Meliadine Interim Closure and Reclamation Plan - Update 2020

Final Report

Agnico Eagle Mines Limited

Mining & Metallurgy

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Quebec, July 30th, 2020

Mr. Michel Groleau
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Subject: Meliadine Interim Closure and Reclamation Plan – Update 2020
Final Report
Our file: 674942-4000-4EER-0002_00

Dear Mr. Groleau,

We are pleased to submit the final version of the report mentioned in the above subject.

Do not hesitate to communicate with the undersigned should you have further questions regarding the content of this report.

Truly yours,

SNC LAVALIN INC.

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List of Revisions

Revision					Revised pages	Remarks
#	Prep.	Rev.	App.	Date		
PA	EV			2020-07-22	All	Issued for internal revision
PB	EV	SP	EV	2020-07-23	All	Issued for client's review
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1.0 Plain Language Summary

1.1 Statutory Context

Agnico Eagle was granted a Type A Water Licence 2AM-MEL1631 in April 2016 (NWB, 2015). This licence authorizes Agnico Eagle to use water and dispose of waste associated with the mining and milling undertakings at the Meliadine mine site. The Licence sets out several conditions with respect to Agnico Eagle's right to alter divert or otherwise use water for the purpose of mining. The development of a closure and reclamation plan is also a requirement of the NIRB Project Certificate 006 (NIRB, 2019).

This document presents the second version of the Interim Closure and Reclamation Plan (ICRP) for the development phase of the Meliadine Gold Project (Meliadine Mine or Meliadine Project). Agnico Eagle will proceed, starting at the end of July 2020, to the Amendment process of the Meliadine Water Licence 2AM-MEL1631. The general purpose of this ICRP is to update the interim closure and reclamation plan produced for the development phase of the Project, including the activities part of the Meliadine Water Licence Amendment, which are approved in the Meliadine FEIS and in the NIRB Project Certificate 006 (NIRB, 2019).

This ICRP, based on the current life of mine, provides increasing levels of detail on the closure and reclamation of individual project components and details for components which are to be progressively reclaimed earlier in the mine life.

The closure goal, as described in the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories issued by the Mackenzie Valley Land and Water Board (MVLWB) and Aboriginal Affairs and Northern Development Canada (AANDC) (AANDC/MVLWB, 2013), is to return the mine site and affected areas to viable and, wherever practicable, self- sustaining ecosystems that are compatible with a healthy environment and with human activities. Planning for mine closure and reclamation is an iterative process where ICRPs are prepared and updated on a regular basis, when there is a significant change to the mine plan, or according to key milestones in the mine life (AANDC/MVLWB, 2013).

1.2 Description of the Project

The Meliadine Mine site (Meliadine or the Project) is located in the Kivalliq region, Nunavut, approximately 30 km south of Rankin Inlet, and 80 km southwest of Chesterfield, as shown on Figure 2-1. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4) (AEM, 2015a). Located in the peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands, the mine site is accessible by plane via the Rankin Inlet Aerodrome.

As presented in the Preliminary Closure and Reclamation Plan (AEM, 2015a), the Meliadine property is divided as Meliadine West property and Meliadine East property. These areas were divided geographically by the Meliadine Lake at 547500 E. Meliadine West contained Tiriganiaq, Wesmeg, Pump, F Zone, and Wolf deposits, whereas Meliadine East contained the Discovery deposits and other regional gold showings.

The Meliadine Mine is 100% owned by Agnico Eagle following acquisition of Comaplex Mines Corporation (Comaplex) on July 6th, 2010. Presently, there are no properties adjacent to the Project that has any influence on the Project (AEM, 2015a).

The Project ore zone exploitation started by extracting the richer ore zones using underground mining techniques (Tiriganiaq Underground), while the open pit ore extraction (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) will start in Year 4 (2023). Both of extraction will continue until end of the mine life. Approximately 15.4 million tonnes (Mt) of ore will be produced. The ore will be milled over approximately 8 years of mine life at a rate of approximately 3,750 tonnes per day (tpd) in Year 1 (2020) to Year 3 (2022) and 5,500 tpd in Year 4 (2023) to Year 8 (2027). The Project will also generate approximately 31.4 Mt of waste rock, 7.0 Mt of overburden waste, and 15.4 Mt of tailings.

The area that will be disturbed during construction and operation for the Project is approximately 453 ha, including the Rankin Inlet facilities. At closure, 418 ha will be reclaimed, including off-site facilities. The 35 ha that will not be reclaimed are associated to residual disturbances derived from the flooded open pits. In addition, roads to the different deposits will be constructed, which will be reclaimed following roads decommissioning.

Mining facilities for the Project include mainly an industrial pad, a mill and services buildings, industrial infrastructures and facilities, laydown areas, accommodation buildings, ore stockpiles and pads, a temporary overburden stockpile, a tailings storage facility (TSF), two (2) waste rock storage facilities (WRSFs), and a water management system that includes collection ponds, water diversion channels, retention dikes/berms, a reverse osmosis system, a saline water treatment plant, an effluent water treatment plant, a water treatment plan and a treated groundwater discharge waterline.

Figure 1-1 : Meliadine Mine Site Location

Source : AEM website

1.2.1 Site Geology and Mining Methods

The Meliadine mine is located near the western shore of Hudson Bay in the Kivalliq District of Nunavut and includes seven (7) gold deposits, six (6) of which are part of the current mine plan. The 111,357-hectare property covers an 80-kilometre-long greenstone belt. The Figure 4-1 presents the area of the project including the claims, leases and subsurface Nunavut Tunngavik Incorporated (“NTI”) concessions. The current mineral reserves are mainly in the Tiriganiaq deposit at underground and open pit depths, and consist of 4.067 million ounces of gold in proven and probable reserves (20.75 Mt at 6.1 g/t) as of December 31, 2019 (AEM website, Mineral reserves).

Commercial production began at Meliadine in mid-May 2019. The mine produced 191,113 ounces gold in 2019. The Company anticipates that mining at Meliadine will be carried out through several underground mining operations and open pits over a 14-year mine life. There are numerous opportunities to create additional value in the surrounding area, both at the mine and on the large regional land package (AEM website).

Archean volcanic and sedimentary rocks of the Rankin Inlet greenstone belt underlie the property. The Pyke Fault and associated secondary structures (i.e., the Lower Fault) appear to control gold mineralization on the property. The deposits are all within 5 km of Tiriganiaq except for Discovery, which is 17 km east-southeast of Tiriganiaq. Each of these deposits has mineralization within 120 m of surface, making them potentially mineable by open pit methods. They also have deeper mineralization that could potentially be mined with underground methods, which are currently being considered in various studies (AEM website).

The current plan is to mine the Tiriganiaq deposit from two (2) open pits and an underground mine. At the end of operations, the Tiriganiaq Pit 1 will be approximately 150 m deep with a footprint area of 26.6 ha, and Tiriganiaq Pit 2 will be approximately 100 m deep with a footprint area of 8.3 ha.

1.2.2 Project Mine Plan and Facilities

Meliadine operations started after commissioning was completed at the end of Q2 2019 and will span approximately 8.5 years (Q2 2019 to 2027). Mining activities are expected to end in Year 7 (2026) and ore processing is expected to end in Year 8 (2027). Closure will occur within three (3) years (Year 9 to Year 11) (2028 to 2030) after the completion of mining and will mainly include the removal of non-essential site infrastructure and equipment. The post-closure phase will commence as active closure is completed in Year 11 (2030) and will continue until Year 18 (2037) or until it is shown that the site and water quality meet all the regulatory closure objectives.

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed. The Mine is expected to produce approximately 15.4 Mt of ore, 31.4 Mt of waste rock, 7.0 Mt of overburden waste, and 15.4 Mt of tailings (AEM, 2020c).

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. The following mining development sequence is planned (AEM, 2020c):

- Tiriganiaq underground mine will be developed and operated from Year -5 (2015) to Year 7 (2026);

- Tiriganiaq Pit 1 will be mined from Year 2 (2021) to Year 7 (2026); and

  Tiriganiaq Pit 2 will be mined from Year 1 (2020) to Year 3 (2022).

The infrastructures of the Project located directly at the Meliadine site are listed below:

- An underground mine (Tiriganiaq Underground), including an underground total suspended solids (TSS) removal plant;
- Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2);
- A mineral processing facility, which includes a crusher plant, process plant, and paste backfill plant;
- Two (2) waste rock storage facilities (WRSFs);
- A tailings storage facility (TSF);
- Sewage treatment plant (STP);
- Water treatment systems;
- Supporting infrastructure, including gated access, emulsion plant and storage facility, potable water treatment plant, permanent camp, maintenance and on-site storage areas, power plant, fuel storage, incinerator, landfill, landfarm, water management system, water intake and diffuser, a temporary overburden stockpile and ore stockpile facilities and laydown area facilities;
- Transportation routes on site including internal access and haul roads;
- Roads to future operation area (deposits), included in the Meliadine FEIS;
- All Weather Access Road (AWAR);
- Quarries and borrow pits.

The Rankin Inlet Site Facilities are located about 30 km south of the mine site. The Rankin Inlet facilities act as a transfer point and temporary storage for all dry freight and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR. The infrastructures present in Rankin Inlet that belong to the Meliadine Mine are:

- Fuel storage facility;
- Laydown and material storage area;
- Barge structure;
- Saline effluent pipeline and diffuser for saline trucked water at Itivia;
- Waterline for discharged of treated groundwater at Melvin Bay near Rankin Inlet;
- Bypass road around the hamlet of Rankin Inlet, and AWAR.

1.3 Closure and Reclamation Activities

1.3.1 Rankin Inlet Site Facilities

Rankin Inlet facilities are located mainly in the Itivia area. This is the transfer point and temporary storage for all dry shipment and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR. Rankin Inlet Facilities are listed below:

- Floating Dock;
- Dry Freight Storage Facility;
- Bulk Fuel Storage Facilities;
- Water and Power Management;
- Saline Water Tank and diffuser;
- Waterline for treated groundwater effluent discharge into marine environment.

At closure, it is planned to offer the infrastructures located in Rankin Inlet to local interests. If there is no local interest or agreement, the facilities and equipment will be decommissioned, dismantled and removed appropriately.

Agnico Eagle will return, if possible, the Rankin Inlet area where the facilities are located to pre-development conditions. The site may also be left in a semi-industrial condition if consistent with a different end land use agreed upon with regulators, the community of Rankin Inlet, and other local interest.

All remaining bulk fuel located at Itivia will first be cleaned and then removed and offered to local interests. Infrastructure, including floating dock and portable equipment will be emptied, and also offered for local use and/or relocation. In the case that there is no local interest for the tanks or remaining infrastructure and equipment, the infrastructure will be dismantled, decontaminate and demolition waste will be either transported to the mine site landfill disposal or barged out of Rankin Inlet to a southern waste disposal, recycling facility or sale for scrap metal.

At closure, scarification of all disturbed areas, including storage pads and roads, is planned to loosen the compacted material to promote surface drainage. Areas will be profiled, and water management structures will be removed from the roadways to re-establish natural drainage patterns.

The saline water tank and diffuser for trucked groundwater will be decommissioned, dismantled and removed as appropriate. The pump, piping, tanks and other components will be either transported to the mine site landfill disposal or barged out of Rankin Inlet.

During mine closure, the waterline system for treated groundwater discharge will be decommissioned; the pipeline network components will be dismantled, removed and disposed on-site in a landfill. The water effluent diffuser will also be dismantled and removed from the shore area and water, using best practices to minimize disturbance, and disposed on-site in the landfill.

It is important to note that any contaminated soils from the facilities will be removed and placed in sealed drums. These will then be transported to the mine site landfarm for treatment or barged out of to a southern destination for treatment and disposal.

No significant residual effects have been identified for after closure of the supporting facilities in Rankin Inlet, but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the natural terrain or loss of plant populations.

1.3.2 Transportation Roads and Quarries

Transportation Routes considered for the Project are listed below:

- Access Road (AWAR) connecting Rankin Inlet to the Mine site;
- By-Pass Road built around the south of the airstrip to Itivia;
- Internal Access and Haul Roads;
- Roads to different deposits;
- Quarries and Granular Borrow Sites along the AWAR and on site.

Agnico Eagle is committed to manage the road as a private road with limited public access during the mine life and to fully decommission the road after post-closure. The transportation roads should be one of the last mining components to be reclaimed in post-closure to preserve access for monitoring.

As mentioned in the Roads Management Plan (AEM, 2019b), it is the responsibility of Agnico Eagle of decommissioning and reclaiming all roads once construction, operations, closure, and post-closure activities are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Rankin Inlet Hamlet) and then complete its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads. In the case that Agnico Eagle stays the owner of the AWAR and the bypass road, natural drainage courses and terrain will be restored by removing culverts and bridges, regrading road fill material and removing in-stream works down to the original channel bed.

The decommissioning details of the 18 quarries are provided also in the Road Management Plan (AEM, 2019b). The quarries and borrow pits have gently sloping walls and are designed for positive drainage wherever possible. Reclamation and closure of quarries and borrow pits will depend on the individual site conditions. All quarry sites and borrow sources developed during the construction of the roads have been selected to generate only non-acid generating/low metal leaching materials

No significant residual effects have been identified for after closure of the transportation roads and quarries but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the terrain and or loss of plant populations and plant communities. There are also some uncertainties regarding the transfer of ownership of the road to the local community or a third party. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Hamlet) and then complete its own environmental assessment and permitting process covering future use.

1.3.3 Underground

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed. Approximately 5.2 Mt of waste rock and 11.6 Mt of ore will be mined from underground. Tiriganiaq underground mine will be developed and operated from Year -5 (2015) to Year 7 (2026) (AEM, 2020c).

The ore is first being sourced entirely from underground with access by decline, using long-hole mining methods. The first three (3) stopes were blasted and mucked out in late 2018. Each stope is backfilled, with cemented pastefill used in primary stopes and dry rockfill for the secondary stopes. Starting in 2020, the ore will be sourced from both the underground and open pits.

A conveyor belt has been built in the underground access ramp to deliver the ore from the underground to the surface ore stockpile dome. A crusher is located underground to reduce the ore to a size that can be accommodated on the conveyor belt. Underground waste rock is transported through the same system that transports the ore but at different times.

At closure, all surface openings will be sealed; the decline ramps and the portals will be capped to eliminate access to the underground mine workings. The sealed surface opening areas will be contoured to prevent natural surface flows to the underground, and disturbed surface areas will be re-contoured to establish positive natural drainage patterns and blend in with the surrounding topography to the extent possible. The raises will be capped with concrete. Any equipment or infrastructure left underground will be cleaned, drained of fluids, inspected, and remediated as appropriate to eliminate the risk of contaminant leakage. All hazardous materials from underground shops, equipment, and magazines (fuels, oils, glycol, batteries, explosives, etc.) will be removed and disposed off-site at an approved disposal facility. Contamination associated with vehicle and equipment operations at work areas will be identified and remediated (AEM, 2015a).

Every stope will be backfilled, with cemented pastefill used in primary stopes, and dry rockfill for the secondary stopes. The paste backfill will be made by mixing pressed filtered tailings, cement and water in a facility (AEM, 2015b). Backfill will be done during the operation and will be completed in closure.

Passive flooding of the Tiriganiaq Underground Mine will occur following the completion of mining. The estimated total flooding volume of the underground workings is 1,372,000 m^3. Seepage water into the underground mine will be the main water source for flooding. At the predicted seepage rate, it is estimated to take six (6) years to flood the underground mine (AEM, 2020b).

No significant long-term effects are expected for the underground mine workings. After closure, the only surface expression of the underground workings will be the sealed vent raises and portals and the area graded and levelled to avoid erosion and water accumulation

1.3.4 Open Pits

Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) will be developed as shown in Figure 4-4. Approximately 20.7 Mt of waste rock, 6.3 Mt of overburden material and 3.3 Mt of ore will be mined from Tiriganiaq Pit 1. Approximately 5.5 Mt of waste rock, 0.63Mt of overburden material and 0.53 Mt of ore will be mined from Tiriganiaq Pit 2 (AEM, 2020c). The following mining development sequence is planned:

- Tiriganiaq Pit 1 will be mined from Year 2 (2021) to Year 7 (2026); and
- Tiriganiaq Pit 2 will be mined from Year 1 (2020) to Year 3 (2022).

A conventional truck/shovel operation is anticipated for the open pits.

The Project lies within an area of continuous permafrost where two (2) groundwater flow regimes can be observed: a shallow (active layer) and a deep (beneath permafrost) groundwater flow regimes. No hydraulic connection is anticipated between the systems because of the presence of the permafrost.

Rock material will be transported by haul truck to either the primary crusher dump area for ore material or the designated WRSFs for waste rock. Temporary ore stockpiling pads will be sited near the primary crusher.

No physical surface constraints have been considered in defining the ultimate pit limits within the Tiriganiaq deposit. The presence of different watercourses located within or near the pit footprints will require some water management including dewatering, drainage and water retention dykes. The ultimate pit limits have been controlled by the presence of the underground mine, which limits the deepening of the pits. Potential future Tiriganiaq pit expansion could interact with and/or be constrained by the development of surface infrastructure such as vent houses and raises that will be installed in the vicinity of the current/final pit walls.

Any water reporting to the open pits will be collected in sumps and ultimately directed to the main attenuation pond CP1. Dust will be managed for environmental and safety reasons on pit haul ramps by spraying water whenever needed during the non-freezing periods.

The description of the closure flooding activities for the open pits as presented herein is taken from the Water Management Plan (AEM, 2020b). When flooding the open pits for closure, the maximum pumping rate from Meliadine Lake shall not exceed 4,000,000 m^3/year during closure of the Mine, as stated in Part E, Item 2 of the Water Licence 2AM-MEL1631. The planned pumping period will occur during the open water season from mid-June to end of September for each year. It will take approximately three (3) years to fill the pits with an assumed pumping rate of 0.44 m^3/s (38,300 m^3/day). The assumed pumping rate of 0.44 m^3/s from Meliadine Lake during closure will have negligible effect to Meliadine Lake when compared to the average outflow rate at the outlet of Meliadine Lake. The pumping rate will be evaluated further to validate that any possible negative effects to Meliadine Lake do not occur.

The water quality model results indicated that water quality in the flooded pits will meet the discharge criteria and post closure treatment will not be required. The water quality within the pits will be monitored during flooding to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system (AEM, 2020b).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

The open pit may be hazardous to wildlife species as wildlife may be injured by inadvertent access into the open pit. Wildlife management and protection practices will be implemented to limit wildlife injury and morbidity during closure and post-closure. A rock berm will be constructed around the open pits to limit or prevent access by people and to discourage access by wildlife. The rock berm(s) was selected over a fence based on feedback received from communities in regard to concerns relating to wildlife behaviour (AEM, 2015a). Proper signage will also be placed around the flooded pits to mark access points.

The open pits are designed to have stable slopes during the mine life and post-closure. The slopes are monitored as part of mine operations and will be progressively modified as required to maintain stability during closure and post-closure.

The following uncertainties have been identified with respect to closure planning of the open pits; long-term stability, surficial water quality within the flooded open pits and flooding rate for filling the open pits at closure.

Water quality monitoring will continue during operations to expand the available water quality database. Water quality forecast for pit lake water will continue to be performed to predict the water quality at closure. The water balance and water management will also be reviewed in operation and in closure to estimate the lake water transfer volume required for flooding, as well as the natural inflows, to ensure adequate water levels are maintained into the pits.

The water treatment facilities are included as a contingency measure should water on site not be suitable for release to the environment. Water quality monitoring will occur during mine operation to include in the site water quality and to provide additional information for future closure water quality prediction and planning modifications if required. Prior to flooding of the pits, the quality of surface water and any groundwater seepage reporting from the pit walls will be sampled to assess potential for contamination of the pit water during re-filling. Water quality monitoring will continue in closure and post-closure.

If the results of water quality monitoring indicate that water in the flooded open pits is not suitable for direct discharge, in-pit treatment and active treatment prior to discharge into the receiving environment will be considered as contingencies for the treatment of the flooded pit water (AEM, 2015a).

1.3.5 Waste Rock Storage Facilities and Overburden

As described in the Mine Waste Rock Management Plan (AEM, 2020c), the design locations of the WRSFs took into consideration the environmental, social, economic, and technical aspects of waste rock management, including long-term physical stability of the facility, the availability of storage capacity, maintaining minimum distances between the toe of the WRSFs and the open pits, haul and access roads and adjacent lakes.

