RAINY RIVER PROJECT

PART I - GENERAL

OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL WATER MANAGEMENT STRUCTURES

New Gold Inc.
Rainy River Mine
5967 Highway 11/71, P.O. Box 5
Emo, Ontario
P0W 1E0

February 2021

Version 2021-1

REVIEW AND REVISION HISTORY

The OMS Manual shall be reviewed annually and following any significant changes at the site to assess if the document is representative of the current condition and operation of the dam at the time of the review. Revisions to the manual should be undertaken within six months of changes. It is the responsibility of the Tailings Dam Engineer to initiate the OMS review.

The review team and approval record are given in Table 1. The version history of the OMS Manual is shown in Table 2.

Table 1 - Review Team

	Name	Company /Department	Position	Signature	Date
Prepared by	Patrick Green	NG Capital Projects	Tailings Dam Engineer		
Reviewed by	Travis Pastachak	NG Capital Projects	Capital Projects Manager		
	Darrol VanDeventer	NG Mine Operations	Mine Manager		
	Sylvie St. Jean	NG Environment	Environment Manager		
	Tony Lord	NG Maintenance	Mobile Maintenance Manager		
	Andre Zerwer	BGC Engineering Inc.	Engineer of Record		
Approved by	Tyler Buckingham	NG Mill	Mill Manager		

Table 2 - Revision Summary

Revision Number	Details of Revision	Date of Issue	Comment
Rev A	Issue for Review	February 9, 2021	N/A

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1.0 OBJECTIVE

The objective of this document is to provide procedures for the operation, maintenance, and surveillance (OMS) of the Tailings Management Area (TMA) at the New Gold Inc. (NGI) Rainy River Mine (RRM), located near Emo, Ontario. This OMS Manual serves as a reference for the safe operation of the structures related to tailings, water management, and water diversion structures. For readability, the OMS Manual has been separated into "Parts", as listed below:

- **PART 1: GENERAL**
- PART 2: TMA – Tailings Management Area
- PART 3: WMP – Water Management Pond
- PART 4: MRP – Mine Rock Pond
- PART 5: SEDIMENT PONDS
- PART 6: WATER DIVERSIONS STRUCTURES
- PART 7: WATER TREATMENT
- PART 8: EPP

2.0 SITE REFERENCE DATA

2.1 Regulatory Requirements

Applicable codes, guidelines, and regulations governing the RRM TMA are listed below:

- Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2003)
- CDA Bulletin Application of Dam Safety Guidelines to Mining Dams (CDA 2014)
- CDA Technical Bulleting: Dam Safety Reviews (CDA 2016)
- Mining Association of Canada Guidelines (MAC 2017)
- LRIA-FF-2017-03
- LRIA-FF-2015-04C

2.2 Grid System and Maps

The mine coordinate system is based on UTM NAD 83 Zone 15 Datum. Elevations are referenced to mean sea level.

3.0 CORPORATE ORGANIZATION

3.1 Organization Chart

An organization chart identifying the parties involved with the management of the RRM and the chain of command is presented in Figure 1. Key staff for the owner, consultants, and external advisors are included. Responsibilities for named individuals are presented in Table 3.

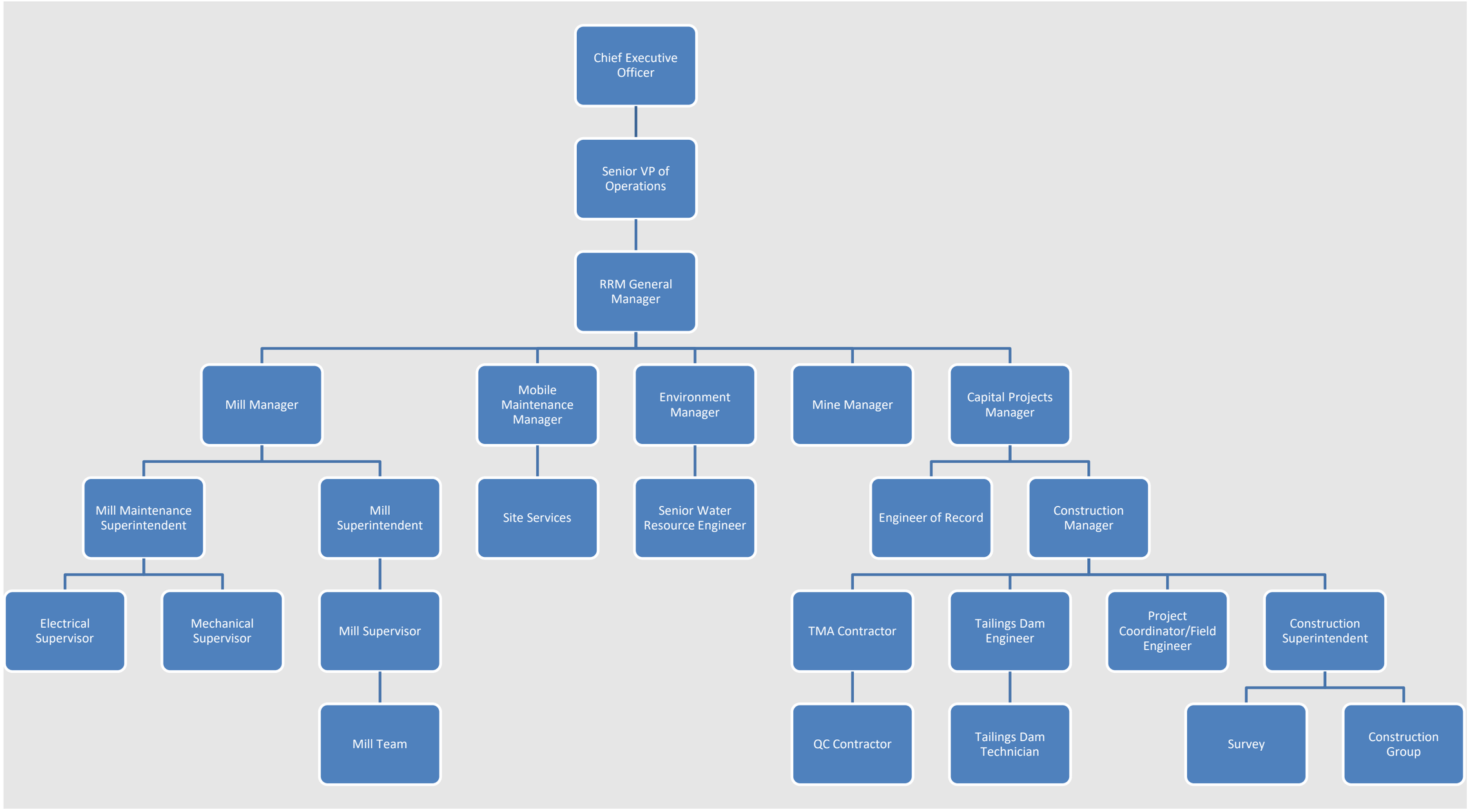

Figure 1 - Organization Chart for Tailings and Water Management

3.2 Responsibilities for Named Individuals

The roles and responsibilities of personnel formally assigned roles in the OMS of the TMA are defined in Table 3.

