SWMU 4 –
Used Carbon Blocks, Floor Logs and Furnace Liner Pile

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5.5.4 SWMU 4 – Used Carbon Blocks, Floor Logs and Furnace Liner Pile

The location of Solid Waste Management Unit (SWMU) 4 is shown on Figure 5.5.4-1a and SWMU 4 monitoring stations and sample locations are provided on Figure 5.5.4-1b. SWMU 4 was an outdoor storage area for used furnace carbon hexagon floor logs and used furnace liner carbon blocks. The used carbon material was placed in the area shown on Figure 5.5.4-1b in the 1990's during furnace maintenance procedures. All of the used carbon material was stored above ground and was not covered with any soil; therefore there are no soil piles in SWMU 4. The pile of used carbon floor logs and furnace liner was approximately 60 feet long by 40 feet wide by 3 feet high, located in an area directly west of SWMU 3. The SWMU is also located north of the coarse slag pile, SWMU 12, and east of SWMU 15, Precipitator Dust Burial Areas and SWMU 16, Buried Precipitator Dust Pan Areas. There are no underground utilities or phosphorus process lines in the area. Two sealed plant water production wells, wells 2 and 2A, are located just north of the SWMU; however, the wells were taken out of service in the 1980's because of sanding problems. The closest monitoring wells are located to the east at SWMU 3. New refractory brick for the kilns, and some new steel pipes for the furnaces were also stored in the SWMU area.

5.5.4.1 Corrective Measures

Rhodia implemented the corrective measures for this SWMU during 2008. The used carbon blocks, floor logs, and furnace liner were tested for ignitability and any floor logs or furnace liner pieces that failed the test were shipped to an off-site facility (Heritage Environmental Services) in Sauget, Illinois for incineration. The ignitability test protocol and management program for the carbon materials was reviewed and approved by EPA in a letter dated May 28, 2008 (Appendix 5.5.3-E). The carbon blocks, floor logs, and electrodes that passed the ignitability testing were approved for recycling, and were transported to the recycling facility (Pamas and Company) in Elberton, Georgia. The used blocks that passed the ignitability testing, but were too small or not suitable for recycling are stockpiled near the coarse slag pile. Section 5.5.3.3 provides additional information related to the management of these carbon materials.

SWMU 4 also contained a small pile of carbon packing rings and small blocks that were removed from the hydration tower of the Phosphoric Acid Plant. The carbon rings and carbon blocks from the Phosphoric Acid Plant are stored in the northwest corner of the SWMU, essentially on the east edge of SWMU 16. The Phosphoric Acid Plant included an oxidation chamber, where elemental phosphorus was oxidized to phosphorus pentoxide, and a hydration tower, where the phosphorus pentoxide was contacted with water to form phosphoric acid. The carbon rings, which were packed in the hydration tower, provided surface area for the phosphoric acid reaction to occur. Therefore,

the carbon rings were not exposed to elemental phosphorus and are managed as non-ignitable carbon material. The material is currently stored at the location mentioned above.

The corrective measures for SWMU 4 are complete as indicated by the EPA's approval of Rhodia's Complete Report (Rhodia, 2009) in a letter dated May 15, 2009 (Appendix 5.5.3-H).

Since SWMU 4 contained the same materials that were contained in SWMU 3, the results of the groundwater monitoring program conducted at SWMU 3 are relevant to the expected conditions at SWMU 4. The groundwater quality dataset for SWMU 3 demonstrates that there are no significant groundwater impacts related to the former pile of used carbon brick and furnace liner; therefore, no significant groundwater impacts are expected for SWMU 4. SWMU 3 groundwater quality is discussed in detail in Section 5.5.3.5.

5.5.4.2 RFI Activities and Results

In October 2012 soil samples were collected from a test pit sidewall at a randomly selected location in SWMU 4. Soil samples were collected from the 0-2 inch interval (SWMU-4 SP-1 0-2") and the 2-12 inch interval (SWMU-4 SP-1 2-12") of a test pit excavated with a rubber tire backhoe. The test pit log is provided in Appendix 5.5.4-A, and the test pit location is shown on Figure 5.5.4-1b (SWMU-4 SP-1). The soil samples were analyzed for general and site-specific parameters (fluoride, elemental phosphorus, total phosphorus) and total metals (*see* Tables 5.5.4-1 and 5.5.4-2, respectively). The soil samples were also analyzed in the field according to the XRF screening and confirmatory analytical program (*see* Section 5.4.2).

Soil data from SWMU 4 were compared to the background/reference area concentrations. Concentrations above the 95% upper confidence limit of the mean background/reference area concentrations are highlighted on the constituent delineation figures presented in this section. Where a 95% upper limit could not be calculated, the maximum detected concentration or the maximum detection limit was selected.

Constituent concentrations are described in this report as above background/reference area concentrations if the mean and maximum concentrations of the SWMU data exceed both of the mean and maximum background/reference area values. All data will be retained for evaluation in the human health and ecological risk assessments. The definitive background comparison will be conducted in the risk assessment using a statistical approach consistent with EPA guidance (U.S. EPA, 2002).

