

United States Environmental Protection Agency

Region 8 START V
TD: 2359-2311-08

TETRA TECH

Analyst: S. DeNeice
Date: 2/9/2024

Rumsey Mill

Phillipsburg, Granite County, Montana

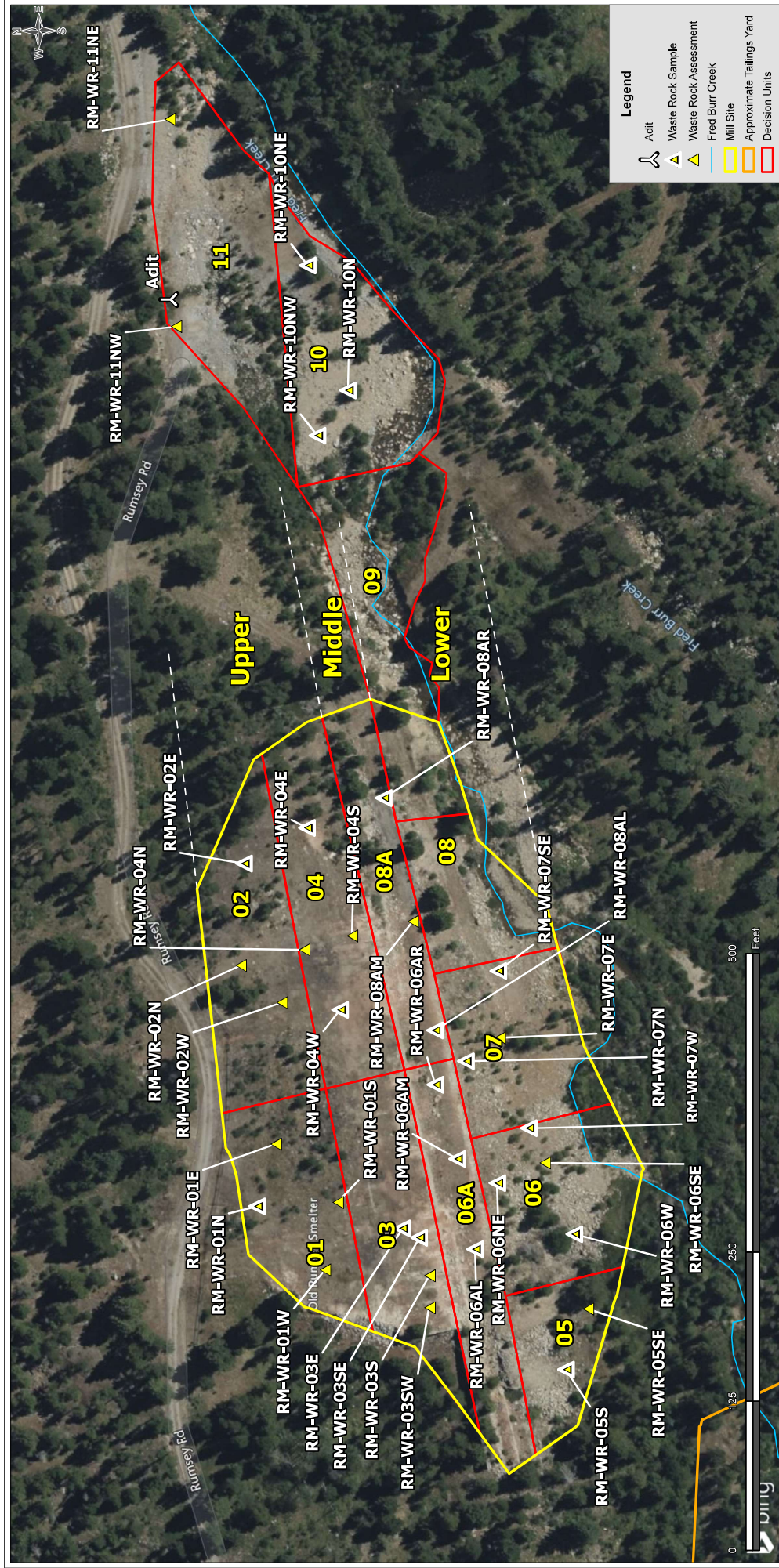
Figure 2

Tailings Yard and Water Assessment Locations

Notes:

Source:
Background: Esri World Topographic Map
Spatial Reference: WGS 1984 Web Mercator Auxiliary Sphere
Coordinate System

Path: V:\008_51\RTV\Rumsey Mill\36\Rumsey Mill_ESI_20240201.aprx Fig: GWS\SWASO QOC1 Sample Loss 11X17 GWS\SWASO QOC1 Sample Loss



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Rumsey Mill

Phillipsburg, Granite County, Montana

Figure 3

Waste Rock

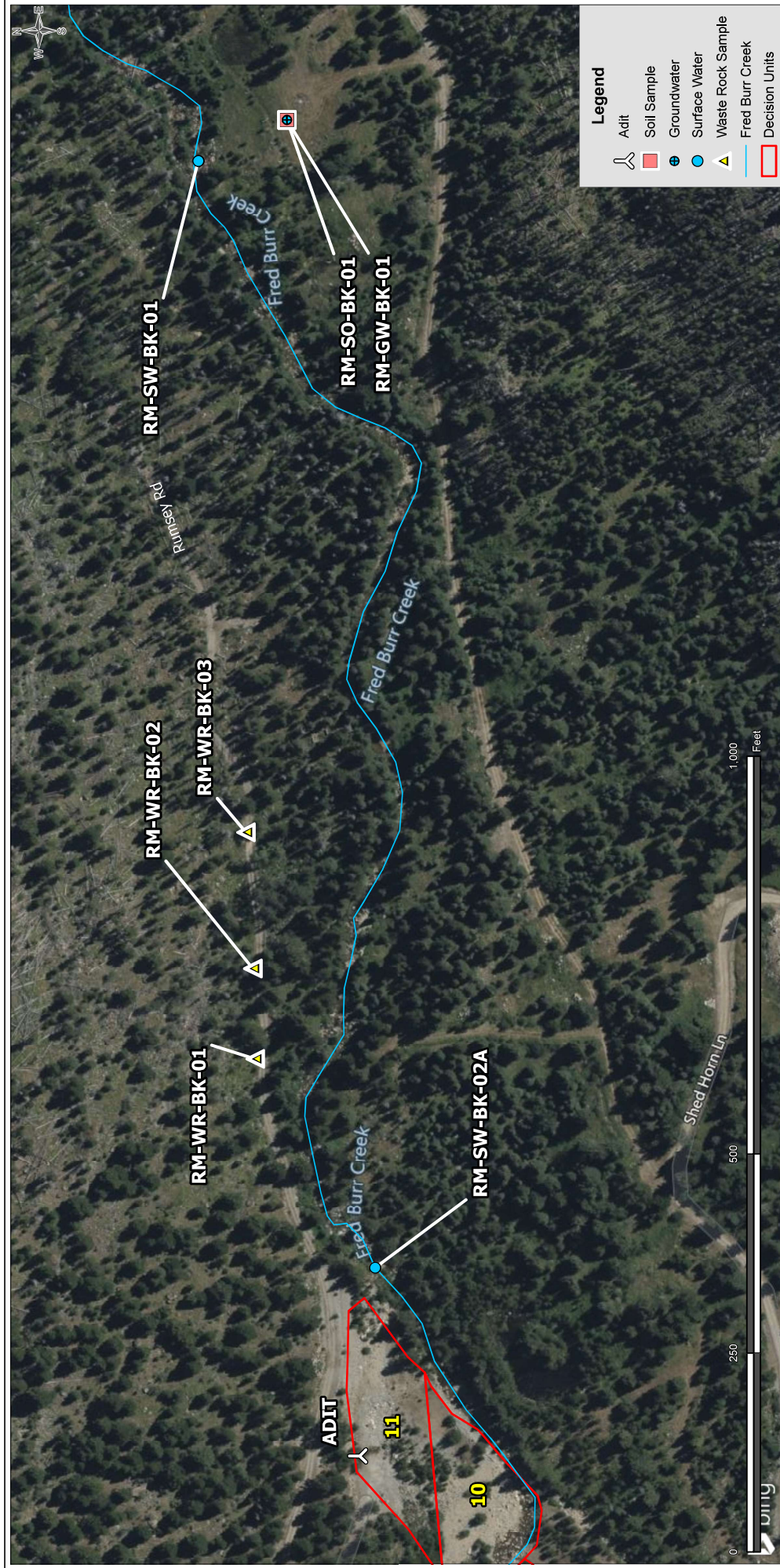
Assessment Locations

Notes:

- Upper tier of the Mill Site was divided into decision units 01, 02, 03 and 04
- Middle tier of the Mill Site was divided into decision units 06A and 08A
- Lower tier of the Mill Site and adjoining areas were divided into decision units 05, 06, 07, 08, 09, 10, and 11

Source:

- Background: Esri World Topographic Map
- Spatial Reference: WGS 1984 Web Mercator Auxiliary Sphere
- Coordinate System



Notes:

Source:
Background: Esri World Topographic Map
Spatial Reference: WGS 1984 Web Mercator Auxiliary Sphere
Coordinate System

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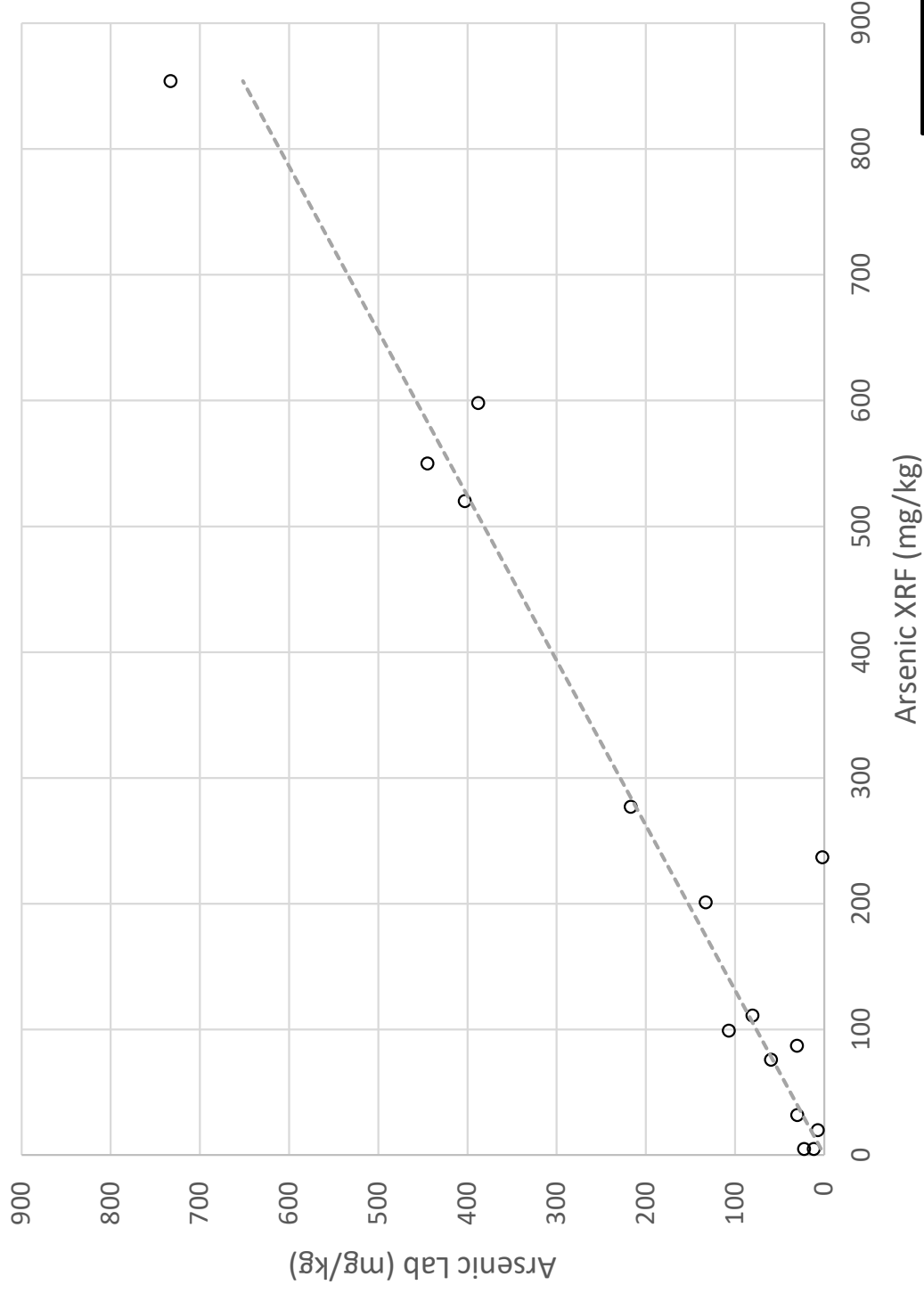
Analyst: S. DeNeice
Date: 2/9/2024