Table 3 - Responsibilities for Named Individuals

Role	Name	Company/ Department	Responsibilities	Phone #	Email
Chief Executive Officer	Renaud Adams	NG Corporate	• Has responsibility for the corporate "Tailings, Heap-Leach and Waste Rock Facilities Management Policy" (Included as Appendix C)	(416) 324-6002	Renaud.Adams@newgold.com
Senior VP of Operations	Eric Vinet	NG Corporate	• Provides corporate accountability for the operations of Rainy River Mine	(416) 645-7283	Eric.Vinet@newgold.com
RRM General Manager	Suresh Kalathil	NG Corporate	• Has accountability for tailings management • Provide support for the implementation of this plan • Ensure resources are available for the management of water quality and effluent release • Ensure that all dam structures meet the Canadian Dam Association Dam Safety Guidelines	(416) 881-7405	Suresh.Kalathil@newgold.com
Mill Manager	Tyler Buckingham	NG Mill	• Owner of the TMA • Accountable for the safe operation of TMA	(807) 707-7241	Tyler.Buckingham@newgold.com
Mill Superintendent	Todd Durand Derrick Colquhoun	NG Mill	• Responsible for TMA maintenance and operation	(807) 708-8408 (807) 707-8598	Todd.Durand@newgold.com Derrick.Colquhoun@newgold.com
Mill Supervisor	Mykel Spinks Simon Tremblay Jody Roussy James Carlson	NG Mill	• Responsible for inspecting tailings facilities and pipelines	(807) 708-1172	Mykel.Spinks@newgold.com Simon.Tremblay@newgold.com Jody.Roussy@newgold.com James.Carlson@newgold.com
Mill Maintenance Superintendent	Raphael Boutin Michael Lenart	NG Mill	• Accountable for maintenance of the TMA, and related infrastructure	(819) 277-0504 (807) 708-3952	Raphael.Boutin@newgold.com Michael.Lenart@newgold.com
Electrical Supervisor	Gary Loveday Darcy Mosbeck	NG Mill	• Responsible for maintenance of pumps, electrical housing, and other electrical requirements	(807) 708-6776 (807) 708-9891	Darcy.Mosbeck@newgold.com Gary.Loveday@newgold.com
Mechanical Supervisor	Scott Hillier	NG Mill	• Responsible for maintenance of pumps, and other mechanical requirements	(807) 276-8515	Scott.Hillier@newgold.com
Mobile Maintenance Manager	Tony Lord	NG Maintenance	• Accountable for operations fleet and dewatering maintenance	(647) 456 8475	Tony.Lord@newgold.com
Site Services Superintendent	Derek McKinnon	NG Maintenance	• Responsible for maintenance of HDPE pipelines	(807) 482 0900 Ext 8329	Derek.McKinnon@newgold.com
Environment Manager	Sylvie St. Jean	NG Environment	• Accountable for regulatory compliance	(807)-707-3497	Sylvie.St.Jean@newgold.com
Senior Water Resource Engineer	Sitotaw Yirdaw	NG Environment	• Responsible for monitoring and reporting water balance and pond levels • Responsible for communicating requirements of maintaining water balance • Responsible for compliance testing and sampling	(807) 482 0900 Ext 8353	Sitotaw.Yirdaw@newgold.com
Mine Manager	Darrol VanDeventer	NG Mine Operations	• Accountable for supplying ore to the mill • Accountable for supplying required/available rock (NAG/PAG) for TMA construction	(807) 482 0900 Ext 8281	Darrol.Vandeventer@newgold.com
Capital Projects Manager	Brian Gagne	NG Capital Projects	• Accountable for all Capital Projects • Accountable for TMA construction	(807) 482 0900 Ext 8295	Brian.Gagne@newgold.com
Construction Manager	Travis Pastachak	NG Capital Projects	• Responsible for construction of the TMA	(807) 482 0900 Ext 8205	Travis.Pastachak@newgold.com

Tailings Dam Engineer	Patrick Green	NG Capital Projects	• Responsible person for the TMA • Owner of the TMA and small dam instrumentation • Owner of data quality of site instrumentation	(807) 620-9611	Patrick.Green@newgold.com
Tailings Dam Technician	Tanvir Rahman	NG Capital Projects	• Responsible for reading and maintaining instrumentation at site	(902) 809 1971	Tanvir.Rahman@newgold.com
Project Coordinator	Brent McFarlane Jason Bell	NG Capital Projects	• Coordinate contracts and projects related to dam construction	(807) 707 3433	Brent.McFarlane@newgold.com Jason.Bell@newgold.com
Construction Superintendent	Garry Noga	NG Capital Projects	• Generally responsible for upstream and downstream buttress construction on the TMA	(807) 707 2015	Garry.Noga@newgold.com
Surveyor	Jessica Dark Jessica Ricklefs	NG Capital Projects	• Provides survey support for construction team • Responsible for survey of tailings beach elevations	(807) 707 7485	Jessica.Dark@newgold.com Jessica.Ricklefs@newgold.com
Consultants					
Engineer of Record	Andre Zerwer	BGC Engineering	• Verifies the TMA and water diversion structures (WDS) are constructed and operated as per the design intent • Performs Annual Dam Safety Inspections (DSI) • Provides support for safe operation and construction of the TMA and WDS • Performs QA during dam construction	(705) 222-3192	Azerwer@bgcengineering.ca
TMA Construction Contractor	Varies	Varies	• Generally responsible for TMA core and filter construction, including abutments		
Survey and Drafting Support	Jason Tremelling	Tulloch Engineering	• Provides QA survey services • Provides drafting support as required	(705) 255 2649	Jason.Tremelling@tulloch.ca

4.0 ADMINISTRATIVE CONTROLS

4.1 Document Control

Controlled Documents are kept on the Document Control site on SharePoint in the “Controlled Documents” library and monitored by the site Document Control Specialist. All drawings from the original Engineer of Record (EoR) Amec Foster Wheeler (AMECFW) are kept in the “Amec E&I Drawings” library. This library is accessible to all New Gold employees. All drawings from the current Engineer of Record BGC Engineering (BGC) are kept in a separate SharePoint site in the “BGC Engineering” folder.