To achieve the above considerations, three (3) areas will be utilized for the combined storage of waste rock and overburden material. These areas are designated as follows:

- WRSF1: located north of Tiriganiaq Pit 1; and
- WRSF3: located north of Tiriganiaq Pit 2.

Two (2) areas are identified for the combined storage of waste rock and overburden material. Originally, four (4) main areas were proposed as the waste rock storage areas in the baseline study for the project during the FEIS to store the waste rock and overburden generated.

Based on the presented design criteria, the WRSFs will provide a 5.6 Mm^3 and 9.2 Mm^3 design capacity for WRSF1 and WRSF3, respectively, which provides sufficient capacity to store waste generated during mine development (AEM, 2020c).

Reclamation of the WRSFs will use currently accepted management practices and appropriate mine closure techniques that will comply with recognized protocols and standards. Geochemical testing indicates that the waste rock and overburden from the Tiriganiaq area is non-potentially acid generating (NPAG) and non-metal leaching (NML). Kinetic tests completed on all waste rock type and at various scales show that drainage water quality is expected to meet MDMER monthly mean effluent limits, including results for arsenic. Therefore, a closure cover system is not proposed for the WRSFs (AEM, 2020c).

The WRSFs were designed for long-term stability and no additional re-grading will be required at closure. Reprofiling could be required if waste rock material is excavated for reclamation work such as TSF cover or rock berms around the open pits.

The contact water management system for the WRSFs will remain in place until mine closure activities are completed and that monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for discharge to the environment with no further treatment required. Once water quality meets the discharge criteria established through the water licensing process, diversion channels/berms/dikes will be decommissioned to allow the water from the WRSFs to naturally flow to the outside environment (AEM, 2020c).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

Dust from the WRSFs is anticipated to be a minor issue during closure. It is also anticipated that the native lichen community will naturally re-vegetate the surface of the WRSFs over time.

1.3.6 Tailings Storage Facilities

The tailings storage facility at Meliadine consist in a dry stack tailings pile. The TSF is designed to accommodate approximately 10.9 Mt of tailings. The two cells system (Cell 1 and Cell 2) is designed to limit dust generation, control tailings surface erosion, and to facilitate the progressive reclamation and closure of the TSF. As the tailings reach final elevation, the tailings will be progressively encapsulated with either waste rock or a layered combination of waste rock and overburden (AEM, 2020c).

Commissioning of the process plant started near the end the fourth quarter of 2018 and actual production commenced early in the second quarter of 2019. The production schedule, quantities, and distribution of tailings by year are presented in Table 5-9. Approximately 15.4 Mt of tailings will be produced over an 8.5-year period. Approximately 10.9 Mt or 71% of the tailings will be deposited within the TSF and the remaining 4.5 Mt or 29% will be used as underground cemented paste backfill (AEM, 2020c).

Based on the tailings production schedule, Cell 1 will reach its design capacity by Year 5 (2024) at an average height of 33 m above the original ground. Cell 2 will start operation from Year 4 (2023) and will reach design capacity in Year 8 (2027), at an average height of 33 m above the original ground (AEM, 2020c).

The TSF is located within the catchment of Lake B7 with a small portion straddling the water catchment of CP1. Site contact water from the TSF is collected by the perimeter water management system located to the northwest and south of the TSF. Seepage and runoff from the TSF will be collected within the CP1 catchment area and in Pond CP3, which will eventually be pumped to CP1. The contact water quality and the water management structures for the TSF will be monitored and assessed according to the Type A Water License 2AM-MEL1631 during operation, closure and post-closure periods.

Mine closure and reclamation of the TSF will utilize currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards. Results of geochemical characterization indicates that most of the tailings produced to-date at the mine are either PAG or uncertain, while ML has not been observed to be an issue. Despite the PAG classification, the TSF is not considered to pose an ARD risk due to the placement methodology used, assumption of freeze-back within the facility and progressive reclamation cover placement (AEM, 2020c). Freeze-back of the tailings and cover placement are management actions being taken to ensure water from tailings does not impact the receiving environment.

The closure plan for the TSF is to progressively place an engineered cover over the tailings surface as the tailings deposit reaches the ultimate elevation. The proposed closure cover includes:

- A minimum thicknesses of 4.5 m waste rock cover over the lower toe of the final tailings side slopes and a minimum thicknesses of 4.0 m waste rock cover over the upper side slopes, placed during operation along with tailings deposition;
- A minimum thicknesses of 2.5 m waste rock cover over 0.5 m thick select overburden till fill over the top surface of final tailings. The top closure cover material will be placed when each cell reaches its operational capacity and sloped 4% to discourage ponding and surface infiltration.

The contact water management system for the TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the TSF are acceptable for the discharge of all contact water to the environment with no further treatment required. Once the water quality meets the discharge criteria established through the water licensing process, the TSF water management infrastructure will be decommissioned to allow the water to naturally flow to the receiving environment (AEM, 2020c).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

An adaptive closure strategy has been adopted for the Meliadine Mine. The preliminary closure cover design adopted for the TSF at this stage will be further evaluated and updated based on the TSF performance monitoring, water quality monitoring and evaluation, and the overall mine closure plan. The final closure cover design for the TSF will be developed before mine closure (AEM, 2020c).

The placement of the engineered cover will also help prevent dust production. It is anticipated that the native lichen community will naturally re-vegetate the TSF cover over time.

The main uncertainties for the closure planning of the TSF are related to the cover design, the water quality from the TSF, the permafrost development and the re-vegetation.

1.3.7 Water Management Structures

As presented in the Water Management Plan (AEM, 2020b), a network of berms, dikes, containment ponds, channels, culverts and sumps are in place and maintained to facilitate water management. The major components are listed below.

- Water containments ponds and associated dikes or berms: Six (6) water containment ponds (CP1, CP2, CP3, CP4, CP5, and CP6) and their associated dikes or thermal berms (D-CP1, Berm-CP3, Berm-CP2, Berm-CP4, D-CP5, and D-CP6) are included in the water management system to manage contact water;
- P-Area: The P-area includes three (3) P-Area containment ponds (P1, P2, and P3,) four (4) containment berms (DP1-A, DP1-B, DP2-A, and DP3-A) and five (5) evaporators. It is part of the surface water management system dedicated to saline water. Eventually, by the end of 2020, the P-Area will be covered by a laydown area including various supporting facilities;
- Saline ponds: Four (4) saline ponds (SP1, SP2, SP3 and SP4) to accommodate excess saline water from underground;
- Water diversion channels and berms: Ten (10) water diversion channels (Channel 1 to Channel 8, Channel 9 and 10) are part of the water management system;
- Water Treatment Plants: Contact water will be treated (if necessary) to meet Water Licence requirements prior to being discharged to the environment. Water for potable use is also treated;
- A freshwater intake: Freshwater usage includes potable uses, fire suppression, make-up water for the mill, and other operational requirements, such as drilling water, dust suppression, batch plant use, and use at the wash bay;
- An effluent diffuser located in Meliadine Lake;
- Sixteen (16) water passage culverts to convey water (Culverts 1 to 8, 10, 11, 13, 14 to 16, 18, 19);
- A network of surface pumps and pipelines;
- A saline water tank and diffuser;
- Waterline for treated groundwater effluent discharge into marine environment.

During mine closure, the water management infrastructure on site will remain in place until mine closure activities are completed, and monitoring demonstrates that the water quality is acceptable for environmental discharge without treatment. Once water quality meets the discharge criteria, the water management systems will be decommissioned to allow the water to naturally flow to the environment.

The open pits will be flooded at closure and passive flooding of the Tiriganiaq Underground Mine will also occur. The containment ponds, dikes and berms will remain in place to collect the surface runoff water and seepage from the mine until the water quality meets discharge criteria. Once the water quality meets discharge criteria, dikes/berms will be breached to allow runoff to follow natural (topographically induced) flow paths.

Once monitoring results have indicated that contact water conveyed in channels and sumps meets acceptable water quality, the infrastructure will be graded and/or surface treated according to site specific conditions to minimize wind-blown dust and erosion from surface runoff, if required.

Culverts will be maintained as required in closure until site water quality monitoring results indicate that water can be released to the environment without further management and without erosion.

The long-term, post-closure water quality in the containment ponds and in the flooded open pit lakes are anticipated to meet Metal and Diamond Mining Effluent Regulations (MDMER), Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) for the protection of aquatic life and/or the Site-Specific Water Quality Objectives (SSWQO) developed for the Mine (AEM, 2020b).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

Water treatment facilities will remain on site until water quality is suitable for direct discharge to the environment. The water treatment and Meliadine Lake effluent diffuser will be maintained for three (3) water treatment seasons as a contingency before being dismantled and disposed of in an appropriate landfill.

Uncertainties are related to water quality during closure and post-closure. However, water quality modelling will continue during operation.

1.3.8 Site Buildings and Equipment

During the life of mine, surface infrastructures are required at different periods for mining, processing, accommodation, fuel storage and electricity. Most of the infrastructures are located within the industrial site of Meliadine.

- Mill;
- Ore Pads;
- Accommodation and Service Building;
- Laboratory and Core Shack;
- Maintenance Shops;
- Emulsion Plant;
- Fuel Storage;
- Power Plants.

The equipment fleet include mobile surface equipment and underground mining equipment.

At closure, all buildings and structures will be decontaminated, decommissioned and dismantled. Demolition waste that cannot be reused, recycled or provided to local interests will be disposed of in the on-site landfill. Salvageable material will be removed off site and metals will be separated and shipped off-site as scrap if economical to do so.

Any above grade concrete structures or foundation will be demolished, and the rubble will be disposed of in the landfill. Any slabs on grade will be punctured and then left in place and covered with soil or non-potentially acid generating/non-metal leaching waste rock. Any subgrade foundations will be left in place. All disturbed site areas will be re-graded to promote natural drainage, revegetation and to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control.

Remaining bulk fuel and empty portable fuel storage tanks will be offered to community interests. All hazardous wastes will be removed for disposal by a licensed handler during the dismantling of buildings and infrastructure. An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons. Any contaminated soil will be excavated and taken to the landfarm for treatment.

Most of the mobile equipment will be removed once the closure stage is complete. Equipment used for closure activities and long-term maintenance will be removed from the site once they are no longer required. A small subset of equipment will be retained on-site for a portion of the post-closure stage.

1.3.9 Waste Management Facilities

The waste management facilities include the landfill, landfarm and incinerator. Hazardous waste management is also part of the global waste management. At the Project site, wastes are safely managed from the time they are produced to their final disposal. All waste is segregated at the mine site and will predominately be landfilled, incinerated, or recycled. Used oil burning will be maximized as much as possible using the secondary chamber of the incinerator. Remaining wastes on site, including hazardous waste, will be packaged for shipment to a certified waste management facility for treatment, recycling, and/or disposal.

The location of the landfill in the WRSF1 serves to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is chemically and physically stable, and consistent with past traditional pursuits and wildlife habitat. While waste rock will be disposed on land and in a manner that encourages total freezing. The design, operation, and/or closure of the WRSFs and landfill do not rely on total freezing. Any unacceptable leachate that is generated following closure of these facilities will be contained, collected, and/or treated, if necessary. Upon closure, it is estimated that the landfill will have a volume of approximately 63,000 m^3 of waste. The landfill will be covered with a minimum of 3.7 m of waste rock and should thereafter be stable (AEM, 2019g).

Contact water from the landfill at its closure will continue to be managed using best management practices as in operation. The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill. Moreover, drainage from the landfill is largely expected to freeze within WRSF1, with little to none reporting to the water collection infrastructure (AEM, 2014, Volume 1).

As described in the Landfarm Management Plan (AEM, 2019h), on site storage and remediation has been established as the preferred method for treatment of light petroleum hydrocarbons (PHC) contaminated soil that may be generated at the mine. The operation landfarm is located within the industrial area of the site. Upon regulatory approval, a landfarm extension (Landfarm C) will be constructed to accommodate additional contaminated soil for treatment. The planned landfarm extension area is within the laydown area, adjacent to the ore pad extension and the warehouse pad.

After removal of all remediated soil and prior to closure and reclamation of the landfarm, the berm and base will be sampled on a 10 m grid, to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN criteria. No excavation will be necessary if agricultural/wildlife criteria are met. If industrial criteria are used, the landfarm will be covered with 2 m of waste rock or other material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm (AEM, 2019j).

Approved waste will be burned in the incinerator during operation and closure. At the end of the active closure phase, the incinerator will be emptied and offered for local use and/or relocation. If there is no local interest, the infrastructure will be demolished and taken to the on-site landfill for disposal or barged out to a southern waste disposal facility.

The hazardous materials will be managed in operations such that minimal quantities remain on site at closure. Any remaining hazardous materials that cannot be used during closure activities will be transported to licensed disposal facilities in the south, as per operation procedures, in accordance with the Hazardous Material Management Plan (AEM, 2018).

1.4 Cost Estimate

A permanent closure and reclamation financial security cost estimate has been prepared with the present Project layout and infrastructure. The cost estimate covers the closure and reclamation of all Project facilities as described in this report and was prepared using RECLAIM Version 7.0 for permanent closure of the Meliadine Mine.

Agnico Eagle is required to submit a detailed financial security cost estimate for the Meliadine ICRP 2020 to Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and to the Kivalliq Inuit Association (KIA) to support land use and water licensing requirements. RECLAIM Version 7.0 workbook has been used for this estimate, as per the Guidelines for Closure and Reclamation Cost Estimates for Mines, issued by Crown-Indigenous Relations and Northern Affairs Canada, Mackenzie Valley Land and Water Board and the Government of the Northwest Territories (INAC, MVLWB, GNWT, 2017).

This cost estimate provides for the closure measures described in detail in the Meliadine ICRP 2020. Most closure activities will occur within the active closure period, from 2028 to 2030 inclusively.

The updated 2020 estimated closure and reclamation costs for the Meliadine Mine represents a total of $66,879,798. This total includes $39,999,695 of direct costs and $26,880,103 of indirect costs.

Differences between the Meliadine ICRP 2019 cost estimate for the closure and reclamation costs and the Meliadine ICRP 2020 cost estimate are presented in detail in Appendix N.

2.0 Introduction

2.1 Purpose and Scope of the Interim Closure and Reclamation Plan

2.1.1 General description of the Project

The Meliadine Mine site (Meliadine Mine or Meliadine Project) is located in the Kivalliq region, Nunavut, approximately 30 km south of Rankin Inlet, and 80 km southwest of Chesterfield, as shown on Figure 2-1. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4) (AEM, 2015a). Located in the peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands, the mine site is accessible by plane via the Rankin Inlet Aerodrome.

Figure 2-2 presents the location of Meliadine in relation with the other Agnico Eagle Nunavut Projects.

The Meliadine property is divided as Meliadine West property and Meliadine East property. These areas were divided geographically by the Meliadine Lake at 547500 E. Meliadine West contained Tiriganiaq, Wesmeg, Pump, F Zone, and Wolf deposits, whereas Meliadine East contained the Discovery deposits and other regional gold showings (AEM, 2015a).

The Meliadine Mine is 100% owned by Agnico Eagle following acquisition of Comaplex Mines Corporation (Comaplex) on July 6th, 2010. Presently, there are no properties adjacent to the Project that has any influence on the Project (AEM, 2015a).

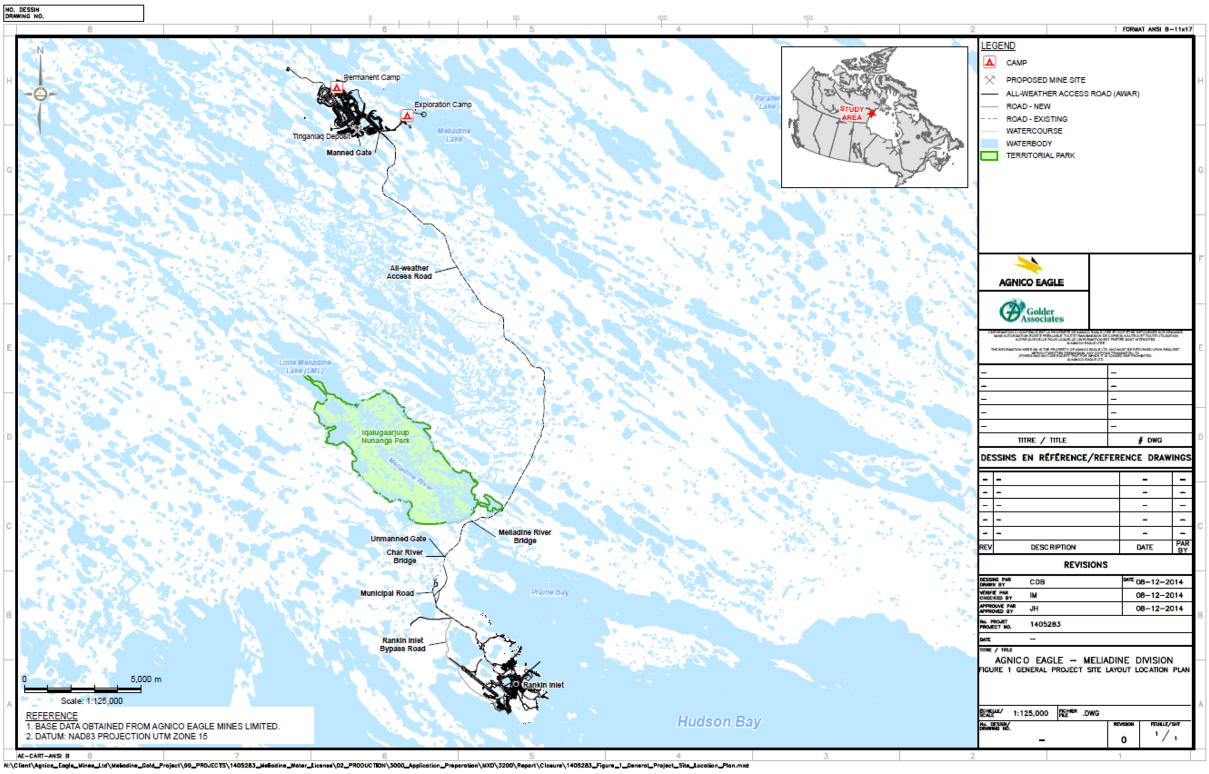
The Project ore zone exploitation started by extracting the richer ore zones using underground mining techniques (Tiriganiaq Underground), while the open pit ore extraction (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) will start in Year 4 (2023). Both of extraction will continue until end of the mine life. Approximately 15.4 million tonnes (Mt) of ore will be produced. The ore will be milled over approximately 8 years of mine life at a rate of approximately 3,750 tonnes per day (tpd) in Year 1 (2020) to Year 3 (2022) and 5,500 tpd in Year 4 (2023) to Year 8 (2027). The Project will also generate approximately 31.4 Mt of waste rock, 7.0 Mt of overburden waste, and 15.4 Mt of tailings.

The area that will be disturbed during construction and operation for the Project is approximately 453 ha, including the Rankin Inlet facilities. At closure, 418 ha will be reclaimed, including off-site facilities. The 35 ha that will not be reclaimed are associated to residual disturbances derived from the flooded open pits. In addition, roads to the different deposits will be constructed, which will be reclaimed following roads decommissioning.

Mining facilities for the Project include mainly an industrial pad, a mill and services buildings, industrial infrastructures and facilities, laydown areas, accommodation buildings, ore stockpiles and pads, a temporary overburden stockpile, a tailings storage facility (TSF), two (2) waste rock storage facilities (WRSFs), and a water management system that includes collection ponds, water diversion channels, retention dikes/berms, a reverse osmosis system, a saline water treatment plant, an effluent water treatment plant, a water treatment plan and a treated groundwater discharge waterline.

The present Meliadine Interim Closure and Reclamation Plan 2020 (Meliadine ICRP 2020) is based on the current Life of Mine (LOM) of Meliadine, as presented in Section 4.4.1.