5.5.3.4.1 General Chemistry

The general chemistry data are summarized in Table 5.5.4-1 and shown in Figure 5.5.4-2. Fluoride was detected in both soil samples with a maximum concentration of 40.0 mg/kg. The mean and maximum concentrations of fluoride exceed the mean and maximum concentrations from the background data set, so fluoride is considered above background. Elemental phosphorus was not detected (DL = 0.000015 mg/kg) in the soil samples. Total phosphorus was detected in both soil samples with a maximum concentration of 27,200 mg/kg. The mean total phosphorus concentration in Silver Bow County is 880 mg/kg (USGS, 2012).

5.5.3.4.2 Metals

The analytical laboratory and correlated XRF data were combined to assist the delineation of the hazardous constituents. Hazardous constituent concentrations based on the XRF data were estimated using the linear equations presented in Section 5.4.2 for the respective metals. The correlation coefficient (R^2) is greater than 0.7 for these metals. The 2012 metals data for SWMU 4 are presented in Table 5.5.4-2 and includes both laboratory analytical results and correlated XRF data (Field). The distribution of the metal constituents in the 0-2 inch and the 2-12 inch interval are shown on Figures 5.5.4-3 and 5.5.4-4, respectively.

Arsenic, barium, cobalt, copper, iron, lead and manganese concentrations are consistent with background/reference area concentrations. The mean and maximum concentrations of antimony, beryllium, cadmium, calcium, chromium, magnesium, mercury, nickel, potassium, selenium, silver, sodium, uranium, vanadium, thallium and zinc exceeded their respective mean and maximum concentrations in the background data set and are considered above background.

5.5.4.3 Conclusions

The following conclusions were developed based on review of the information presented in this section:

- The used carbon blocks, floor logs and furnace liner were tested to demonstrate which carbon pieces needed to be managed as hazardous waste and which carbon pieces did not.
- Carbon materials that failed the testing protocol were incinerated by Heritage Environmental Services in Sauget, Illinois.
- Large pieces of carbon blocks and floor logs that did not need to be managed as hazardous waste were recycled by Pamas and Company in Elberton, Georgia.

- EPA approved the Completion Report in a letter dated May 15, 2009 signifying that corrective measures under the 7003 Order are complete.
- The groundwater quality dataset for SWMU 3 (*see* Section 5.5.3.5) demonstrates that there are no significant groundwater impacts related to the former pile of used carbon blocks, floor logs, and furnace liner in SWMU 4.
- SWMU 4 surface soil sampling identified fluoride concentrations above background concentrations and total phosphorus concentrations above the mean concentration for Silver Bow County.
- Surface soil sampling in SWMU 4 indicated the following metals are above background concentrations: antimony, beryllium, cadmium, calcium, chromium, magnesium, mercury, nickel, potassium, selenium, silver, sodium, thallium, uranium, vanadium and zinc.

There is sufficient information to conduct the risk assessment for SWMU 4. The risk assessment will identify which parameters, if any, are present at concentrations that may warrant corrective measures. The dataset will be reviewed at that time and additional sampling may be necessary to inform the corrective measures study or later during the corrective measures design phase.

5.5.4.4 References

Rhodia, 2009. Rhodia's Completion Report, Used Carbon and Electrode Project, Silver Bow, Montana, April 9, 2009.

U.S. EPA., 2002. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites. U.S. Environmental Protection Agency. EPA 540-R-01-003. OSWER 9285.7-41. September 2002.

U.S. Geological Survey, 2012. Average concentrations of elements in Silver Bow County, Montana. Open-File Report 2004-1001. Accessed December 11, 2012, at http://mrdata.usgs.gov/geochem/county.php?place=f30093&el=P&rf=northwestern

Tables

Table 5.5.4-1
Soil Data - General and Site Specific Parameters
SWMU 4
Rhodia Silver Bow Plant
[concentrations in mg/kg]

Chemical Name				Fluoride	Phosphorus, elemental (white)	Phosphorus, total
Background Mean, Exceedances **Bold**				**4.1**		
Background Maximum, Exceedances Underline				37		
Background 95% UCL, Exceedances *Italic*				*7.6*		
Location ID	**Sample Date**	**Depth**	**Sample Type**			
SWMU-4 SP-1	10/02/2012	0 - 2 in	N	***11.9***	< 0.000015	27200
SWMU-4 SP-1	10/02/2012	2 - 12 in	N	***36.7***	< 0.000015	4640 J
			FD	***40.0***	< 0.000015	1890 J