Rumsey Mill

Phillipsburg, Granite County, Montana

Figure 4
Background
Assessment Locations

Arsenic XRF vs Lab

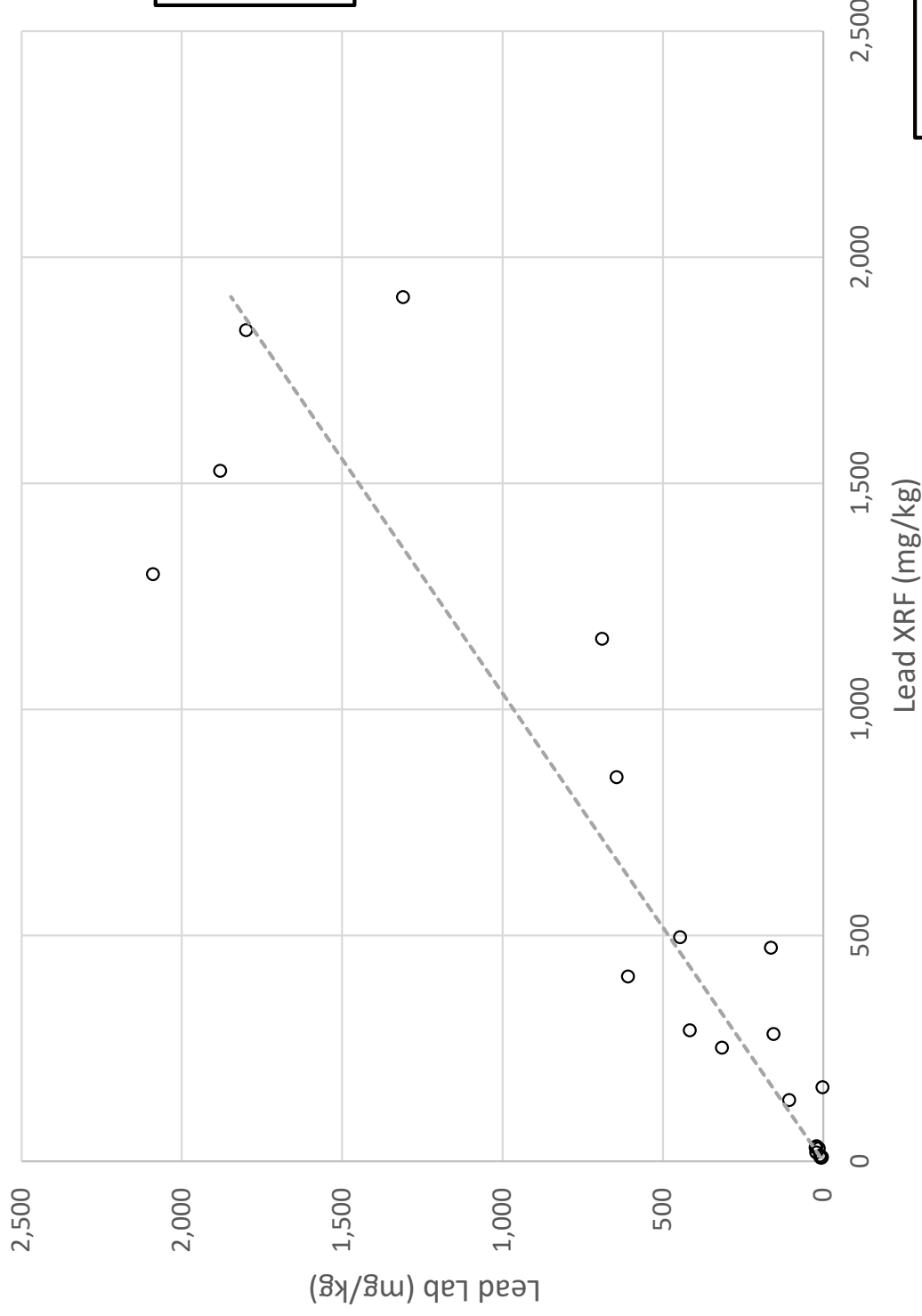


$$y = 0.7634x$$
$$R^2 = 0.9585$$

- Arsenic XRF vs Arsenic Lab
- Linear (Arsenic XRF vs Arsenic Lab)

Figure 5
Rumsey Mill Site
TD 2359-2311-08

Lead XRF vs Lab



$y = 0.9661x$
 $R^2 = 0.8936$

- Lead XRF vs Lead Lab
- Linear (Lead XRF vs Lead Lab)

Figure 6
Rumsey Mill Site
TD 2359-2311-08

APPENDIX E. TABLES WITH SUMMARY OF RESULTS

Table 5

Waste Rock Result Summary

Rumsey Mill, Philipsburg, Granite County, Montana

Sample Number: RM-WR-01N-2023-1012		Field Sample	RM-WR-02E-2023-1012	Field Sample	RM-WR-03E-2023-1011	Field Sample	RM-WR-03SE-2023-1011	Field Sample	RM-WR-04W-2023-1012	Field Sample	RM-WR-04E-2023-1012	Field Sample	RM-WR-06AL-2023-1010	Field Sample	RM-WR-06AM-TOP-2023-1010	Field Sample	RM-WR-06AR-2023-1010
Sample Type: Date Sampled:		10/12/2023	10/12/2023	10/12/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/12/2023	10/12/2023	10/12/2023	10/12/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023	10/10/2023
Matrix:		Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock
Sampling Location:		RM-WR-01N	RM-WR-02E	RM-WR-03E	RM-WR-03SE	RM-WR-04W	RM-WR-04E	RM-WR-06AL	RM-WR-06AM	RM-WR-06AR							
Sample Depth Below Ground Surface (feet):		3	4	0.5	0.5	2	3	1							1		2
CAS Number	Analyte	EPA Ind. RML	EPA Ind. RSL	Upper Level Mill Site													
Total Metals (mg/kg)																	
7429-90-5	Aluminum	1,100,000	1,100,000	7,440	7,960		6,500	7,970		8,230	6,120		8,050		9,160		5,640
7440-36-0	Antimony	470	470	2.39	0.616 J-		115	142		396	337		164		202		9.62
7440-38-2	Arsenic	300	3	59.6	11.7		869	1,140		5,610	4,280		1,510		1,470		80.5
7440-39-3	Barium	220,000	220,000	92.2	109		279	208		360	388		235		228		143
7440-41-7	Beryllium	2,300	2,300	0.179	0.22		0.209	0.254		0.34	0.249		0.301		0.342		0.194
7440-43-9	Cadmium	100	100	0.139	0.037		3.34	2.58		12.6	7.11		3.6		2.51		0.692
7440-70-2	Calcium	--	--	1,690	1,640		76,800	58,400		34,800	37,000		20,200		22,100		2,020
7440-47-3	Chromium	1,800,000	1,800,000	3.34	3.85		3.89	4.35		5.26	3.37		4.2		4.35		2.75
7440-48-4	Cobalt	350	350	3.86	5.1		5.07	5.33		5.15	4.25		3.89		4.21		6.8
7440-50-8	Copper	47,000	47,000	5.94	5.1		45.2	93.8		431	257		163		83.8		21.9
7439-89-6	Iron	820,000	820,000	10,400	12,900		11,400	17,600		27,100	15,200		12,400		15,700		13,700
7439-92-1	Lead	800	800	4.27	10.3		231	586		2,090	1,880		1,800		690		23.7
7439-95-4	Magnesium	--	--	2,730	3,550		4,360	4,360		3,320	3,080		3,470		3,070		3,460
7439-96-5	Manganese	26,000	26,000	347	246 J-		1,130	1,140		4,860	2,730		993		926		588
7439-97-6	Mercury	46	46	0.062	0.189		1.33	7.78		14.7	10.7		16.4		7.24		3.8
7440-02-0	Nickel	18,000	18,000	2.23	2.74		2.6	3.4		3.69	2.41		3.18		3.52		2.48
7440-09-7	Potassium	--	--	1,740	2,500		3,530	3,540		2,350	2,060		2,500		2,170		2,550
7782-49-2	Selenium	5,800	5,800	1.2 U	0.91 U		1.1 U	0.1 J		0.1 J	0.1 J		0.09 J		0.98 U		0.81 U
7440-22-4	Silver	5,800	5,800	0.414	1.14		31.8	110		389	267		156		68.9		4.63
7440-23-5	Sodium	--	--	107	105		221	302		629	521		540		372		89
7440-28-0	Thallium	12	12	0.11	0.124		0.5	0.782		1.57	1.78		1.54		1.15		0.157
7440-62-2	Vanadium	5,800	5,800	20.7	26.3		23.3	26.6		29.6	24		25.5		23.6		28.1
7440-66-6	Zinc	350,000	350,000	32.1	24.3		755	674		3,740	2,420		942		749		227