Figure 2-1 : Meliadine Mine Site Location (AEM, 2015)



Source : AEM, 2015a

Figure 2-2 : Meliadine Mine Site Location

Source : AEM website

2.1.2 Purpose of the ICRP

This document presents the second version of the Interim Closure and Reclamation Plan (ICRP) for the development phase of the Meliadine Gold Project. Agnico Eagle will proceed, starting at the end of July 2020, to the Amendment process of the Meliadine Water Licence 2AM-MEL1631. The general purpose of this ICRP is to update the interim closure and reclamation plan produced for the development phase of the Project, including the activities part of the Meliadine Water Licence Amendment, which are approved in the Meliadine FEIS and in the NIRB Project Certificate 006 (NIRB, 2019).

This ICRP, based on the current life of mine, provides increasing levels of detail on the closure and reclamation of individual project components and details for components which are to be progressively reclaimed earlier in the mine life.

The ICRP document is the main reference to be used throughout the closure engineering process for the development of the Final Closure and Reclamation Plan. This document does not include detailed engineering closure designs, or specific post-closure monitoring programs as these will be developed in the future. However, a view of the current closure concepts for each area of the mine site and the plans to advance these designs are provided.

The focus of this ICRP for the Project is to:

- Provide closure objectives for the Project components;
- Describe closure options for temporary and permanent closure;
- Identify uncertainties related to the proposed closure objectives, options, or criteria;
- Identify post-closure monitoring requirements and responsibilities for the selected closure activities;
- Predict the likelihood of potential post-reclamation risks to the environment and human and wildlife health; and
- Estimate the closure and reclamation costs.

2.1.3 Description of the proponent

The proponent of the Project is:	Agnico Eagle Mines Limited (Agnico Eagle)
The address for the proponent is:	Meliadine Gold Project – Agnico Eagle 145 King Street East, Suite 400 Toronto, Ontario M5C 2Y7, Canada
The Project site is located at:	latitude 63°1'23.8"N, longitude 92°13'6.42"W (UTM 6988500N, 540250E, NAD83, Zone 15) Territory of Nunavut, Canada

Acting on behalf of the proponent: SNC-Lavalin Inc. (SLI)
Mines et métallurgie
5400 des Galeries Blvd., Suite 450
Québec (Qc) Canada G2K 2B4

The contact persons for the Project: Jessica Huza, Meliadine Environment Superintendent
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Agnico Eagle Mines Limited
Email: michel.groleau@agnicoeagle.com

2.2 Goal of the Closure and Reclamation Plan

Permanent closure is defined as the final closure of the mine site after mining has ceased. Permanent closure is typically a planned event, the timing of which is dependent on the life of mine of the project. The closure approach for the project, as well as specific closure activities at each project facility, is guided by the intended end land use of the area. Based on stakeholder and local community consultation to date, the intended end land use for project-affected areas is a return to the "natural" state. As such, closure activities are focused on decommissioning mine components so that they blend into the existing landscape to the extent possible.

Agnico Eagle is committed to responsible mining practices for the protection of human, wildlife and aquatic life health, and for minimizing impacts on the environment. Agnico Eagle intends to leave behind a positive community and environmental legacy. The closure goal as described in the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest (AANDC/MVLWB, 2013), is to return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities. The four (4) closure principles of physical stability, chemical stability, no long-term active care requirements, and future use (including aesthetics and values) support the closure goal:

- Physical stability: The components of the reclaimed site should be built or modified at closure so that they do not erode, subside or move under extreme design events, and therefore do not pose a threat to humans, wildlife, or environmental health and safety;
- Chemical stability: The components of the reclaimed site should be chemically stable so as to prevent adverse soil, water and air quality effects that might pose a risk to humans, wildlife or environmental health and safety; and
- Future use and aesthetics: The reclaimed site should be compatible with the surrounding lands at the completion of the reclamation activities.

These broad objectives were used to support the identification of closure objectives that are specific to the Project. These specific objectives are:

- Physically and chemically stable lands and waters at the reclaimed Meliadine site that are safe for human, wildlife and aquatic life;
- Lands and waters at the reclaimed Meliadine site that allow for traditional uses;
- Final landscape guided by pre-development conditions and traditional knowledge;
- Post closure conditions that, where appropriate, do not require a continuous presence of Project staff until a walk-away condition is achieved.

2.3 Closure and Reclamation Planning Team

The strategy used by Agnico Eagle is an integrated approach consisting of a consortium between the Meliadine departments, the corporate office and Engineering consultant firms. This multidisciplinary team will form the Reclamation Planning Team, which will be responsible for coordinating activities and projects related to closure. The Reclamation Planning Team will oversee the review of the ICRP, developing the Final Closure and Reclamation Plan and communicate its content to all departments of the Project. The communication effort is intended to provide a sufficient level of awareness among operations staff as to the importance of closure and reclamation activities on Project development. The team members are comprised of Environment and Permitting Departments staff members for now. External support for the development of the plan is currently provided by SNC Lavalin Inc. for the development of the Meliadine ICRP 2020, although other consultants and contractors may be involved in the preparation of the subsequent ICRP and/or the final plan.

The Reclamation Planning Team will ensure to:

- Take leadership of the Closure Project and develop a work environment characterized by open communication, commitment, dedication to safety and continuous improvement;
- Liaise with departments and manage inter-company relationships;
- Take responsibility for the staffing and organization of the studies required for the interim and final closure and reclamation plans;
- Respect the schedule and permitting requirements;
- Identify closure risks and opportunities;
- Manage documentation; and
- Provide services in an ethical manner that is consistent with the Agnico Eagle corporate policies and its professional reputation.

Furthermore, Agnico Eagle has developed a Responsible Mining Management System (RMMS) Standard. The RMMS supports the application of Agnico Eagle's Sustainable Development policy. All Agnico Eagle Divisions must implement the RMMS outlined in the current standard at all their sites. Sites include operations, exploration, projects, offices, and closed sites. The application of RMMS does not take precedence over site-specific statutory and permitting requirements. The primary focus of this system is to provide an integrated framework for the management of health, safety, environmental and social acceptability performance. This standard applies to all phases of mining projects including closure and post-closure phases.

2.4 Engagement

Agnico Eagle is committed to engaging all stakeholders through public engagement and consultation during the development, construction, operation and closure of the Project. Consultations under various owners and operators of the Project have been recorded from 1995 to the present and have included information sessions, consultation, informed participation, and negotiation (AEM, 2014, Volume 1). In its public engagement and consultation, Agnico Eagle focused on those communities in close proximity to the Project; Rankin Inlet, located some 25 km south of the Project, and secondarily Chesterfield Inlet, some 70 km to the northeast. Stakeholders were identified and consulted amongst general public, local, and regional communities and Inuit organizations, federal and territorial government departments, and government institutes having a mandate relevant to the Project. The participation of community members, including Elders and community organizations, in all forms of consultation ensured that local knowledge and Inuit Qaujimajatuqangit (IQ) were an input to the Project's design (AEM, 2014, Volume 1).

Agnico Eagle has initiated ongoing discussions and consultations with the Government of Nunavut (GN), the Kivalliq Inuit Association (KIA), local Hunters' and Trappers' Organizations (HTO), and the Municipality of Rankin Inlet, to ensure that all parties are kept aware of the development plans for the Project. Agnico Eagle has also engaged in meetings with the Community Lands and Resources Committee. This will continue throughout the mine life and closure phase (AEM, 2014, Volume 1). Consultations are reported annually by Agnico Eagle through the Meliadine Annual Report (AEM, 2019a, 2020a).

Common to all communities were concerns related to caribou preservation, jobs, and training. An additional concern raised in 2012 was employee relations, particularly as it relates to the accommodation of different cultures working together. Key community findings and the Agnico Eagle's response to address them are outlined in the Meliadine Final Environmental Impact Statement (FEIS) (AEM, 2014, Volume 1) and in the Public Engagement and Consultation Baseline Report, which has been updated to include consultation following the release of the FEIS and later submitted in support of the Type A Water Licence Application.

The Amendment process of the Meliadine Water Licence 2AM-MEL1631 to be initiated at the end of July 2020 will also include discussions and consultations with the local communities and stakeholders.

Agnico Eagle continues to actively conduct public consultation/participation with local organizations and residents of the nearby communities. Activities include community meetings held in Rankin Inlet and Chesterfield Inlet, meetings with the Rankin HTO, meetings with the Meliadine Community Liaison Committee in Rankin Inlet, interviews conducted with Elders in Kivalliq communities on a variety of topics and site tours for Rankin Inlet residents. Consultations with local communities are reported annually by Agnico Eagle through the Meliadine Annual Report (AEM, 2019a, 2020a).

2.5 Regulatory Instruments for Closure and Reclamation

2.5.1 Applicable regulatory guidelines

The ICRP follows applicable regulatory guidelines, the principles of which are described in:

- Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (AANDC/ MVLWB, 2013);
- Mine Site Reclamation Guidelines for the Northwest Territories (AANDC, 2007);
- Abandonment and Reclamation Policy for Inuit Owned Lands (QIA);
- Mine Site Reclamation Policy for Nunavut (AANDC, 2002);
- Environment Canada, Environmental Code of Practice for Metal Mines (Environment Canada, 2009).

The Project is located within the Nunavut Territory and is thus subject to the regulatory processes established under the applicable laws and regulations of Canada and of Nunavut. The Project is subject to the Federal and Territorial Acts and Regulations listed below:

- Arctic Waters Pollution Prevention Act and Regulations;
- Canadian Environmental Act and Regulations;
- Fisheries Act and Regulations;
- Metal and Diamond Mining Effluent Regulations;
- Navigable Waters Protection Act and Regulations;
- Nunavut Land Claims Agreement and Regulations;
- Nunavut Waters and Nunavut Surface Rights Tribunal Act and Regulations;
- Territorial Lands Act and Regulations;
- Nunavut Environmental Protection Act and Regulations;
- Nunavut Transportation of Dangerous Goods Act and Regulations; and
- Nunavut Mine Health and Safety Act and Regulations.

The Nunavut Water Board (NWB) Water Licence and the Nunavut Impact Review Board (NIRB) Project Certificate for Meliadine details are found in Table 2-1. In addition, a list of the known Federal and Territorial Acts and Regulations applicable to the ICRP and a list of all Authorizations for the Project are found in **Appendix H**.

Table 2-1 : NWB Water Licence and NIRB Project Certificate for Meliadine

Authorization	Issuing Authority	Note
Type A Water Licence (2AM-MEL1631), issued April 1, 2016, expires March 31, 2031	Nunavut Water Board (NWB)	
Project Certificate NIRB-006 Amendment 1, issued February 26, 2019	Nunavut Impact Review Board (NIRB)	Amendments and additions to Terms and Conditions of Project Certificate to reflect significant modifications to the Meliadine Gold Mine Project as proposed in the Saline Effluent Discharge to the Marine Environment proposal and amendments to reflect implementation of project monitoring and reporting requirements

2.5.2 Concordance between the Water Licence Requirements and the ICRP

Agnico Eagle was granted a Type A Water Licence 2AM-MEL1631 in April 2016 (NWB, 2016). This licence authorizes Agnico Eagle to use water and dispose of waste associated with the mining and milling undertakings at the Project mine site. The Licence sets out several conditions with respect to Agnico Eagle's right to alter divert or otherwise use water for the purpose of mining. Specifically, in Part J, the Licence stipulates the conditions applying to abandonment, reclamation and closure. A summary of the specific requirements listed within the Water Licence applicable for the ICRP are provided in Table 2-2. The development of a closure and reclamation plan is also a requirement of the NIRB Project Certificate 006.

Table 2-2 : Concordance between the Water Licence Requirements and the ICRP Sections

Part/Condition	Water Licence Requirements	Corresponding Sections in the ICRP
Part J-1	The Board has approved the document entitled Preliminary Mine Closure and Reclamation Plan, dated April 2015, under Part B, Item 12. The Licensee shall submit to the Board for approval, within six (6) months of Commercial Operation, an Interim Closure and Reclamation Plan prepared in accordance with the Mine Site Reclamation Guidelines for the Northwest Territories, 2007 and consistent with the INAC Mine Site Reclamation Policy for Nunavut, 2002.	All sections of the ICRP
	The Plan shall include the following:	
	a. Detailed description, including maps and other visual representations, of the pre-Construction conditions for each site, accompanied by a detailed description of the proposed final landscape, with emphasis on the reclamation of surface drainage over the restored area;	Sections 3.0 Section 5.0
	b. A description of how progressive reclamation will be employed and monitored throughout the life of the mine, plus reclamation scheduling and coordination of activities with the overall sequence of the project; details of reclamation scheduling and procedures for coordinating reclamation activities within the overall mining sequence and materials balance;	Section 5.0 Section 6.0 Section 8.0
	c. Implications of water quality model re-calibration results on discharge strategy and any adaptive management measures that may be required;	Section 5.2.4, 5.2.5, 5.2.6, 5.2.7
	d. An evaluation of closure and reclamation measures for each mine component, including the goals, objectives, closure criteria and the rationale for selection of the preferred measures;	Section 5.0
	e. A comprehensive assessment of materials suitability, including geochemical and physical characterization, and schedule of availability for reclamation needs, with attention to cover materials, including maps where appropriate, showing sources and stockpile locations of all reclamation construction materials and any Water related mitigation required during implementation;	Section 3.3.5 Section 4.4.1 Section 5.0
	f. An assessment and description of any required post-closure treatment for drainage Water that is not acceptable for discharge from any of the reclaimed mine components;	Sections 5.2.4, 5.2.5, 5.2.6, 5.2.7
	g. Contingency measures for all reclamation components including action thresholds that are linked to the monitoring programs;	Section 5.0
	h. Monitoring programs to assess reclamation performance and environmental conditions including monitoring locations for	Section 9.0

Part/Condition	Water Licence Requirements	Corresponding Sections in the ICRP
	surface Water and groundwater, parameters, schedules and overall timeframes; i. QA/QC procedures for managing all waste disposal areas; j. A list of non-salvageable materials and disposal locations; k. Rock storage facility closure design plans and sections including the types of material placed and volumes; l. Underground mine plans and sections, including the areas of backfill, the type of material placed and volumes; m. Protocol for the disposal of any contaminated soil at closure; n. An assessment of the long-term physical stability of project components; o. A detailed criteria for the final breaching of the Dam(s); p. A revised closure and reclamation cost estimate; and q. A detailed implementation schedule for completion of reclamation work.	Section 5.2.5, 5.2.6, 5.2.9 Section 5.2.9 Section 5.2.5 Sections 4.4.1, 5.2.3 Section 5.2.9 Section 5.0 Section 5.2.7 Section 10.0 Section 8.0
Part J-8	The Licensee shall implement progressive reclamation, including progressive covering of the tailings, and re-vegetation if practically possible.	Section 6.0 Section 8.0
Part J-9	The Licensee shall notify the Board in writing, at least sixty (60) days prior to any intent to achieve Recognized Closed Mine status.	Section 4.4.1 Section 8.0
Schedule I	Monitoring programs according to Table 2	Section 9.0

3.0 Project Environment

This section provides a detailed description of the pre-disturbance conditions and the current development status of the Project. The Project Environment details presented herein were extracted from the main documents listed below:

- Final Environmental Impact Statement (FEIS), Volume 1 to 10 (AEM, 2014), including;
  - Permafrost Baseline Studies (SD 6-1) (AEM, 2014);
  - Terrestrial Synthesis Baseline (SD 6-2) (AEM, 2014);
  - Geochemistry Baseline (SD 6-3) (AEM, 2014);
- Meliadine Preliminary Closure and Reclamation Plan (AEM, 2015a);
- Meliadine Interim Closure and reclamation Plan (SLI, 2019);
- Updated Technical Report on the Meliadine Gold Project (AEM, 2015b);
- Type A Water Licence Main Application Document (AEM, 2015c);

- Meliadine Annual Report 2018 (AEM, 2019a) and 2019 (AEM, 2020a);
- Meliadine Water Management Plan (AEM, 2020b);
- Meliadine Mine Waste Management Plan (AEM, 2020c);
- Meliadine Roads Management Plan (AEM, 2019b);
- Water Quality and Flow Monitoring Plan (AEM, 2019c);
- Groundwater Management Plan (AEM, 2020d);
- Metal Leaching and Acid Rock Drainage Monitoring Report (AEM, 2019d, 2020h);
- Air Quality Monitoring Plan (AEM, 2020e);
- Noise Abatement and Monitoring Plan (AEM, 2020f);
- Wildlife protection and response plan (AEM, 2019e);
- Meliadine Gold Mine - FEIS Addendum Environmental Assessment of Treated Groundwater Effluent Discharge into Marine Environment (AEM, 2020g).

3.1 Atmospheric Environment

3.1.1 Climatic Conditions

Climate data were extracted from the Closure and Reclamation plan 2015 (AEM, 2015a) and the Mine Waste Management Plan 2019 (AEM, 2019c). A single monitoring station is installed at the mine site and installed to meet international meteorological installation standards. The station tower records monthly data the following parameters:

- wind speed and direction;
- temperature;
- solar radiation; and
- total precipitation.

The Meliadine site is in the Kivalliq Region of Nunavut, near the northern border of the southern Arctic terrestrial ecozone, and within the Arctic tundra climate region. This ecoregion is classified as a polar desert and is characterized by long cold winters and short cool summers. Winds are predominately from north and-northwest with an average of 23 km/hr.

The mean annual air temperature at the Project site is approximately -10.4 degrees Celsius (°C). The monthly average temperature ranges from -31.0°C in January to +12°C in July, with above-freezing averages for only four (4) months of the year i.e., June to September.

Total annual precipitation averaging is estimated to be 411.7 millimeters (mm) per year, with 51% of precipitation falling as rain, and 49% falling as snow. This mean annual precipitation is based on the hydrological year from October 1st to September 30th. Average annual evaporation for small waterbodies in the Project area is estimated to be 323 mm between June and September. The average annual loss of snowpack to sublimation and snow redistribution is estimated to vary between 46% and 52% of the total precipitation for the winter period and occurs between October and May.

Table 3-1 summarizes estimated monthly climate characteristics at the Project site.

Table 3-1 : Estimated Mine Site Monthly Climate Characteristics

Month[a]	Max. Air Temp. (°C)	Min. Air Temp. (°C)	Rainfall[b] (mm)	Snowfall[c] (mm)	Total Precip.[d] (mm)	Lake Evap. (mm)
January	-19.8	-37.2	0.0	12.9	11.1	0
February	-24	-35.3	0.0	13.1	11.1	0
March	-18.8	-30.8	0.0	18.6	16.1	0
April	-10.4	-20.2	1.4	28.8	26.4	0
May	-1.2	-10.8	7.7	19.2	25.2	0
June	6.7	0.1	26.4	7.1	37.0	60.4
July	14.9	6.9	43.7	0.2	51.2	124.4
August	11.2	7.7	63.7	0.3	74.6	95.6
September	6.8	1.3	45.2	5.7	57.8	42.7
October	1.7	-9.9	15.5	36.9	50.0	0
November	-10.2	-23.6	0.3	33.3	28.5	0
December	-19.4	-33.3	0.0	18.9	15.8	0
Annual	**14.9**	**-37.2**	**203.9**	**195.0**	**404.8**	**323.1**

[a] Climate characteristics obtained from the 2009 Aquatics Synthesis Baseline (FEIS SD 7-1; Agnico Eagle 2014).
[b] Rainfall was adjusted to account for undercatch by 13%.
[c] Snowfall was adjusted to account for undercatch by 50%.
[d] Total precipitation was adjusted to account for undercatch by 32%.
Source: Preliminary Closure and Reclamation Plan (AEM, 2015a).

Short-duration rainfall values, representative of the Project are presented in Table 3-2, based on Intensity duration-frequency (IDF) curves available from the Baker Lake A meteorological station (1987-2006) operated by Environment Canada.

Table 3-2 : Estimated Mine Site Extreme 24-hour Rainfall Events

Return Period (years)	Precipitation (mm)
2	33
5	44
10	50
25	57
50	61
100	65

Notes:
Precipitation extreme obtained from the 2009 Aquatics Synthesis Baseline (FEIS SD 7-1; Agnico Eagle 2014).
No adjustments were made for undercatch since undercatch is generally not significant for extreme rainfall events on a daily time scale.
Source: Preliminary Closure and Reclamation Plan (AEM, 2015a).

