



# Signal Mill Scope



Angelina Cruse, Anna Gorman,  
Ali Husain, Wyatt LaFave

# Introduction

Client: The Bureau of Land Management (BLM)

Project Purpose: To provide the BLM with a human and environmental risk assessment based on the constitution and spatial extent of the contaminants found at Signal Mill

Location: Signal Mill is located in Arizona, approximately 22 miles south of Wikieup in Mohave County and east of the McCracken Mine. Signal Mill borders the Big Sandy River on the western bank [1].



Figure 1. Signal Mill Site - evidence of ATV tracks [2]

# Location

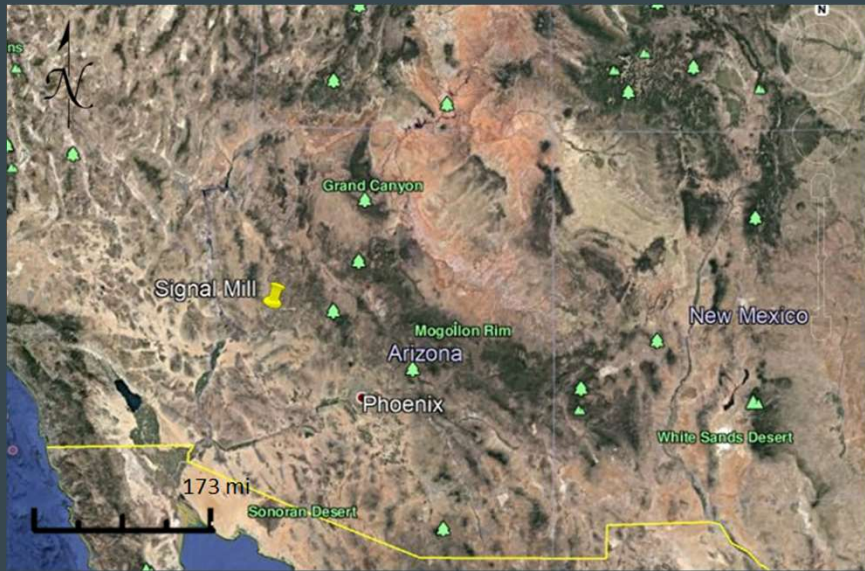


Figure 2. Signal Mill Site location marked by yellow pin [3]



Figure 3. Signal Mill in relation of Wikieup and McCracken Mine [3]

# Background

- Signal Mill was a stamp mill where ores were processed from the McCracken mine.
- A recent investigation by the BLM on April 9th, 2018 showed the results of 10 X-Ray Fluorescence samples.
- This preliminary investigation yielded the results in Table 1. The contaminants presented are most likely the contaminants of concern at the site.

Table 1. Contaminant Concentrations (in ppm) from Initial Investigation [1]

Sample #	Site	Latitude	Longitude	Contaminant Concentration								
				Pb	As	Hg	Zn	Mn	V	Ba	Ag	Sb
1	Signal Mill	34.47222	-113.62476	14542.4	418.59	75.43	31467.29	66259.59	149.13	36968.43	691.41	31.88
2	Signal Mill	34.47237	-113.62471	11690.38	151.58	79.61	36019.4	10559.25	<LOD	1419.24	219.6	55.53
3	Signal Mill	34.47222	-113.62474	4647.22	182.63	47.65	12266.27	13645.8	73.72	1796.12	11.05	<LOD
4	Signal Mill	34.47209	-113.62469	22400.74	394.96	91.45	42378.46	11158.64	37.17	7285.86	131.93	112.61
5	Signal Mill	34.47203	-113.62446	35907.42	<LOD	77.96	40024.83	11134.78	45.07	9430.04	162.84	67.74
6	Signal Mill	34.47169	-113.62437	19471.04	<LOD	37.84	22344.06	9984.22	40.43	7045.68	115.01	28.91
7	Signal Mill	34.47160	-113.62400	26828.93	328.55	308.86	18575.02	18173.51	70.08	10159.31	236.56	73.59
8	Signal Mill	34.47138	-113.62392	12436.05	<LOD	72.47	29018.56	6873.92	<LOD	2186.35	64.33	67.51
9	Signal Mill	34.47076	-113.62399	13371.81	<LOD	62.42	21750.39	4590.7	88.1	10033.01	83.58	59.99
10	Signal Mill	34.47065	-113.62416	24143.39	767.97	1190.53	35907.79	44584.74	186.36	38543.32	213.74	58.58

# Task 1. Develop a Work Plan

## 1.1 Sampling Plan

### 1.1.1 Sampling Methods

### 1.1.2 Sampling Documentation

### 1.1.3 Required equipment

## 1.2 Analysis Plan

## 1.3 Health and Safety Plan

### 1.3.1 Training Requirements

### 1.3.2 Disposal of Hazardous Materials

# Task 2. Field Work

2.1 Survey

2.2 Take samples

2.3 Transportation

Figure 4. Soil sampling in action [4]