Table 5

Waste Rock Result Summary

Rumsey Mill, Philipsburg, Granite County, Montana

Sample Number:		Sample Type:		Date Sampled:		Matrix:		Sampling Location:		Sample Depth Below Ground Surface (feet):											
CAS Number	Analyte	EPA Ind. RML	EPA Ind. RSL	Middle Level Mill Site		RM-WR-08AL-2023-1011	RM-WR-08AR-2023-1011	Field Sample	RM-WR-05S-2023-1012	Field Sample	RM-WR-06NE-2023-1010	Field Sample	RM-WR-DU-2023-1010	Field Duplicate	RM-WR-06W-TOP-2023-1010	Field Sample	RM-WR-06W-BOT-2023-1010	Field Sample	RM-WR-07W-MID-2023	Field Sample	RM-WR-07N-2023-1010
Total Metals (mg/kg)																					
7429-90-5	Aluminum	1,100,000	1,100,000	8,190	10,800				9,820		8,940		8,040		8,230		9,840		5,240		8,440
7440-36-0	Antimony	470	470	318	627				1.46		99.3		91.6		36.5		22.9		1.76		20.5
7440-38-2	Arsenic	300	3	2,500	217				22.5		1,400		1,050		733		445		30.3		388
7440-39-3	Barium	220,000	220,000	323	204				105		271		202		188		150		79.6		175
7440-41-7	Beryllium	2,300	2,300	0.302	0.243				0.255		0.32		0.261		0.26		0.266		0.15		0.302
7440-43-9	Cadmium	100	100	3.79	1.81				0.032		1.89		1.55		1.65		1.26		0.044		1.2
7440-70-2	Calcium	--	--	19,400	5,900				1,430		17,700		15,700		1,730		1,360		1,280		1,620
7440-47-3	Chromium	1,800,000	1,800,000	4.64	5.1				3.49		4.46		3.98		3.75		4.31		2.68		5.37
7440-48-4	Cobalt	350	350	4.05	8.4				5.24		6.64		4.08		6.43		7.82		4.26		8.29
7440-50-8	Copper	47,000	47,000	133	198				8.99		70.3		58.8		102		67.6		7.3		120
7439-89-6	Iron	820,000	820,000	13,200	19,300				13,300		14,900		12,000		17,800		17,900		10,600		21,900
7439-92-1	Lead	800	800	1,310	609				9.05		644		401		446		252		21.2		416
7439-95-4	Magnesium	--	--	3,190	6,340				3,790		4,290		3,630		4,630		4,100		3,220		4,910
7439-96-5	Manganese	26,000	26,000	1,480	647				203		1,420 J		842 J		938		827		168		1,040
7439-97-6	Mercury	46	46	12.2	70				0.242		4.28		4.15		153		227		14.9		480
7440-02-0	Nickel	18,000	18,000	3.48	4.05				2.35		3.25		2.56		2.93		3.57		1.92		3.87
7440-09-7	Potassium	--	--	2,100	4,300				2,330		3,040		2,610		3,530		2,940		2,350		4,310
7782-49-2	Selenium	5,800	5,800	0.1 J	0.87 U				0.99 U		1 U		1.1 U		0.88 U		0.96 U		0.87 U		0.1 J
7440-22-4	Silver	5,800	5,800	129	42.4				0.56		60.4		51.2		66		33.9		3.33		45.2
7440-23-5	Sodium	--	--	589	160				242		277		197		115		106		103		131
7440-28-0	Thallium	12	12	2.05	0.219				0.131		0.956		0.633		0.293		0.283		0.109		0.437
7440-62-2	Vanadium	5,800	5,800	25.3	42.8				27.9		31.7		25.5		30		28.1		22.4		34.2
7440-66-6	Zinc	350,000	350,000	1,190	511				21.5		600		492		552		346		26.7		381

Table 5
Waste Rock Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Sample Number:		RM-WR-07SE-2023-1010	RM-WR-10NW-2023-1011	RM-WR-10N-2023-1011	RM-WR-10NE-2023-1011	RM-WR-BK-01-2023-1011	RM-WR-BK-02-2023-1011	RM-WR-BK-03-2023-1011
Sample Type:		Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample
Date Sampled:		10/10/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023	10/11/2023
Matrix:		Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock	Waste Rock
Sampling Location:		RM-WR-07SE	RM-WR-10NW	RM-WR-10N	RM-WR-10NE	RM-WR-BK-01	RM-WR-BK-02	RM-WR-BK-03
Sample Depth Below Ground Surface (feet):		2	3	4	4	1.5	2	1.5
CAS Number	Analyte	EPA Ind. RML	EPA Ind. RSL	Lower Level Mill Site			East of Mill Site Background Area	
Total Metals (mg/kg)								
7429-90-5	Aluminum	1,100,000	1,100,000	7,110	12,000	20,700	6,860	37,200
7440-36-0	Antimony	470	470	6.08	1.17	2.1	0.639	3.48
7440-38-2	Arsenic	300	3	133	50.3	30.7	7.34	107
7440-39-3	Barium	220,000	220,000	142	110	207	76.6	393
7440-41-7	Beryllium	2,300	2,300	0.238	0.174	0.437	0.132	1.03
7440-43-9	Cadmium	100	100	0.613	0.187	0.064	0.022	0.168
7440-70-2	Calcium	--	--	1,680	5,220	1,860	1,370	2,950
7440-47-3	Chromium	1,800,000	1,800,000	14.3	7.07	6.09	2.7	7.6
7440-48-4	Cobalt	350	350	6.15	6.07	6.15	4.01	5.34
7440-50-8	Copper	47,000	47,000	42.9	9.26	13.2	12	26.8
7439-89-6	Iron	820,000	820,000	17,600	15,700	15,400	8,420	19,700
7439-92-1	Lead	800	800	155	31.6	14	4.7	21.7
7439-95-4	Magnesium	--	--	4,230	4,900	3,820	2,650	3,170
7439-96-5	Manganese	26,000	26,000	629	422	254	124	355
7439-97-6	Mercury	46	46	86	0.89	0.263	0.048	0.593
7440-02-0	Nickel	18,000	18,000	3.39	5.41	4.6	1.83	7.38
7440-09-7	Potassium	--	--	3,660	3,600	2,220	1,630	1,820
7782-49-2	Selenium	5,800	5,800	0.88 U	0.87 U	0.17 J	0.72 U	0.3 J
7440-22-4	Silver	5,800	5,800	16.6	4.08	2.1	0.374	3.06
7440-23-5	Sodium	--	--	96	114	115	61	177
7440-28-0	Thallium	12	12	0.297	0.154	0.148	0.071	0.134
7440-62-2	Vanadium	5,800	5,800	30.2	32.9	25.4	17.2	41.9
7440-66-6	Zinc	350,000	350,000	204	49.8	36.4	20.8	88.3

Table 5
Waste Rock Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Table 5 Notes:	
–	no data available
BK	Background
BOLD	Analyte detected above the EPA RSL November 2023 (TR=10 ⁻⁶ and THQ=1.0)
BOLD	Analyte detected above the EPA RML November 2023 (TR=10 ⁻⁴ and THQ=1.0)
DU	Duplicate
EPA	U.S. Environmental Protection Agency
Ind.	Industrial
mg/kg	milligram per kilogram
RM	Rumsey Mill
RML	Regional Removal Management Level
RSL	Regional Screening Level
WR	Waste Rock
J	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample
J-	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased low
U	The analyte was analyzed for, but was not detected at or above the associated value (reporting limit)

Table 5
Waste Rock Acid Base Counting Findings
Rumsey Mill, Philipsburg, Granite County Montana