3.1.2 Climate Change

The baseline environment for climate change has analyzed the historic climate trends at Rankin Inlet and Baker Lake using data from the climate data archives. At Rankin Inlet, average annual, spring and winter temperatures have shown a statistically significant warming trend. There was also a statistically significant increase in winter precipitation. None of the other temperature or precipitation trends were shown to be statistically significant (AEM, 2014, Volume 1).

The results of the Rankin Inlet trend analysis show that the average annual, spring, and winter temperatures have been experiencing a statistically significant increase (i.e., warming). An increase in winter precipitation was also significant, but this trend was not confirmed in other seasons. At Baker Lake, the annual average and winter temperatures showed a statistically significant warming trend. None of the other temperature and none of the precipitation trends were shown to be statistically significant (AEM, 2014, Volume 5).

Long-term climate trends were assessed as part of the Project (AEM, 2014, Volume 5), and included estimating changes in air temperature and precipitation from observed historical values for three typical time horizons: 2011 to 2040 (the 2020s), 2041 to 2070 (the 2050s), and 2071 to 2100 (the 2080s). The average projected climate trend deviations from the observed historical values are provided in Table 3-3 below. Conclusions on trend deviation for air temperature and precipitation are as follows:

- The climate in the Project region is projected to be warmer for the 2020s, 2050s, and 2080s time horizons when compared to the observed historical values.
- Precipitation shows a larger percent increase compared to historical values; however, most projections are within the annual recorded precipitation values.
- Conclusions from Final Environmental Impact Statement (FEIS) (AEM, 2014, Volume 5) also indicate that a warming climate can increase the thickness of the permafrost active layer. Overall, warming could cause thawing of ice-rich permafrost, potentially resulting in permafrost degradation including thaw lakes and subsidence of the land surface.

Table 3-3 : Summary of Average Projected Climate Trend Deviations from Observed Historic Values

Station and Period			Air temperature (°C)	Precipitation (mm equiv.)
Baker Lake	2020s	Annual	+ 1.5 to 2.0	+ 20 to 40
		Spring	+ 2.0 to 2.5	+ 5 to 10
		Summer	+ 1.0 to 1.5	+ 10 to 15
		Fall	+ 2.0 to 2.5	+ 10 to 15
		Winter	+ 2.0 to 2.5	+ 5 to 10
	2050s	Annual	+3.0 to 3.5	+30 to 50
		Spring	+3.0 to 3.5	+5 to 10
		Summer	+2.0 to 2.5	+10 to 15
		Fall	+3.0 to 3.5	+15 to 20
		Winter	+4.5 to 5.0	0 to +5
	2080s	Annual	+4.5 to 5.0	+35 to 55
		Spring	+4.0 to 4.5	+5 to 10
		Summer	+2.0 to 2.5	+10 to 15
		Fall	+5.0 to 5.5	+15 to 20
		Winter	+ 7.0 to 7.5	+ 5 to 10

Source: Preliminary Closure and Reclamation Plan (AEM, 2015a)

3.1.3 Air Quality

The existing air quality in the general Project area was characterized using background air concentrations from available literature and monitoring data sources. Field studies were not undertaken to characterize the existing air quality in Rankin Inlet because adequate data were available. Specifically, data are available from both the Environment Canada National Air Pollution Surveillance Network, and the Government of Northwest Territories air monitoring network. Although the communities selected for comparaison are located at substantial distances from Rankin Inlet, they are considered to be indicative of Rankin Inlet background air quality as they are also northern communities, have similar sources of electrical power, are similar in size, and are expected to have similar anthropogenic activities (AEM, 2014, Volume 1 and 5).

Much of the Regional Study Area (RSA) could be considered pristine and free of anthropogenic air emissions. For this reason, it is likely that background air concentrations along the AWAR and around the mine site would be very low and lower than the existing air quality data. The only available monitoring data at remote locations within NWT/Nunavut were collected for the Fortune Minerals NICO Project (Fortune Minerals 2011). This monitoring, which quantified the levels of nitrogen dioxide (NO2) and sulphur dioxide (SO2), confirms that the existing air quality in remote areas have lower levels than in the communities (AEM 2014, Volume 5).

The assessment of potential air quality effects from Project activities focused on the operational phase when emissions and activities will be at their highest. Effects from all compounds except for 24-hour total suspended particulate (TSP) and particles nominally smaller than 10 µm in diameter (PM10), are predicted to be of negligible to moderate magnitude at the mine site and of negligible magnitude along the AWAR.

Effects of TSP and PM10 are predicted to be of high magnitude for the mine and of moderate to high magnitude for the AWAR within the SSA and LSAs. However, all residual effects are assessed to be of a negative direction, medium-term duration, and fully reversible once Project emissions cease. Therefore, the potential residual air quality effects from Project activities were determined to be not significant. No potential cumulative effects on air quality were identified (AEM, 2014, Volume 5).

3.1.3.1 Air Quality Monitoring Program

The air quality monitoring plan measures the concentration of airborne particulate surrounding the major areas of activity, and the deposition of those particles over time. The program uses a combination of active and passive sampling methods. Air quality monitoring is performed for: suspended particulates (including trace metals), dustfall, NO_2 and SO_2 during the pre-construction, construction and operations phases (AEM, 2020e).

The objectives of the air quality monitoring program during operations are (AEM, 2020e):

- To verify the predicted concentrations of TSF, PM_{10} and $PM_{2.5}$; and
- To verify that the mitigation measures considered integral to the Project are being incorporated as planned and are effective.

Dynamic particulate monitoring for the Meliadine site includes intermittent 24-h sampling for TSP, PM_{10} and $PM_{2.5}$ using Partisol Sequential Air Samplers. In addition to the dynamic monitoring for suspended particulates, a dustfall monitoring program has been implemented at the mine site to measure deposition rates of particulate matter. Unlike the active samplers, dustfall collection is a passive program that provides a measure of all particulates that would be directly deposited onto vegetation, soil, and water in the vicinity of the Project (AEM, 2020e). The dustfall rates measured at the dustfall stations are analyzed for indications of increasing trends or measured concentrations above the applicable air quality guideline, as well as spatial and temporal trends. The conclusions of this analysis are presented yearly in the annual report. In accordance with Condition 2 of the Project Certificate, Agnico Eagle will monitor NO_2 and SO_2 at two (2) onsite locations throughout the construction and operations phase of the project, with passive NO_2-SO_2 samplers (AEM, 2020e).

In accordance with Term & Condition 1c of the Project Certificate, snowpack monitoring for contaminants will be conducted annually, to assist in predicting the impact of contaminants released in snowmelt on the water quality in Meliadine Lake (AEM, 2020e).

Air quality monitoring includes analysis of dustfall in seven (7) locations, as well as NO_2 and SO_2 in two (2) locations, over one month averaging periods throughout the year. In addition, Agnico Eagle began sampling dustfall transects at three locations along the AWAR, and one location along the Rankin Inlet Bypass Road. Units are in place for the year-round analysis of suspended particulates (TSP, $PM_{2.5}$, and PM_{10}), but sample collection only occurred for a three-month period (AEM, 2020a). Available results for all parameters are compared to regulatory guidelines and Final Environmental Impact Statement (FEIS) predictions, and spatial and temporal trends are assessed.

The air quality monitoring plan for closure will be developed in the future, based on the operation monitoring plan and results.

3.1.4 Noise

The baseline noise environment was characterized through a combination of literature review and field work (AEM, 2014, Volume 5). The baseline average hourly noise level at the proposed Project site is expected to be 35 decibels “A weighted” (weighted to account for the frequency response of the human ear in decibels; dBA). Near Rankin Inlet, the field study indicated average night time noise levels between 45 and 52 dBA.

3.1.4.1 Noise monitoring

The objective of the noise monitoring program at Meliadine is to measure noise levels at four (4) previously determined monitoring locations over at least two 24 h periods. All noise monitoring stations are near seasonally occupied cabins, which were identified as being the most sensitive receptors in the noise impact assessment (AEM 2014, Volume 5). The program aims to confirm the predictions made in the FEIS regarding Project impacts on area noise levels, and in doing so, determine if supplemental or alternative mitigation strategies are required to reduce noise emissions from the Project (AEM, 2020f).

As described in the Noise Abatement and Monitoring Plan (AEM, 2020f), the program includes a Noise Abatement Plan (NAP) and Noise Monitoring Plan (NMP). The NAP describes how noise abatement is incorporated into the Project, while the NMP describes the annual ambient noise monitoring program. Together, the NAP and NMP are designed to control potential Project noise impacts on Points of Reception (PORs) located in the Project area. If the noise monitoring confirms excessive Project associated noise levels exist, the monitoring data will be used to determine where the NAP requires improvement and if additional monitoring activities are required.

3.2 Physical and Terrestrial Environment

3.2.1 Topography and drainage basin

As presented in the Preliminary Closure and Reclamation Plan (AEM, 2015a), topography and lake bathymetry characteristics for the Project presented herein are from the Permafrost Thermal Regime Baseline Report (AEM, 2014, Volume 6, SD 6-1). The dominant terrain in the Project area comprises glacial landforms, such as drumlins (glacial till), eskers (gravel and sand), and lakes. A series of low relief ridges composed of glacial deposits-oriented northwest-southeast control the regional surface drainage patterns. The Tiriganiaq deposit is located on a large peninsula separating the east and west basins of Meliadine Lake.

The Project property is located about 60 m above sea level (masl) in low-lying topography with numerous waterbodies. The surveyed lake surface elevations in the Project area range from about 51 masl at Meliadine Lake to about 74 masl for local small perched lakes. Kettle lakes, and other lakes formed by glacio-fluvial processes or glacial processes, are common throughout the Project area. The development of the Project infrastructure including the open pits, process plant and associated facilities, WRSFs and TSF affected some small lakes and ponds.

Late-winter ice thickness on freshwater lakes in the Project area ranges between 1.0 and 2.3 m with an average thickness of 1.7 m. Therefore, lake ice freezes to the lake bottom at depths shallower than approximately 1.0 to 2.3 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July.

3.2.2 Surficial Geology

As explained in the Preliminary Closure and Reclamation Plan (AEM, 2015a), terrain and soil characteristics for the Project presented herein were extracted from the FEIS (AEM, 2014, Volume 6). In general, the local overburden stratigraphy in the Project area consists of a thin layer of topsoil overlying a layer of silty gravelly sand. Cobbles and boulders are present throughout the entire site and at various depths. The bedrock surface at site is encountered between about 2 and 18 m below ground surface.

Terrain and soil mapping have been completed. The mapping describes and characterizes the terrain and soil resources, their distribution across the landscape, and their quality and sensitivities within the Local Study Area (LSA). Seven (7) soil map units were identified, and fifteen terrain units have been defined and mapped for the LSA. Soil sensitivities to wind and water erosion range from low to moderate.

Soil samples were collected for total metal analysis to measure background metal concentrations. The results for the Tiriganiaq deposit indicated areas where naturally occurring arsenic and chromium concentrations are high (i.e., above Canadian Soil Quality Guidelines (CCME, Canadian Council of Ministers of the Environment, 2006).

3.2.3 Bedrock Geology

As summarized in the FEIS (AEM, 2014, Volumes 1 and 2), the Project is in the northern portion of the Archean Rankin Inlet Greenstone Belt, defined by the regional Pyke Fault. This Archean is situated in the Northwest Hearne Sub-domain of the Churchill Structural Province that forms part of the northern Canadian Shield. The Meliadine trend is defined by the regional Pyke Fault, a prominent high-strain fault zone which is northwest trending within the stratigraphy of the Archean Rankin Inlet Group. The Rankin Inlet Group was subjected to lower to middle greenschist facies metamorphism and multiple periods of deformation, including two (2) identified periods of Archean and Proterozoic age. The Meliadine ore deposits are low-sulphide, gold-quartz vein deposits as per the geo-environmental classifications. All the rocks in the deposit areas are lower to middle greenschist metamorphic grade. The main lithological units likely to be mined include the following:

- Turbiditic sedimentary rocks of the hanging wall, comprising greywacke, siltstone, and argillite (Sam Formation) with gabbro dykes;
- Volcanic-hosted and sediment-hosted iron formation, including greywacke, siltstone, and argillite (Upper Iron Formation) with abundant magnetite and chert layers;
- Sericite altered siltstones and graphitic argillite near the Lower Fault zone contact (Tiriganiaq Formation); and
- Schistose and carbonate-altered mafic volcanic rocks in the footwall (Wesmeg Formation).

3.2.4 Geological Hazards and Seismicity

The mine site is in an area of relatively low seismic risk. The peak ground acceleration for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada-Natural Resources Canada (NRC) website (NRC, 2015). The estimated PGA is 0.022 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.037 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area (see **Appendix J** for the seismic zoning map and the seismic hazard calculation).

3.2.5 Permafrost

As presented in the FEIS (AEM, 2014, Volume 1 and 6), the Project site is located within a region of continuous permafrost within the Southern Arctic terrestrial ecozone; one of the coldest and driest regions of Canada (see **Appendix I**). Permafrost is defined as ground that remains at or below 0°C for at least two (2) years. Permafrost does not necessarily contain ice; rather, its definition is based solely on the temperature of the mineral or organic parent material. Permafrost in the Project area is considered to be an irregular surface, and so the actual depth of permafrost is variable. In this region, the layer of permanently frozen subsoil and rock is generally deep and overlain by an active layer that thaws during summer. The ground temperature data indicates that the active layer is 1.0 to 3.0 m in areas of shallow soil and away from the influence of lakes. It is anticipated that the active layer adjacent to lakes or below a body of moving water, such as a stream, will be deeper. Permafrost depths are estimated to be between 360 and 495 m, depending on proximity to lakes, slope, aspect, and other site-specific conditions.

Late-winter ice thickness on freshwater lakes is approximately 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July, depending on site specific conditions of water depth and exposure. Based on bathymetry data, maximum lake depth varies from 2.5 to 5.0 m. Where water depth is greater than about 1.0 to 2.3 m, taliks are expected. A talik is a zone of unfrozen ground year-round that lies in permafrost areas. Formation of open taliks that penetrate through the permafrost may also be expected for relatively deeper and larger lakes in the project area. Round lakes that do not freeze to the bottom in winter and have a minimum radius of approximately 290 to 330 m, or elongated lakes that do not freeze to the bottom and have a minimum half width of approximately 160 to 195 m, are expected to have a talik underneath that extends through permafrost.

The ground ice content of permafrost soil and rock in the Meliadine area is expected to be between 0% and 10% (dry permafrost) based on regional scale compilation data. Locally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as frost mounds. These areas of local ground ice are generally associated with low-lying areas of poor drainage.

Rock and soil-related terrain instability is a minor concern in the Meliadine project area. Although permafrost will degrade in certain areas, for the most part the permafrost is “dry” and has low ground ice content. The exception is the wetlands occupying lowlands adjacent to lakes and ponds where excess ground ice is present and thaw instability is foreseeable. These impacts can be mitigated using currently accepted permafrost engineering practices as part of construction and closure.

3.2.6 Hydrogeology

As presented in the FEIS (AEM, 2014, Volume 1 and 7), in areas of continuous permafrost, there are two (2) groundwater flow regimes: a deep regime beneath the permafrost and a shallow regime in the active layer near the ground surface and above permafrost (see **Appendix J**). From late spring to late summer when temperatures are above 0°C, the active layer becomes thawed. Within the active layer, the water table is expected to be a subdued replica of the topographic surface. The deep groundwater regime is connected to taliks located beneath large lakes. The water level elevations in lakes that have these deep taliks provide the driving force, or hydraulic head, for the deep groundwater flow. Groundwater in the active layer flows to local depressions and ponds that drain to larger waterbodies. The talik beneath large waterbodies will be open. The open talik will connect to the deep groundwater flow regime beneath the permafrost.

Elongated waterbodies with terraces and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine. Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime. No impact is expected to Lake B7 by mine activities (AEM, 2020b).

3.2.7 Surface Water Hydrology

As presented in the FEIS (AEM, 2014, Volume 1 and 7), hydrology in the Project area is highly influenced by geographic location, the headwater nature of the Project watersheds, and by the seasons. The mine site is in the northeast part of the Meliadine Lake watershed, which covers 586 km², on a peninsula extending into Meliadine Lake. The surface area of Meliadine Lake is 107 km², with a highly convoluted shoreline of 465 km, and 243 islands. Meliadine Lake has outflows that drain into Hudson Bay through two (2) separate river systems: the Meliadine River, which carries about 80% of the flow, and an outlet to Peter Lake on the Diana River (a stream distance of 70 km) which takes the rest.

Based on bathymetric surveys, the lakes on the peninsula of Meliadine Lake range from 1.3 ha to 90.5 ha in surface area and are shallow (mean depths range from 0.7 m to 1.6 m). Only four (4) lakes have maximum depths of 4.0 m or greater. The surveyed ponds on the peninsula ranged from 0.1 to 18.8 ha in surface area. They are shallow, with maximum depths of less than 1.0 m in 62% of the surveyed ponds.

As explained on the preliminary closure and reclamation plan (AEM, 2015a), watersheds within the local study area comprise an extensive network of waterbodies and interconnecting streams. Channels are only slightly entrenched with banks typically consisting of mats of vegetation, below which are found organics and fine soils within a matrix of cobble and boulders similar to the bed materials. After the spring runoff and before the late summer rains, the streams are usually dry. During spring snowmelt peak discharges, erosion of channel banks is likely enhanced by frozen conditions. However, during conditions above freezing after spring runoff, these banks may be sensitive to changes in flow regime.

Local watersheds have lake surface fractions (i.e., the ratio of lake area to land area) of up to 51%, and the hydrology of these watersheds is dominated by lake storage and evaporation. Regional and local watershed boundary details are presented in **Appendix J**.

Summer evaporation is roughly equivalent to summer precipitation, with little if any net input from summer rain. The net input to the annual water balance of the watershed comes from spring run-off that recharges the lakes and ponds. Snowmelt runoff in the region begins in the period from late May to mid-June, and the snowmelt peak is often the peak flow for the year. Flows typically decline through the late summer and fall, with freeze-up occurring towards the end of October (except for Meliadine Lake, which has been observed to flow over the winter). All channels are anticipated to freeze to the bottom with zero flows over the winter period.

3.3 Chemical Environment

3.3.1 Soil Chemistry

Geochemical characterization results indicated that the overburden produced will be NPAG, and that leachate concentrations are generally lower than waste rock and is predicted to meet the Metal Mining

Effluent Regulations (MMER[1]) effluent monthly mean limits. Waste rock and overburden have compatible geochemical characteristics such that these materials can be managed together in the same disposal facilities (AEM, 2014, Volume 1).

3.3.2 Sediment Quality

Sediment can be an important source or sink for contaminants such as metals. Contaminants entering aquatic systems (via tributary streams or directly from local sources) are usually associated with suspended particulate material in the water column that eventually settle in depositional areas as sediment, especially in deeper areas of lakes. Sediment provides a long-term, temporal record of deposition, integrating concentrations over time.

Lakebed substrate in the project area is a key habitat attribute that dictates the species composition and abundance of benthic invertebrates and its importance as feeding habitat by fish. Water depth is the strongest determinant of physical features of the lake substrate, especially grain size. Substrate consists of coarse materials consisting of a boulder/cobble mix along the shallow areas close to shore. Transition areas, consisting of fine organic materials interspersed among cobbles, are common throughout most of the lake. Substrates within the deep sections of the lake are composed primarily of fine organic material and silt (AEM, 2015a).

Sediments were analysed for particle size, nutrients (carbon, phosphorus, and nitrogen), total and dissolved metals, and selected organic compounds. Sediment quality data were compared to quality guidelines (*Interim Sediment Quality Guidelines* (ISQG) and *Probable Effect Level* (PEL) guidelines for the protection of aquatic life). The ISQG were derived solely from the threshold effects level (CCME 2001). The threshold effects level represents the concentration below which adverse biological effects are expected to rarely occur.

Concentrations of arsenic, chromium, and copper in sediments were above guidelines in many samples. The mean concentrations of arsenic from Meliadine Lake and the regional waterbodies were above the ISQG, but the mean concentration of arsenic from the Peninsula waterbodies was above the PEL guideline. In addition, the 90^{th} percentile concentration of arsenic from Meliadine Lake was above the PEL guideline. Mean concentrations of chromium were below the ISQG in Meliadine Lake, Peninsula waterbodies, and regional waterbodies, but the 90^{th} percentile and maximum concentrations from these three groups of waterbodies were above the ISQG. Concentrations of chromium were never above the PEL guideline. Copper concentrations (mean and 90^{th} percentile) from these three groups of waterbodies were above the ISQG, but were never above the PEL guideline. Some organic compounds were detected in sediments but were either less than the detection limit or less than the ISQGs and PELs (AEM, 2015a) (AEM, 2014, Volume 1).