4.2 Risk Assessment and Management of Change

The risk assessment and management of change process is described in SAF-SOP-0008; the scope entails the following:

- A process to analyse and manage Health, Safety, Environment, Community, and operational risks
- Changes are effectively considered prior to execution and communicated across the organization, and within the workplace, using a standardized approach
- All workplaces are inspected regularly for hazards and unsafe conditions
- Hazards and unsafe conditions are identified, recorded, and resolved.

4.3 Competency and Training Requirements

Training will be provided to employees to ensure responsible personnel are competent. The RRM, in conjunction with the EoR, will provide training on the use of the OMS Manual. It will be the responsibility of the Managers to ensure all responsible parties have undergone OMS Manual and ERP awareness training. Table 4 outlines mandatory training requirements.

Table 4 – Mandatory Training Requirements

	Chief Executive Officer	Senior VP Operations	General Manager	Mill Manager	Mill Supervisor	Mill Maintenance Superintendent	Electrical Supervisor	Mechanical Supervisor	Mobile Maintenance Manager	Site Services Superintendent	Environment Manager	Senior Water Resource Engineer	Mine Manager	Capital Projects Manager	Construction Manager	Tailings Dam Engineer	Tailings Dam Technician	Project Coordinator	Construction Superintendent	Surveyor & Drafting Support	Engineer of Record	TMA Construction Contractor
OMS – Part 1 General	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OMS – Part 2 TMA				X	X	X	X	X			X	X		X	X	X					X	X
OMS – Part 3 WMP				X	X	X	X	X			X	X			X	X						
OMS – Part 4 MRP				X	X	X	X	X			X	X			X	X						
OMS – Part 5 Sediment Ponds										X	X	X			X	X						
OMS – Part 6 Diversion Structure											X	X			X	X						
OMS – Part 7 Water Treatment				X	X	X	X	X			X	X			X	X						
OMS – Part 8 Pinewood & Culvert										X	X	X			X	X						
OMS – Part 9 EPP	X	X	X	X	X	X				X	X	X	X	X	X	X		X	X		X	X
ENV-SOP-0001 Spill Reporting				X	X	X				X	X	X		X	X	X	X	X	X	X	X	
ENV-SOP-0008 Water Elevation Survey												X			X	X			X	X		
MIL-BCR-SOP-0004 BCR 2 Operation				X	X	X					X	X				X						
MIL-CND-SOP-0009 Line Inspections				X	X	X				X					X	X	X			X		
MIL-GEN-SOP-0043 Switching Pumps				X	X	X										X						
MIL-WTP-SOP-0002 Response to Upset				X	X	X										X						
MIL-WTP-0010 Nitrification Cell Op.				X	X	X										X						
MIL-WTP-SOP-0014 Bio. Treatment Op.				X	X	X										X						
CST01-4340-M03-0001.001 WTP Op & Maint. Manual				X	X	X										X						
SAF-SOP-0008 Risk Assessment and MOC		X	X	X	X	X				X	X	X		X	X	X		X	X		X	X
SAF-SOP-0011 Incident Management Procedure	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
SAF-SOP-0045 Working Around Water					X					X	X	X			X	X	X	X	X	X	X	X
(TBD) Reading Geo. Inst.																X	X	X	X	X	X	
(TBD) **Dam Safety Inspection**			X	X							X	X		X	X	X	X	X	X		X	

4.4 RASCI Charts

Specific critical tasks are detailed by using RASCI Charts (Responsible, Accountable, Supportive, Consulting, Informed). These are regularly being created and reviewed annually, or earlier. A list of developed RASCI charts is summarized below and provided in Appendix H.

- TMA Tailings Discharge & Pipe Relocation
- TMA Geotechnical Instrumentation
- Tailings & Water Line Inspections

5.0 SITE BASELINE CONDITIONS

5.1 Site Location and Tenure

The site is located in the Township of Chapple, approximately 70 kilometers (km) by road northwest of Fort Frances, in Northwestern Ontario. New Gold has 100% interest in the lands forming the RRM through direct ownership or option agreement, however surface rights are not owned throughout the site boundary.

The RRM is located within lands used by Indigenous Groups for traditional and ceremonial purposes. NGI has regulatory requirements and/or bipartisan agreements to engage with the communities including, but not necessarily limited to:

- Rainy River First Nations,
- Naicatchewenin First Nation,
- Big Grassy River First Nation,
- Naotkamegwanning (Whitefish Bay) First Nation,
- Anishinaabeg of Naongashiing (Big Island) First Nation,
- Animakee Wa Zhing #37 First Nation,
- Ojibways of Onigaming First Nation, and
- Sunset Country Métis community (represented by Métis Nation of Ontario Region 1 Consultation Committee).

Road access to the site is by provincial Highways 600 and 71 and Korpi Road (east access road). A site location map is provided in Figure 2. The mine is serviced by local municipal infrastructure and is in close proximity to Fort Frances, Ontario.

The site topography is variable with elevations ranging from 350 m to 390 m, with all elevations referenced in this manual to sea level. The terrain is comprised of both forested and non-forested areas, including agricultural and wetland areas. The local drainage systems are characterized by numerous small creeks that drain into the Pinewood River. The small creeks typically originate from rocky uplands or headwater wetland systems.

The forested areas are dominated by mixed poplar and black spruce forests. Wetlands are comprised mainly of treed and open fens, together with wetland thickets and marsh areas.