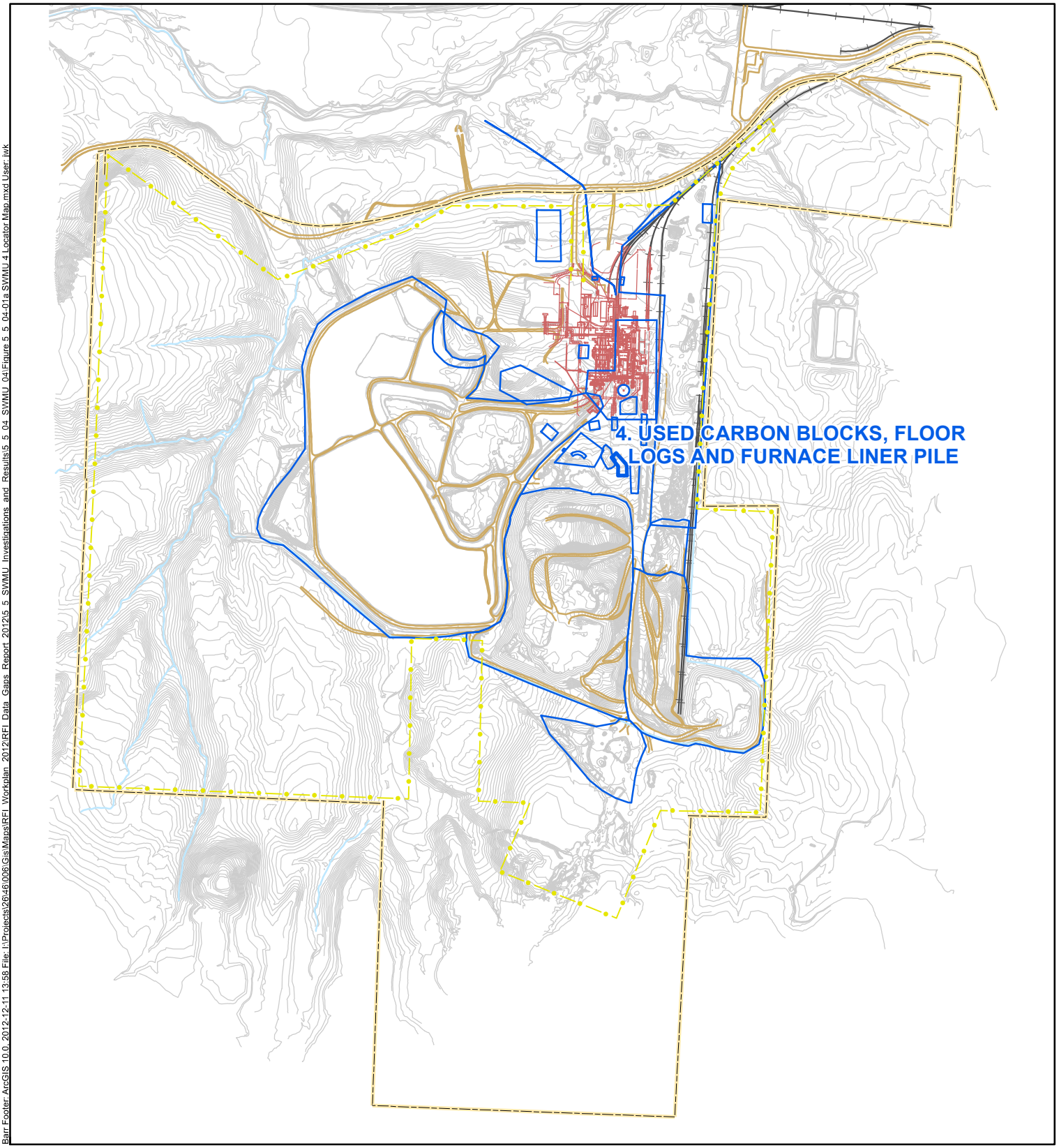
Table 5.5.4-2
Soil Data - Metals
SWMU 4
Rhodia Silver Bow Plant
[concentrations in mg/kg]

Chemical Name / Analysis Location				Antimony Lab	Arsenic Lab	Arsenic Field	Barium Lab	Beryllium Lab	Cadmium Lab	Cadmium Field	Calcium Lab	Chromium Lab	Chromium Field	Cobalt Lab	Copper Lab	Iron Lab	Lead Lab	Lead Field	Magnesium Lab	Manganese Lab	Manganese Field	Mercury Lab	Nickel Lab	Potassium Lab	Selenium Lab	Selenium Field
Background Mean, Exceedances **Bold**				**0.50**	**23**	**23**	**150**	**0.51**	**1.6**	**1.6**	**3900**	**11**	**11**	**5.9**	**35**	19600	**17**	**17**	**3500**	**540**	540	**0.021**	**5.3**	**3000**	**0.41**	**0.41**
Background Maximum, Exceedances Underline				3.9	120	120	290	1.3	8.9	8.9	14000	48	48	9.5	301	35300	190	190	5700	1100	1100	0.20	21	5300	0.70	0.70
Background 95% UCL, Exceedances *Italic*				*1.0*	40	*40*	*170*	*0.55*	*1.1*	*1.1*	*4500*	*12*	*12*	*6.1*	64	20600	*35*	*35*	*3700*	*570*	570	*0.038*	*6.0*	*3200*	*0.47*	*0.47*
Location ID	**Sample Date**	**Depth**	**Sample Type**																							
SWMU-4 SP-1	10/02/2012	0 - 2 in	N	***4.81***	9.70	--	***259***	***2.46 J***	***33.69***	--	***248000***	***187***	--	2.39 J	**41.5**	9410	***99.8***	--	***6470***	213	--	***0.426***	***48.4***	***11500***	***6.3***	--
SWMU-4 SP-1	10/02/2012	2 - 12 in	N	**0.864**	**38.3**	--	***195***	***1.32 J***	***4.24 J***	--	***56400 J***	***42.7 J***	--	***6.65 J***	**55.5**	16100	**33.1 J**	--	***3910***	***583***	--	***21.8***	***10.8 J***	***5020***	***0.9***	--
			FD	**0.634**	**37.8**	--	**163**	***1.03 J***	***2.20 J***	--	***16100 J***	***23.3 J***	--	***6.60 J***	**56.3**	16600	**26.6 J**	--	3080	***625***	--	***24.9***	***8.28 J***	***4010***	***0.7 J***	--
SWMU-4 SP-1	10/05/2012	0 - 2 in	N	--	--	**29.88 J**	--	--	--	***51.32 J***	--	--	***356.69 J***	--	--	--	--	***129.63***	--	--	266.27	--	--	--	--	***10.34 J***
			FD	--	--	20.96 J	--	--	--	***46.84 J***	--	--	***342.26 J***	--	--	--	--	***146.26 J***	--	--	227.21	--	--	--	--	***12.75 J***
SWMU-4 SP-1	10/05/2012	2 - 12 in	N	--	--	**38.58 J**	--	--	--	< 0.2 J	--	--	***31.48 J***	--	--	--	--	**26.56 J**	--	--	431.59	--	--	--	--	< 0.7
			FD	--	--	***43.76 J***	--	--	--	< 0.2	--	--	**11.30**	--	--	--	--	**27.34 J**	--	--	476.12	--	--	--	--	< 0.7

