



March 31th, 2020

RGC Report No: 212019/2

Attention: Nicole Pesonen
Environmental Superintendent

RE: Review of 2019 Acid Base Accounting (ABA) Results, Nyrstar Myra Falls

1 General

This report reviews Acid Base Accounting (ABA) results for waste rock and drill core samples collected in 2019 as part of ongoing Acid Rock Drainage/Metal Leaching (ARD) management at Nyrstar Myra Falls (NMF).

2 Background

In 2019, approximately 173,747 cubic meters (m³) of waste rock was removed from the northern hillslope above the Lynx Tailings Disposal Facility (TDF) to stabilize the hillslope. The waste rock had been deposited in Waste Rock Dump (WRD) #2 and WRD#3 and was re-purposed to raise the Lynx TDF embankment berm. Additional, run-of-mine waste rock was generated from the Price Mine and HW Mine in 2019 and development rock was generated during the Phillips Reach Decline Project.

Sampling and geochemical testing of the re-located waste rock and underground mine waste generated is required for Permit M-26. Further details and background information, including a summary of previously-collected geochemical data are provided in the ARD/ML Management Plan and are not repeated here. Details on construction and reclamation activities in 2019, the mine plan, and the volumes of materials presented in this memo are from the 2019 Reclamation Report.

3 Review Impetus and Objectives

The objectives of this memo are to:

- Compile and interpret ABA results and related testwork for samples of existing waste rock, run-of-mine waste rock, and development rock collected in 2019.

- Recommend changes to routine geochemical characterization programs in 2020, if necessary.

4 Methods

4.1.1 Sample Collection

Eighty samples of existing and run-of-mine waste rock and development rock were collected in 2019. The following types of samples were sampled:

- Existing waste rock from WRD#2.
- Existing waste rock from WRD#3.
- Underground mine waste from Price Mine.
- Underground mine waste from Price Mine and HW Mine.
- Development rock from Phillips Reach Decline Development.
- Existing waste rock in the core of the Lynx TDF embankment berm.
- Existing waste rock in the Mill area and Camp area.

All samples were collected by site staff under the direction of the NMF Environment Department and sent to Bureau Veritas for geochemical analyses. Samples of waste rock from WRD#2 and WRD#3 were collected during re-location of these materials to the construction stockpile where materials used to raise the Lynx TDF embankment berm are sourced. Descriptions of these materials were not provided.

Samples existing waste rock in the core of the Lynx TDF embankment berm during a geotechnical drilling program completed by Wood. Samples of waste rock in the Mill area and Camp area were collected during drilling in November 2019 to install additional monitoring wells (MW19-01, MW19-02 and MW19-03) to characterize the geochemical characteristics of mine waste and characterize water levels and groundwater quality.

4.1.2 Analytical Procedures

Samples were analyzed for static tests for ABA and near-total metal concentrations by aqua regia digestion at the Bureau Veritas lab in Vancouver, B.C. ABA results are tabulated in Section 5 and near-total metal concentrations are summarized in Appendix A. Original lab reports are provided in Appendix B.

4.1.3 Waste Classification Criteria

Samples were classified as Potentially Acid Generating (PAG) material or Non-PAG material based on conventional ABA procedures. Any materials with a Neutralization Potential Ratio (NPR) less than two is classified as PAG material.

Waste rock with an NPR greater than two was classified as Non-PAG material and waste rock characterized by less than 0.05 wt. % total sulphur (S_{total}) is considered non-sulfidic material, as per the ML/ARD Management Plan.

Native till material is considered clean (“non-acid generating”) if the total sulfur content is <0.1%, as per the Permit M-26 permit amendment from July 2005.

5 Results and Discussion

5.1 Mine Waste Production Underground

Monthly mining and milling production in 2019 are summarized in the 2019 Reclamation Report. A total of 194,796 tonnes (t) were mined in 2019. The mill began full operation in May 2019 and a total of 145,398 tonnes were milled from May to December. No samples of the milled materials were collected for ABA. Active mining in the Price Zone underground commenced via surface access through the Price 4, 5 and 13 Level Portals. Ore was transported by cart through the Lynx 13 Portal and hauled at surface to a stockpile near the mill.

34,813 m³ of PAG material (waste rock) was brought to surface from the HW Mine and the Price Mine in 2019. This material was placed in construction stockpiles for use during the Lynx TDF embankment dam raise. Fifteen samples of this run-of-mine waste rock were collected (**Table 5-1**). Fourteen of fifteen samples were classified as PAG material. S_{total} values for Price Mine waste ranged from 2.9 to 11.4 wt. % S and the samples were each characterized by NP values less than 50 kg CaCO₃ eq./t.

Samples of Price Mine and HW Mine waste (sampled together) were characterized by slightly lower S_{total} (and AP) values than the samples of Price Mine waste. NP values were slightly lower and one sample was classified as Non-PAG material. These small differences are inconsequential, as all of the waste rock from the Price Mine and HW Mine is designated (without segregation) for use during future raises of the Lynx TDF embankment dam. No further characterization of these materials by ABA is needed but sampling of construction materials for Shake Flask Extraction (SFE) should be considered (see Section 6).

5.2 Phillips Reach Decline Development

25,641 m³ of development rock from the Phillips Reach were brought to surface and stockpiled in the clean rock quarry. This rock was generated during the Phillips Reach Decline Extension and is intended for use during future reclamation works or any construction on site that is not related to the Lynx TDF raise. Five samples of development rock from Phillips Reach were collected in 2019 (**Table 5-2**).

