Remedial Action	0.4	1.5	0.5	0.2	2.6
1	Capping Based Containment	1.2	0.9	0.35	0.6	3.05
2	Excavation with Capping and Soil Washing	1.7	0.9	0.275	0.85	3.725
3	Enhanced Excavation and Consolidation with Capping	1.7	0.6	0.175	0.9	3.375

Weighting: Effectiveness (0.4), Implementability (0.3), Long-term Effectiveness (0.2), Cost (0.1)

- Effectiveness 1 = not effective 5 = very-effective
- Implement-ability 1 = hard to implement 5 = easy to implement
- Cost 1 = expensive 5 = inexpensive
- Long-term Effectiveness 1 = not effective 5 = very-effective

RESOURCE RECOVERY

Table 30: Valuable Mineral Value

Location	Description	Metal value ($)
HS-1	Waste rock	108,411,779
HS-2	Waste rock	29,664,751
DU6	Ore pile	160,972,972
DU1	Large tailings-just disturbed areas	673,110,734
DU2 (1)	Western small tailings	122,481,730
DU2 (2)	Eastern small tailings	829,995,865

- Minerals assessed
  - Gold (Au) = $38,189 /kg
  - Scandium (Sc) = $15,000 /kg
- Phytoremediation [35&36]
  - Removes Pb, As, and Cadmium (Cd)
  - Can isolate Au, Ag, and Sc
  - Uses sugar cane and mulberry trees
  - Growable in Arizona
- Milling

PROJECT IMPACTS

- Public Health, Safety, and Welfare
  - High lead and arsenic concentrations
  - Physical hazards
  - Poor access to healthcare
  - Removal of hazards improving health
- Social
  - Image of the BLM
    - Improved with treatment
    - Negatively impacted with ignorance
- Environmental
  - Inhibitions to different species
  - Treatment will disrupt habitats
- Economic
  - BLM budget cuts
  - Resource recovery
  - Additional jobs
  - Recreation
  - Future development

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Figure 21: Team in Hazmat Suits for Soil Disposal

THANK YOU

Questions?

Figure 22: Site Weather Complications, Featuring Rashel (Left) and Gloria (Right)