Table 5.5.4-2
Soil Data - Metals
SWMU 4
Rhodia Silver Bow Plant
[concentrations in mg/kg]

			Chemical Name	Silver	Silver	Sodium	Thallium	Uranium	Uranium	Vanadium	Vanadium	Zinc	Zinc
			Analysis Location	Lab	Field	Lab	Lab	Lab	Field	Lab	Field	Lab	Field
Background Mean, Exceedances **Bold**				**0.73 (1)**	**0.73 (1)**	**140**	**0.35**	**1.8**	**1.8**	**41**	**41**	**59**	**59**
Background Maximum, Exceedances Underline				1.7 (1)	1.7 (1)	620	1.0	4.1	4.1	83	83	380	380
Background 95% UCL, Exceedances *Italic*				*0.35 (1)*	*0.35 (1)*	*220*	*0.46*	*2.0*	*2.0*	*43*	*43*	*98*	*98*
Location ID	**Sample Date**	**Depth**	**Sample Type**										
SWMU-4 SP-1	10/02/2012	0 - 2 in	N	***50.0***	--	***2350***	***10.1***	***57.7***	--	***148***	--	***9840***	--
SWMU-4 SP-1	10/02/2012	2 - 12 in	N	***6.1 J***	--	***611 J***	***0.993 J***	***12.6 J***	--	***58.3***	--	***1130 J***	--
			FD	***2.7 J***	--	***278 J***	***0.581 J***	***7.480 J***	--	***46.3***	--	***486 J***	--
SWMU-4 SP-1	10/05/2012	0 - 2 in	N	--	***108.42***	--	--	--	***37.56 J***	--	***230.34 J***	--	***22971.90***
			FD	--	***122.84***	--	--	--	***52.22 J***	--	***261.78 J***	--	***22634.25***
SWMU-4 SP-1	10/05/2012	2 - 12 in	N	--	***7.42 J***	--	--	--	< 8.32	--	***47.12***	--	***1136.32***
			FD	--	***1.87 J***	--	--	--	***3.32 J***	--	35.72 J	--	***1003.68***