Three of the five samples are non-sulphidic. The other two samples were characterized by less than 0.2 wt. % S and NP values of 88.1 and 89.5 kg CaCO₃ eq./t. These two samples were classified as Non-PAG material, with a very low capacity to generate acidity should they oxidize. Development rock is, therefore, appropriate for use as cover material, rip rap, road crush (in all areas of the site) and/or construction, if necessary.

5.3 Re-Located Surface Waste Materials

143,000 m³ of waste rock was removed from WRD#3 in 2019 and 30,714 m³ was removed from WRD#2. These WRDs are located on the northern hillslope above the Lynx TDF. Waste rock was removed to stabilize these WRDs as part of ongoing reclamation works. Waste rock was placed in a construction stockpile near the Lynx TDF or placed directly onto the TDF. Fourteen samples of waste rock re-located from WRD#3 were collected in 2019 and four samples of waste rock from WRD#2 were collected (**Table 5-3**). This is approximately one sample per 10,000 m³ of waste rock re-located and is consistent with the ML/ARD Management Plan.

Each of the eighteen samples is classified as PAG material. Waste rock from WRD#3 is characterized by higher AP values than waste rock from WRD#2. NP values for waste rock are comparable, i.e. median values of 25.5 and 33.1 kg CaCO₃ eq./t. These data suggest some differences in the geochemical characteristics of waste rock in WRDs #2 and #3 but that the majority of waste rock is PAG material. This is consistent with ABA results provided in RGC (2016). None of the waste rock re-located from WRD#2 or WRD#3 (or other WRDs) should therefore be segregated and must be considered PAG material unless future ABA results suggest otherwise.

5.4 Existing Waste Rock in Lynx TDF Embankment Berm

Waste rock samples from the Lynx TDF embankment berm were collected during a geotechnical drilling program to characterize off-spec materials that may have been used to construct the core of the embankment berm. Further details are provided in Wood (2020). Thirty one samples of waste rock for geochemical testing were collected from boreholes BH-02, BH-04, and BH-06 (**Table 5-4**).

Twenty four of the thirty one samples are classified as PAG material and five samples are classified as Non-PAG material. Two samples are non-sulphidic material (< 0.05 wt. % S). Median NPR values from the four boreholes ranged from 0.3 to 0.7 and NP values were typically less than 50 kg CaCO₃ eq./t. These data suggest waste rock in the Lynx TDF embankment berm will generate substantial ARD, should it oxidize, which is consistent with previous geochemical data (RGC, 2016) and seepage water quality downgradient of the Lynx TDF embankment berm (RGC, 2020).

5.5 Existing Waste Rock in Mill Area

Waste rock samples were collected during drilling to install monitoring wells MW19-02 and MW19-03. Well MW19-02 was installed in BH-03 behind the Mill near a thick package of surface waste towards the former Lynx offices. Well MW19-03 is located in the Camp area near Arnica Creek and was installed in BH-02. Fourteen samples were collected from boreholes BH-02 and BH-03 for geochemical testing (**Table 5-5**).

Six of seven samples from BH-03 (Mill Area) are classified as PAG material. S_{total} values range from 1.39 to 3.71 wt. % S. NPR values are less than 1, suggesting these materials may

generate substantial acidity should they oxidize. Five of seven samples from BH-02 (Camp Area) were classified as Non-PAG material and the other two were non-sulphidic material (<0.05 wt. % S). The Non-PAG materials are low-sulphide materials (up to 0.14 wt. % S) that are not predicted to generate substantial acidity.

6 Summary

Eighty samples for ABA and near-total metal concentrations were collected in 2019, as per the ML/ARD Management Plan. Results are summarized below:

- Fourteen of fifteen samples of run-of-mine waste rock from the Price Mine and HW Mine was classified as PAG material and the remaining sample was non-sulphidic material. PAG materials are predicted to generate substantial ARD and must, therefore, be appropriately handled before being incorporated into the Lynx TDF embankment berm.
- Development rock generated during the Phillips Reach Decline Extension is non-sulphidic material or low-sulphide Non-PAG material. 25,641 m³ of this rock was stockpiled in the quarry area in 2019. Development rock is, therefore, appropriate for use as cover material, rip rap, road crush, and/or construction, if necessary.
- Each of the samples of waste rock re-located from WRD#2 and WRD#3 is classified as PAG material. 173,747 m³ was re-located and subsequently used to raise the Lynx TDF embankment berm. These PAG materials are predicted to generate substantial ARD, which is consistent with findings from RGC (2016).
- Samples of waste rock used to construct the core of the Lynx TDF embankment berm are predominantly PAG material that is predicted to generate substantial ARD. This is consistent with previously-collected geochemical data and seepage water quality downgradient towards the Superpond.
- Six of the seven samples of waste rock collected from borehole BH-03 near the Mill is classified as PAG material. Most of the samples are characterized by 1 to 2 wt. % S and NP values of 40 kg CaCO₃ eq.t or less. These materials are predicted to generate substantial ARD and may explain observed groundwater quality impacts near the Mill (see RGC, 2020). Samples from BH-02 (Camp Area) are non-sulphidic material or low-sulphide Non-PAG material that are unlikely to generate ARD.

7 Recommendations

No major changes to the geochemical characterization programs detailed in the ML/ARD Management Plan are recommended. The collection of tailings samples should, however, be prioritized in 2020 to ensure the tailings deposited in the Lynx TDF are adequately characterized. Samples of tailings and existing (re-located) waste rock should also be submitted for SFE testing.

8 Closure

We trust that this letter report meets your requirements at this time. If you have any queries, please contact the undersigned.

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9 References

NMF (2020), 2019 Reclamation Report for Nyrstar Myra Falls, March 2020.

RGC (2016), Preliminary Assessment of Tailings and Waste Rock Geochemistry, Nyrstar Myra Falls, Report No. 212001/7. April 2016.