Sample ID	Sample Date	Sample Time	Lab #	Moisture, Total D3173 wt%	Sulfur, Total D4239 Moist Free wt%	Neutralization Potential Sobek 3.2.3 t CaCO ₃ /1000t		Acid Potential Calculation t CaCO ₃ /1000t		Acid - Base Accounting Calculation t CaCO ₃ /1000t [>20 kg/ton CaCO ₃ is non acid producing]	Neutralization Potential Ratio [>3 the material is non-acid producing]		Finding
						NP	AP	NNP=NP-AP	NPR=NP/AP				
RM-WR-04E-2023-1012	10/12/2023	1315	T2301790-001	12.29	0.23	149	7	142	21.29	Non-Acid Producing			
RM-WR-04W-2023-1012	10/12/2023	1200	T2301790-002	11.16	0.28	129	9	121	14.33	Non-Acid Producing			
RM-WR-08AL-2023-1011	10/11/2023	1015	T2301790-003	14.47	0.1	76	3	73	25.33	Non-Acid Producing			
RM-WR-06AL-2023-1010	10/10/2023	1700	T2301790-004	0.75	0.12	99	4	95	24.75	Non-Acid Producing			
RM-WR-06AM-TOP-2023-1010	10/10/2023	1640	T2301790-005	0.87	0.08	78	3	75	26.00	Non-Acid Producing			

Table 5 Notes:

NP - Neutralization Potential

AP - Acid Production Potential

NNP - Net Neutralization Potential

NPR - Neutralization Potential Ratio

Result Interpretation Source - https://pubs.usgs.gov/of/2003/ofr-03-210/Section508/IX_Acid-base_Accounting-508.pdf

Table 6
Soil Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

CAS Number		Analyte		EPA Ind.		EPA Ind.		RML		RSL		Depth Interval Below Ground Surface (feet):																		Transect 3 Tailings Yard	
												Transect 1 Tailings Yard									Transect 2 Tailings Yard										
Total Metals (mg/kg)																															
7429-90-5	Aluminum	1,100,000	1,100,000	5,330		3,400		4,260		7,680		5,340		13,300		7,000		7,290		16,800											
7440-36-0	Antimony	470	470	10.1		69.8		20.9		1.38		0.304		13.5 J-		0.07 J		6.52		0.147											
7440-38-2	Arsenic	300	3	403		1,590		561		115		28.1		618 J		2.1		198		20.5											
7440-39-3	Barium	220,000	220,000	109		60.4		89		128		91.1		202		93.4		117		214											
7440-41-7	Beryllium	2,300	2,300	0.164		0.152		0.142		0.21		0.269		0.482		0.157		0.24		0.744											
7440-43-9	Cadmium	100	100	1.51		1.21		1.05		1.46		0.269		5.42		1.91		0.702		0.543											
7440-70-2	Calcium	--	--	1,400		812		1,460		2,070		1,380		1,370		2,200		2,540		2,840											
7440-47-3	Chromium	1,800,000	1,800,000	2.45		2.29		8.01		4.82		4.42		6.31		5.31		5.79		10.1											
7440-48-4	Cobalt	350	350	3.67		1.51		3.41		6.74		4.21		6.08		5.65		5.76		8.92											
7440-50-8	Copper	47,000	47,000	40.2		217		71.2		13.8		14.3		80.1 J		6.02		23.7		27.1											
7439-89-6	Iron	820,000	820,000	11,400		13,300		14,400		41,300		40,100		25,100		14,900		24,900		39,000											
7439-92-1	Lead	800	800	106		489		190		4.28		3.31		163 J-		2.16		61.6		6.09											
7439-95-4	Magnesium	--	--	2,800		1,180		2,870		3,790		2,010		4,750		4,340		4,100		5,840											
7439-96-5	Manganese	26,000	26,000	946		1,300		1,970		461		160		1,320		421		630		1100											
7439-97-6	Mercury	46	46	-- ^a		-- ^a		-- ^a		0.838		0.245		18.9		0.088		21		0.211											
7440-02-0	Nickel	22,000	22,000	1.9		1.04		2.06		2.2		1.63		3.26		1.92		2.2		4.64											
7440-09-7	Potassium	--	--	1,560		701		1,410		2,160		1,140		1,740		1,390		1,650		3,170											
7782-49-2	Selenium	5,800	5,800	0.85 U		0.07 J		0.76 U		0.2 J		0.1 J		0.2 J		1 U		0.12 J		0.22 J											
7440-22-4	Silver	5,800	5,800	17.6		100		28.5		0.271		0.136		11.7		0.036		7.14		0.084											
7440-23-5	Sodium	--	--	96		362		168		87		66		125		96		105		163											
7440-28-0	Thallium	12	12	0.107		0.08		0.109		0.137		0.095		0.206		0.076		0.123		0.252											
7440-62-2	Vanadium	5,800	5,800	21.4		14.9		26.8		51.6		67		53		36.5		54.4		91.7											
7440-66-6	Zinc	350,000	350,000	442		802		677		317		104		845		360		232		480											

Table 6
Soil Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Sample Number: Sample Type: Date Sampled: Matrix: Sampling Location:		RM-SO-10-2-9-3-6-2023-1011		RM-SO-10-14-2-15-02023-1011		RM-SO-11-0-3-0-6-2023-1012		RM-SO-12-2-7-3-3-2023-1011		RM-SO-13-3-0-3-6-2023-1011		RM-SO-BK-01-1.1-1.7-2023-1012	
		Field Sample		Field Sample		Field Sample		Field Sample		Field Sample		Field Sample	
		10/11/2023		10/11/2023		10/12/2023		10/11/2023		10/11/2023		10/12/2023	
RM-SO-10		Soil		Soil		Soil		Soil		Soil		Soil	
RM-SO-10		RM-SO-10		RM-SO-10		RM-SO-11		RM-SO-12		RM-SO-13		RM-SO-BK-01	
2.9-3.6		14.2-15.0		0.3-0.6		2.7-3.3		3.0-3.6		1.1-1.7			
Depth Interval Below Ground Surface (feet):		Transect 4 Tailing Yard		Transect 5 Tailings Yard									
CAS Number	Analyte	EPA Ind. RML	EPA Ind. RSL										
Total Metals (mg/kg)													
7429-90-5	Aluminum	1,100,000	1,100,000	17,900	5,960	7,450	12,400	13,600	8,120				
7440-36-0	Antimony	470	470	1.06	0.097 U	8.16	13.8	1.68	1.15				
7440-38-2	Arsenic	300	3	52.8	1.34	126	537	130	40.3				
7440-39-3	Barium	220,000	220,000	238	151	134	200	143	98.2				
7440-41-7	Beryllium	2,300	2,300	0.73	0.154	0.239	0.462	0.444	0.182				
7440-43-9	Cadmium	100	100	15.9	0.105	2.08	5.03	12.8	0.042				
7440-70-2	Calcium	--	--	2,360	2,030	5,310	1,240	1,710	1,550				
7440-47-3	Chromium	1,800,000	1,800,000	9.36	3.17	8.87	6.21	5.92	4.07				
7440-48-4	Cobalt	350	350	8.42	5.31	5.5	5.7	5.83	4.74				
7440-50-8	Copper	47,000	47,000	28.5	9.65	23.3	82.3	20.2	4.13				
7439-89-6	Iron	820,000	820,000	33,500	11,500	27,300	24,700	24,500	12,100				
7439-92-1	Lead	800	800	13.1	2.09	58.4	128	75.7	5.83				
7439-95-4	Magnesium	--	--	6,000	4,340	3,170	4,320	4,340	3,540				
7439-96-5	Manganese	26,000	26,000	1,180	577	498	1,210	1,010	184				
7439-97-6	Mercury	46	46	1.84	0.012 J	34	17.3	52	0.172				
7440-02-0	Nickel	22,000	22,000	4.87	2.05	2.32	3.11	3.03	2.3				
7440-09-7	Potassium	--	--	2,000	2,500	1,270	1,500	1,810	2,050				
7782-49-2	Selenium	5,800	5,800	0.35 J	0.97 U	0.19 J	0.16 J	0.11 J	0.92 U				
7440-22-4	Silver	5,800	5,800	0.533	0.009 J	10.6	22.3	2.97	0.957				
7440-23-5	Sodium	--	--	86	121	92	106	73	111				
7440-28-0	Thallium	12	12	0.221	0.121	0.097	0.177	0.305	0.131				
7440-62-2	Vanadium	5,800	5,800	75.6	26.9	71.3	51.2	48.1	25.9				
7440-66-6	Zinc	350,000	350,000	1,350	43.6	300	934	673	28.6				