3.3.3 Surface Water Quality

Due to the site's northern latitude and climate, lakes naturally experience long periods of cold temperatures and low light levels during the winter months. Ice covers the lakes for extended periods of time each year and low water temperature exists year-round. As a result of the ice cover, gas exchange with the atmosphere

[1] The FEIS was issued in 2014 and refer to the Metal Mining Effluent Regulations (MMER 2012, Consolidated Regulations)

is limited most of the year. However, oxygen concentrations remain high under the ice because of the low rates of biological activity and decomposition of organic material.

Water quality studies conducted from 1994 to 2011 and in 2013 were summarized by waterbody type, as follows: Meliadine Lake; waterbodies on the peninsula of Meliadine Lake plus near the Discovery area; larger, regional lakes including the reference lake, Peter Lake, and Little Meliadine Lake; watercourses (streams) on the peninsula of Meliadine Lake, near the Discovery area, and along the AWAR; and watercourses (rivers) including Meliadine River and Char River. A total of 263 water quality samples have been collected between 1994 and 2013 with greatest sampling effort in the peninsula lakes and streams. Sediment quality sampling effort has been greatest in Meliadine Lake and the peninsula lakes with a total of 66 and 56 samples, respectively, and 143 samples overall collected between 1994 and 2013 (AEM, 2014, Volume 1 and 7).

Water quality data were collected and analysed for general parameters (field and laboratory), major ions, nutrients (carbon, phosphorus, and nitrogen), total and dissolved metals, and selected organic compounds, and were compared to quality guidelines (CCME - *Canadian Water Quality Guidelines for the Protection of Aquatic Life* and Health Canada's *Guidelines for Canadian Drinking Water Quality*).

Metal concentrations are generally very low in surface waterbodies in the Project area, and in most cases, concentrations are less than guidelines. Measured organic compounds are generally below detection limits. Small and shallow ponds are the predominant waterbody types in the region and have low habitat value for year-round use by fish (FEIS, Volume 1, and AEM, 2015a).

3.3.3.1 Surface Water Quality Monitoring

There are many monitoring programs conducted to evaluate water quality at Meliadine. These are mainly a requirement of the Meliadine Water License 2AM-MEL1631 Schedule I. They are designed to provide immediate feedback such that mitigation or adaptive management can be implemented. The site map with the different surface water sampling locations is presented in **Appendix G**.

As presented in the Water Quality and Flow Monitoring Plan (AEM, 2019c), the surface water monitoring is divided into two levels of monitoring to characterize the range of impacts between the sources of contact water in the individual mine facilities and the point of discharge or release to the receiving environment. The two levels of monitoring include the compliance monitoring, as described in the Water License and the event monitoring.

As presented in the Water Management Plan (AEM, 2020b) water quality forecast model is also completed for the surface water quality at the Meliadine site. Long-term, post-closure water quality in the containment ponds (CP1, CP2, CP3, CP4, CP5, and CP6) and in the flooded open pit lakes are anticipated to meet MDMER limits and CCME-WQG for the protection of aquatic life or the Site-specific Water Quality Objectives (SSWQO) to be developed for aluminum, fluoride, and iron. Arsenic concentrations in CP3 could slightly exceed the SSWQO post-closure, a criterion that is conservatively protective of the receiving aquatic environment (Golder, 2013). If arsenic levels exceed post-closure SSWQOs then water arsenic treatment will be implemented accordingly until arsenic levels decrease below the SSWQO concentration.

The Aquatic Effects Monitoring Plan (AEMP) is implemented, which considers the range of Project activities and potential Project-environment interactions identified as being of concern for the aquatic ecosystem. The purpose of the AEMP is to provide information on the health of the aquatic receiving environment and will include routine monitoring of water quality in lakes and streams, and the health of fish and other aquatic life and their habitat in the freshwater environment. The AEMP functions as an integrated monitoring program, which considers a variety of pathways identified as pertinent to potential effects of the Project on the aquatic environment. The AEMP is designed to address predicted impacts to the aquatic environment related to changes in surface water quantity and quality, sediment quality, aquatic life, fish habitat and fish health due to physical alterations of the watersheds, and water and air emissions during construction, operations and closure. The AEMP has been developed in consultation with Inuit communities, stakeholders, and regulatory authorities (AEM, 2014, Volume 7. Golder, 2019a).

3.3.4 Groundwater Quality

The Project lies within the Canadian Shield in an area of continuous permafrost. In areas of continuous permafrost, there are generally 2 groundwater flow regimes: a shallow groundwater flow regime located in the active (seasonally thawed) layer near the ground surface, and a deep groundwater flow regime beneath permafrost.

The following details are from the FEIS for Meliadine (AEM, 2014, Volume 7). In the Canadian Shield, primarily in response to upward diffusion of deep-seated brines, concentrations of Total Dissolved Solids (TDS) in groundwater increase with depth. Chloride and calcium, with sodium to a lesser degree, are the chemicals that contribute to TDS in shield brines. By comparison, sea water is mostly composed of chloride and sodium. Three groundwater samples were collected in 2011:

- Groundwater sample from about 100 m bgs with a TDS of about 4,700 milligrams per litre (mg/L);
- Groundwater sample from about 450 m bgs with a TDS of about 60,900 mg/L; and
- Groundwater sample from about 600 m bgs with a TDS of about 61,000 mg/L.

As reported in the preliminary closure and reclamation plan (AEM, 2015a), these values are greater than values observed at other sites in the Canadian Shield at corresponding depths. This difference, together with the relatively high proportion of sodium relative to calcium in groundwater samples likely indicates the presence of relic sea water in bedrock. It is known that this area was largely overlain by seawater during the last period of glaciation. Such occurrences have been observed at other areas where land was submerged by oceans in the past.

A TDS profile with depth was prepared for Meliadine mine site based on the three samples identified above and, compared to TDS profiles from sites in the Canadian Shield, as well as the Diavik and Meadowbank sites. It is assumed that the TDS attributed to the sodium chloride of the recent incursion of seawater will decrease with depth down to the calcium chloride profile established for Meadowbank (AEM, 2015a).

An additional groundwater sampling round was undertaken in the summer of 2013. The TDS of the three groundwater samples collected in 2013 are as follows:

- groundwater sample from about 455 m bgs with a TDS of about 54,290 mg/L;
- groundwater sample from about 510 m bgs with a TDS of about 57,700 mg/L; and
- groundwater sample from about 580 m bgs with a TDS of about 58,420 mg/L.

It is expected that the following key salinity parameters will vary with depth: chloride, sulphate, calcium, magnesium, potassium, sodium, and strontium. In all water samples, the concentration of dissolved trace metals in the groundwater is low, including arsenic which has a concentration below the analytical method detection limit in all samples. All parameters not associated with salinity are expected to be constant with depth.

As outlined in the Groundwater Management Plan (AEM, 2020d), groundwater investigations suggested that total dissolved solids (TDS) concentrations are relatively consistent below the permafrost at approximately 64,000 mg/L. Groundwater quality samples have been collected from 2017 through 2019 from diamond drillholes intersecting water bearing structures. Results from the 146 samples collected from 2017 to 2019 indicate stable and consistent concentrations for several parameters and indicate that TDS concentrations are less than predicted at a mean concentration of 56,000 mg/L. The discrepancy between expected and observed TDS levels is potentially due to the difference of sampling depth between pre-development testing and samples collected during development. Pre-development samples were collected below permafrost (>450 m below ground surface), whereas the bulk of samples collected to-date have been collected in the basal cryopeg (280 m to 450 m below ground surface). Samples and trends will continue to be assessed as development progresses below the cryopeg. It should also be noted that mining operations include drill-and-blast excavation for the development of the Underground Mine, which results in certain parameters in groundwater to be influenced by explosives (particularly ammonia and nitrate).

3.3.4.1 Groundwater Monitoring Program

Table 3-4 presents a summary of the underground monitoring plan presented in the Groundwater Management Plan (AEM, 2020d).

Table 3-4 : Groundwater Monitoring Plan

Monitoring Type	Monitoring Location	Purpose	Frequency
Verification	Underground Seeps	Quantity - Seepage survey to verify underground inflow rate .	Updated Daily
Verification	SP1 and SP4	Quality - Monitorquality of surface saline storage ponds	Monthly
Verification	Level 300 pre-clarification	Quality - Monitor quality of collective saline contact water underground prior to clarification	Monthly
Verification	Underground seeps/DDHs	Quality - Verify quality of groundwater flowing into underground mine	Quarterly
Verification	SWTP Inlet and Outlet	Quality - Monitor quality of saline contact water being pumped from underground and monitor final treated effluent prior to continued transfer to CP5	Every two (2) weeks

Source: (AEM, 2020d)

3.3.5 Geochemical Characterization

As presented in FEIS for Meliadine (AEM, 2014, Volume 1 and 6), a baseline mine waste geochemical characterization program characterized the geo-environmental properties of waste rock, ore, tailings, and overburden from the Tiriganiaq, Pump, Wesmeg, Wolf, F Zone, and Discovery deposits. The objectives of the program were to identify chemicals of environmental interest in the framework of mine water and waste management and probable future mine water quality. This was accomplished through static testing and kinetic testing at various scales, including standard laboratory humidity cells, large leaching columns and larger field scale leaching tests.

The waste rock and ore samples selection was completed to obtain a data set that is compositionally and spatially representative of the material to be removed by mining at each deposit. All waste rock, tailings, and overburden samples were subjected to a variety of static testing to evaluate chemical and mineralogical composition, the potential to generate acid rock drainage (ARD), as well as short- and long-term metal leach potential. Acid rock drainage potential was assessed following Guidelines for Acid Rock Drainage Prediction in the North (AANDC 1992) for waste rock and tailings. All leach test water quality results were screened against Metal Mining Effluent Regulations (MMER) for effluent quality (DFO, 2006).

The summary of the results presented below are presented in the FEIS (AEM, 2014, Volume 6) and summarized in the Meliadine Preliminary Closure and Restauration Plan (AEM, 2015a)

3.3.5.1 Mine waste rock

Static and kinetic testing methods were used to assess the chemical composition of the mine waste, its potential to generate ARD, and its potential to leach metals to the receiving environment upon exposure to ambient conditions.

The key findings from the geochemical properties of the waste rock are summarized as follows (AEM, 2015a):

- ARD generation test results (ABA; static testing) indicated that the waste rock from the Tiriganiaq deposit has no potential for acid-generation (NPAG), stemming from their low sulfur content and the presence of a sufficient readily-available buffering capacity.
- The final pH values of the leachates from the short-term leaching tests (SFE tests) are circum-neutral to alkaline with values ranging from 6.1 to 9.5, corroborating the available buffering capacity.
- Leachate quality from the SFE tests meet mine effluent criteria (DFO, 2006) for almost all parameters except for arsenic. Arsenic was leached in concentrations marginally higher than the MMER effluent limit (maximum monthly mean of 0.5 mg/L) in one Tiriganiaq greywacke/siltstone sample. However, the average arsenic concentration from all samples was well below the MMER limit.
- Kinetic test leachate quality results from humidity cells, large columns and field cell tests on waste rock also yielded circum-neutral to alkaline pH values ranging from 6.5 to 9.3. This confirms the NPAG classification of Tiriganiaq waste rock groups that was defined through the static test methods.
- For all kinetic leaching test types, leachate concentrations were below mine effluent criteria (DFO, 2006).

- Large column and field cell tests, conducted at low water-to-rock ratios that are more appropriate to site conditions, generated leachate concentrations well below MMER criteria.

Based on the waste rock geochemical testing findings, the waste rock from the Tiriganiaq deposit area is considered to be NPAG and has a low potential for metal leaching (ML) in view of proposed waste rock management for the Project. Kinetic tests at various scales indicate that drainage water quality will meet MMER monthly mean effluent limits.

3.3.5.2 Tailings

The key findings from the geochemical characterization programs for tailings are summarized as follows (AEM, 2015a):

- Test results from acid-base accounting (ABA) indicated that the tailings sourced from the Tiriganiaq deposit are expected to be non-potentially acid generating (NPAG) according to Indian and Northern Affairs Canada (AANDC, 1992) guidance.
- Humidity cell test results on the whole ore tailings samples indicated that the tailings samples maintained neutral pH (>6.5), and stable to decreasing parameter concentrations through testing to date indicating that Acid Rock Drainage (ARD) conditions have not yet developed in any sample.
- Most leachates from the shake flask extraction (SFE) tests had constituent concentrations below MMER except for arsenic in the Tiriganiaq whole ore tailings. The SFE Metal Leaching potential test results indicated that the arsenic concentration from the Tiriganiaq whole ore tailings samples was 1.2 mg/L for the Tiriganiaq open-pit ore and 0.55 mg/L for the Tiriganiaq underground ore. These values exceed the maximum monthly mean criterion for arsenic of 0.5 mg/L (DFO, 2006).
- Arsenic concentrations reported decreasing trends in all whole ore tailings samples in the humidity cell tests, with initial concentrations ranging from 0.05 to 0.9 mg/L (Cycle 0), and the final test cycle to date ranging from 0.003 to 0.05 mg/L. This is substantially lower than reported from the static leach tests.

Tailings acid generation and long-term metal leaching should not be an issue at the Project. However, the test results do indicate that tailings pore water (i.e., process water) would contain residual arsenic and cyanide. While the tailings may have a potential to leach arsenic, especially during initial flushing or wet weather, long-term arsenic leaching from tailings is predicted to be low and below MMER based on the humidity cell test results.

3.3.5.3 Overburden

The key findings from the geochemical characterization programs for the overburden material are summarized as follows (AEM, 2015a):

- Overburden samples reported very low sulphur content and the presence of available buffering capacity; all samples were NPAG.
- For all overburden samples, the concentrations of all leachate parameters met mine effluent criteria (DFO, 2006) except for one Tiriganiaq surface overburden sample that exceeded the MMER maximum monthly mean limit (0.5 mg/L) for zinc. However, the average zinc concentration for all the Tiriganiaq overburden samples (0.09 mg/L) was an order of magnitude below the MMER limit.

- Arsenic content in the overburden samples exceeded the CCME *Industrial Soil Guidelines* (12 mg/kg). These results are consistent with a previous study that documented the natural occurrence of higher arsenic concentrations in the soil and surface water samples collected in the area of the Meliadine deposits.

The geochemical characterization results indicated that the overburden produced will be NPAG, and that leachate concentrations are generally lower than waste rock and will meet MMER monthly mean limits. Waste rock and overburden have compatible geochemical characteristics such that these materials can be managed together in the same disposal facilities.

3.3.5.4 Geochemical Monitoring

In accordance with the Meliadine Project Certificate No.006 and Water License 2AM-MEL1631 conditions, Agnico Eagle has developed a waste rock and quarry monitoring plan to characterize the metal leaching and acid rock drainage (ML/ARD) potential of excavated materials on-site. The yearly results are presented in the Metal Leaching and Acid Rock Drainage Monitoring Report (AEM, 2019d, 2020h).

The waste rock and tailings storage facilities were designed and will be operated to minimize the impact on the environment and to consider geochemical stability. Geochemical monitoring is or will be completed on the waste rock, tailings and quarry material. The collected samples will be sent to an accredited commercial laboratory. Analyses included (AEM, 2019d, 2020h):

- Acid-base accounting;
- Paste pH;
- Total sulphur (LECO);
- Sulphate sulphur (HCl leach);
- Total carbon (LECO);
- Total inorganic carbon (TIC);
- Neutralization potential (modified Sobek);
- Element scan by aqua regia digestion and a 31 element ICP-MS finish.

In 2018, Agnico Eagle conducted geochemical testing on waste rock material from underground development and surface material from approved quarries and eskers. Based on geochemical characterization results obtained in 2018 for the waste rock and quarry samples, there is low risk for ARD or metal leaching from the materials. Results are within project prediction studies for the project (AEM, 2019d). In 2019, based on geochemical characterization results obtained to date for the waste rock and containment pond samples, there is low risk for ARD or metal leaching from the materials. Results are within project prediction studies for the project. The filtered tailings results are showing a slightly lower NPR than what was predicted in the baseline study but are still assessed to pose a low risk for ARD as a result of the management system and close approach developed for the storage facility (AEM, 2020h). Sampling is planned to continue during operations and closure.

3.4 Biological Environment

As presented in the FEIS (AEM, 2014, Volume 6), baseline studies on vegetation, and terrestrial wildlife in and around the Project area were conducted for three study areas:

- A regional study area (RSA) to capture any effects that may extend beyond the immediate Project area on vegetation and wildlife in the broader regional context;
- A local study areas (LSA) to assess the immediate direct and indirect effects of the Project on vegetation and wildlife;
- The AWAR LSA to assess limit of direct and indirect effects from the road on the surrounding vegetation and is delineated by a 1 km buffer on either side of the anticipated right-of way surrounding the proposed road alignment.

A map illustrating the LSA and RSA study area is provided in **Appendix K**.

The regional study area was defined as a 52 km radius from the proposed Project and covers an area of approximately 850 000 ha. The LSA for the mine boundary was defined by the expected spatial extent of the immediate direct (e.g., Project footprint) and indirect effects (e.g., dust deposition) from the Project on the surrounding vegetation. The LSA is based on the 2009 Project footprint and includes the Meliadine main site, F Zone area, and the Discovery area.

3.4.1 Vegetation Habitat

Baseline vegetation surveys were conducted at the Project in 1998, 2008 and 2009. The objectives of the vegetation baseline study were to:

- Collect quantitative vegetation and plant community data;
- Define and map plant communities using these collected data;
- Identify and report on valued components;
- Describe and map the occurrence of rare plants or unusual plant associations within the LSA; and
- Develop a regional ecological land classification system.

In general, the community types identified within, or in the vicinity of the Project and AWAR areas include:

- Upland terrestrial vegetation classes: predominantly heath vegetation defined as land where the soils are not saturated for extended periods of the year. Presence of low growing evergreen shrubs, such as Labrador tea, bearberry, and black crowberry. Heath vegetation in the area also consists of heath tundra or heath boulder and bedrock associations;
- Wetland classes: areas that are saturated for most, or all of the growing season. Wetlands or riparian vegetation in the area consists of wet sedge meadows or tussock-hummock areas and low shrubby riparian vegetation along the margins of lakes and rivers; and,
- Un-vegetated classes: areas disturbed by pre-mining activities or bare ground and water.

The vegetation baseline details for the Project are provided in the 2009 Terrestrial Synthesis Baseline Report (AEM, 2014, Volume 6, SD 6-2). Heath vegetation represents the dominant vegetation cover at 445 926 ha

(52%) of the RSA boundary, whereas wetlands and riparian areas are distributed over 122 575 ha (14%) of the RSA boundary. The remaining 280 983 ha (33%) of the RSA boundary are classified as water (predominantly lakes and the tidal basin of Hudson's Bay) and a small percentage of bare ground and rock outcrops.

A total of six (6) rare plant species were observed within the Project area. An additional 13 species of rare plants may have the potential to occur in the Project area. These species are all listed as "Sensitive" in Nunavut (CESCC, 2011) with one exception (autumn bluegrass), which has been ranked as "Undetermined" due to insufficient data. None of these species are federally listed (COSEWIC, 2012; SARA 2012).

In order to provide a basis for evaluating potential effects of dust borne contaminants containing metals originating from the Project site and AWAR, an assessments of baseline metal concentrations in plant tissue and soil in the Project area was undertaken. Surrounding the mine site and along the road, a total of 29 permanent sample sites were established; plant tissue samples from at least two (2) different plant species and a soil sample were collected from each site. Most of the soil metal concentrations were within acceptable guidelines, except for arsenic, which exceeded CCME (2007) guidelines for agricultural use on 12 plots; all but three of which were found in the immediate vicinity of the proposed Project site or along the AWAR near the mine site. Metal concentrations in tissue from selected plant species were also analyzed to provide an understanding of baseline levels of various metals that may be concentrated in plant tissue. The results of the plant tissue metals analyses indicated a wide variability in the range of metal concentrations, with highest levels of arsenic found in alpine manzanita *(Arctostaphylos alpine)* and water sedge (*Carex aquatilis)* on two (2) plots located near the proposed mine site (AEM, 2015a).