RGC (2020), 2019 Surface Water and Groundwater Monitoring Report, Nyrstar Myra Falls, RGC Report No. 212019/2, March 2020.

TABLES

Table 5-1

ABA Results for Run-of-Mine Waste from Price and HW Mines, 2019

Sample No	Sample ID	Description	Paste pH	Paste EC	S _{total}	S _{sulphate}	S _{sulphide}	AP	NP	NNP	NPR	Class
	Units			uS/cm	wt%	wt%	wt%	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t		
<i>Detection Limits</i>			<i>N/A</i>	<i>1</i>	<i>0.02</i>	<i>0.01</i>	<i>0.02</i>	<i>0.6</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	
<i>Waste rock samples from Price mine</i>												
XH3124	22260	Price waste	8.6	355	2.91	0.07	2.84	88.8	40.5	-48.3	0.5	PAG
XH3125	22261	Price waste	8.6	329	2.80	0.08	2.72	85.0	47.0	-38.0	0.6	PAG
XH3126	22262	Price waste	8.6	358	3.20	0.09	3.11	97.2	40.2	-57.0	0.4	PAG
XH3127	22263	Price waste	8.1	1,380	11.40	0.14	11.26	351.9	38.1	-314.0	0.1	PAG
XH3128	22264	Price waste	7.8	1,430	8.21	0.12	8.09	252.8	15.9	-237.0	0.1	PAG
WR5422	4392	Price waste	7.9	1,270	4.88	0.09	4.79	149.7	24.6	-125.0	0.2	PAG
WR5423	PRICE 1	Price waste	7.7	1,760	4.51	0.10	4.41	137.8	27.5	-110.0	0.2	PAG
		n	7	7	7	7	7	7	7	7	7	
		Min:	7.7	329.0	2.8	0.1	2.7	85.0	15.9	-314.0	0.1	
		Max:	8.6	1760.0	11.4	0.1	11.3	351.9	47.0	-38.0	0.6	
		Median	8.1	1270.0	4.5	0.1	4.4	137.8	38.1	-110.0	0.2	
		Mean:	8.2	983.1	5.4	0.1	5.3	166.2	33.4	-132.8	0.3	
		SD:	0.4	613.2	3.2	0.0	3.2	100.3	11.0	105.0	0.2	
<i>Waste rock from Price mine and HW mine</i>												
XH3086	23177	Price + HW waste	7.9	798	2.73	0.04	2.69	84.1	66.7	-17.4	0.8	PAG
XH3087	23200	Price + HW waste	7.9	1,280	2.48	0.07	2.41	75.3	37.3	-38.0	0.5	PAG
XH3088	23196	Price + HW waste	6.7	1,540	2.56	0.25	2.31	72.2	13.8	-58.4	0.2	PAG
XH3089	23194	Price + HW waste	7.6	1,400	6.79	0.05	6.74	210.6	25.4	-185.0	0.1	PAG
XH3090	23192	Price + HW waste	6.6	1,490	2.56	0.36	2.20	68.8	20.6	-48.2	0.3	PAG
XH3091	23187	Price + HW waste	7.5	1,450	1.71	0.32	1.39	43.4	19.7	-23.7	0.5	PAG
XH3092	23182	Price + HW waste	8.3	252	0.04	0.02	0.02	0.6	9.1	8.5	15.2	Non-sulphidic
XH3093	23209	Price + HW waste	7.8	1,480	2.28	0.21	2.07	64.7	76.3	11.6	1.2	PAG
		n	8	8	8	8	8	8	8	8	8	
		Min:	6.6	252.0	0.0	0.0	0.0	0.6	9.1	-185.0	0.1	
		Max:	8.3	1540.0	6.8	0.4	6.7	210.6	76.3	11.6	15.2	
		Median	7.7	1425.0	2.5	0.1	2.3	70.5	23.0	-30.9	0.5	
		Mean:	7.5	1211.3	2.6	0.2	2.5	77.5	33.6	-43.8	2.4	
		SD:	0.6	454.5	1.9	0.1	1.9	59.9	24.9	62.2	5.2	

Table 5-2

ABA Results for Rock Samples from Phillips Reach Decline, 2019

Sample No	Sample ID	Description	Paste pH	Paste EC uS/cm	S _{total} wt%	S _{sulphate} wt%	S _{sulphide} wt%	AP kg CaCO ₃ eq./t	NP kg CaCO ₃ eq./t	NNP kg CaCO ₃ eq./t	NPR	Class
<i>Detection Limits</i>			<i>N/A</i>	<i>1</i>	<i>0.02</i>	<i>0.01</i>	<i>0.02</i>	<i>0.6</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	
<i>Rock samples from Phillips Reach</i>												
-	Phillips 1	Phillips Reach	8.2	262	0.02	0.01	0.01	0.6	13.9	13.6	-	Non-sulphidic
-	Phillips 2	Phillips Reach	8.3	266	0.02	0.01	0.01	0.6	12.9	12.9	-	Non-sulphidic
WR5415	4384	Phillips Reach	8.5	241	0.02	0.01	0.02	0.6	11.9	11.9	-	Non-sulphidic
WR5416	4390	Phillips Reach	8.8	301	0.07	0.01	0.06	1.9	88.1	86.2	46.4	Non-PAG
WR5417	4391	Phillips Reach	8.7	343	0.18	0.01	0.17	5.3	89.5	84.2	16.9	Non-PAG
		n	5	5	5	5	5	5	5	5	2	
		Min:	8.2	241.0	0.0	0.0	0.0	0.6	11.9	11.9	16.9	
		Max:	8.8	343.0	0.2	0.0	0.2	5.3	89.5	86.2	46.4	
		Median	8.5	266.0	0.0	0.0	0.0	0.6	13.9	13.6	31.7	
		Mean:	8.5	282.6	0.1	0.0	0.1	1.8	43.3	41.8	31.7	
		SD:	0.2	40.1	0.1	0.0	0.1	2.0	41.6	39.7	20.2	

