MELIADINE MINE FILTERED TAILINGS STORAGE FACILITY

Overview of design, operation and performance December 1st, 2022





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AGENDA



- Meliadine Mine Site
- TSF timeline
- Geochemical and Geotechnical characteristics of the tailings
- Feasibility Study
- Detailed Deposition Plan and Final Design
- Operation and Monitoring













Current Life of Mine

- Operations: 2019 2032
- Closure: 2033 2042
- Post-Closure: 2043 2047

- E UR A SIA GREENLAND NOR TH AMERICA
- Milling rate: 8,500 t/day (permitted) 6,250 t/day (planned)
- Total Oz: ~ 4M oz (remaining reserves)







MELIADINE TSF TIMELINE





TSF CONCEPT DEVELOPMENT TAILINGS MANAGEMENT SCOPING STUDY IN 2012



Slurry Option - 57% solid content



Paste Option - 75% solid content



TSF CONCEPT DEVELOPMENT TAILINGS MANAGEMENT SCOPING STUDY IN 2012

2012





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TSF CONCEPT DEVELOPMENT TAILINGS GEOCHEMISTRY – 2012 RESULTS



- Samples tested from different ore body (sample taken in 2009 and 2011).
- Various tests completed: ABA, SFE, NAG, HCT, etc..
- Results are suggesting tailings are to be **non-acid generating (NAG)**.
- Tailings may have a **potential of leaching arsenic, especially during the initial flushing**. Humidity cell tests on tailings samples indicated that arsenic concentrations decreased rapidly such that all samples reported concentrations below the MDMER limit by cycle 4.
- Test results show that tailings pore water could contain residual arsenic and cyanide.



TSF CONCEPT DEVELOPMENT TRADE OFF STUDY - 2013



- Trade-off study on slurry option and filtered tailings option.
- Focused on tailings storage infrastructure, water management, process equipment and closure.
- Comparison on costs (CAPEX and OPEX), schedule, quality, and risks.
- The exercise found that **filtered tailings placed in an on-land facility could offer significant advantages** at many levels.
- Filtered tailings technology retained as the tailings management approach for the Meliadine Project.



TAILINGS CHARACTERISTIC PHYSICAL CHARACTERISTIC – 2014

- The tailings index and gradation analysis tests indicated that the tailings are inorganic silt with **low plasticity** and **low compressibility** and consist of 17%, 81% and 2% of sand, silt, and clay size particles, respectively.
- Tailings have the gradation curve of 98% passing 150 μm, 83% passing 75 μm, 40% passing 20 μm, and 5% passing 3 μm.







TAILINGS CHARACTERISTIC PHYSICAL CHARACTERISTIC – 2014

- The moisture-density relationship (Standard Proctor, ASTM D698) test indicated that the maximum dry density of the tailings was 1,800 kg/m³ under an optimum moisture content of 14.9%.
- The coefficient of consolidation (cv) of the tailings ranged from 24.6 to 29.8 (m²/year) under various pressures from 10 to 1,600 kPa.







TAILINGS CHARACTERISTIC PHYSICAL CHARACTERISTIC – 2014

- The shear strength parameters were determined to be an inferred **internal angle of friction of 33.5**° and an apparent cohesion of 9.9 kPa for the tailings samples with a dry density of 1,708 kg/m³.
- The saturated hydraulic conductivity of the tailings sample was 2.91E-07 m/sec for the tailings sample with a dry density of 1,700 kg/m³





FEASABILITY STUDY 2014 DESIGN CONCEPT AND PARAMETERS

- Filtered Tailings Storage Facility (TSF) on-land to accommodate ~9.3M tonnes of tailings.
- Three cells approach for operation.
- Protective erosion rockfill cover placed during operation (progressive closure).
- Water management: CP3, channel 3 and berm 2.

-ecchemical characteristics

scopingsudy

2012

Geotechnical transite FeasibilityStudy

Tade Off Study



FEASABILITY STUDY 2014 DESIGN CONCEPT AND PARAMETERS



Value

4(H):1(V) below elevation of 84.0 m

3(H):1(V) above elevation of 84.0 m

4(H):1(V)

4

Approximately 30

65.811

141.855

32.408

71,327

57.254

96,213

350.971



	16	





DESIGN REPORT DESIGN CONCEPT AND PARAMETERS

- Increase in overall tonnage to 10.9 M tonnes of tailings.
- Approx. 33 m average height same • footprint.
- From 3 to 2 cells: •

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easibility study

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Scoping Study

2012

.de-Off Study

 Better construction access and less access ramp area.