Table 6
Soil Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Table 6 Notes:	
--	no data available
-- ^a	Sample was dried in the field, therefore not analyzed for mercury.
BOLD	Analyte detected above the EPA RSL November 2023 (TR=10 ⁻⁶ and THQ=1.0)
EPA	Analyte detected above the EPA RML November 2023 (TR=10 ⁻⁴ and THQ=1.0)
Ind.	U.S. Environmental Protection Agency
mg/kg	Industrial
RM	milligram per kilogram
RML	Rumsey Mill
RSL	Regional Removal Management Level
SO	Regional Screening Level
	Soil
J	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample
J-	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased low
U	The analyte was analyzed for, but was not detected at or above the associated value (reporting limit)

Table 7
Groundwater Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Sample Number:			RM-GW-06-2023-1011	RM-GW-10-2023-1011	RM-GW-11-2023-1011	RM-GW-12-2023-1012	RM-GW-13-2023-1012	RM-GW-14-2023-1012	RM-GW-15-2023-1012	RM-GW-16-2023-1012	RM-GW-17-2023-1012	RM-GW-BK-01-2012	
Sample Type:			Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	Field Sample	
Date Sampled:			10/11/2023	10/11/2023	10/11/2023	10/12/2023	10/12/2023	10/12/2023	10/12/2023	10/12/2023	10/12/2023	10/12/2023	
Matrix:			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	
Sampling Location:			RM-GW-09	RM-GW-10	RM-GW-11	RM-GW-12	RM-GW-13	RM-GW-14	RM-GW-15	RM-GW-16	RM-GW-17	RM-GW-BK-01	
Groundwater Elevation (feet):			5,708.5	5,708.26	5,709.24	5,713.10	5,711.54	5,717.72	5,716.67	5,733.81	5,733.36	5,867.42	
CAS Number	Analyte	Human Health GW	Transect 1 Mill Site			Transect 2 Mill Site			Transect 3 Mill Site			Transect 4 Mill Site	Upstream of Mill Site Background Area
Total (T) and Dissolved (D) Metals (ug/L)													
7429-90-5	Aluminum (D)	--	593	28.5	137	124	11.6	31.8	10.3	193	6.5 J*	1,430	
7429-90-5	Aluminum (T)	--	3,510	3,100	1,490	122,000		6,000	1,780	2,280	1,680	1,030,000	
7440-36-0	Antimony (D)	6	2.1	0.736	1.04	0.989	0.397	0.793	0.898	2.06	0.732	0.645	
7440-36-0	Antimony (T)	--	2.05	1.62	2.15	0.524	0.38	0.624	0.953	2.11	0.713	1.95	
7440-38-2	Arsenic (D)	10	25.7	15.5	97.5	8.5	56	2.6	5.5	0.65	0.16 J	1.07	
7440-38-2	Arsenic (T)	--	33.9	115	127	49.6	55.9	9.82	8.25	2.49	0.9	103	
7440-39-3	Barium (D)	1,000	20.1	15.1	48	47.8	57.4	22.8	92.5	40.9	37.8	64.8	
7440-39-3	Barium (T)	--	45.8	99.4	69.5	2,410	64.6	122	74.6	72.7	23.600		
7440-41-7	Beryllium (D)	4	0.019 J	0.04 U	0.01 J	0.008 J	0.04 U	0.04 U	0.04 U	0.011 J	0.04 U	0.055	
7440-41-7	Beryllium (T)	--	0.084	0.113	0.049	4.71	0.018 J	0.201	0.052	0.082	0.051	45.7	
7440-43-9	Cadmium (D)	5	0.218	0.042	0.155	0.034 J	0.09	0.435	4.49	0.04 J	0.027 J	0.009 J	
7440-43-9	Cadmium (T)	--	0.285	0.079	1.21	1.09	0.091	2.32	4.96	0.056	0.09	2.3	
7440-70-2	Calcium (D)	--	11,900	4,760	12,000	31,600	21,900	25,800	38,600	19,200	20,200	15,700	
7440-70-2	Calcium (T)	--	12,000	5,900	11,900	82,500	21,800	38,700	19,500	20,300	366,000		
7440-47-3	Chromium (D)	100	0.5	0.18 J	0.29	0.16 J	0.3	0.24	0.32	0.35	0.11 J	1.94	
7440-47-3	Chromium (T)	--	2	12.5	176	61.9	0.75	397	2.03	2.8	0.36	1,230	
7440-48-4	Cobalt (D)	--	0.343	0.159	1.18	1.31	1.41	0.875	0.173	0.679	0.238	3.52	
7440-48-4	Cobalt (T)	--	0.535	2.1	0.999	52.3	1.6	4.52	0.874	1.53	0.934	596	
7440-50-8	Copper (D)	1,300	1.95	0.58	1.63	1.09	0.28	0.78	0.93	1.45	0.54	2.25	
7440-50-8	Copper (T)	--	5.43	15.3	9.51	219	1.15	14.4	5.3	5.3	5.36	1,760	
7439-89-6	Iron (D)	--	340	104	1,060	148	4,540	27.4	30.2	355	6	3,150	
7439-89-6	Iron (T)	--	2,240	4,070	2,390	140,000	5,090	6,880	1780	3,360	1,730	1,220,000	
7439-92-1	Lead (D)	15	1.57	0.478	0.908	0.099	0.047	0.027	0.018 J	0.34	0.012 J	1.03	
7439-92-1	Lead (T)	--	7.41	19.4	4.87	124	1.24	5.37	0.818	2.27	1.25	735	
7439-95-4	Magnesium (D)	--	2,900	744	2,800	7,110	3,610	6,250	7,990	3,550	3,720	3,490	
7439-95-4	Magnesium (T)	--	3,310	1930	2,480	47,900	3,950	8,250	8,610	4,210	4,210	418,000	
7439-96-5	Manganese (D)	--	14.9	87.3	721	115	4,020	10.8	578	93.8	19.3	197	
7439-96-5	Manganese (T)	--	39.7	1160	769	2,600	4,050	866	624	144	358	22,800	
7439-97-6	Mercury (D)	2	0.23	0.2 U	0.12 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	
7439-97-6	Mercury (T)	--	1.43	0.77	1.37	7.28	0.02 J	0.1 J	0.78	0.07 J	0.03 J	9.37	
7440-02-0	Nickel (D)	100	0.25	0.34	0.55	0.55	0.51	0.34	0.78	0.44	0.27	2.41	
7440-02-0	Nickel (T)	--	0.76	3.03	0.69	29.1	0.55	1.72	1	1.08	0.74	368	
7440-09-7	Potassium (D)	--	3430	1,000	2,210	4,240	3,470	4,050	3,960	2,290	2,310	3,150	
7440-09-7	Potassium (T)	--	3740	1,690	2,470	27,300	3,690	5,540	4,440	2,800	2,670	255,000	
7782-49-2	Selenium (D)	50	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	
7782-49-2	Selenium (T)	--	1 U	1 U	1 U	0.6 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	8 J	
7440-22-4	Silver (D)	100	0.052	0.02 U	0.056	0.02 U	0.02 U	0.02 U	0.03	0.061	0.059	14.7	
7440-22-4	Silver (T)	--	0.337	0.584	0.612	6.94	0.021	0.145	0.03	0.061	0.059	14.7	
7440-23-5	Sodium (D)	--	6,900	5,330	5,130	9,390	8,150	7,920	8,680	5,940	8,120	74,725	
7440-23-5	Sodium (T)	--	7,020	5,540	5,130	11,200	8,540	8,140	8,700	6,010	6,990	544.6	
7440-28-0	Thallium (D)	2	0.02 U	0.02 U	0.02 U	0.027	0.02 U	0.02 U	0.02 U	0.011 J	0.015 J	51.1	
7440-28-0	Thallium (T)	--	0.048	0.057	0.018 J	1.62	0.01 J	0.118	0.04	0.034	0.058	52.56	
7440-62-2	Vanadium (D)	--	2.11	0.35	2.25	1.19	0.74	1.68	0.57	1.57	0.44	11.6	
7440-62-2	Vanadium (T)	--	6.85	12.1	10.1	292	2.56	16	4.23	9.83	4.3	2,860	
7440-66-6	Zinc (D)	2,000	102	45.6	68.4	1.2 J	63.9	121	60.6	8.3	9.1	3	
7440-66-6	Zinc (T)	--	162	258	132	368	70.8	437	103	19.2	23.2	1,990	
Hardness (mg/L)			43.6	22.7	39.9	403	70.7	103	131	66	68	2,640	
Hardness, Total as CaCO3 (T)													
Water Quality Parameters (units)													
--	Conductivity (uS/cm)	--	57,429	26,606	52,344	12,081	98,638	103,304	137,768	72,385	77,118	74,725	
--	Dissolved Oxygen (mg/L)	--	0.11	0.12	0.13	0.12	0.12	1.65	0.09	0.17	0.18	0.17	
--	ORP (mV)	--	-439	-271.2	-374.6	-507.3	-497.5	-53.8	-488.8	-483.8	-456.8	-544.6	
--	pH (SU)	--	6.29	6.27	6.32	6.58	6.23	6.52	6.43	6.29	6.49	6.5	
--	Salinity (ppt)	--	38.01	16.17	--	89.43	70.24	74.32	105.01	49.03	52.56	51.1	
--	Temperature (°C)	--	10.4	7.2	9.5	9	9	9.6	9.6	8.1	7.3	9.8	
--	Turbidity (NTU)	--	133.55	115.14	58.63	6,260.07	314.76	280.3	131.41	230.05	56.1	1,590.36	