Table 5-3

ABA Results for Rock Samples from Re-Located Waste Rock, 2019

Sample No	Sample ID	Description	Paste pH	Paste EC	S _{total}	S _{sulphate}	S _{sulphide}	AP	NP	NNP	NPR	Class
Units			uS/cm	wt%	wt%	wt%	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t			
<i>Detection Limits</i>			<i>N/A</i>	<i>1</i>	<i>0.02</i>	<i>0.01</i>	<i>0.02</i>	<i>0.6</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	
<i>Waste rock samples from WRD#2</i>												
WG1560	WRD2 SOIL		8.2	404	0.38	0.02	0.36	11.3	3.5	-7.8	0.3	PAG
WE5446	4382	WRD#2	7.6	1,155	1.63	0.08	1.55	48.4	24.6	-23.8	0.5	PAG
WE5447	4383	WRD#2	7.7	1,305	1.82	0.09	1.73	54.1	27.4	-26.7	0.5	PAG
WE5448	4381	WRD#2	7.6	1,252	1.50	0.08	1.42	44.4	26.3	-18.1	0.6	PAG
		n	4	4	4	4	4	4	4	4	4	
		Min:	7.6	404.0	0.4	0.0	0.4	11.3	3.5	-26.7	0.3	
		Max:	8.2	1305.0	1.8	0.1	1.7	54.1	27.4	-7.8	0.6	
		Median	7.7	1203.5	1.6	0.1	1.5	46.4	25.5	-21.0	0.5	
		Mean:	7.8	1029.0	1.3	0.1	1.3	39.6	20.5	-19.1	0.5	
		SD:	0.3	421.3	0.6	0.0	0.6	19.2	11.4	8.3	0.1	
<i>Waste rock samples from WRD#3</i>												
WE5417	CHP4376	WRD#3	7.9	1,102	2.94	0.06	2.88	90.0	40.8	-49.2	0.5	PAG
WE5418	CHP4377	WRD#3	6.6	1,563	2.85	0.48	2.37	74.1	7.0	-67.1	0.1	PAG
WE5419	CHP4378	WRD#3	4.8	1,686	1.97	0.51	1.46	45.6	0.0	-45.6	0.0	PAG
WE5420	CHP4379	WRD#3	7.4	1,330	2.38	0.09	2.29	71.6	42.5	-29.1	0.6	PAG
WE5421	CHP4380	WRD#3	6.7	1,368	2.20	0.25	1.95	60.9	14.8	-46.1	0.2	PAG
WR5370	4385	WRD#3	7.7	1,650	2.02	0.29	1.73	54.1	34.4	-19.7	0.6	PAG
WR5371	4386	WRD#3	7.5	1,420	2.46	0.27	2.19	68.4	29.1	-39.3	0.4	PAG
WR5372	4387	WRD#3	7.6	1,420	1.94	0.21	1.73	54.1	25.0	-29.1	0.5	PAG
WR5373	4388	WRD#3	7.6	1,430	2.36	0.20	2.16	67.5	32.3	-35.2	0.5	PAG
WR5374	4389	WRD#3	7.6	1,370	2.01	0.23	1.78	55.6	33.8	-21.8	0.6	PAG
WR5375	WWD 3-1	WRD#3	7.7	1,360	4.44	0.08	4.36	136.3	47.7	-88.6	0.3	PAG
WR5376	WWD 3-2	WRD#3	7.7	1,510	3.87	0.07	3.80	118.8	32.3	-86.5	0.3	PAG
WR5377	WWD 3-3	WRD#3	7.7	1,390	3.14	0.16	2.98	93.1	36.4	-56.7	0.4	PAG
WR5378	WWD 3-4	WRD#3	7.7	1,450	4.03	0.11	3.92	122.5	40.0	-82.5	0.3	PAG
		n	14	14	14	14	14	14	14	14	14	
		Min:	4.8	1102.0	1.9	0.1	1.5	45.6	0.0	-88.6	0.0	
		Max:	7.9	1686.0	4.4	0.5	4.4	136.3	47.7	-19.7	0.6	
		Median	7.6	1420.0	2.4	0.2	2.2	70.0	33.1	-45.9	0.4	
		Mean:	7.3	1432.1	2.8	0.2	2.5	79.5	29.7	-49.7	0.4	
		SD:	0.8	144.1	0.8	0.1	0.9	28.6	13.7	23.5	0.2	