3.4.1.1 Vegetation monitoring

In 2018, Agnico Eagle Mines and the University of Saskatchewan were successful in receiving a Natural Sciences and Engineering Research Council (NSERC) Collaborative Research and Development grant. The grant entitled "Tundra Restoration: Niche construction in early successional plant-soil systems" will support on-site and laboratory research from June 2018 to June 2022. The primary objective of this research is to address Term and Condition no. 41 of the Project Certificate for the Meliadine site. The specific objective is the characterization of initial and realized niches of biological soil crusts and tundra vascular plants across a chronosequence of naturally recolonized drilling waste dumps. Work started during the summer 2018 and continued in 2019, with both educational activities and a field revegetation trial (AEM, 2019a, 2020a).

Following the examination of drilling waste sites, it was found that natural revegetation of drilling wastes is occurring at the Meliadine site. The community composition between drilling wastes and the paired undisturbed tundra was similar 20-25 years post disturbance and species richness recovered within 6 years. Due to the different life history characteristics of tundra plants, individual species responses to disturbance were observed. While sedges and mosses may recover more rapidly on these drilling wastes, dwarf shrubs and lichens may require longer to recover. These trends in natural recovery are important for guiding future restoration efforts and techniques. Specifically, targeting sedge and moss species for transplanting and/or seeding of disturbed substrates may be a highly effective strategy for initiating the development of early successional tundra communities (AEM, 2019a).

Vegetation monitoring is also completed as part of the Terrestrial Ecosystem Monitoring and Management Plan (TEMMP) and is discussed in section 3.4.3.

3.4.2 Aquatic Biota and Habitat

Studies targeting the ecological characteristics of the aquatic environment in the LSA and RSA were conducted from 1997 to 2012. Investigations included ground and aerial surveys to assess habitat quality of streams, bathymetric surveys of selected lakes, continuous recordings of water temperature in streams and lakes, collection of in-situ water quality data, and measurements of vertical distribution of temperature and dissolved oxygen in lakes (AEM, 2015a).

As presented in the FEIS (AEM, 2014, Volume 7), habitat for fish was dominated by shallow runs; other habitat types encountered included riffles, pools and riffle/boulder garden combinations. High quality habitats occurred in pools and deeper run habitats that were present mainly in larger streams connecting the primary chains of lakes in each Peninsula basin. Coarse substrates and abundant instream cover in these larger streams provided suitable habitat for Arctic grayling spawning and rearing. The valued ecosystem components occupying top trophic positions in the Meliadine Lake ecosystem were Arctic char, lake trout, and Arctic grayling

Mainly shallow, ponds were also investigated in the area of the proposed mine site (i.e., the Peninsula) and contained poor to moderate fish habitat. The surveys showed that pond habitat was suitable mainly for rearing and spawning by forage species, particularly ninespine stickleback. The lack of suitable coarse substrates limits the spawning potential for Arctic grayling. Freezing to bottom during winter, overwintering by fish in the Peninsula ponds is not possible. Spring freshet and/or important precipitation events allows movement between ponds, they offer seasonal habitat (when accessible) and there is no potential to support fish on an annual basis.

In order to characterize the lower trophic communities within the LSA and RSA, numerous investigations at streams, ponds, and lakes where completed in 1997, 1998 and 2001. At the base of the ecosystem, phytoplankton in lake water and periphyton on shoreline rocks use nutrients and carbon sources for growth and provide food to benthic invertebrates and zooplankton. Zooplankton feed directly on phytoplankton, while benthic invertebrates feed on periphyton and decaying organic material that settle on the bottom of waterbodies. Fish feed on zooplankton and benthic invertebrates, and predatory fish feed on smaller fish (AEM, 2015a).

3.4.2.1 Aquatic Ecosystem Monitoring

Upon the discharge of dewatering effluent to Meliadine Lake, the Mine became subject to the Metal and Diamond Mining Effluent Regulations (MDMER). Under the MDMER, the Mine is required to conduct Environmental Effects Monitoring (EEM) studies, the results of which are used by Environment and Climate Change Canada (ECCC) to assess the effectiveness of the effluent regulations by evaluating effects on fish, fish habitat, and use of fisheries resources by humans (Golder, 2019a).

The Aquatic Effects Monitoring Program (AEMP) is a requirement of the Type A Water Licence 2AM-MEL-1631. The AEMP is intended to function as an integrated monitoring program, which considers pathways to potential effects of the Mine on the aquatic environment, including changes in surface water quality, sediment quality, lower trophic communities, fish habitat, and fish health due to release of mine water, physical alteration of watersheds, and air emissions during construction, operations, and closure. The AEMP was also designed to incorporate EEM requirements of the MDMER throughout the life of the Mine, with supplemental components included to fulfill the additional conditions and requirements of the Water Licence (Golder, 2019a).

3.4.3 Wildlife

Wildlife represents an important ecosystem component, and some species are protected by legislation and/or are important to Inuit. The baseline details for the terrestrial baseline data are presented in the FEIS (AEM, 2014, Volume 6). Wildlife baseline studies were completed for the Project between 1998 and 2009 in support of the environmental assessment. Aerial surveys documented the abundance and distribution of caribou in the RSA. Wildlife baseline is complemented by observations recorded in the Meliadine Wildlife Observation Log and will include additional information from the annual Hunter Harvest Survey which is expected to collect data as of 2019.

Due to the extreme northern climate and low structural heterogeneity, relatively few terrestrial vertebrates are found in the Project area. Baseline data were collected over 5 years (1998, 1999, 2000, 2008, and 2009). During the baseline wildlife surveys, the following species or species group were identified: barren-ground caribou (Rangifer tarandus), arctic fox (Alopex lagopus), raptors, upland birds, shorebirds, waterfowl, Tundra Swan (Cygnus columbianus) and loons. Wolves (Canis lupus), muskox (Ovibos moschatus) and polar bears (Ursus maritimus) are infrequently observed on the Project area. Grizzly bears (Ursus arctos horribilis) and wolverines (Gulo gulo) are not seen in the Meliadine area. Relevant existing traditional and scientific knowledge on key wildlife species was documented and supplemented with wildlife surveys during the terrestrial baseline study (AEM, 2014, Volume 6, SD-6).

Barren-ground caribou is a key mammal as Inuit population heavily depends on it for food, fuel (from caribou fat), and materials for clothing, tools, and traditional crafts. Caribou are listed as secure in Nunavut and as a species of Special Concern federally (COSEWIC, 2010). Seasonal and yearly differences of the various population parameters are difficult to determine as little scientific information is available on local caribou population parameters, distribution, abundance, and migration corridors. The region includes the major summer range and calving grounds for some of Canada's largest caribou herds.

Bird studies have been undertaken for the Project since the mid-1990s and include baseline studies completed from 1998 to 2000, 2008 to 2009, and 2011. These studies have used a variety of species-specific methods to quantify bird populations with a focus on loons and other waterfowl, upland birds, raptors, and on bird species at risk within the RSA. Surveys recorded the presence and abundance of upland breeding birds, shorebirds, and water birds in the RSA. Ground and aerial surveys were used to locate swan and loon breeding areas and raptor nests in the RSA. The region is a major breeding and nesting ground for a variety of migratory birds. The peregrine falcon population near Rankin Inlet has the highest known breeding density in the Arctic (AEM, 2015a, AEM, 2014, Volume 6).

Barren-ground caribou of the Qamanirjuaq herd are regular but transient visitors during their spring migration and calving periods. The region is a major breeding and nesting ground for a variety of migratory birds. The peregrine falcon population near Rankin Inlet has the highest known breeding density in the Arctic.

3.4.3.1 Wildlife monitoring

Wildlife protection at Meliadine is ensured by various protocols implemented during operations and presented in the Terrestrial Effects Monitoring and Mitigation Program (TEMMP, a component of the FEIS) (Golder, 2019b, 2020) and the Wildlife protection and response plan (AEM, 2019e).

The purpose of the TEMMP is to collect date from wildlife and vegetation monitoring programs, and to describe natural variation and potential mine-related changes in wildlife populations within and adjacent to the Mine. The scope of the TEMMP annual report is to report on monitoring of the Project during construction, operation, maintenance, reclamation, and closure. The TEMMP is a requirement of the Meliadine Project Certificate no.006.

Wildlife monitoring is an essential tool in protecting and maintaining wildlife in the vicinity of the Project. A comprehensive monitoring strategy has been implemented and, as required, is adapted to meet the objectives of the management strategy and methods set out in the TEMMP (Golder, 2015). Monitoring programs evaluate the effectiveness of mitigation measures and assess Project-related impact predictions. For all wildlife monitoring programs there is a certain level of uncertainty or unpredictability; therefore, residual effects identified during monitoring may require implementation of adaptive management strategies (Golder, 2019b, 2020).

Agnico Eagle has established several wildlife monitoring programs that involve collaborations with regional initiatives and community members and contribute to monitoring cumulative effects. These include caribou collar program, regional muskoxen surveys, hunter harvest program, raptor monitoring program, waterfowl and shorebird monitoring and wildlife surveys.

As presented in the Wildlife protection and response plan (AEM, 2019e), mitigation measures and monitoring initiatives to lessen the likelihood that wildlife will become habituated to the Meliadine site and its infrastructures. Measures are defined to deter wildlife from obtaining camp food waste, finding shelter around the site, gaining access to harmful substances present on the project site, being injured as a result of vehicle collisions, and damaging mine property. Despite these mitigation measures, personnel may occasionally come in contact with wildlife that inhabits the Meliadine area. Incidents must be managed to keep both humans and wildlife safe while using only humane control methods (AEM, 2019e).

As explained in the annual report (AEM, 2019a, 2020a), all observations, problematic interactions, wildlife surveys conducted weekly along the AWAR, caribou migration, operation shut downs related to caribou migration, aerial observations when helicopters are active, onsite audits (i.e for wildlife attractants) conducted by third parties, and mitigation actions taken following problematic issues are reported in the monthly report and to the Government of Nunavut, the Kangiqliniq Hunters and Trappers Organization and Kivalliq Inuit Association.

3.5 Social Environment

The Kivalliq region is sparsely populated. It is part of the Inuit homeland and Inuit form over 80% of the population. Recently, Rankin Inlet and Baker Lake have been experiencing population growth. Rankin Inlet has a lower percentage of Inuit residents, and higher incomes. Much of the economy in the Kivalliq region is based on subsistence hunting, trapping and fishing. Mineral exploration and mining activities as well as construction, tourism and government services are the other principal activities (AEM, 2014, Volume 1).

3.5.1 Traditional Activities

The maintenance of traditional culture is an important component of Inuit wellbeing. Traditional culture gives people identity and protects more vulnerable people by providing food and other assistance. Traditional celebrations demonstrate recognition and emotional support for people’s achievements. Family and community ties are maintained through the sharing of country food. The benefits of country foods were attributed to nutritional health and physical fitness, teaching younger generations traditional skills, and local concepts of responsibilities. Activity on the land, such as hunting and fishing, keeps skills alive and reinforces Inuit values, for example, environmental protection, cooperation, resourcefulness, and providing for others.

Caribou are an important part of Inuit life, providing food, fuel (from caribou fat), and materials for clothing, tools and traditional crafts. Other animals important to the communities of Rankin Inlet, Chesterfield Inlet, and Whale Cove include fur bearing species such as foxes, wolves, wolverines and polar bears and marine mammals, such as seals and beluga whales. Birds and bird eggs are also important. In times when caribou were unavailable, these species provided important sources of food and materials to the Inuit. Polar bears and marine mammals provide sources of food and materials supplementary to caribou. Meliadine Lake is an important lake for fishing for residents of Rankin Inlet. Traditional plants, such as berries, are collected throughout the RSA for food and medicine.

It has been difficult for people to adjust to southern cultural influences in light of differing cultural values. Some people may feel that their social obligations interfere with their goals for advancement in the new economic environment. People also speak about the misunderstanding between generations that has come with the introduction of southern people values and material goods. Some elders feel that traditional culture is losing strength in the young. Most of the young say that they are close to their families, respect their elders, and respect their culture. Traditional life also meant people had clear gender roles. However, men find it hard now to provide for their families if they don’t have work or money to go on the land. It may be easier for women whom are typically the primary caregivers to children.

Although Inuit no longer live entirely off the land and their culture has changed, people have maintained their language over the last decade. Studies show that there is strong commitment to Inuktitut and most people feel they speak it well. People say, however, that many children are using English more now than they did in the past. Managing cultural influences, particularly from the south, will continue to be important for the retention of traditional Inuit culture (AEM, 2014, Volume 1).

3.5.2 Inuit Qaujimajatuqangit (IQ)

Traditional knowledge of the existing conditions is included in baseline reports or environmental setting portions of the FEIS. The Inuit Qaujimajatuqangit (IQ) collected on the Project included knowledge on the existing condition, Project impact concerns, and recommendations for the Project. Knowledge of the existing conditions is included in baseline reports or environmental setting portions of the Final Environmental Impact Statement. Concerns on the various Project impacts are included as part of the effects assessments and recommendations are considered when developing mitigation and monitoring plans.

3.5.3 Cultural, Archaeological and Paleontological Resources

Archaeological sites within the Project area span approximately 3,500 years of occupation of the Barrenlands. The oldest sites are associated with the early Arctic Small Tool tradition or Pre-Dorset. Predominately the sites within the local Project area are associated with Thule or Caribou Inuit. Most of the sites contain tent rings, caches, and hunting blinds and are associated with summer and autumn activities.

There are 52 sites within the proposed mine infrastructure, 43 within the Phase 2 AWAR, and 3 associated with the bypass road. In total, 34 sites are within the immediate Project footprint and will be impacted. Thirty-one of these sites have been mitigated and Agnico Eagle is committed to mitigating the remaining 3. All sites impacted by the Project have been mitigated using standard archaeological methods to document the sites.

The level of documentation is appropriate for the site significance. The documentation of the site preserved the information and therefore the residual impact to the archaeological record is considered minor (AEM, 2014, Volume 1).

4.0 Project Description

4.1 Location and Access

The mine site of the Project is in the Kivalliq region, Nunavut, approximately 30 km south of Rankin Inlet (coordinates 62°48’35’’N; 092°05’58’’W) and 80 km southwest of Chesterfield, as shown in Figure 2-1. Rankin Inlet is the regional centre and the largest community of the Kivalliq region, and the second-most populated community in Nunavut behind the capital of Iqaluit. The mine is located on Inuit Owned Lands and, as such, land and environmental management are generally governed by the provisions of the Nunavut Land Claims Agreement.

The Project involves pre-development, construction, operation, and closure, including decommissioning and the rehabilitation of a conventional gold mine.

The Meliadine property is divided as Meliadine West property and Meliadine East property. These areas were divided geographically by the Meliadine Lake at 547500 E. Meliadine West contained Tiriganiaq, Wesmeg, Pump, F Zone, and Wolf deposits, whereas Meliadine East contained the Discovery deposits and other regional gold showings (AEM, 2015a).

The Tiriganiaq deposit is located at 63°01'3"N, 92°12'3"W (National Topographic Survey sheets 55/J, N, and O). Mineral tenure covers 80,223 hectares of which 76,793 ha are held under the Canada Mining Regulations and administered by CIRNAC (Crown-Indigenous Relations and Northern Affairs Canada, formerly AANDC) and are referred to as Crown Land. The Crown Land is made up of mining claims covering 25,507 ha and mineral leases covering 51,286 ha. There are also 3,430 ha of subsurface Nunavut Tunngavik Inc. concessions administered by a division of the Nunavut territorial government (AEM, 2015a).

The mine site access is by plane via the Rankin Inlet airport. Meliadine Mine relies on marine transportation to the harbor at Itivia in Rankin Inlet via Hudson Bay for most of its supplies including fuel, construction and operation equipment, materials and consumables, including dangerous goods, food, household goods and other non-perishable supplies. The AWAR provides year-round access between Rankin Inlet and the Project site.

4.2 Site History

Multiple companies were involved in the exploration of Meliadine resources in the early 1970’s. Historically, the Meliadine property was divided as Meliadine West property and Meliadine East property. These areas were divided geographically by the Meliadine Lake at 547500 E. Meliadine West contained Tiriganiaq, Wesmeg, Pump, F Zone, and Wolf deposits, whereas Meliadine East contained the Discovery deposits and other regional gold showings (AEM, 2015a, 2015c). Exploration activities (mostly Meliadine West) by operators are summarized in Table 4-1.

The Project moved from an exploration project to an advanced exploration project starting in 2007 when an underground exploration and bulk sample program was advanced for the first time. In late 2010, Agnico

Eagle announced that it planned to accelerate the pace of advanced exploration at the Meliadine West property given the encouraging drilling results. Agnico Eagle subsequently reopened the underground decline and advanced a second bulk sample from underground in 2011, increased the number of operating diamond drills, and modified and expanded the exploration camp and associated facilities (sewage treatment, potable water treatment, power generation, etc.) to allow exploration to continue year-round. Exploration continued during the environmental assessment. Diamond-drilling was required to better define existing mineral resources and to find new resources on the minerals claims. In 2011, condemnation drilling was required to confirm that the mine buildings and other infrastructure were not planned on top of potential new ore zones (AEM, 2015c).

The Project is 100% owned by Agnico Eagle following acquisition of Comaplex Mines Corporation (Comaplex) on July 6th, 2010. Presently, there are no properties adjacent to the Project that has any influence on the Project.

The construction phase started in the last quarter of 2015 and has taken about 3.5 years, ending in 2019. The mine construction period focused primarily on-site preparation and the construction of infrastructure, with some mining activities (advancement of the mine ramp) occurring at the Tiriganiaq underground mine. Operation started after commissioning was completed at the end of Q2 2019. The operation phase will span over approximately 8.5 years (Q2 2019 to 2027) (AEM, 2020c).

The Nunavut Impact Review Board issued a Project Certificate no.006 in February 2015 (amended in February 2019), setting out the terms on which the Meliadine project could proceed. In March 2017, Agnico Eagle and the Kivalliq Inuit Association (KIA) signed the Inuit Impact Benefit Agreement (IIBA) for the Meliadine Mine. Through the agreement, both Agnico Eagle and the KIA are intent on ensuring that business opportunities, employment and training opportunities arising from this mine will benefit the Inuit of the Kivalliq Region. Agnico Eagle was granted a Type A Water Licence 2AM-MEL1631 in April 2016.

Agnico Eagle will proceed, starting at the end of July 2020, to the Amendment process of the Meliadine Water Licence 2AM-MEL1631. The general purpose of the Meliadine ICRP 2020 is to update the interim closure and reclamation plan produced for the development phase of the Project, including the activities part of the Meliadine Water Licence Amendment, which are approved in the Meliadine FEIS and in the NIRB Project Certificate 006 (NIRB, 2019).