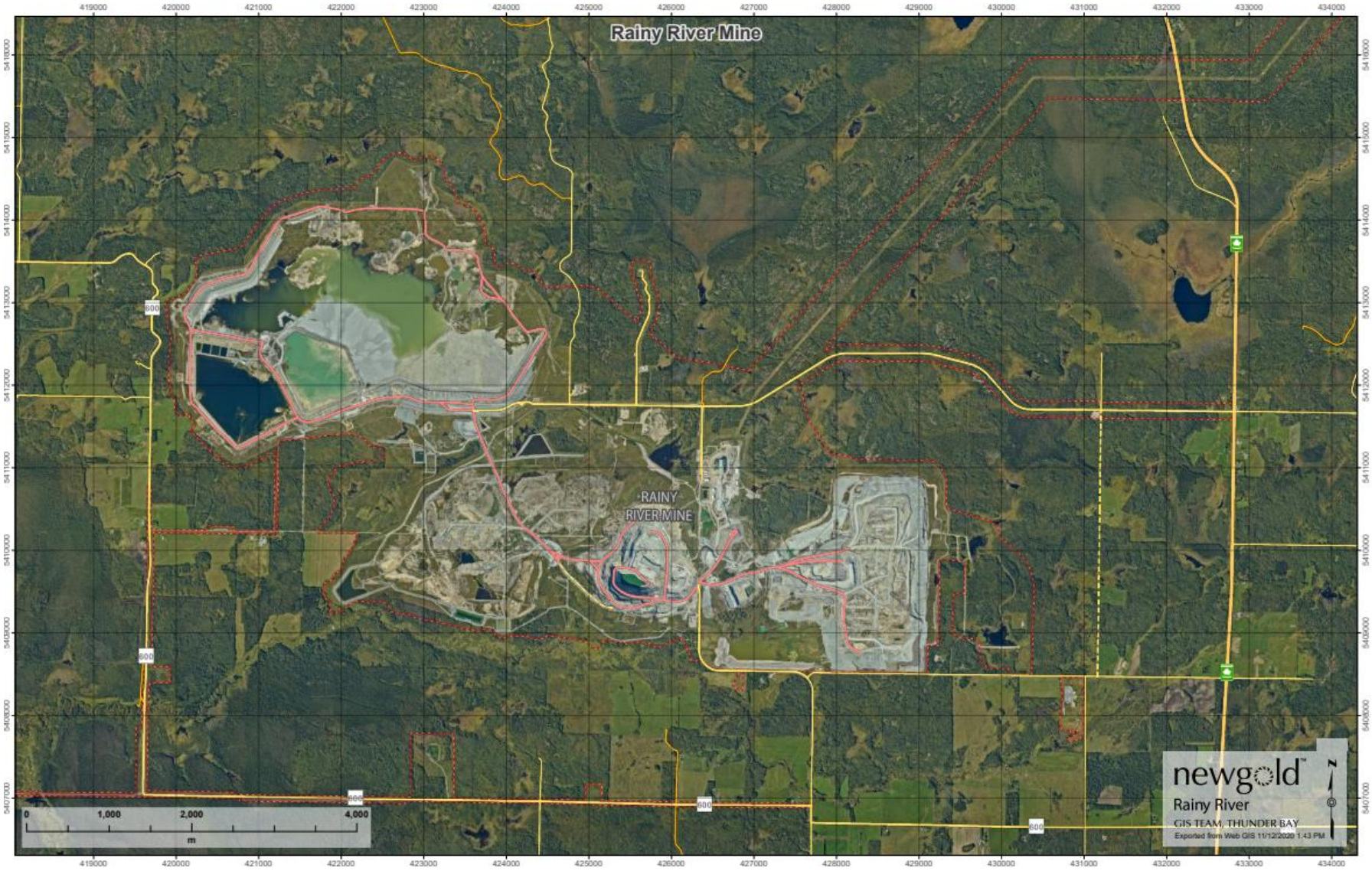

Figure 2 - Site Map

5.2 Temperature

The mean annual temperature and precipitation for RRM is outlined in the 1971 to 2000 Canadian Climate Normals (CCN). Temperatures from the Barwick meteorological station (Station 6020559; Environment Canada 2012), located 20 km to the south, were used for a baseline and are summarized in Table 5 (AMEC, 2013).

Table 5 - Summary of Temperature Climate Normals

Summary of Temperature Climate Normals (°C)													
Climate Station	**Jan**	**Feb**	Mar	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Barwick	-15.9	-11.6	-4.4	4.2	11.7	16.2	18.8	17.8	12.1	5.5	-3.8	-12.7	3.2

5.3 Precipitation

There is an average of 695 mm of precipitation annually at RRM, with 552 mm of this falling as rain and the remaining 143 mm as snow. Most precipitation occurs in the summer months and the CCN records an extreme precipitation event of 152 mm of daily rainfall. The monthly mean precipitation is given in Table 6.

Table 6 - Mean Monthly Precipitation

Mean Monthly Precipitation													
Type	**Jan**	**Feb**	Mar	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Precipitation (mm)	28.3	24.1	29.7	40	68.3	113.8	99	84	80	56.2	41.7	29.7	694.7
Rainfall (mm)	0.3	3.3	11	30.4	67.3	113.8	99	84	79.4	50.4	12.8	0.8	552.4
Snowfall (cm)	28.0	20.8	18.7	9.6	1.0	0.0	0.0	0.0	0.6	5.8	28.9	28.9	142.3

The Ministry of Transportation provides a tool which interpolates intensity, duration, and frequency (IDF) data published by Environment Canada for any location in Ontario. Prior to 2020, all designs were based on this data, excluding the probabilistic water balance model. The IDF return event quantities are provided for latitude 48.83 °N longitude -94.00 °E in Table 7.

Table 7 - Interpolated IDF Return Events

Interpolated IDF Return Event (mm)									
Return Period (year)	Storm Duration								
	5 min	10 min	15 min	30 min	1 hr	2 hr	6 hr	12 hr	24 hr
2	8.5	12.3	15.2	19.8	24.2	29.4	38.1	44.6	50.8
5	10.8	15.4	19.6	24.1	29.4	33.4	40.9	44.9	50.9
10	12.9	17.7	21.8	27.8	39.4	48.7	72.2	86.7	92.5
25	13.4	20.3	26.6	39.5	49.7	62.8	80.4	93.8	102.0
50	14.7	22.6	29.8	44.6	56.7	71.4	91.0	106.0	116.0
100	16.1	25.1	33.0	49.8	63.1	80.0	101.0	118.0	129.0

The Environmental Design Flood (EDF) events for many dams at site are 1:100 year 30-day events, which is not readily available from Environment Canada. Since the methods used to determine the EDF event were not clear, further investigations determined that using the IDF information from Baudette Minnesota was reasonably accurate and better representative of site weather patterns. The historical data events range up to 1:1000 year 60-day events. From 2020 onwards, all design storms will follow the IDF return event quantities in Table 8 (National Oceanic and Atmospheric Administration, 2020).