Table 5-4

ABA Results for Waste Rock Samples from Lynx TDF Embankment Berm, 2019

Sample No	Sample ID	Description	Paste pH	Paste EC	S _{total}	S _{sulphate}	S _{sulphide}	AP	NP	NNP	NPR	Class
	Units			uS/cm	wt%	wt%	wt%	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t		
<i>Detection Limits</i>			<i>N/A</i>	<i>1</i>	<i>0.02</i>	<i>0.01</i>	<i>0.02</i>	<i>0.6</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	
<i>Waste rock from the Lynx TDF embankment berm</i>												
XH3101	23217	BH-04 (Lynx Berm)	7.5	1,470	5.10	0.21	4.89	152.8	39.2	-114.0	0.3	PAG
XH3102	23218	BH-04 (Lynx Berm)	8.2	236	0.04	0.02	0.02	0.6	33.3	32.7	55.5	Non-sulphidic
XH3103	23219	BH-04 (Lynx Berm)	7.5	1,320	1.60	0.34	1.26	39.4	29.5	-9.9	0.7	PAG
XH3104	23220	BH-04 (Lynx Berm)	7.7	1,420	1.84	0.35	1.49	46.6	33.5	-13.1	0.7	PAG
XH3105	23221	BH-04 (Lynx Berm)	7.5	1,080	7.92	0.06	7.86	245.6	26.9	-219.0	0.1	PAG
XH3106	23222	BH-04 (Lynx Berm)	8.4	538	0.14	0.02	0.12	3.8	125.0	121.0	32.9	Non-PAG
XH3107	23223	BH-04 (Lynx Berm)	8.0	940	1.76	0.04	1.72	53.8	20.6	-33.2	0.4	PAG
XH3108	23224	BH-04 (Lynx Berm)	7.7	1,130	2.00	0.06	1.94	60.6	20.4	-40.2	0.3	PAG
		n	8	8	8	8	8	8	8	8	8	
		Min:	7.5	236.0	0.0	0.0	0.0	0.6	20.4	-219.0	0.1	
		Max:	8.4	1470.0	7.9	0.4	7.9	245.6	125.0	121.0	55.5	
		Median	7.7	1105.0	1.8	0.1	1.6	50.2	31.4	-23.2	0.6	
		Mean:	7.8	1016.8	2.6	0.1	2.4	75.4	41.1	-34.5	11.4	
		SD:	0.3	434.5	2.7	0.1	2.7	83.2	34.5	100.1	21.1	
XH3109	22251	BH-05 (Lynx Berm)	7.7	1,430	2.15	0.17	1.98	61.9	41.3	-20.6	0.7	PAG
XH3110	22252	BH-05 (Lynx Berm)	7.7	1,140	0.88	0.07	0.81	25.3	92.9	67.6	3.7	Non-PAG
XH3111	22253	BH-05 (Lynx Berm)	7.5	1,250	4.49	0.10	4.39	137.2	17.9	-119.0	0.1	PAG
XH3112	22254	BH-05 (Lynx Berm)	7.6	1,380	7.73	0.10	7.63	238.4	32.9	-206.0	0.1	PAG
XH3113	22255	BH-05 (Lynx Berm)	8.2	301	0.73	0.07	0.66	20.6	28.8	8.2	1.4	PAG
XH3114	22256	BH-05 (Lynx Berm)	8.7	445	0.41	0.03	0.38	11.9	51.5	39.6	4.3	Non-PAG
XH3115	22257	BH-05 (Lynx Berm)	8.2	270	0.64	0.01	0.63	19.7	13.4	-6.3	0.7	PAG
XH3116	22258	BH-05 (Lynx Berm)	8.1	933	2.49	0.05	2.44	76.3	47.5	-28.8	0.6	PAG
		n	8	8	8	8	8	8	8	8	8	
		Min:	7.5	270.0	0.4	0.0	0.4	11.9	13.4	-206.0	0.1	
		Max:	8.7	1430.0	7.7	0.2	7.6	238.4	92.9	67.6	4.3	
		Median	7.9	1036.5	1.5	0.1	1.4	43.6	37.1	-13.5	0.7	
		Mean:	8.0	893.6	2.4	0.1	2.4	73.9	40.8	-33.2	1.5	
		SD:	0.4	486.2	2.5	0.0	2.5	78.6	24.9	88.9	1.6	
XH3129	22276	BH-06 (Lynx Berm)	7.8	1,270	2.17	0.21	1.96	61.3	46.5	-14.8	0.8	PAG
XH3130	22277	BH-06 (Lynx Berm)	8.1	746	0.69	0.04	0.65	20.3	41.8	21.5	2.1	Non-PAG
XH3131	22278	BH-06 (Lynx Berm)	7.9	1,250	4.61	0.12	4.49	140.3	24.5	-116.0	0.2	PAG
XH3132	22279	BH-06 (Lynx Berm)	8.4	456	1.56	0.02	1.54	48.1	43.5	-4.6	0.9	PAG
XH3133	22280	BH-06 (Lynx Berm)	7.2	1,450	10.34	0.27	10.07	314.7	26.3	-288.0	0.1	PAG
XH3134	22281	BH-06 (Lynx Berm)	7.4	691	1.17	0.04	1.13	35.3	10.0	-25.3	0.3	PAG
XH3135	22282	BH-06 (Lynx Berm)	7.5	1,260	7.58	0.06	7.52	235.0	25.0	-210.0	0.1	PAG
XH3136	22283	BH-06 (Lynx Berm)	7.8	1,230	5.67	0.10	5.57	174.1	1.3	-173.0	<0.1	PAG
XH3137	22284	BH-06 (Lynx Berm)	8.4	226	0.03	0.01	0.02	0.6	8.5	7.9	14.2	Non-PAG
		n	9	9	9	9	9	9	9	9	7	
		Min:	7.2	226.0	0.0	0.0	0.0	0.6	1.3	-288.0	0.1	
		Max:	8.4	1450.0	10.3	0.3	10.1	314.7	46.5	21.5	14.2	
		Median	7.8	1230.0	2.2	0.1	2.0	61.3	25.0	-25.3	0.3	
		Mean:	7.8	953.2	3.8	0.1	3.7	114.4	25.3	-89.1	2.6	
		SD:	0.4	432.1	3.5	0.1	3.5	108.5	16.4	112.0	4.9	
XH3138	22259		8.3	245	0.02	0.01	0.02	0.6	11.3	11.3	-	Non-sulphidic
XH3139	23176		7.6	1,360	3.83	0.20	3.63	113.4	31.1	-82.3	0.3	PAG
XH3140	23178		7.7	1,390	2.41	0.14	2.27	70.9	63.0	-7.9	0.9	PAG
XH3141	23179		7.3	1,420	6.63	0.15	6.48	202.5	27.5	-175.0	0.1	PAG
XH3142	23216		7.4	1,430	2.48	0.15	2.33	72.8	18.8	-54.0	0.3	PAG
XH3143	23225		7.8	1,300	5.92	0.10	5.82	181.9	46.3	-136.0	0.3	PAG
		n	6	6	6	6	6	6	6	6	5	
		Min:	7.3	245.0	0.0	0.0	0.0	0.6	11.3	-175.0	0.1	
		Max:	8.3	1430.0	6.6	0.2	6.5	202.5	63.0	11.3	0.9	
		Median	7.7	1375.0	3.2	0.1	3.0	93.1	29.3	-68.2	0.3	
		Mean:	7.7	1190.8	3.5	0.1	3.4	107.0	33.0	-74.0	0.4	
		SD:	0.3	465.7	2.5	0.1	2.4	75.6	18.9	72.3	0.3	