Figures



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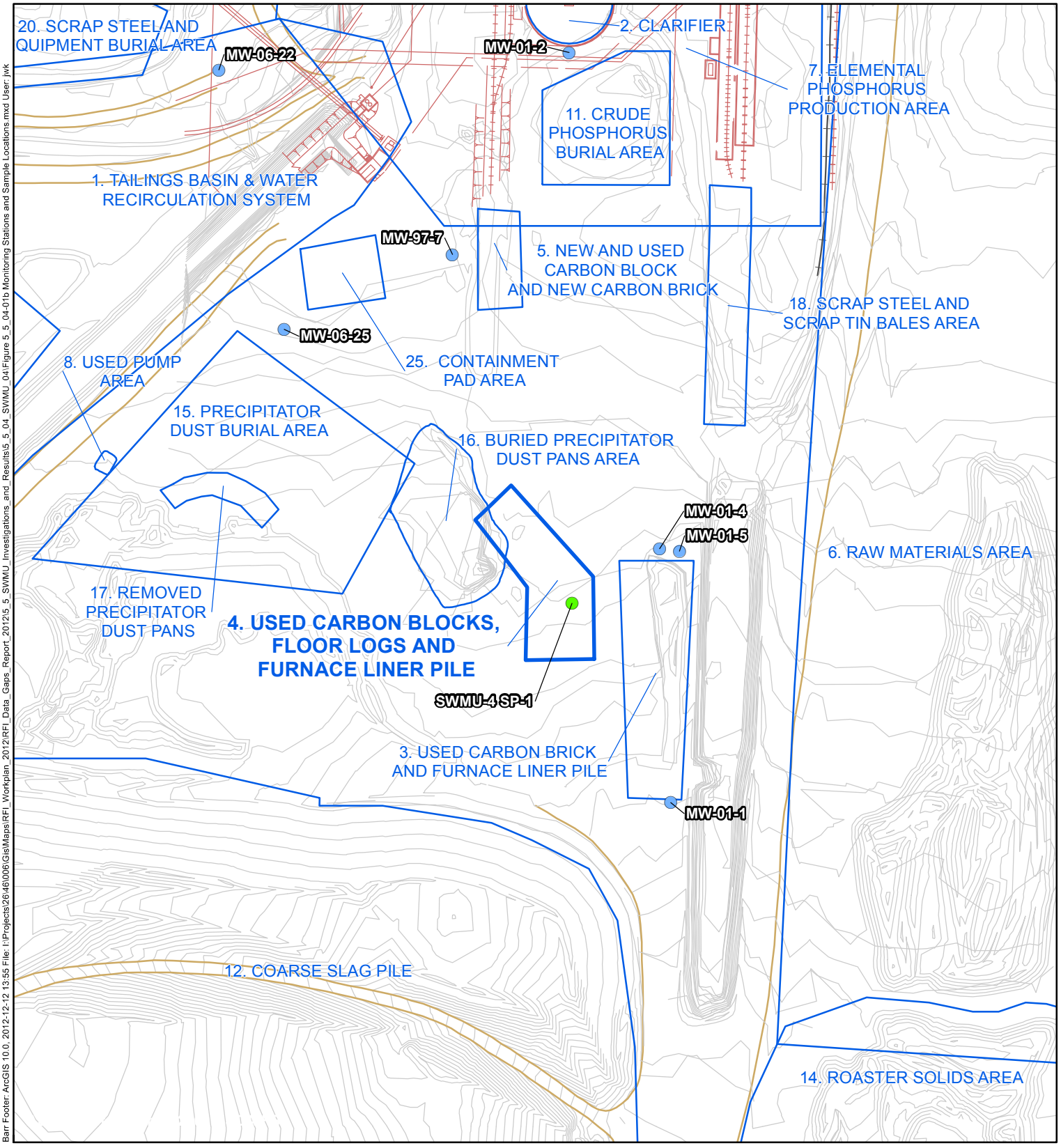
SWMU 4
Other SWMUs
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures
Fence Line
Property Boundary

N

Feet
1,000 0 1,000

Figure 5.5.4-1a

SWMU 4 LOCATION
Rhodia Silver Bow Plant
Montana



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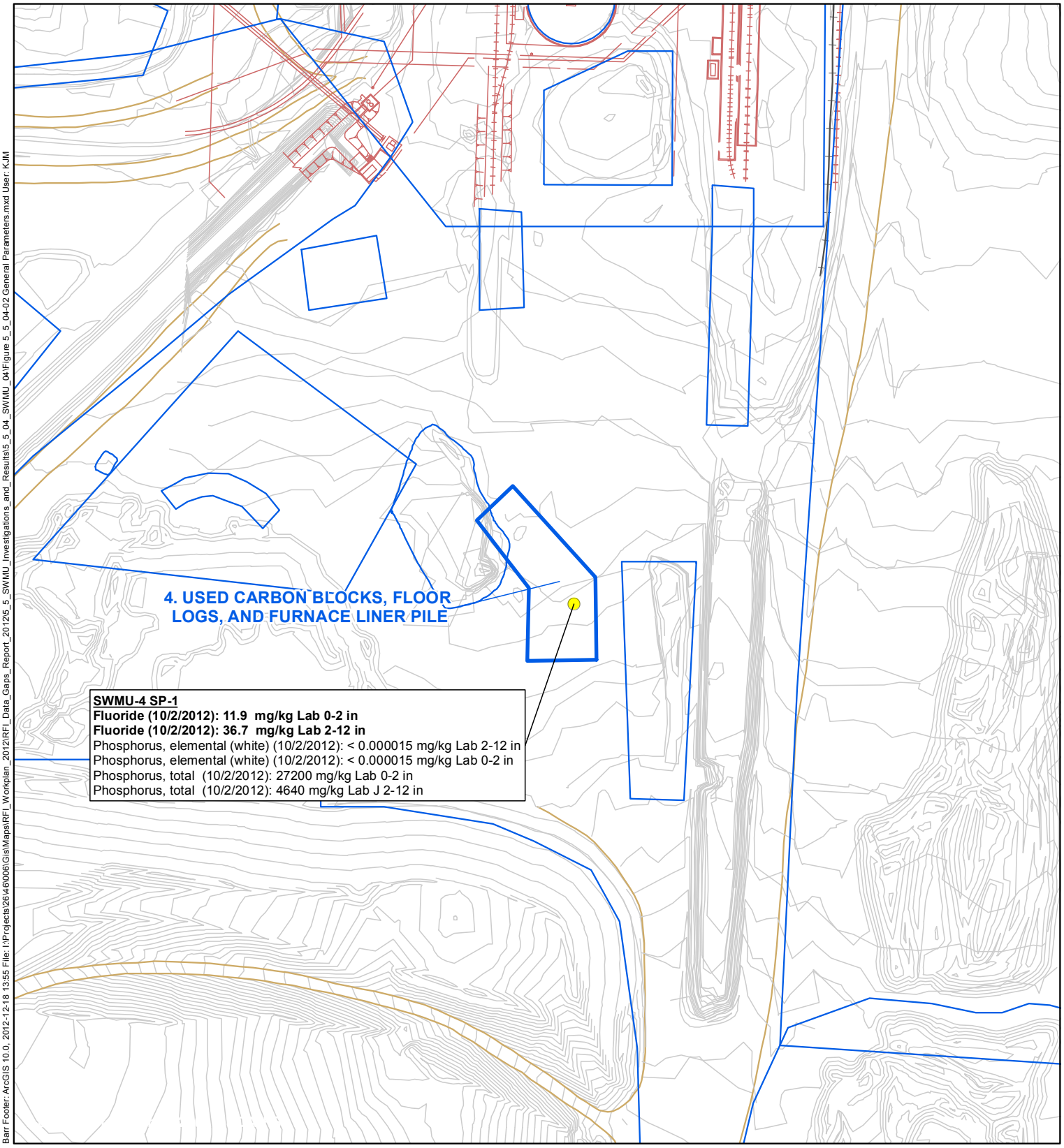
Monitoring Well
Soil Sample
SWMU 4
Other SWMUs
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