Table 7
Groundwater Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Table 7 Notes:
^a Montana human health standards for metals in groundwater are based upon the dissolved portion of the sample after filtration through a 0.45 µm membrane filter.

--	no data available
BOLD	analyte detected above the human health standard for groundwater (2019, DEQ-7 Montana Numeric Water Quality Standards)
°C	degrees Celsius
CaCO ₃	calcium carbonate
D	dissolved metals
GW	groundwater
mg/L	milligram per liter
mV	millivolts
NTU	nephelometric turbidity units
pH	potential of hydrogen
ppt	parts per thousand
RM	Rumsey Mill
SU	standard units
T	total metals
ug/L	microgram per liter
uS/cm	microSiemens per centimeter
J	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample.
J+	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased high.
U	The analyte was analyzed for, but was not detected at or above the associated value (reporting limit).

Table 8
Surface Water Result Summary
Rumsey Mill, Philipsburg, Granite County, Montana

Table 8 Notes:

^a Montana human health standards for metals (except aluminum) in surface water are based upon the analysis of samples following a "total recoverable" digestion procedure
^b Freshwater aquatic life standards for these metals (Cadmium, Copper, Chromium (III), Lead, Nickel, Silver, Zinc) are expressed as a function of total hardness (mg/L CaCO₃)
The values displayed in the chart correspond to a total hardness of 25 mg/L. If the hardness is <25mg/L as CaCO₃, the number 25 must be used in the calculation. If the hardness is greater than or equal to 400 mg/L as CaCO₃, 400 mg/L must be used in the calculation. Since most samples had a hardness below 25, the aquatic life standards for these samples were calculated using a hardness of 25, and are shown in the columns on the left side of the table.
For sample RM-SW-ADIT-2023-1010, the hardness was between 25 and 400, so sample-specific aquatic life standards were calculated; these appear on the right side of the table with orange formatting.

--	no data available
BOLD	Analyte detected above the human health standard for surface water
BOLD	Analyte detected above the acute aquatic life standard for surface water
BOLD	Analyte detected above the chronic life aquatic standard for surface water
°C	degrees Celsius
CaCO ₃	calcium carbonate
D	dissolved metals
mg/L	milligram per liter
mV	millivolts
NTU	nephelometric turbidity units
pH	potential of hydrogen
ppt	parts per thousand
RM	Rumsey Mill
SU	standard units
SW	surface water
T	total metals
TDS	total dissolved solids
ug/L	microgram per liter
uS/cm	microSiemens per centimeter
J	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample.
J+	The analyte was positively identified; the associated value is the approximate concentration of the analyte in the sample and may be biased high.
U	The analyte was analyzed for, but was not detected at or above the associated value (reporting limit).

Table 9
XRF Linear Regression Correlation Data Set
Rumsey Mill, Philipsburg, Granite County, Montana

Location	Sample Number	Arsenic Lab Result (mg/kg)	Arsenic XRF Reading (ppm)	RPD
RM-WR-01N	RM-WR-01N-2023-1012	59.6	76	24%
RM-WR-02E	RM-WR-02E-2023-1012	11.7	5	80%
RM-WR-04W	RM-WR-04W-2023-1012	5610	2954	62%
RM-WR-04E	RM-WR-04E-2023-1012	4280	4857	13%
RM-WR-06AL	RM-WR-06AL-2023-1010	1510	2489	49%
RM-WR-06AM	RM-WR-06AM-TOP-2023-1010	1470	2107	36%
RM-WR-06AR	RM-WR-06AR-2023-1010	80.5	111	32%
RM-WR-08AL	RM-WR-08AL-2023-1011	2500	3354	29%
RM-WR-08AR	RM-WR-08AR-2023-1011	217	277	24%
RM-WR-05S	RM-WR-05S-2023-1012	22.5	5	127%
RM-WR-06NE	RM-WR-06NE-2023-1010	1400	2040	37%
RM-WR-06W	RM-WR-06W-TOP-2023-1010	733	854	15%
RM-WR-06W	RM-WR-06W-BOT-2023-1010	445	550	21%
RM-WR-07W	RM-WR-07W-MID-2023	30.3	32	5%
RM-WR-07N	RM-WR-07N-2023-1010	388	598	43%
RM-WR-07SE	RM-WR-07SE-2023-1010	133	201	41%
RM-WR-BK-01	RM-WR-BK-01-2023-1011	30.7	87	96%
RM-WR-BK-02	RM-WR-BK-02-2023-1011	7.34	20	93%
RM-WR-BK-03	RM-WR-BK-03-2023-1011	107	99	8%
RM-SO-03	RM-SO-03-0.3-0.6-2023-1010	403	520	25%
RM-SO-05	RM-SO-05-3.0-3.8-2023-1010	618	1889	101%
RM-SO-05	RM-SO-05-4.3-4.6-2023-1010	2.1	237	196%