Table 5-5

ABA Results for Waste Rock Samples from Mill Area, 2019

Sample No	Sample ID	Description	Paste pH	Paste EC	S _{total}	S _{sulphate}	S _{sulphide}	AP	NP	NNP	NPR	Class
	Units			uS/cm	wt%	wt%	wt%	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t	kg CaCO ₃ eq/t		
<i>Detection Limits</i>			<i>N/A</i>	<i>1</i>	<i>0.02</i>	<i>0.01</i>	<i>0.02</i>	<i>0.6</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	
<i>Existing Waste Rock (MW19-02), Mill Area</i>												
XH3094	23215	BH-03 (MW19-02)	7.5	1,200	2.19	0.09	2.10	65.6	61.1	-4.5	0.9	PAG
XH3095	23210	BH-03 (MW19-02)	7.3	1,090	1.39	0.06	1.33	41.6	11.0	-30.6	0.3	PAG
XH3096	23208	BH-03 (MW19-02)	7.7	1,180	1.22	0.09	1.13	35.3	31.2	-4.1	0.9	PAG
XH3097	23213	BH-03 (MW19-02)	9.5	1,170	2.01	0.06	1.95	60.9	38.7	-22.2	0.6	PAG
XH3098	23211	BH-03 (MW19-02)	8.1	1,030	2.00	0.07	1.93	60.3	33.1	-27.2	0.5	PAG
XH3099	23212	BH-03 (MW19-02)	8.0	1,160	3.71	0.08	3.63	113.4	41.5	-71.9	0.4	PAG
XH3100	23214	BH-03 (MW19-02)	8.4	219	0.04	0.01	0.03	0.9	12.7	11.8	14.1	Non-PAG
		n	7	7	7	7	7	7	7	7	7	
		Min:	7.3	219.0	0.0	0.0	0.0	0.9	11.0	-71.9	0.3	
		Max:	9.5	1200.0	3.7	0.1	3.6	113.4	61.1	11.8	14.1	
		Median:	8.0	1160.0	2.0	0.1	1.9	60.3	33.1	-22.2	0.6	
		Mean:	8.1	1007.0	1.8	0.1	1.7	54.0	32.8	-21.2	2.5	
		SD:	0.7	352.5	1.1	0.0	1.1	34.3	17.3	26.9	5.1	
<i>Existing Waste Rock (MW19-03), Camp Area</i>												
XH3117	23207	BH-02 (MW19-03)	7.5	425	0.06	0.02	0.04	1.3	9.3	8.0	7.2	Non-PAG
XH3118	23206	BH-02 (MW19-03)	7.8	344	0.07	0.02	0.05	1.6	10.0	8.4	6.3	Non-PAG
XH3119	23205	BH-02 (MW19-03)	8.4	313	0.09	0.01	0.08	2.5	31.7	29.2	12.7	Non-PAG
XH3120	23203	BH-02 (MW19-03)	8.5	456	0.14	0.02	0.12	3.8	18.6	14.8	4.9	Non-PAG
XH3121	23202	BH-02 (MW19-03)	8.5	245	0.06	0.01	0.05	1.6	25.4	23.8	15.9	Non-PAG
XH3122	23201	BH-02 (MW19-03)	8.6	243	0.02	0.01	0.02	0.6	23.4	23.4	-	Non-sulphidic
XH3123	23204	BH-02 (MW19-03)	8.6	236	0.02	0.01	0.02	0.6	23.3	23.3	-	Non-sulphidic
		n	7	7	7	7	7	7	7	7	5	
		Min:	7.5	236.0	0.0	0.0	0.0	0.6	9.3	8.0	4.9	
		Max:	8.6	456.0	0.1	0.0	0.1	3.8	31.7	29.2	15.9	
		Median:	8.5	313.0	0.1	0.0	0.1	1.6	23.3	23.3	7.2	
		Mean:	8.3	323.1	0.1	0.0	0.1	1.7	20.2	18.7	9.4	
		SD:	0.4	90.1	0.0	0.0	0.0	1.1	8.2	8.3	6.0	