# Task 3. Analysis

3.1 Dry sieve analysis (ASTM C136)

3.2 XRF Analysis (EPA Method 6200)

3.3 Acid Digestion (EPA Method 3050B)

3.4 FAAS (EPA Method 7000B)

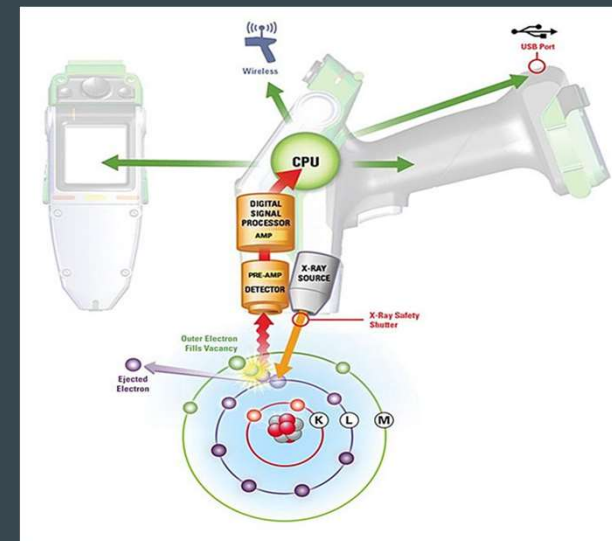


Figure 5: XRF technology [5]

# Task 4. Risk Assessment

## 4.1 Ecological Risk Assessment

- a. Problem formulation - goals, scope, and focus
- b. Risk analysis - reference standards (plants, soil invertebrates, birds, and mammals)
- c. Risk characterization - probability of adverse effects due to exposure



Figure 6. Plant ecology [6]



Figure 7. Animal ecology [7]



Figure 8. Insect ecology [8]



# Task 4. Risk Assessment

## 4.2 Human Health Risk Assessment

### 3.2.1 Carcinogenic vs. Non-carcinogenic Risk

### 3.2.2 Lead Risk (IEUBK and ALM)



Figures 9. Lead [9]



Figure 10. Lead [9]



Figures 11. Lead [9]

# Task 5. Project Management

5.1 Meetings and Correspondence

5.2 Schedule management

5.3 Project Deliverable

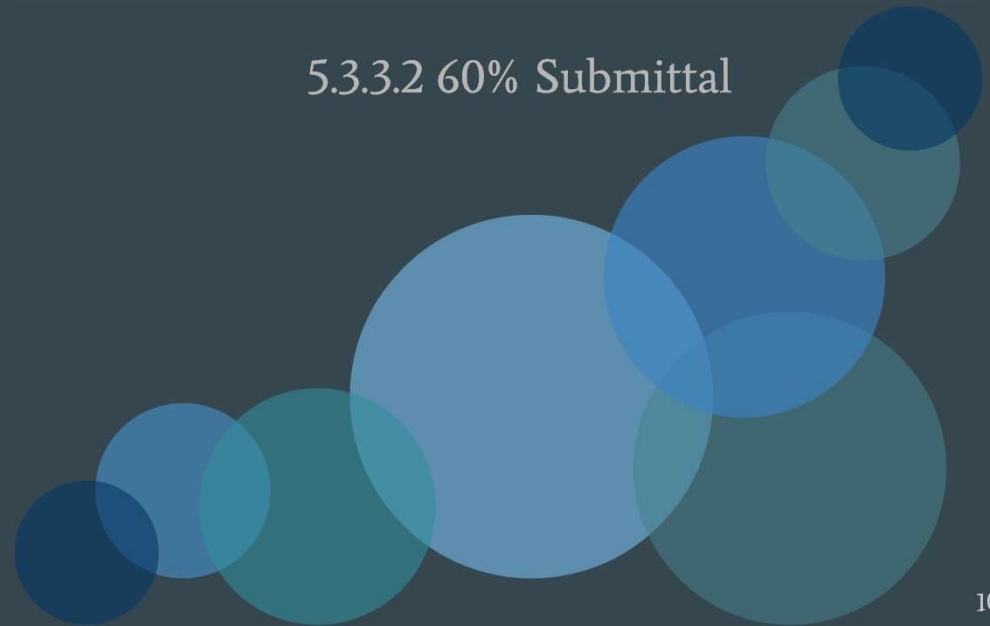
5.3.1 Website

5.3.2 Final Presentation

5.3.3 Final PA/SI Report

5.3.3.1 30% Submittal

5.3.3.2 60% Submittal



# References

[1] Bureau of Land Management, "Signal Mill Site Summary," Bureau of Land Management, 2018.

[2] Bureau of Land Management, Signal Photos, Bureau of Land Management, 2018.

[3] "Arizona Map" GOOGLE EARTH, [Accessed: 05-Oct-2018]

[4] Pennington, "How to Take an Accurate Soil Sample," [Online]. Available: <https://www.pennington.com/all-products/grass-seed/resources/how-to-take-an-accurate-soil-sample>. [Accessed: 10-10-2018].

[5] <https://www.wur.nl/en/show/Environmental-Risk-Assessment-ERA.htm>. [Accessed: 8-10-2018].

"XRF Technology," *Thermo Fisher Scientific - US*. [Online]. Available: <https://www.thermofisher.com/us/en/home/industrial/spectroscopy-elemental-isotope-analysis/spectroscopy-elemental-isotope-analysis-learning-center/elemental-analysis-information/xrf-technology.html>. [Accessed: 05-Oct-2018].

[6] Wageningen University and Research, "Environmental Risk Assessment (ERA)," 2018. [Online]. Available:

[7] G. Moreau and e. al., "Identifying Habitat for Endangered Species: Making Habitat Selection Models More Realistic," *Journal of Applied Ecology*, vol. 49, no. 3, 6 2012.

[8] Australian National University, "Insect ecology, morphology or physiology," [Online]. Available: <http://biology.anu.edu.au/research/projects/insect-ecology-morphology-or-physiology>. [Accessed 8 10 2018].

[9] Hermes Metals, "Lead," 2014. [Online]. Available: <http://hermesmetals.com/>. [Accessed 10 10 2018].