N

Feet
150 0 150

Figure 5.5.4-1b

SWMU 4
MONITORING STATIONS
AND SAMPLE LOCATIONS
Rhodia Silver Bow Plant
Montana



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Sample Location
SWMU 4
Other SWMUs
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

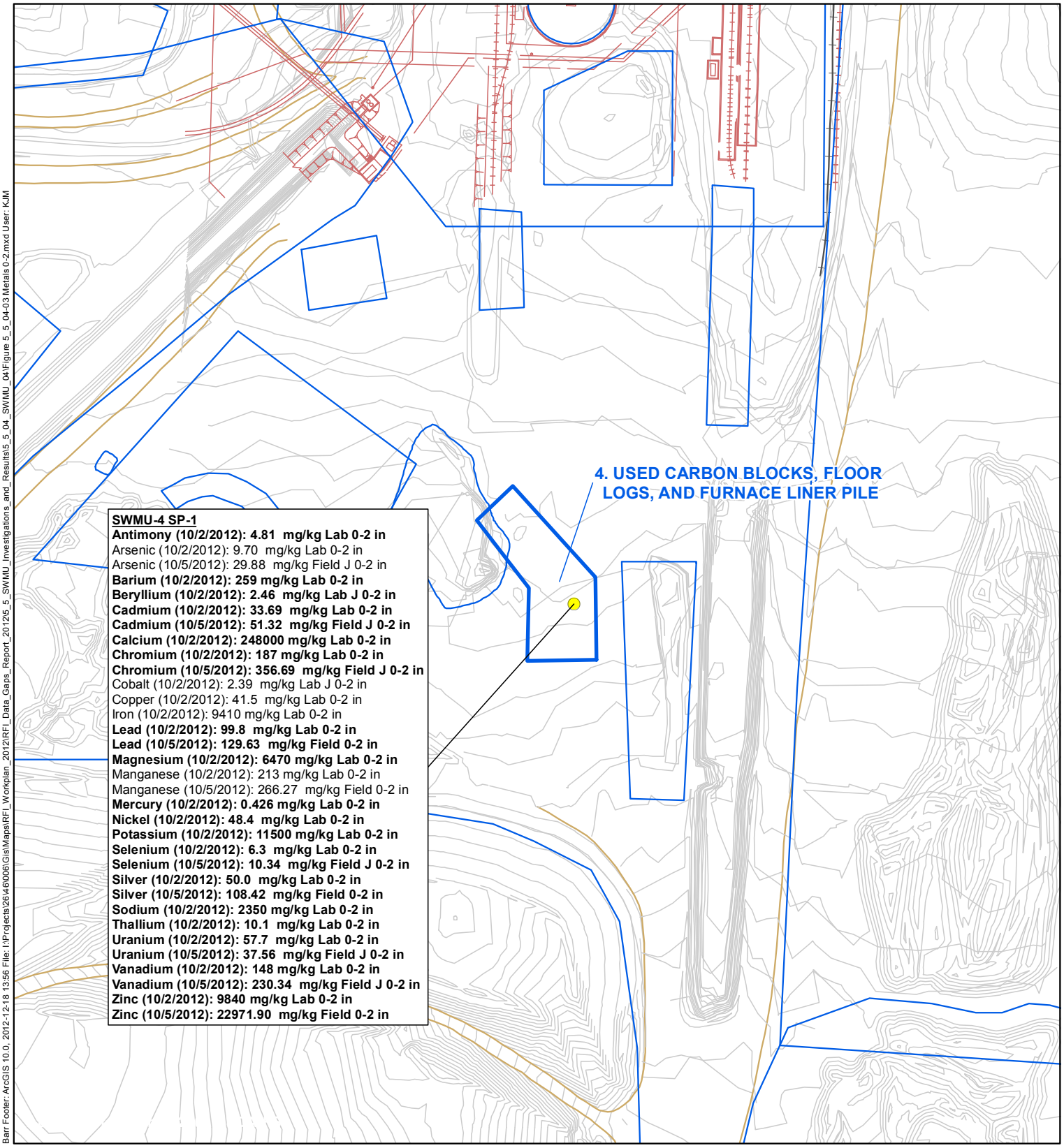
Bold font indicates that sample concentration is greater than the 95% UCL of mean Reference Area Concentration.