APPENDICES

Appendix A

Near-Total Metal Concentrations, 2019

Sample No	Sample ID	Description	Method:	WGHT	TC000	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200	AQ200		
			Analyte:	Wgt	TOT/S	Al	As	Ca	Cd	Co	Cu	Fe	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Se	Ag	Zn		
			Unit:	kg	%	%	PPM	%	PPM	PPM	PPM	%	%	%	PPM	PPM	%	PPM	%	PPM	%	PPM	PPM	PPM		
			MDL:	0.01	0.02	0.01	0.5	0.01	0.1	0.1	0.1	0.01	0.01	0.01	0.1	0.1	0.001	0	0.001	0	0.05	0.05	1	1		
<i>Waste rock samples from WRD#2</i>																										
WG1560	WRD2 SOIL	WRD#2	Rock		0.38	3.06	10.9	1.35	5.8	21.3	264	5.28	0.16	2.02	1.030	0.9	0.028	25	0.094	230	0.39	<0.5	39	1,350		
WE5446	4382	WRD#2	Rock	2.39	1.63	2.55	21.3	1.36	19.2	19.3	527	4.92	0.13	1.96	1.214	1.8	0.015	21	0.083	1,021	1.52	<0.5	41	5,173		
WE5447	4383	WRD#2	Rock	2.82	1.82	2.51	30.7	1.42	22.4	18.7	567	4.91	0.13	1.95	1.295	2.6	0.014	21	0.081	1,068	1.7	0.7	40	5,775		
WE5448	4381	WRD#2	Rock	3.84	1.5	2.45	23.8	1.36	18.9	19.1	496	4.78	0.11	1.87	1.207	2.3	0.013	20	0.081	994	1.43	<0.5	39	4,932		
<i>Waste rock samples from WRD#3</i>																										
WE5417	CHP4376	WRD#3	Rock	2.46	2.94	2.09	24.4	1.77	21.4	20.3	612	4.99	0.14	1.81	1.227	3	0.009	17	0.102	594	2.82	<0.5	45	4,948		
WE5418	CHP4377	WRD#3	Rock	2.53	2.85	1.51	23.4	1.09	9.8	11.1	346	3.95	0.16	1.38	524	2.7	0.01	12	0.112	473	2.73	0.8	28	2,093		
WE5419	CHP4378	WRD#3	Rock	2.09	1.97	2.27	13	0.7	1.1	4.7	158	3.61	0.12	2.46	684	2.5	0.007	6	0.048	91	1.96	0.6	23	410		
WE5420	CHP4379	WRD#3	Rock	3.98	2.38	2.21	30.5	1.96	14.7	17.6	732	4.74	0.14	1.9	1,089	4	0.013	16	0.102	523	2.24	0.8	49	3,391		
WE5421	CHP4380	WRD#3	Rock	3.41	2.2	2.64	19.1	1.26	10.9	23.8	401	5.39	0.11	1.92	1,150	2.2	0.014	16	0.095	258	2.08	<0.5	33	2,262		
WR5370	4385	WRD#3	Rock	3.72	2.02	2.18	20.9	1.8	14.6	16.6	546	4.36	0.12	1.76	974	2.6	0.012	13	0.094	507	1.83	0.8	47	3,242		
WR5371	4386	WRD#3	Rock	3.01	2.46	1.99	28.8	1.61	25.6	14.5	779	4.18	0.11	1.77	868	7.7	0.01	13	0.087	935	2.14	1.2	43	5,493		
WR5372	4387	WRD#3	Rock	2.68	1.94	2.19	22	1.56	12.6	14.5	546	4.28	0.12	1.95	883	2.8	0.011	12	0.097	518	1.98	0.8	37	2,894		
WR5373	4388	WRD#3	Rock	2.78	2.36	2.33	22.2	1.66	17.8	14.5	425	4.54	0.12	2.13	998	2.7	0.01	12	0.095	742	2.18	1	44	3,931		
WR5374	4389	WRD#3	Rock	3.08	2.01	2.18	27.6	1.83	13.8	16.3	544	4.32	0.13	1.89	957	2.8	0.012	13	0.088	802	1.94	1	49	3,048		
WR5375	WWD 3-1	WRD#3	Rock	3.94	4.44	1.31	43.3	1.83	45.3	18.3	1,211	4.78	0.14	1.18	1,117	7.1	0.01	19	0.114	1,617	4.13	1.8	55	9,056		
WR5376	WWD 3-2	WRD#3	Rock	3.9	3.87	1.55	35.8	1.52	23.5	17.6	771	4.81	0.14	1.33	914	3.7	0.01	14	0.112	819	3.71	0.9	40	5,620		
WR5377	WWD 3-3	WRD#3	Rock	4.65	3.14	1.77	35.6	1.65	23.9	17	771	4.57	0.13	1.44	901	4.4	0.011	15	0.104	818	2.87	1.1	45	5,369		
WR5378	WWD 3-4	WRD#3	Rock	4.15	4.03	1.47	56	1.59	41.2	17.8	1,127	4.7	0.14	1.27	946	5.6	0.011	15	0.105	1,302	3.67	1.7	43	9,233		
<i>Rock samples from Phillips Reach</i>																										
	Phillips 1	Phillips Reach	Rock	6.07	<0.02	3.88	2.9	4.24	<0.1	29.1	177	6.66	0.05	1.65	906	0.5	0.041	41	0.085	2	<0.05	<0.5	21	73		
	Phillips 2	Phillips Reach	Rock	6.25	<0.02	3.37	1.4	3.53	<0.1	28.8	144	6.97	0.03	1.62	907	0.5	0.056	40	0.089	5	<0.05	<0.5	21	121		
WE5415	4384	Phillips Reach	Rock	5.02	<0.02	2.57	2.4	1.92	0.1	17.1	104	3.83	0.07	1.09	620	0.4	0.157	25	0.066	3	<0.05	<0.5	51	65		
WE5416	4390	Phillips Reach	Rock	3.54	0.07	2.34	2.6	3.46	0.4	19.8	61	3.75	0.09	2.1	1,134	0.6	0.03	41	0.068	9	0.07	<0.5	78	137		