Table 4-1 : Summary of 1987 to 2013 Exploration Works on Meliadine Property

Year	Operator	Exploration Activities and Highlights
1987	Asamera	Investigation of gold occurrence at Tonic Lake Sample of quartz vein with arsenopyrite of 5 g/t Au
1989	Asamera/Comaplex (50%-50% JV)	Follow-up on the 5 g/t sample along strike of the iron formation Discovery deposit identified with chip sample grades of up to 4.4 g/t Au over 4 m
1990	Asamera/Comaplex (50%-50% JV)	Total of 112 m of channel sampling and 15 diamond drill holes on Discovery deposit Airborne geophysical surveys on Meliadine East
1991	Rio Algom Inc. (60 % JV on Meliadine West)	Drilling on Meliadine West Airborne survey and boulder sampling on Meliadine West where 75 boulders assayed greater than 34 g/t Au
1992	Asamera/Comaplex (50%-50% JV)	Drilling on Meliadine West (Pump and Wolf deposits)
1993 to 1994	Comaplex/Cumberland (50%-50% JV)	Drilling on Meliadine West Discovery of the Tiriganiaq deposit (11.3 g/t Au over 2.2 m), F Zone and Pump deposits
1995	Western Mining Corporation (WMC)	Drilling
1996	WMC	Drilling
1997	WMC	Mapping, geochemical and geophysical exploration Drilling at Pump, F Zone, Tiriganiaq, Wolf and regional targets Ground magnetic and IP surveys
1998	WMC	Drilling at Pump, F Zone, Wolf and Tiriganiaq Ground magnetic survey
1999	WMC	Drilling at Tiriganiaq, F Zone and Discovery
2000	WMC	Drilling at Tiriganiaq and exploration targets within the Meliadine West property
2001 to 2002	WMC	Aeromagnetic surveys
2003	WMC	Drilling exclusively on Tiriganiaq
2004	Comaplex Minerals Corp.	Drilling on Meliadine West Best assay results were as high as 153.5 g/t Au over 20.2 m (uncut) on Tiriganiaq
2010	Agnico Eagle	Acquisition of Meliadine Project
2011	Agnico Eagle	Bulk sampling program of Meliadine East and West
2012	Agnico Eagle	Drilling Tiriganiaq, Discovery, F Zone, Pump, and Wesmeg
2013	Agnico Eagle	Tiriganiaq drilling: 14,608 m in 44 exploration and conversion holes were completed. A total of 72,322 m in 339 drill holes was drilled on the entire Meliadine property during the 2013 campaign

Source: AEM, 2015a

4.2.1 Project Alternatives

During the study phase, alternatives to Project components and activities were assessed by Agnico Eagle. The Project alternative description presented below is extracted from the Main Application Document for the Type A Water Licence (AEM, 2015c). The alternatives were defined using the following criteria: technical feasibility, economic viability, environmental acceptability, community preference, social acceptability, and reclamation and closure. Select mine components can be constructed in different locations or operated differently, and activities can be completed or achieved in different ways; therefore, alternatives were evaluated and rated using the above referenced criteria.

The alternative assessment approach employed by Agnico Eagle recognizes that community preferences are important, and that positive and negative effects on valued components of the ecosystemic and socio-economic environments must be carefully weighed in selecting the preferred alternative. The process gave due consideration to the vulnerability of the Arctic ecosystem, the potential for extension of the mine life, reclamation and closure, and potential for cumulative effects.

Agnico Eagle completed an explicit analysis of all the reasonable identified means of carrying out the Project components or activities, including the "no-go" alternative. The alternatives analysis is summarized here but was presented in more detail in the FEIS (AEM, 2014). Project alternatives analyzed included the following:

- the marine shipping route for fuel and dry cargo;
- access road alternatives – community bypass road alignment;
- AWAR – restricted or unrestricted use by public;
- use of the Rankin Inlet airport or build airstrip on-site;
- use of Itivia or a private port;
- production rate and mining methods – open pit versus underground mining;
- location of mill complex and associated infrastructure;
- alternatives to on-site processing of ore;
- alternate road access to deposits;
- location of main fuel storage tank farm;
- power generation – power plant location, fuel transportation, choice of generating
- equipment, fuel choice, wind energy, solar, thermal energy, and hydroelectric;
- location and transport technology type for TSF;
- form of mill tailings generated – slurry, thickened, or filtered;
- alternatives to using cyanide in the mill process;
- waste rock/overburden storage alternatives;
- waste management and disposal alternatives;

- site water treatment alternatives;
- salt water management for underground water (including concentrated brine disposal options);
- mine dewatering alternatives;
- closure and reclamation alternatives;
- hiring point for work force; and
- "no-go" alternative.

4.3 Site Geology and mining methods

The information as presented below is extracted from the Agnico Eagle website and from the Meliadine Project Technical Report (AEM, 2015b).

The Meliadine mine is located near the western shore of Hudson Bay in the Kivalliq District of Nunavut and includes seven (7) gold deposits, six (6) of which are part of the current mine plan. The 111,357-hectare property covers an 80-kilometre-long greenstone belt. The Figure 4-1 presents the area of the project including the claims, leases and subsurface Nunavut Tunngavik Incorporated ("NTI") concessions. The current mineral reserves are mainly in the Tiriganiaq deposit at underground and open pit depths, and consist of 4.067 million ounces of gold in proven and probable reserves (20.75 Mt at 6.1 g/t) as of December 31, 2019 (AEM website, Mineral reserves).

Commercial production began at Meliadine in mid-May 2019. The mine produced 191,113 ounces gold in 2019. The Company anticipates that mining at Meliadine will be carried out through several underground mining operations and open pits over a 14-year mine life. There are numerous opportunities to create additional value at Meliadine, both at the mine and on the large regional land package (AEM website).

Archean volcanic and sedimentary rocks of the Rankin Inlet greenstone belt underlie the property. The rock layers have been folded, sheared and metamorphosed. They trend west-northwest, dip steeply to the north, and have been overturned. The rock units are truncated by the Pyke Fault, a regional structure that extends the entire 80-km length of the property (AEM website).

The Pyke Fault and associated secondary structures (i.e., the Lower Fault) appear to control gold mineralization on the property. Along the fault is a series of oxide iron formations that host six (6) of the seven (7) Meliadine mine deposits currently known. The deposits consist of multiple lodes of mesothermal quartz-vein stockwork, laminated veins and sulphidized iron formation mineralization. The northern, magnetite-rich Upper Oxide iron formation hosts the Tiriganiaq zone, the largest deposit to date with a strike length of approximately 3.0 km at surface and a known depth of 800 m, as well as the Wolf North and Discovery zones. The southern, weakly magnetic Lower Lean iron formations contain the F Zone, Pump, Wolf Main and Wesmeg deposits. Normeg is hosted by mafic volcanics and is located between the Wesmeg and Tiriganiaq zones (AEM website).

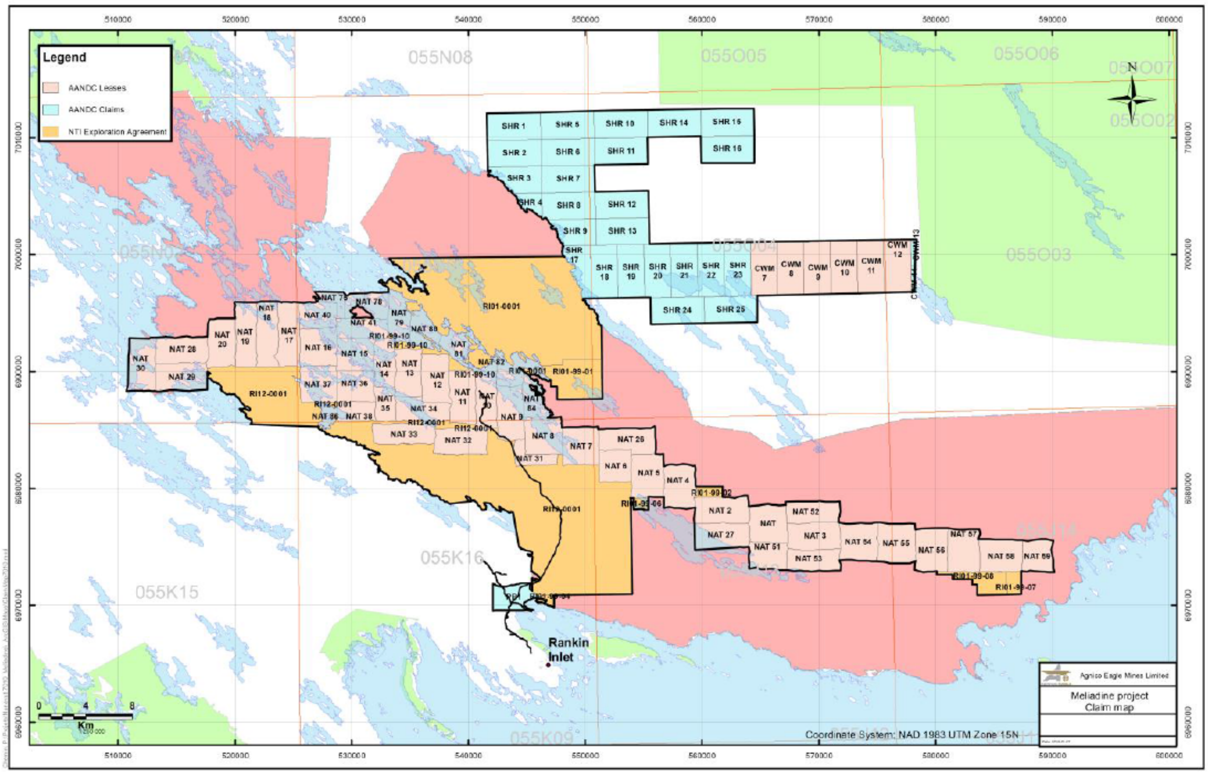
The deposits are all within 5 km of Tiriganiaq except for Discovery, which is 17 km east-southeast of Tiriganiaq. Each of these deposits has mineralization within 120 m of surface, making them potentially mineable by open pit methods. They also have deeper mineralization that could potentially be mined with underground methods, which are currently being considered in various studies (AEM website).

The **Appendix J** presents the regional and local geology maps for Meliadine. The Tiriganiaq-Westmeg-Nortmeg schematic geological cross-section and the Tiriganiaq composite longitudinal section are also presented.

The current plan is to mine the Tiriganiaq deposit, including the Wesmeg 650, lode from two (2) open pits and an underground mine (AEM, 2015b). At the end of operations, the Tiriganiaq Pit 1 will be approximately 150 m deep with a footprint area of 26.6 ha, and Tiriganiaq Pit 2 will be approximately 100 m deep with a footprint area of 8.3 ha. Figure 4-2 presents the Tiriganiaq open pit looking north.

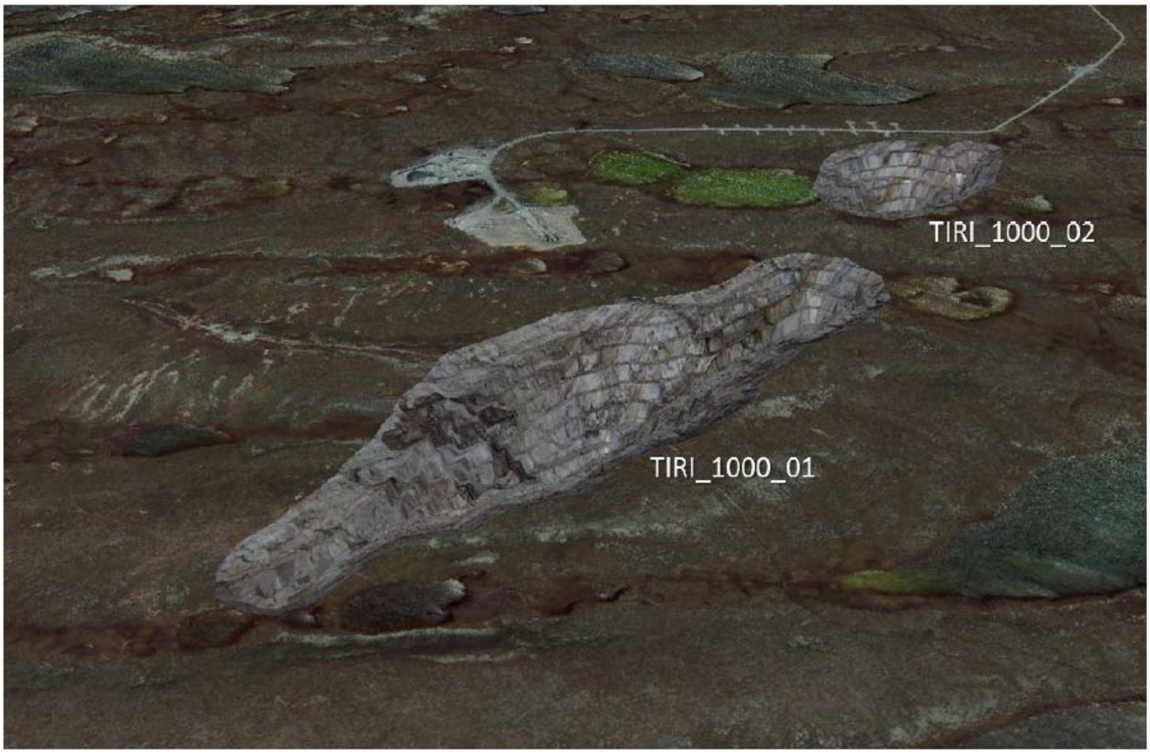
As presented in the Meliadine Project Technical Report (AEM, 2015b), the current Tiriganiaq underground reserves lie between 100 m and 650 m below surface. The main underground mine plan consists of 23 levels (level 100 through level 650) set at 25-m intervals. Figure 4-3 presents the Tiriganiaq underground mine looking south.

Figure 4-1 : Meliadine project claims, leases and concessions as of December 31, 2014



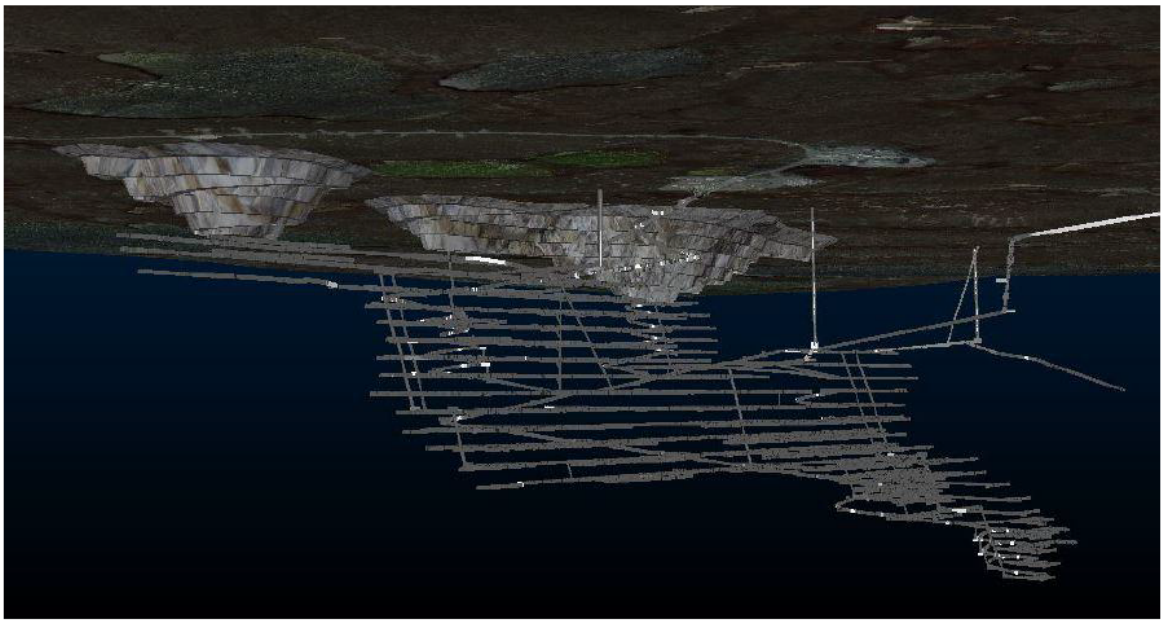
Source: (AEM, 2015b)

Figure 4-2 : Tiriganiaq open pit looking North



Source: (AEM, 2015b)

Figure 4-3 : Tiriganiaq underground mine looking South



Source: (AEM, 2015b)

4.4 Project Summary

The Project is composed of the following known gold deposits: Tiriganiaq, F Zone, Pump, Wesmeg, and Discovery. Agnico Eagle will develop these deposits in a phased approach to allow production to commence while ongoing exploration continues to increase the known ore reserve. The initial phase of development focuses on the ore is being sourced entirely from underground. In the second phase, the ore will be sourced from both the underground and open pits.

The area that will be disturbed during construction and operation for the proposed Project is approximately 453 ha including off-site facilities in Rankin Inlet. At closure, 418 ha will be reclaimed, including off-site facilities, while approximately 35 ha will not be reclaimed. Non-reclaimed land is associated with residual disturbances derived from the flooded open pits (AEM, 2015a). In addition, roads to the different deposits will be constructed upon approval, which will be reclaimed following roads decommissioning.

4.4.1 Project Mine Plan

Meliadine operations started after commissioning was completed at the end of the second quarter of 2019 and will span approximately over 8.5 years (Q2 2019 to 2027). Mining activities are expected to end in Year 7 (2026) and ore processing is expected to end in Year 8 (2027). Closure will occur within three years (Year 9 to Year 11) (2028 to 2030) after the completion of mining and will mainly include the removal of non-essential site infrastructure and equipment. The post-closure phase will commence as active closure is completed in Year 11 (2030) and will continue until Year 18 (2037) or until it is shown that the site and water quality meet all the regulatory closure objectives.

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed. The Mine is expected to produce approximately 15.4 Mt of ore, 31.4 Mt of waste rock, 7.0 Mt of overburden waste, and 15.4 Mt of tailings (AEM, 2020c).

The following mining development sequence is planned (AEM, 2020c):

- Tiriganiaq underground mine will be developed and operated from Year -5 (2015) to Year 7 (2026);
- Tiriganiaq Pit 1 will be mined from Year 2 (2021) to Year 7 (2026); and

  Tiriganiaq Pit 2 will be mined from Year 1 (2020) to Year 3 (2022).

In 2018, the Meliadine Mine was still in the construction phase, developing the underground in preparation to operate the Tiriganiaq underground mine. A total of 688,069 t of waste was excavated, 3,134 t was used as underground backfill and the rest was used for construction purposes. A total of 39,216 t of marginal and 60,846 t of ore was excavated and stored at the surface ore pad (AEM, 2019a).

In 2019, the Meliadine Gold Mine began commercial gold production on May 14th, 2019. A total of 482,736 t of waste rock was excavated from underground and 236,219 t of waste rock was excavated from Tiriganiaq Pit 2. A total of 90,024 t of waste rock was used as underground backfill, 141,154 t was used as TSF closure cover and the rest was used for construction purposes. A total of 1,108,666 t of ore was mined (AEM, 2020c).

Table 4-2 summarizes the schedule and quantities to be mined from the open pit and underground mining operations. The usage or destination of the three (3) mine waste materials (waste rock, tailings and overburden) is presented in Table 4-3. The production schedule, quantities, and distribution of waste rock by year is presented in Table 4-4.

Table 4-2: Summary of the Mine Production Schedule

Year	Mine Year	Mine Waste and Ore from Underground (t)		Mine Waste and Ore from Tiriganiaq Pit 1 (t)			Mine Waste and Ore from Tiriganiaq Pit 2 (t)		
		Waste Rock	Ore	Overburden	Waste Rock	Ore	Overburden	Waste Rock	Ore
2019	Yr-1	482,736	1,108,666	334,383*	--	--	77,301	236,219	--
2020	Yr1	871,289	1,392,153	238,208	853,138	1,183	554,928	2,772,255	128,238
2021	Yr2	705,814	1,560,327	1,959,165	159,028	46,388	--	2,50,994	143,042
2022	Yr3	734,254	1,542,547	1,644,159	2,583,128	558,777	--	230,031	264,851
2023	Yr4	766,156	1,516,664	2,020,044	2,733,105	415,189	--	--	--
2024	Yr5	805,326	1,486,178	130,110	6,171,994	735,511	--	--	--
2025	Yr6	541,685	1,453,224	--	4,946,761	944,834	--	--	--
2026	Yr7	332,451	1,503,865	--	3,220,643	600,057	--	--	--
2027	Yr8	5,006	--	--	--	--	--	--	--
Total (t)		**5,244,718**	**11,563,624**	**6,326,068**	**20,667,797**	**3,301,939**	**632,230**	**5,489,498**	**536,131**

** Includes approximately 142,446 of overburden from various excavation work constructed 2016-2018 (CP3, CP4, SP2 etc.)*

Source: (AEM, 2020c)

Table 4-3 : Summary of the Mine Waste Quantities and Destination

Mine Waste Stream	Estimated Quantities		Waste Destination
Overburden	7.0 Mt		Temporary storage in the Overburden Stockpile ~ 0.1 Mt for reclamation of TSF
			Closure and site reclamation for the TSF
			Co-disposed with waste rock within WRSFs
Waste Rock	31.4 Mt		Infrastructure construction (surface and underground)
			WRSFs (i.e., WRSF1 and WRSF3)
			Closure and site reclamation for the TSF
Tailings	15.4 Mt	10.9 Mt	As dry stack tailings placed in the TSF
		4.5 Mt	Used in underground mine as cemented paste backfill

Source: (AEM, 2020c)

Table 4-4 : Schedule, Quantities, and Distribution of Waste Rock by Year

Year	Mine Year	Total Waste Rock from Mine Operation (t)	Utilization of Waste Rock (t)			Waste Rock to be Placed in WRSFs(t)	
			Surface Construction/ Thermal Protection	Rockfill for Underground Backfill	TSF Closure Cover	WRSF1	WRSF3
2019	Yr -1	718,955	355,753	90,024	141,154	--	--
2020	Yr 1	4,496,682	933,341	353,880	192,926	244,280	2,772,255
2021	Yr 2	3,115,835	977,039	457,130	188,949	--	1,492,717
2022	Yr 3	3,547,414	100,000	425,235	166,920	2,625,228	230,031
2023	Yr 4	3,499,261	922,281	361,568	229,319	1,916,093	--
2024	Yr 5	6,977,320	220,831	437,801	538,419	1,753,283	4,026,986
2025	Yr 6	5,488,446	262,505	433,045	277,896	--	3,706,341
2026	Yr 7	3,553,094	100,000	416,418	245,524	--	--
2027	Yr 8	0	100,000	316,672	99,050	--	--
2028	Yr 9	0	100,000	313,388	453,339	--	--
	Total (t)	**31,402,013**	**4,141,751**	**3,605,160**	**2,533,496**	**6,538,884**	**12,228,330**
	Volume (m^3)	**16,703,198**	**2,203,059**	**1,917,638**	**1,347,604**	**3,478,130**	**6,504,431**

Source: (AEM, 2020c)

4.4.2 Project Facilities

This section presents list of all facilities require to support the mining operation at the Meliadine site and in Rankin Inlet. The detail description of the facilities is presented in section 5.0. The Figure 4-4 shows the current and planned main infrastructures at the Meliadine site. The Figure 4-5 presents the main infrastructures in Rankin Inlet. The AWAR and the Bypass road are presented on Figure 5-1 and Figure 5-2 of the next section.