Table 8 - Precipitation Frequency Estimates

PDS-based precipitation frequency estimates (in mm)										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	7.8	9.3	11.8	14.0	17.3	20.0	22.9	26.2	30.5	34.0
10-min	11.5	13.6	17.2	20.5	25.3	29.5	33.5	38.1	44.5	49.8
15-min	14.0	16.6	21.0	25.0	31.0	35.8	40.9	46.5	54.4	60.5
30-min	19.0	22.3	28.2	33.5	41.4	48.0	55.1	62.7	73.4	82.0
60-min	24.4	28.7	35.8	41.9	51.3	58.7	66.5	74.9	86.6	96.0
2-hr	30.0	34.8	43.2	50.5	61.0	69.6	78.2	87.4	99.8	109.7
3-hr	33.5	38.9	48.0	55.6	66.8	75.2	84.1	93.2	105.4	114.8
6-hr	39.6	45.7	55.9	64.8	77.2	87.4	97.5	108.2	122.7	134.1
12-hr	45.5	52.1	63.8	74.4	90.2	103.6	117.9	133.1	154.9	172.5
24-hr	51.3	58.9	73.2	86.4	106.9	124.5	143.8	165.1	195.6	220.7
2-day	58.2	67.6	84.6	100.8	126.0	147.6	170.9	196.9	234.2	264.2
3-day	64.3	73.7	91.4	108.2	134.6	157.2	182.1	209.6	249.4	281.9
4-day	69.6	79.2	97.0	114.0	140.5	163.6	189.0	216.9	256.5	289.6
7-day	83.1	93.5	112.5	130.0	157.0	179.8	204.7	231.9	271.8	302.3
10-day	95.0	106.7	127.3	145.8	173.5	196.6	221.0	247.1	284.5	315.0
20-day	128.8	144.8	171.5	194.1	225.3	249.9	274.3	299.7	335.3	360.7
30-day	157.5	176.8	207.8	233.2	266.7	292.1	320.0	342.9	375.9	401.3
45-day	194.3	216.9	252.5	281.9	317.5	345.4	370.8	396.2	426.7	447.0
60-day	226.1	251.0	289.6	320.0	358.1	386.1	411.5	436.9	464.8	485.1

5.4 Evaporation

The Hydrological Atlas of Canada (1978) estimates the RRM region experiences 600-700 mm/year of lake evaporation and 500-600 mm/year of evapotranspiration. Consultants Klohn Crippen Berger (KCB) (2011) predicted average evapotranspiration in the RRM area of likely between 315-560 mm/year (45-80% of average annual precipitation). The nearest evaporation data is available from the Atikokan Climate Station (Station 6020379) located 175 km east of the RRM. This data is summarized in Table 9.

Table 9 - Mean Monthly Evaporation

Mean Monthly Evaporation at Atikokan Station (mm)							
Type	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Annual**
Pan Evaporation	141	149	167	133	79	45	713
Lake Evaporation	111	116	129	104	63	36	560

5.5 Hydrology

The collection of runoff and hydrology data for the RRM is challenged by low gradient, small systems, and frequent beaver impoundment. Water Survey of Canada Station 05PC011 at the Pinewood River provides the longest and most reliable available data set. Water Survey of Canada Station 05PC023 (at Highway 617) provides a shorter period of record and is known to provide erroneous readings of up to 20%. Table 10 presents mean streamflow data in the Pinewood River as presented in the EA application, which have been pro-rated where required and in winter months.

Table 10 - Monthly Streamflow in the Pinewood River at WSC 05PC011 (m^3/s)

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	Annual
Mean	0.218	0.144	0.538	9.595	7.135	5.412	3.163	1.536	1.787	2.352	1.913	0.383	194.8
5^{th} %ile	0.073	0.049	0.181	3.228	2.400	1.820	1.064	0.517	0.601	0.791	0.644	0.129	65.5
95 %ile	0.440	0.292	1.087	19.41	14.43	10.95	6.398	3.107	3.615	4.758	3.870	0.776	394.1

The RRM site on the north side of the Pinewood River is drained by four small creek systems, which include from east to west: Clark Creek (Teeple Drain), West Creek, Marr Creek and Loslo Creek (Cowser Drain). These creek basins range in size from 7.3 km^2 (Marr Creek) to 16.35 km^2 (West Creek). Major portions of the Clark Creek, Marr Creek and Loslo Creek basins will be overprinted by RRM developments, principally the TMA and stockpiles. West Creek currently diverted around the pit and flows to Loslo Creek via West Creek Diversion.

It should be also noted that the lower approximately 3.3 km reach of Loslo Creek and 2.3 km of Clark Creek leading to the outflow into the Pinewood River have been previously designated as Municipal drains under the Drainage Act (respectively, the Cowser Drain constructed in 1980 and the Teeple Drain constructed in 1994).

5.6 Geology

The geology at the Rainy River Mine consists of glacial sediments deposited during advance and retreat of the Laurentide Ice Sheet during the Late Wisconsinan, between approximately 20,000 and 11,500 years before present (Bajc, 2001). Glacial advance and retreat led to the deposition

of fine-grained glaciolacustrine soils and glacial (till) deposits. The typical stratigraphic sequence (from oldest to youngest) observed in the TMA and water management dam foundations includes the following stratigraphic units:

- Whiteshell Till (WST): generally comprised of a dense, granular lodgement till deposited by Labradorean ice advancing from northeast to southwest.
- Wylie Formation: generally comprised of interbedded silt and clay deposited in a glaciolacustrine environment.
- Whitemouth Lake (WML) Till: generally comprised of a high plastic clay lodgement till with trace amounts of sand and gravel deposited by the Keewatin ice advancing from west to east. The WML Till contains sheared and softened zones attributed to glacial deposition processes.
- Brenna Formation and Sherack Formation: comprised of variable silt and clay deposited in a glaciolacustrine environment.
- Poplar River Formation: comprised of glaciofluvial sands and gravels deposited in fluvial channels.

The WST is a semi-confined aquifer that hosts artesian groundwater pressure in localized areas of the mine. The artesian condition arises from recharge from surface exposures on topographic highs, hydraulic connection between the recharge points and more deeply buried occurrences, and the relatively impermeable overlying soils. The observed artesian pressures will reduce dissipation rates of construction-induced excess pore pressures developed in the overlying cohesive soils.

The Wylie Formation, WML Till, and the Brenna Formation contain swelling clay minerals with possible coarse-grained intervals. This heterogeneity in permeability and hydraulic conductivity affect pore pressure response at depth.

The geological conceptual model is given in Figure 3.