WE5417	4391	Phillips Reach	Rock	2.65	0.18	2.28	2.8	3.32	0.4	19.6	57	3.55	0.09	1.73	928	1	0.027	29	0.088	9	0.17	<0.5	52	136		
<i>Waste rock samples from Price mine</i>																										
XH3124	22260	Price waste	Rock	3.89	2.91	1.96	88.1	1.38	28.1	10.8	527	3.97	0.2	1.68	1,109	5.8	0.021	9	0.079	1,157	2.84	0.7	64	6,537		
XH3125	22261	Price waste	Rock	3.85	2.8	1.51	128	1.77	32.8	10.8	853	3.6	0.17	1.26	989	7.1	0.019	15	0.07	1,224	2.72	0.8	55	7,548		
XH3126	22262	Price waste	Rock	3.69	3.2	1.81	113.3	1.45	33.7	9.7	779	3.79	0.2	1.63	988	6.9	0.018	9	0.072	1,449	3.17	1.2	72	7,713		
XH3127	22263	Price waste	Rock	4.78	11.4	1.2	109.2	1.33	60.4	9.8	1,990	9.98	0.13	1.21	378	17	0.015	49	0.02	520	>10,000	7.9	29	>10,000		
XH3128	22264	Price waste	Rock	4.61	8.21	0.75	151.8	0.61	45	4.8	1,167	7.45	0.17	0.55	318	6.9	0.019	9	0.016	1,128	8.3	2.7	22	9,840		
WR5422	4392	Price waste	Rock	3.46	4.88	0.96	94.4	0.8	47.5	8.9	1,292	4.22	0.19	0.97	557	7.3	0.019	15	0.034	1,359	4.6	2.9	25	9,577		
WR5423	PRICE 1	Price waste	Rock	6.24	4.51	0.96	125.6	1.08	53.6	9	1,493	4.06	0.14	0.89	610	9.8	0.021	16	0.055	3,393	4.13	4	35	>10,000		
<i>Waste rock from Price mine and HW mine</i>																										
XH3086	23177	Price + HW waste	Rock	2.4	2.73	2.05	39	2.35	26.7	16.4	1,997	4.42	0.22	1.75	884	5.8	0.026	21	0.066	878	2.45	1.1	67	6,480		
XH3087	23200	Price + HW waste	Rock	2.14	2.48	2.2	20.4	1.64	6.9	15.6	353	4.84	0.2	1.68	1,077	4.8	0.032	12	0.088	299	2.49	1.1	35	1,739		
XH3088	23196	Price + HW waste	Rock	2.49	2.56	3.68	14.8	1.12	19.4	23.5	1,237	6.21	0.09	3.23	1,232	2.5	0.035	25	0.095	236	2.24	1.3	30	4,124		
XH3089	23194	Price + HW waste	Rock	2.63	6.79	1.15	51.4	0.96	69.7	10.6	2,390	6.01	0.2	0.91	869	17.8	0.02	15	0.052	495	6.31	7.2	22	>10,000		
XH3090	23192	Price + HW waste	Rock	2.48	2.56	2.37	29.5	1.54	18.8	15.4	707	5.05	0.11	1.93	729	6.4	0.021	20	0.065	748	2.47	1.8	29	4,424		
XH3091	23187	Price + HW waste	Rock	2.68	1.71	2.42	22.3	1.41	9.6	17.4	683	4.74	0.14	1.78	783	3	0.033	13	0.065	219	1.64	0.9	35	2,121		
XH3092	23182	Price + HW waste	Rock	3.52	0.04	3.94	1.5	2.29	0.9	27.3	86	5.83	0.07	2.23	1,062	0.5	0.046	20	0.078	9	<0.05	<0.5	23	286		
XH3093	23209	Price + HW waste	Rock	1.77	2.28	2.21	33.7	3.08	21.3	17.3	548	4.45	0.22	1.67	851	3.1	0.024	20	0.087	746	2.18	0.8	74	5,160		
<i>Existing Waste Rock (MW19-03), Mill Area</i>																										
XH3094	23215	BH-03 (MW19-02)	Rock	1.86	2.19	1.87	36.7	2.28	14.6	17.3	549	3.84	0.14	1.77	911	3.6	0.017	43	0.089	637	2.01	0.8	56	3,546		
XH3095	23210	BH-03 (MW19-02)	Rock	1.26	1.39	3	8.2	0.89	7.8	23.9	246	5.79	0.14	2.17	831	1.8	0.045	29	0.085	366	1.3	0.7	27	1,816		
XH3096	23208	BH-03 (MW19-02)	Rock	0.93	1.22	2.44	13.9	1.62	4.4	17.3	300	4.56	0.1	2	826	3.3	0.028	27	0.072	174	1.19	1	39	989		
XH3097	23213	BH-03 (MW19-02)	Rock	2.04	2.01	2.46	25.5	1.66	13.3	19.7	563	4.38	0.14	2.22	806	3.7	0.027	63	0.069	321	1.9	1.7	38	3,053		
XH3098	23211	BH-03 (MW19-02)	Rock	1.25	2	1.88	39	1.45	24.9	12.3	669	3.68	0.14	1.5	737	6.7	0.021	19	0.046	507	1.88	1.2	36	5,393		
XH3099	23212	BH-03 (MW19-02)	Rock	2.58	3.71	2.56	53.2	1.68	36.8	17.3	1,052	5.93	0.15	2.07	805	13.2	0.02	19	0.06	176	3.59	3.7	37	8,121		
XH3100	23214	BH-03 (MW19-02)	Rock	1.8	0.04	3.81	<0.5	2.42	0.2	26.5	80	5.6	0.06	2.15	1,138	0.5	0.046	17	0.084	3	<0.05	<0.5	26	87		
<i>Existing Waste Rock (MW19-02), Mill Area</</i>																										