2022

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 Greater area for freeze-back. Dealed Deposition Plan & Dealer Report

2018

Project Construction 53015

Neizhre Water Licence



DESIGN REPORT THERMAL ANALYSIS RESULTS



- The original overburden ground below the tailings will remain frozen, with the estimated temperature being around -4°C in the long term.
- Most of the tailings placed would freeze after one winter.
- The tailings will become frozen within several winters after the final closure cover is placed.
- The predicted temperatures of the placed tailings range from -1°C to -4°C within 100 years of assumed climate change conditions after initial mine closure.
- The thermal model will be verified and refined on a periodic basis throughout the lifespan of the TSF, as ground/tailings temperature monitoring data and as-built information becomes available.

DEPOSITION PLAN TAILINGS DEPOSITION STRATEGY



To promote permafrost development in the tailings and underlying ground surface, the following placement strategies will be adopted:

- Seasonality considerations. November to March is typically a period of sub-zero temperatures and snowfall, while April to October is a period of thawing/freezing conditions with rainfall. The initial lift of tailings over original ground will be placed during winter conditions whenever feasible.
- Restricted yearly tailings thickness. The **maximum thickness of tailings placed during the initial year of each cell will be limited to 2.6 m**, while the total yearly thickness placed in a cell for subsequent years will be no greater than 10.3 m.



DEPOSITION PLAN TRANSPORTATION







• The tailings are loaded into 40-ton haul truck in the TDB and hauled to the TSF.

DEPOSITION PLAN TRANSPORTATION



- The tailings are end dumped and spread with a dozer in 0.3m lifts.
- Each lift is compacted with a 10-ton vibratory drum roller.







DEPOSITION PLAN

Estimated yearly volumes \rightarrow Overall model



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Year	Mine Year	Tailing Solids to be Placed in Dry Stack TSF (t)		Estimated Average Height of Tailings Placed in Center Area of Each Cell (m)		Planned Tailings Placement Period	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
2019	Yr-1	582,026		1.6		Jan to Dec	
2020	Yr 1	885,037		5.3		Jan to Dec	
2021	Yr 2	1,052,607		10.3		Jan to Dec	
2022	Yr 3	997,007		16.1		Jan to Dec	
2023	Yr 4	868,728	620,522	22.7	2.6	Jan to Jul	Aug to Dec
2024	Yr 5	717,635	992,439	33.0	6.9	Jan to May	Jun to Dec
2025	Yr 6		1,689,813		15.2		Jan to Dec
2026	Yr 7		1,668,059		24.7		Jan to Dec
2027	Yr 8		846,252		33.0		Jan to Aug
	Total 5,103,041 5,817		5,817,086				

DEPOSITION PLAN





Quarter in Year -1	Tailing Solids to be Placed in Dry Stack TSF (t)	Estimated Volume of Compacted Tailings (m ³)	Approximate Top Elevation of Tailings in Cell 1 (masl)	Planned Tailings Deposition Area
Q1	102,459	62,096	70.2	East portion of Cell 1 in CP1 Catchment Area
Q2	153,552	93,062	68.5	West portion of Cell 1 in CP3 Catchment Area
Q3	153,108	92,793	69.7	West portion of Cell 1 in CP3 Catchment Area
Q4	172,907	104,792	70.6	Most of Cell 1, except for the high ground in the southeast end



DEPOSITION PLAN



2019 Quarterly deposition \rightarrow Monthly deposition January-February-March





OPERATIONS FEBRUARY 2019





OPERATIONS Q1 2020



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OPERATIONS Q3 2020









OPERATIONS DUST MANAGEMENT



Zamboni trial for dust mitigation by encapsuling the surface with a thin layer of ice.



OPERATIONS OCTOBER 2021 INTERIM SLOPE





OPERATIONS Q2 2022













DEPOSITION GOING FORWARD





Agnico Eagle | TSF Construction and Monitoring

MONITORING GEOTECHNICAL DESIGN ASSUMPTION VERIFICATION



- Tailings samples collected and sent to lab for testing on quarterly basis:
 - Particle size analysis
 - Moisture-density relationship
 - Moisture content

Design Parameter	Assumed	2020Tested Average	2021Tested Average	2022 Tested Average
		(15 Samples)	(15 Samples)	(9 Samples)
Relative Density (kg/m3)	2,830	2,937	2,940	-
Max. Dry Density (kg/m3)	1,800	1,803	1845	1786
Optimum moisture (%)	14.9	15.8	14.3	15.1
In situ moisture (%)	17.6	15.8	17.4	16.3
% Clay-Sized	2.0	4.6	4.3	2.3
% Silt-Sized	81.0	71.4	70.4	72.0
% Sand-Sized	17.0	24.0	25.3	25.8



MONITORING TAILINGS GEOCHEMICAL TESTING RESULTS



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MONITORING CP3 WATER QUALITY RESULTS





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MONITORING GROUND TEMPERATURE CABLES











THANKS!!!

QUESTIONS?





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