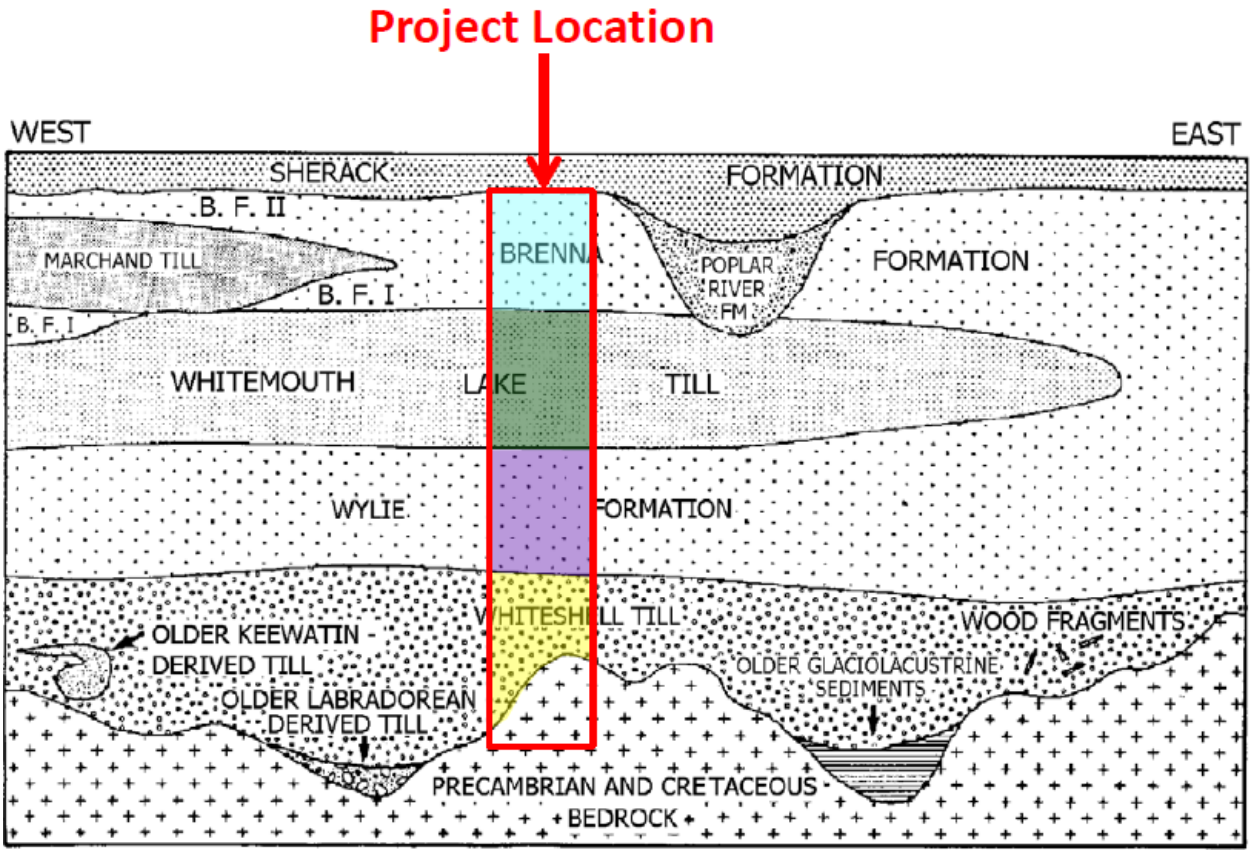

Figure 3 - Geological Conceptual Model

Deformation features from glacial advance in the WML Till include rip-up clasts, slickensided surfaces, and small-scale (up to 1.0 m in thickness) strain-softened zones. Although large-scale zones of strain-softening or slickensides have not been conclusively identified, small-scale softened zones may increase stress concentration, grow, and coalesce under external loading (such as the loading caused by dam construction). Brittle failures have been observed in over steepened excavation faces of the WML Till where high strain rates are present (BGC, September 10, 2019).

5.7 Hydrogeology

Regional groundwater flow is generally towards the west in the Pinewood River watershed, but locally is towards the Pinewood River corridor. Horizontal gradients are relatively steep on higher ground, approaching 0.01, but become more subdued in the lower lying areas where they decrease to approximately 0.003. This change in horizontal gradient is a strong indication that, as the groundwater flows from the higher ground to lower elevations, there is flow from the relatively impermeable shallow bedrock to the more permeable Whiteshell Till and other granular material immediately above the bedrock, referred to generically as the Pleistocene lower granular deposits (PLGD).

The hydrological conceptual model is given in Figure 4.

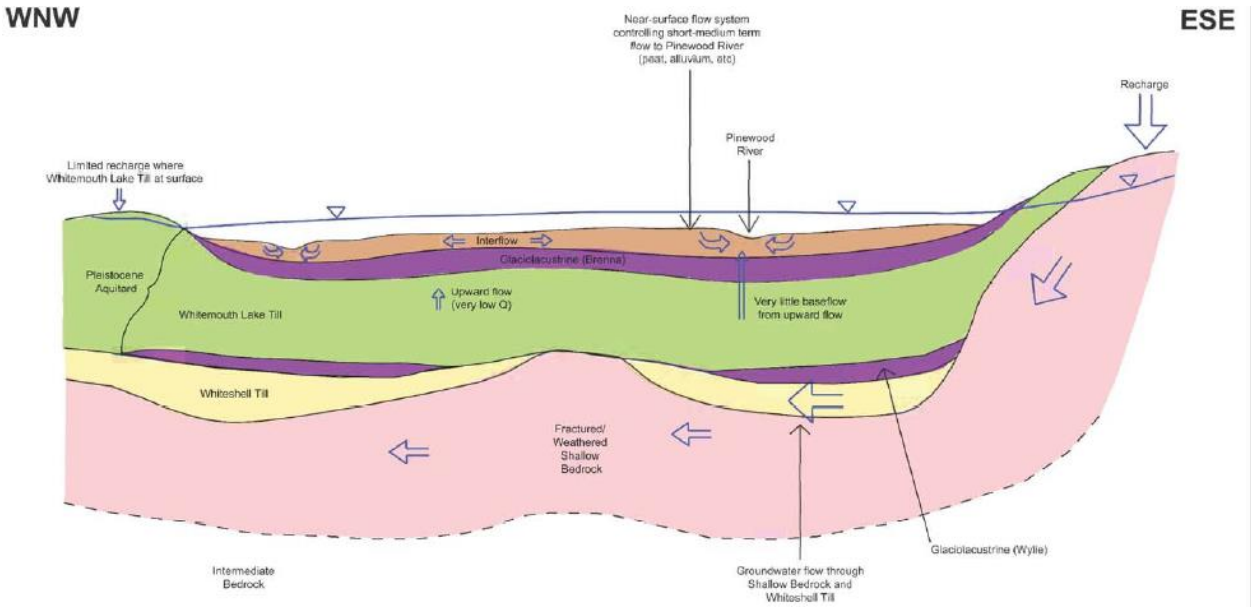

Figure 4 - Hydrogeological Conceptual Model *(ITRB 2018-04-04)*

Groundwater in the shallow bedrock and PLGD becomes confined as it moves westwards and towards the Pinewood River beneath the lower permeability silty clays of the WML Till and the glaciolacustrine deposits that largely sandwich this till (the Pleistocene Aquitard). Artesian conditions within the shallow bedrock and PLGD are common along the stream corridors with upwards gradients on the order of 0.03 to 0.1, while downwards gradients occur in the higher areas between the streams.