Location	Sample Number	Lead Lab Result (mg/kg)	Lead XRF Reading (ppm)	RPD
RM-WR-01N	RM-WR-01N-2023-1012	4.27	10	80%
RM-WR-02E	RM-WR-02E-2023-1012	10.3	13	23%
RM-WR-04W	RM-WR-04W-2023-1012	2090	1299	47%
RM-WR-04E	RM-WR-04E-2023-1012	1880	1528	21%
RM-WR-06AL	RM-WR-06AL-2023-1010	1800	1839	2%
RM-WR-06AM	RM-WR-06AM-TOP-2023-1010	690	1156	50%
RM-WR-06AR	RM-WR-06AR-2023-1010	23.7	31	27%
RM-WR-08AL	RM-WR-08AL-2023-1011	1310	1912	37%
RM-WR-08AR	RM-WR-08AR-2023-1011	609	409	39%
RM-WR-05S	RM-WR-05S-2023-1012	9.05	9	1%
RM-WR-06NE	RM-WR-06NE-2023-1010	644	850	28%
RM-WR-06W	RM-WR-06W-TOP-2023-1010	446	496	11%
RM-WR-06W	RM-WR-06W-BOT-2023-1010	316	252	23%
RM-WR-07W	RM-WR-07W-MID-2023	21.2	34	46%
RM-WR-07N	RM-WR-07N-2023-1010	416	290	36%
RM-WR-07SE	RM-WR-07SE-2023-1010	155	282	58%
RM-WR-BK-01	RM-WR-BK-01-2023-1011	14	29	70%
RM-WR-BK-02	RM-WR-BK-02-2023-1011	4.7	9	63%
RM-WR-BK-03	RM-WR-BK-03-2023-1011	21.7	20	8%
RM-SO-03	RM-SO-03-0.3-0.6-2023-1010	106	136	25%
RM-SO-05	RM-SO-05-3.0-3.8-2023-1010	163	473	97%
RM-SO-05	RM-SO-05-4.3-4.6-2023-1010	2.16	164	195%

Table 9 Notes:

Milligrams per kilogram = mg/kg

Parts per million = ppm

Relative percent difference = RPD

Table 10
Predicted Laboratory Results for XRF Field Screening Results
Rumsey Mill, Philipsburg, Granite County, Montana

			Location	Depth Interval	Collection Date	Description	Sample Preparation	Arsenic XRF Readings (ppm)	Lead XRF Readings (ppm)	Predicted Lab Arsenic (ppm)	Predicted Lab Lead (ppm)
Tailings Yard	Transect 1	RM-SO-03	1' to 1'3"	10/10/2023	Dark brown fine grade sands	Partially oven dried	1,179	599	900	579	
		RM-SO-03	5'0" to 5'3"	10/10/2023	Medium brown sand with medium sized rocks.	Partially oven dried	63	13	48	13	
		RM-SO-03	9'9" to 10'	10/10/2023	Fine grey silty sands	Partially oven dried	5	10	4	10	
		RM-SO-03	10'3" to 10'6"	10/10/2023	Light grey gravely sand with brown spots, fine silt throughout	Partially oven dried	10	12	8	12	
		RM-SO-03	15' to 15'3"	10/10/2023	Light grey gravely sand with brown spots	Partially oven dried	14	12	11	12	
	Transect 2	RM-SO-04	8.9'-9.5'	10/10/2023	Brown course sand and medium gravel, brown medium cobbles	Partially oven dried	6	10	5	10	
		RM-SO-05	8.1-8.5'	10/10/2023	Light brown cobbly sand	Partially oven dried	42	10	32	10	
		RM-SO-05	13.3'-13.8'	10/10/2023	White, dark and orange silty sand into brown cobbles with sand	Partially oven dried	19	11	15	11	
	Transect 3	RM-SO-07	0.5'-1.0'	10/11/2023	Dark brown silty sands	Partially oven dried	87	51	66	49	
		RM-SO-07	14.1'-14.8'	10/11/2023	Medium brown with silty sands with cobbles.	Partially oven dried	6	9	5	9	
	Transect 4	RM-SO-09	1.0'-1.6'	10/11/2023	Medium brown gravely sand	Partially oven dried	15	10	11	10	
		RM-SO-09	4.2'-5'	10/11/2023	Light brown/tan coarse sand	Partially oven dried	23	10	18	10	
		RM-SO-09	7.5'-8.3'	10/11/2023	Course gravel with sand	Partially oven dried	4	9	3	9	
Mill Site	Upper Level	RM-WR-01W	3' bgs	10/12/2023	Red pulverized brick material	Partially air dried	87	88	66	85	
		RM-WR-01W	4 - 5' bgs	10/12/2023	Light brown/grey sandy material	Partially air dried	54	11	41	11	
		RM-WR-01S	0 - 2' bgs	10/12/2023	Dark brown sandy material	Partially air dried	7	16	5	15	
		RM-WR-01S	2 - 2.3' bgs	10/12/2023	Reddish material	Partially air dried	6	13	5	13	
		RM-WR-01E	--	10/12/2023	Dark grey sandy silty material	Partially air dried	167	127	127	123	
		RM-WR-01E	--	10/12/2023	Light brown sandy clay material	Partially air dried	289	69	221	67	
		RM-WR-02N	--	10/12/2023	Light brown sandy clay material	Partially air dried	978	54	747	52	
		RM-WR-02N (10 yds north)	--	10/12/2023	--	Partially air dried	97	15	74	14	
		RM-WR-02W	4' bgs	10/12/2023	Light grey/brown sandy material	Partially air dried	53	7	40	7	
		RM-WR-04S	4' bgs	10/12/2023	Light brown sandy material	Partially air dried	34	12	26	12	
		RM-WR-04N	--	10/12/2023	Light brown sandy material	Partially air dried	50	9	38	9	
	Middle Level	RM-WR-06AM	middle layer	10/10/2023	--	Partially oven dried	1,030	305	786	295	
		RM-WR-08AM	1' bgs	10/11/2023	Light grey with reddish-tint of pulverized brick and rock	Partially air dried	544	758	415	732	
		RM-WR-08AM	2' bgs	10/11/2023	Light brown material	Partially air dried	240	556	183	537	
	Lower Level	RM-WR-06W	middle layer	10/10/2024	--	Partially air dried	198	68	151	66	
		RM-WR-06SE	4' bgs	10/10/2023	--	Partially air dried	236	118	180	114	
		RM-WR-07W	top layer	10/10/2023	--	Partially air dried	283	164	216	158	
		RM-WR-07W	bottom layer	10/10/2023	--	Partially air dried	1,102	608	841	587	
		RM-WR-07E	4' bgs	10/10/2023	--	Partially air dried	89	86	68	83	
		RM-WR-10NW	3' bgs	10/11/2023	Light brown sand	Partially air dried	52	26	40	25	
RM-WR-10N		4' bgs	10/11/2023	Heavy clay layer	Partially air dried	4	11	3	11		
RM-WR-10NE		2 - 3' bgs	10/11/2023	Dark brown silty sand	Partially air dried	350	105	267	101		
RM-WR-10NE		4 - 5' bgs	10/11/2023	Heavy clay layer	Partially air dried	345	88	263	85		
RM-WR-11NE		4' bgs	10/11/2023	Light brown, sandy and silty material	Partially air dried	35	45	27	43		