N

Feet
150 0 150

Figure 5.5.4-2

SWMU 4
GENERAL PARAMETERS
Rhodia Silver Bow Plant
Montana



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- Sample Location
- SWMU 4
- Other SWMUs
- Elevation Contour
- Drainage
- Railroad
- Road
- Former Plant Structures

Bold font indicates that sample concentration is greater than the 95% UCL of mean Reference Area Concentration.

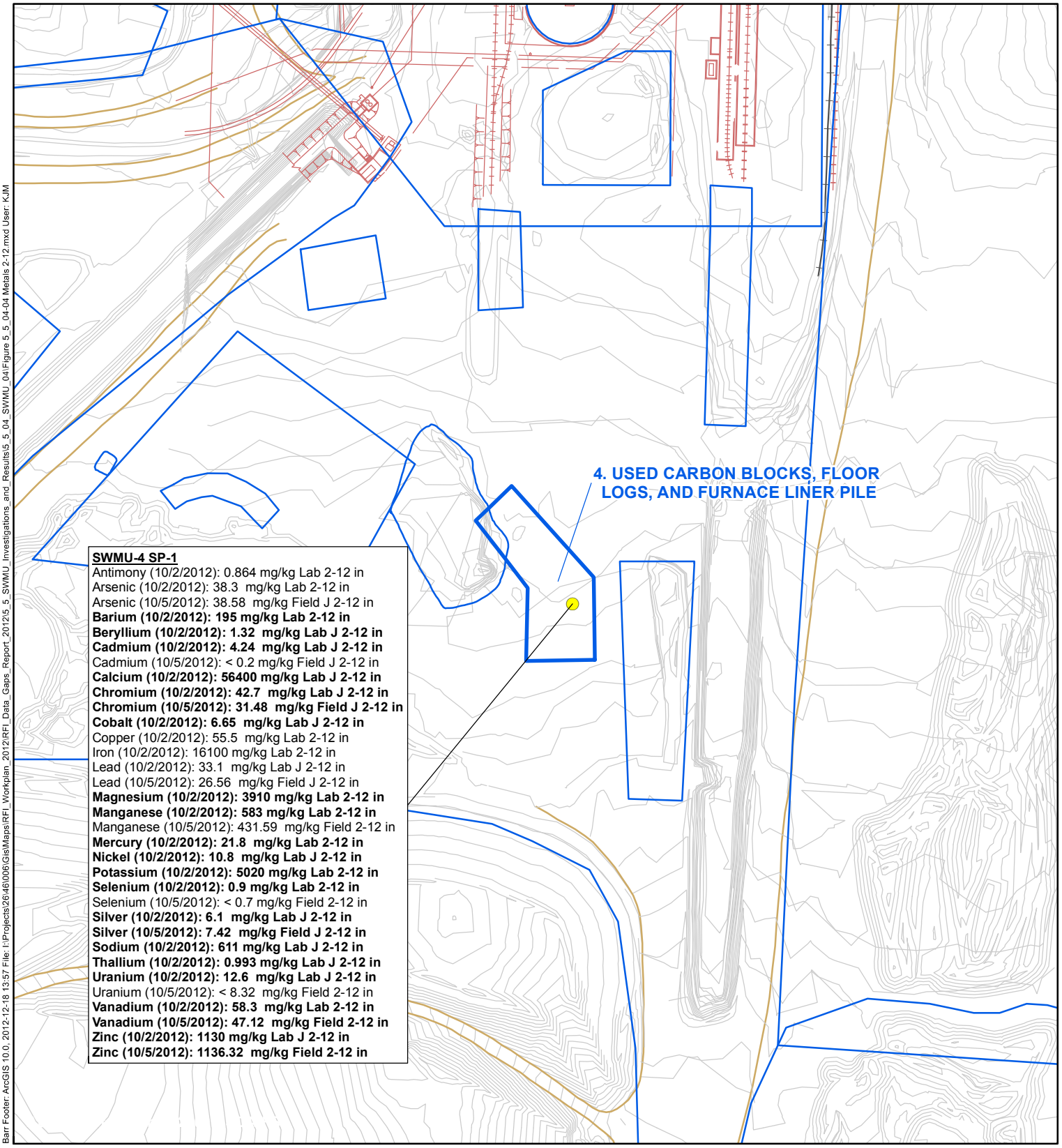
N

Feet

150 0 150

Figure 5.5.4-3

SWMU 4
METALS, 0-2 INCHES
Rhodia Silver Bow Plant
Montana



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Sample Location
SWMU 4
Other SWMUs
Elevation Contour
Drainage
Railroad
Road
Former Plant Structures

Bold font indicates that sample concentration is greater than the 95% UCL of mean Reference Area Concentration.