Groundwater quality is typical calcium magnesium-bicarbonate type water with the majority of sampling points having total dissolved solids exceeding 500 mg/L. Sampling of groundwater since 2007 has indicated metal concentrations above application guidelines e.g., arsenic, cobalt, iron, molybdenum, zinc, mercury and uranium.

5.8 Water Quality

Water quality at the RRM is influenced by the presence of clays/silts and water quality guidelines are frequently exceeded at baseline or upstream sites. There are several circumstances where exceedance of the Provincial Water Quality Objectives (PWQO) and Canadian Environmental Quality Guidelines (CEQG) values are common:

- Total metal values for samples showing elevated total suspended solids (TSS), especially for very common minerals such as aluminum and iron
- Total aluminum concentrations in areas where clay / silt soils are common, as aluminum is a common clay mineral
- Samples collected from under the ice in low volume water systems, because the process of ice formation tends to exclude ions from the ice crystal lattice, thereby concentrating the ejected ions in the underlying water column
- Samples collected during summer drought conditions in low volume water systems, because of ion concentration due to evaporative processes

The majority of parameters for surface waters met PWQO and CEQG for the protection of aquatic life, with the exception of common exceedances for aluminum (mainly CEQG), iron and phosphorus; frequent exceedances for cadmium (CEQG), copper (mainly CEQG) and cobalt (PWQO); and occasional, to rare, exceedances for arsenic, lead, nickel and zinc.

5.9 Tailings

Based on geochemical testing, the tailings are PAG with an expected lag time to net acidic conditions of approximately 30 years. In addition, there is a potential risk of elevated cadmium concentrations in the TMA during operations due to leaching from the tailings.

Metal release from subaerial (beached) tailings may occur prior to acidic conditions and management of the tailings pond water may be required at this time. Metal release may occur from submerged tailings; however, subaerial tailings appear to be a greater source of loadings than submerged tailings. The milled ore is also a substantial source of loadings to the tailings pond, in some cases (e.g., cadmium) it is the dominant loading source early in mining operations.

Geochemical assessments suggest that cadmium concentrations in the TMA may exceed the working site-specific value (0.001 mg/L subject to confirmation through permitting) within 1 year after mining begins. Reductions in the tailings beach areas could extend the period until exceedance is reached. Water treatment in the WMP has been employed to support discharges from the WMP meeting discharge effluent quality targets.

5.10 Biodiversity

5.10.1 Fish

The fish community proximal to the RRM is dominated by baitfish and forage fish species with sportfish (e.g., Walleye and Northern Pike) in the lower Pinewood River below the Pinewood Pumphouse. Presently the lower reaches of Marr and Loslo Creek remain fish bearing after the headwaters have been cut off by the TMA construction. West Creek and Clark Creek are former tributaries to the Pinewood River and have been offset for by the Clark Creek and West Creek Diversion structures. Clark Creek and West Creek Diversion structures are offsetting habitat and support all life history stages of baitfish and forage fish species.

The freshwater diversions are fish bearing waters and subject to protection under numerous permits and legislation e.g., *Fisheries Act*. Cowser Drain (Loslo Creek) and the Pinewood River are also fish bearing. Water quality discharges into these areas must meet MMER and ECA permit requirements. Additional studies as required by the ECA e.g., for mercury, sulphate and ammonia are ongoing, the results of which may influence operation of the TMA.

5.10.2 Vegetation

The RRM is within Ecoregion 5S (Agassiz Clay Plain) and there are no published “Significant Wildlife Habitat Ecoregion Criteria Schedules” for this ecoregion. Aspen-Birch hardwood forest is the dominant (46.6 %) forest type proximal to the mine, followed by coniferous swamp / wetland (29.4 %). Agricultural lands are present across 8% of the area proximal to the mine, primarily along roads and in areas of well drained clays. No records of rare vegetation communities or rare plants were identified during the Environmental Assessment.

Based on the ecoregion, the growing season length is 180-190 days with mean annual temperatures of 1.5 to 3.0 ºC. The frost-free period is ~125 days from mid-May to mid/late September (Ministry of Agriculture; 1976-2005).

5.10.3 Wildlife

Key wildlife aspects influencing the OMS manual include the presence of:

- Species at risk including but not limited to Eastern Whip-poor-will and Bobolink which require consideration of limits of disturbance, timing of works, noise mitigation and dust management
- Snapping turtles, for which measures must be taken to prevent them entering the TMA, process water and water treatment facilities
- Migratory birds requiring noise mitigation measures, reduced light pollution, timing windows on clearing, deterrents to prevent use of the TMA and monitoring for use of the TMA
- Deer, which along with other wildlife require that a fence is to be constructed around the active tailings deposition areas
- Bear, which along with other wildlife need to be managed through controlling wildlife-human interactions including reporting, no harassing of wildlife, no fishing or hunting on the mine site, speed restriction and waste management to exclude wildlife.

5.11 Natural Hazards

Natural hazards to the RRM are limited to weather related hazards e.g., flooding, drought, extreme cold or high winds and forest fires. Other natural hazards e.g., volcanic activity, subsidence, avalanches, and landslides are not expected to affect the mine given surrounding geology and topography. Responses to natural hazards are considered as part of the site EPRP. Potential natural hazards relating to the OMS are discussed here, however further consideration on how to respond to natural hazards is considered in the maintenance and contingency sections.

- Forest Fire: there is potential for forest fires to affect operations of the mine, with the cycle in the area of the RRM being 63 to 210 years.
- Pit Slope Failure: could be caused by flooding or slope instability. Modelling of the 1:100 year flow in the Pinewood River would result in the Pinewood River cresting adjacent to the pit between elevations 347-349 m. A proposed flood protection berm will provide protection during potential ice jams in the Pinewood River.
- Flooding: there is potential for flooding, and associated rainfall to affect operations of the mine. Design of the dams and diversion structures has considered these events. Results of flooding leading to a potential need to discharge additional water is offset by the increased assimilative capacity of the receiving environment at the permitted 1:1 discharge ratio.
- Drought: drought conditions may result in a reduction in water availability for processing and discharge. Drought conditions for processing is mitigated through the design of the WMP and water storage. In the event of 5th percentile low flow fall, only 1.53 Mm^3 could

be discharged. However, this is managed through capacity in the TMA, WMP and water treatment. Water balance model is regularly updated and reviewed by RRM management.