N

Feet
150 0 150

Figure 5.5.4-4
SWMU 4
METALS, 2-12 INCHES
Rhodia Silver Bow Plant
Montana

Appendices

Appendix 5.5.4-A

SWMU 4 - Test Pit Log

PROJECT NO. 26460006

TEST PIT NO. SWMU-4 SP-1 SHEET 1 OF 1

TEST PIT WALL LOG

PROJECT Rhodia RFI LOCATION SWMU-4 Used Carbon Blocks MAP OF N WALL OF PIT

ELEVATION N/A CONTRACTOR MT Reclamation & Landscaping DATE EXCAVATED 10/2/12

WATER LEVEL AND DATE N/A - Dry EXCAVATION METHOD Backhoe LOGGER CML2

APPROXIMATE DIMENSIONS LENGTH 5' WIDTH 2' DEPTH 1.5' REMARKS

ELEVATION | DEPTH BELOW SURFACE ( ) | SAMPLE: INTERVAL, TYPE AND NUMBER

0

1

2

0"
2"
12"

0-12": Reddish silty sand w/ gray gravel (fill)

12-18": Reddish brown sandy silt (native)

LENGTH: 0 1 2 3 4 5

COMMENTS

Sample collected at 14:30 SWMU-4 SP-1 (0-2)

Sample collected at 14:45 SWMU-4 SP-1 (2-12)

Collected sample SWMU-4 SP-201 (2-12)

Appendix 5.5.4-B

2012 XRF Instrument Concentrations

Appendix 5.5.5-B - XRF Instrument Concentrations

Element	SWMU-4 SP-1 0-2 in			SWMU-4 SP-1 0-2 in R			SWMU-4 SP-1 2-12 in		
	Concentration	Instrument		Concentration	Instrument		Concentration	Instrument	
		Reading	2σ		Reading	2σ		Reading	2σ
Molybdenum	9 J	8.78	5.27	9 J	8.92	5.28	10 U	< LOD	6.38
Zirconium	175	175.14	12.29	170	170.39	12.14	349	348.65	11.44
Strontium	655	655.38	15.97	648	648.01	15.85	356	355.87	9.86
Uranium	53 J	52.95	15.75	68 J	68.06	16.23	23 U	< LOD	15.2
Rubidium	149	148.69	9.25	145	145.38	9.25	112	112.08	6.51
Thorium	19 U	< LOD	12.51	18 U	< LOD	11.68	20 J	20.45	6.31
Lead	174	174.4	16.69	196	195.72	17.46	42	42.26	7.86
Selenium	18 J	17.78	6.55	19 J	19.24	6.51	7 U	< LOD	4.98
Arsenic	40 J	39.97	14.39	26 J	26.25	14.57	53	53.35	8.32
Mercury	33 J	32.88	21.13	41 J	41.44	20.92	24 J	24.21	8.63
Zinc	25292	25292.27	223.93	24945	24944.66	221.8	1523	1523.04	46.41
Tungsten	435 U	< LOD	289.83	428 U	< LOD	285.06	133 U	< LOD	88.36
Copper	164	163.85	31.92	108 J	108.22	29.41	74 J	74.09	18.58
Nickel	126 J	125.96	58.48	109 J	108.88	56.97	86 U	< LOD	57.37
Cobalt	296 U	< LOD	197.18	290 U	< LOD	193.16	244 U	< LOD	162.4
Iron	22707	22707.14	386.61	22392	22391.73	382.91	23153	23153.09	324.18
Manganese	375 J	375.03	86.43	323 J	322.94	83.09	595	595.45	75.07
Chromium	496	495.96	26.04	478	478.37	25.7	99	99.37	19.29
Vanadium	234	233.56	32.07	255	254.52	32.29	111 J	111.41	34.02
Titanium	1247	1247.06	95.54	1218	1218.36	94.49	3148	3147.65	114.28
Scandium	554 J	553.57	151.12	485 J	484.86	149.97	165 J	164.59	68.69
Calcium	123746	123745.7	820.91	123080	123080.43	817.43	25301	25300.95	370.13
Potassium	21794	21793.71	532.64	21773	21772.78	531.43	19100	19099.83	460.41
Sulfur	1690 U	< LOD	1126.59	1623 U	< LOD	1081.78	1003 U	< LOD	668.86
Barium	649	649.02	43.86	722	721.83	45.06	635	634.69	36.65
Cesium	132	132.3	12.03	147	147.25	12.29	87	86.76	9.82
Tellurium	223	222.59	38.12	233	232.79	38.78	160	159.57	31.41
Antimony	76	75.56	14.35	90	89.65	14.72	35 J	34.93	11.53
Tin	77	76.95	12.81	77	77.2	13.04	42 J	41.84	10.16
Cadmium	71	71.32	9.65	67	66.84	9.68	11 J	10.86	6.94
Silver	134	134.16	9.37	151	150.74	9.85	18 J	18.07	5.4
Palladium	13 J	12.96	8.54	21 J	21.09	9.03	15 U	< LOD	10.32