- Seismic Hazard: the site is located in the Canadian Shield which is comprised of Precambrian granites and gneisses that host some of the oldest rocks in the world. No earthquakes recorded with a magnitude greater than M 4.5 have occurred within approximately 500 km of the site. Further details regarding the PSHA are provided in the *2013/2014 Geotechnical Site Investigations Report* (AMEC, 2014d).

6.0 FACILITY DESCRIPTIONS

The components of the RRM relative to the scope of the OMS include tailings and process water management, water treatment, and freshwater diversions. This section will describe the interconnectivity between the systems at a high level. For more detail, see the individual Parts as described in Section 1.0.

6.1 Tailings and process water management

Tailings and process water management is accomplished by the following structures:

- TMA – This includes Cells 1, Cell 2, Cell 3, seepage collection, and associated pipelines
- WMP
- MRP.

The TMA provides long term containment for the tailings. The mill make-up water is reclaimed from the Tailings Management Area (TMA), the Water Management Pond (WMP) and/or the Mine Rock Pond (MRP).

The TMA dam raising schedule is divided into seven stages and has been set to ensure sufficient pond storage to satisfy mill make-up water supply and effluent management requirements. Both the WMP and MRP are constructed to final elevation.

The TMA has been designed to optimize natural degradation processes, by ensuring there is sufficient time to allow for heavy metals to precipitate to low levels in the pond. The natural degradation processes are most effective during warm weather conditions when biophysical activity is optimal and are also augmented by exposure to sunlight.

Bubblers (10) throughout the WMP provides sufficient aeration to treat for ammonia and will keep the water over the WMP from completely freezing during the winter. Mill make-up water is provided through reclaim from the TMA and/or the transfer of contact water from the Mine Rock Pond (MRP) decided by the reclaim logic described in Appendix A.1.

6.2 Water Treatment

A schematic diagram of the Water Treatment Train (WTT) is shown in Figure 4. Water treatment is provided by:

- Water Treatment Plant (WTP), Biochemical Reactor 1 (BCR 1) and Biochemical Reactor 2 (BCR 2); and
- Sediment ponds 1, 2 and 3

Treated surplus water is transferred to the WMP before it is discharged to the environment, predominately via Biochemical Reactor 2 (BCR2) and the Outflow Basin (OB), to the Loslo Creek confluence with the Pinewood River (EDL2). A pipeline to the Pinewood River downstream of McCallum Creek (EDL1) can also discharge water at times of higher flow and when there is insufficient flow at EDL2. BCR2 will treat for phosphates and sulphates and residual metals. Effluents planned for discharge to the environment will meet discharge criteria or be pumped back to the WMP for further treatment.

Sedimentation ponds have been designed to allow for the settlement of total suspended solids present in the non-contact runoff or effluent prior to discharge to the environment. Sediment Ponds 1, 2 and 3 receive runoff and seepage from the West Mine Rock Stockpile (WMRS).

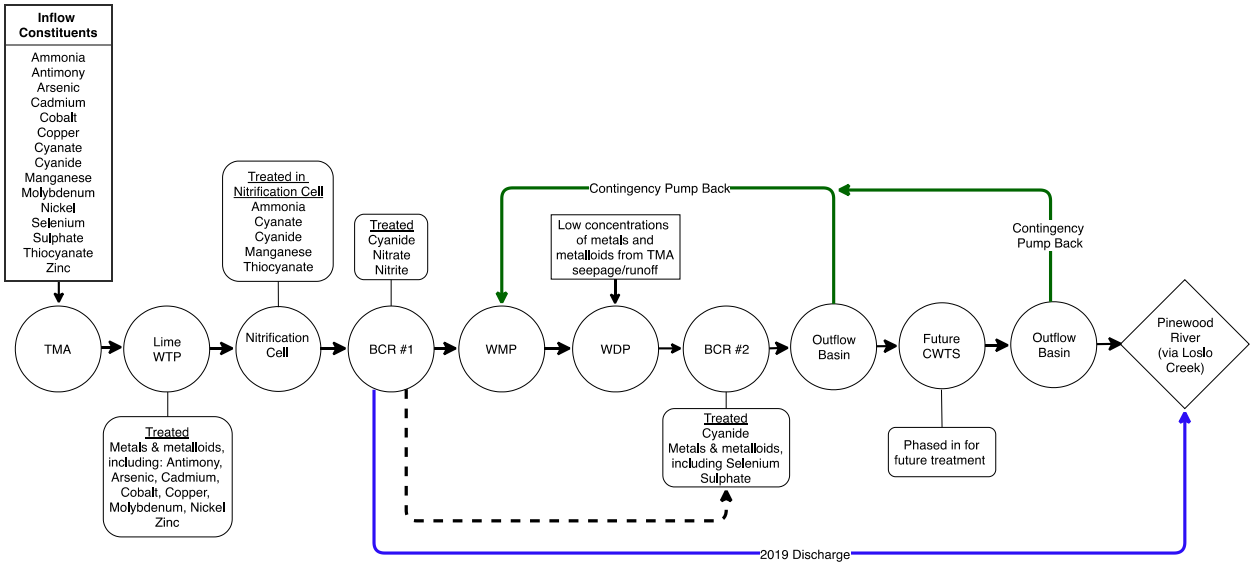

Figure 4 - Water Treatment Train Overview

6.3 Freshwater Diversion System:

The Freshwater Diversion system includes:

- Marr and Loslo Creek diversion ditches
- Clark Creek diversion including the Clark Creek and Teeple dam structures
- West Creek diversion including the Stockpile and West Creek dam and diversions structures.

The freshwater diversions function to reduce inflows to the RRM and provide offsetting habitat for the loss of portions of Loslo, Marr, Clark and West Creeks. Diversion of the non-contact runoff from these catchments reduces the effluent management requirements. All structures support fish habitat with the exception of Marr and Loslo diversion ditches.

7.0 REGULATORY

7.1 Approval Summary

Approvals for permits as well as Environmental Assessment (EA) commitments can be found on the Environment SharePoint webpage at

https://newgold4.sharepoint.com/sites/yag_environment/SitePages/Home.aspx

7.2 Commitment Tracking

All Regulatory requirements are tracked in the Intelex software application. A link can be found on the Environment webpage

https://newgold4.sharepoint.com/sites/yag_environment/SitePages/Home.aspx

The Environmental Management System framework is found in the EMS Manual ENV-MAN-EMS-0001 draft.