Existing infrastructure has been developed from previous bulk sampling programs, which were completed in the 2008 by Comaplex and 2011 by Agnico Eagle. The pre-existing site infrastructure is regulated by the NWB under the Water Licence 2BE-MEP1318 (Meliadine East Project) (expires 2018-10-31) and the Water Licence 2BW-MEL1215 (expires 2015-05-31). The existing facilities at the Project site, which are also covered in this ICRP, include:

- An exploration camp, located on the shore of Meliadine Lake, approximately 2.3 km north-east of the Tiriganiaq deposit;
- An underground portal; and

- A core shack and storage building remaining from a previous exploration camp (Meliadine East; the decommissioning of the Meliadine East camp on Atulik Lake began during the summer of 2010 and was completed by spring 2011).

The infrastructures of the Project located directly at the Meliadine site are listed below:

- An underground mine (Tiriganiaq Underground), including an underground total suspended solids (TSS) removal plant;
- Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2);
- A mineral processing facility, which includes a crusher plant, process plant, and paste backfill plant;
- Two (2) waste rock storage facilities (WRSFs);
- A tailings storage facility (TSF);
- Sewage treatment plant (STP);
- Water treatment systems;
- Supporting infrastructure, including gated access, emulsion plant and storage facility, potable water treatment plant, permanent camp, maintenance and on-site storage areas, power plant, fuel storage, incinerator, landfill, landfarm, water management system, water intake and diffuser, a temporary overburden stockpile and ore stockpile facilities and laydown area facilities;
- Transportation routes on site including internal access and haul roads;
- Roads to future operation area (deposits), included in the Meliadine FEIS;
- All Weather Access Road (AWAR);
- Quarries and borrow pits.

The Rankin Inlet Site Facilities are located about 30 km south of the mine site. The Rankin Inlet facilities act as a transfer point and temporary storage for all dry freight and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR. The infrastructures present in Rankin Inlet that belong to the Meliadine Mine are:

- Fuel storage facility;
- Laydown and material storage area;
- Barge structure;
- Saline effluent pipeline and diffuser for saline trucked water at Itivia;
- Waterline for treated groundwater effluent discharge into marine environment;
- Bypass road around the hamlet of Rankin Inlet, and AWAR.

Figure 4-4: Meliadine Infrastructure General Map

Source: Provided by AEM

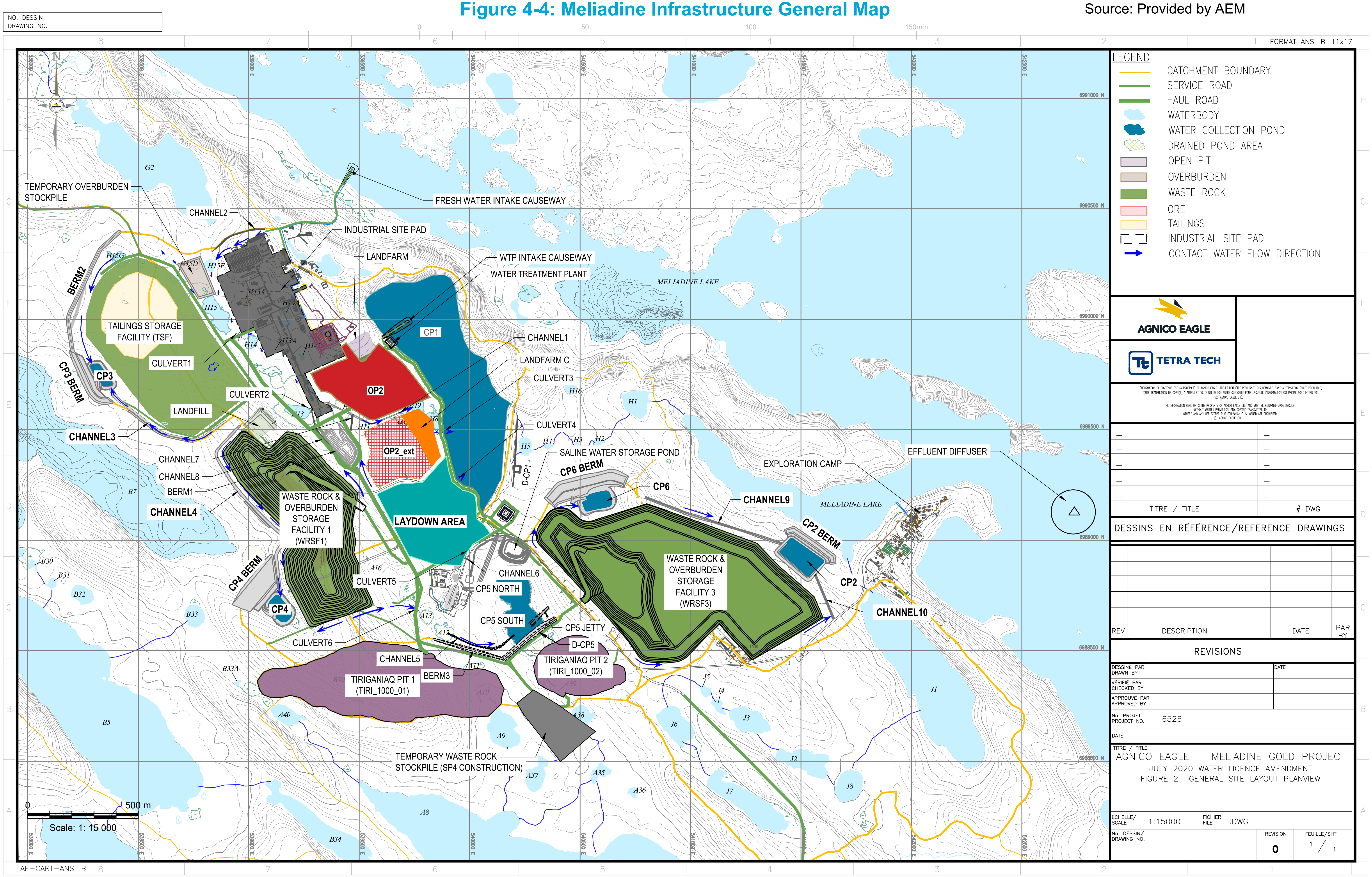
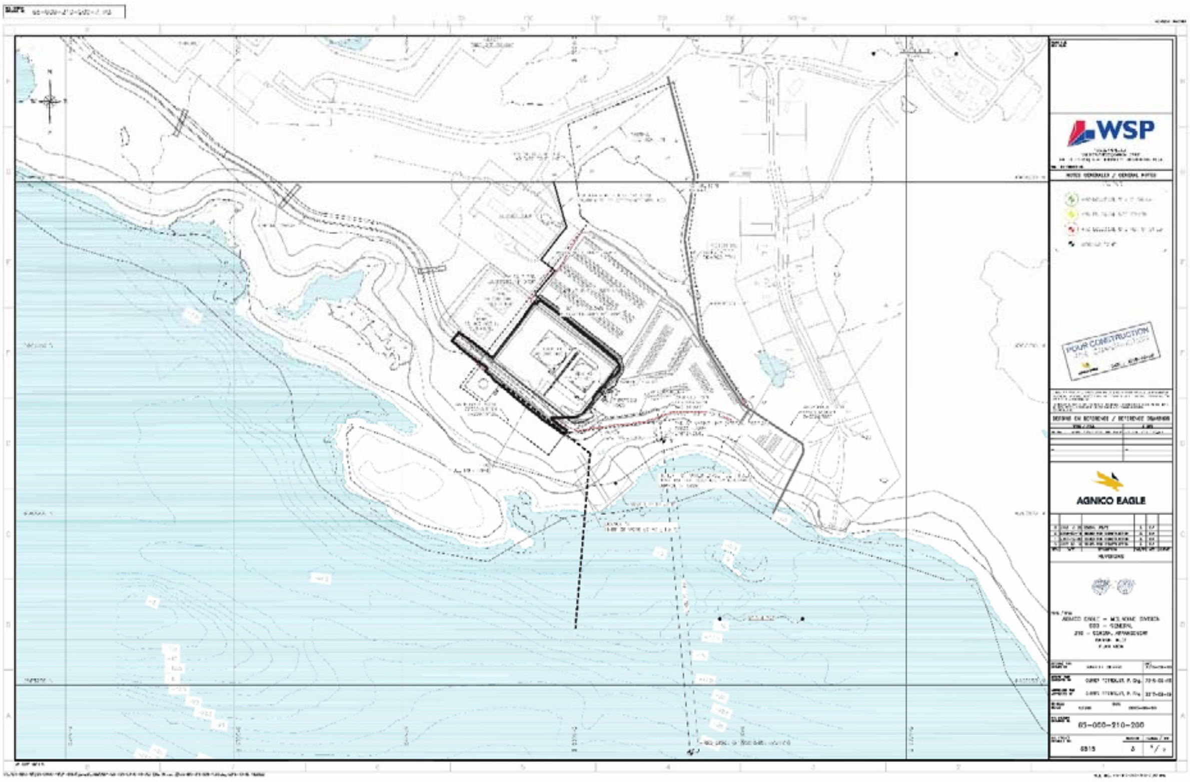


Figure 4-5 : Rankin Inlet Infrastructure General Map



5.0 Permanent Closure and Reclamation

5.1 Definition of Permanent Closure and Reclamation

Permanent closure is defined as the final closure of a mine site with no foreseeable intent by the existing proponent to return to either active exploration or mining. Permanent closure indicates that the proponent intends to have no further activity on the site aside from post-closure monitoring and potential contingency actions. Permanent closure does not, however, preclude the proponent or another party from pursuing opportunities at the existing site or in the area at a time beyond the foreseeable future (AANDC/ MVLWB, 2013).

5.2 Permanent Closure and Reclamation Requirements

This section provides the permanent closure and reclamation requirements for each individual component of the Project. The components are categorized in sub-sections for clarity. The specified closure objectives may be revised with subsequent updates to the Interim Closure and Reclamation Plan but are considered reasonable at this time to guide the advancement of closure planning.

The details presented herein for each mine component were extracted from the main documents listed below:

- Final Environmental Impact Statement, Volume 1 to 10 (AEM, 2014);
- Meliadine Preliminary Closure and Reclamation Plan (AEM, 2015a);
- Meliadine Interim Closure and Reclamation Plan 2019 (SLI, 2019);
- Updated Technical Report on the Meliadine Gold Project (AEM, 2015b);
- Type A Water Licence Main Application Document (AEM, 2015c);
- Air Quality Monitoring Plan (AEM, 2020e);
- Meliadine Incinerator Design Report and Drawings (AEM, 2017);
- Hazardous Materials Management Plan (AEM, 2018);
- Meliadine Annual Report 2018 (AEM, 2019a) and 2019 (AEM, 2020a);
- Meliadine Water Management Plan (AEM, 2020b);
- Meliadine Mine Waste Management Plan (AEM, 2020c);
- Meliadine Roads Management Plan (AEM, 2019b);
- Water Quality and Flow Monitoring Plan (AEM, 2019c);
- Groundwater Management Plan (AEM, 2020d);
- Metal Leaching and Acid Rock Drainage Monitoring Report (AEM, 2019d, 2020h);
- Wildlife protection and response plan (AEM, 2019e);

- Landfill and Waste Management Plan AEM (2019g);
- Landfarm Management Plan (AEM, 2019h);
- Design report for Itivia laydown area culvert (Tetra Tech, 2017a);
- Design Report for Operation Landfill (Stage 1), Meliadine Gold Project (Tetra Tech, 2017b);
- Construction summary (as-built) report for landfarm (Tetra Tech, 2018);
- Construction summary report for Rankin Inlet bypass road and culverts (Tetra Tech, 2019);
- Prefeasibility Level Design-WRSF3 & Water Management Infrastructure (Tetra Tech, 2020);
- Meliadine Gold Mine - FEIS Addendum Environmental Assessment of Treated Groundwater Effluent Discharge into Marine Environment (AEM, 2020g);
- Reclamation Work and Costs – Waterline for Treated Groundwater Effluent Discharge (SLI, 2020a);
- Main Application Document, Type A Water Licence 2AM-MEL1631 Amendment (AEM, 2020i);
- Application for Water Licence Amendment, Nunavut Water Board (AEM, 2020j).

5.2.1 Rankin Inlet Facilities

5.2.1.1 Description of the components

Rankin Inlet facilities are located mainly in the Itivia area as presented on Figure 4-5. This is the transfer point and temporary storage for all dry shipment and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR. Rankin Inlet Facilities are listed below:

- Floating Dock: A floating dock facility (spud barge) dedicated to the Project located at Itivia. This floating dock consists of a barge that is connected by cables to the shore, while the other end is anchored in place by two (2) "spuds" onto the seabed, which allow the barge to rise and fall with the tides. The barge is connected to the shore using a ramp or removable bridge section. A portable crane (capacity of about 200 t) is set up on the floating dock and used to lift the sea cans and other containers and equipment directly off the delivery barges and place them onto trucks. The gateway to link the barge to the beach is approximately about 6.5 m wide by 21 m long. The ship(s) will be located offshore in deep water (approximately 3 km from Itivia) where they will be offloaded onto barges for the transport of materials to the Itivia laydown area. Sea cans, large equipment, machinery, and vehicles are placed onto the barges for transport through the access passage using tugs before being docked alongside the floating dock located at Itivia.
- Dry Freight Storage Facility: A fenced-in laydown area is located near the offloading barge to store the material being received during the barge season. An area of approximately 6.68 ha is established to act as a laydown yard for the incoming freight. The 6.68 ha laydown is backfilled with crushed rock with a total excavation of approximately 42,000 m³ (AEM, 2014, Volume 1). The culvert under Itivia laydown area road are a group of 2 pipes, length of 30 m each and diameter of 900 mm (Tetra Tech, 2017a).

- Bulk Fuel Storage Facilities: The Itivia oil handling facility including the fuel tank farm is located fairly close to the barge landing and within an area of about 114,200 m^2. The tank farm includes two (2) diesel fuel storage tanks of 20 ML and 13.5 ML and one 4 ML tank, for a total capacity of up to 37.5 ML of diesel fuel. Fuel is pumped from the barges to the storage tanks (AEM, 2014, Volume 1).
- Water and Power Management: Water accumulation within the berms lined with geomembrane surrounding the Bulk Fuel Storage Facilities has to be managed as it is release to the environment. Power for facilities is supplied by portable generators and yard lighting is provided by portable diesel-powered light towers.
- Saline Water Tank and Diffuser: The effluent discharge system consists of a truck discharge pump, a back-up discharge truck pump, a 100 000-litre storage tank, as well as suction, discharge pipelines and a diffuser. A pumping station including two (2) pumps is installed on the containment area. Treated saline water stored in SP3 will be hauled by tanker trucks to Itivia. Truck loads will be up to 36 m^3 per truck and will be unloaded using a flexible 4" HDPE suction pipe. The truck discharge pump will transfer the treated effluent into the 6'' discharge HDPE pipeline and through the diffuser. The truck discharge pump will also be used to transfer effluent into the storage tank until the next day before it is pumped into sea, when necessary (AEM, 2020d).
- Waterline for treated groundwater effluent discharge into marine environment: For groundwater management, Agnico Eagle is proposing, upon regulatory approval, to convey water through waterlines instead of trucking and releasing an increased volume of treated groundwater from Meliadine Mine into the ocean at Melvin Bay through a diffuser near Rankin Inlet. The groundwater will be treated at the mine in compliance to the water quality effluent guidelines for safe discharge in the ocean. The discharge of treated groundwater from the mine into Melvin Bay will occur every year during open water season (summer months from May to October), while there is mining activities at the Meliadine Mine. The waterline will be constructed along the AWAR and the bypass road. The proposed discharge volume of treated groundwater effluent to the ocean ranges from 6,000 to 12,000 m^3/day. The treated groundwater will be conveyed through two (2) waterlines (two (2) 16-inch diameter HDPE pipes) along the 34 km of the AWAR and 7 km of bypass road between Rankin Inlet and the Meliadine Mine. The waterlines will be located on the side of the roads and attached to the bridges. The proposed diffuser system will leave the Itivia Fuel Storage Facility through a Horizontal Directional Drilling (HDD) corridor before daylighting at a depth of 7m. The outfall will connect with the HDD section and terminate with a diffuser at 20 m depth in Melvin Bay. The diffuser system includes a 75 m length (diameter of 12-inch HDPE DR-11) of outfall and a 25 m length diffuser. The diffuser located into Melvin Bay is approximately 20 m below the water surface (AEM, 2020g).

Additional details for the saline water tank and the waterline for the treated groundwater effluent are available in section 5.2.7.

5.2.1.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are summarized in Section 3.0 of this plan.

The Meliadine facilities are currently in use and will be during the period of operation, until closure or post-closure.

As mentioned in the FEIS Addendum for the treated groundwater waterline (AEM, 2020g), for the most part, discharge into the ocean does not have much impact on the environment via waterlines from Meliadine Mine. Most effects from the Project related to the waterlines, such as discharge to the marine environment has been reviewed and approved. The waterlines will be built close to the road on the tundra, impacting the vegetation where the waterlines will lie. There is a possibility that the waterlines could spill on the tundra or into the ocean. The effluent is treated groundwater, with a quality similar to ocean water. Even if the waterline or diffuser had a leak, it would still be safe and Agnico Eagle would fix any leaks in the waterline and stop the spill (AEM, 2020g).

The facilities will be dismantled and reclaimed following best practices put in place during operation and in order to minimize long term disturbance and impact on the community. The facilities could also be transferred to the local community upon interest.

5.2.1.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Rankin Inlet Site facilities are listed in Table 5-1, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-1: Closure Objectives and Criteria – Rankin Inlet Facilities

Closure Objectives	Closure Criteria	Action / Measurements
Return area to its original state or to a condition compatible with the end land-use targets	Remove all facilities and restore natural/compatible terrain as much as possible	Dismantle and reclaim all infrastructure, fuel reservoirs, chemicals and industrial wastes Physical inspection to confirm removal
The systems are dismantled and removed/disposed of (i.e. waterlines, diffuser)	Remove all components above ground, under water or buried	Components or materials will be cleaned up and salvageable materials removed, shipped or disposed at the landfill Physical inspection to confirm removal
Infrastructure, equipment and storage area will not be a source of contamination to the environment or a safety hazard to humans and wildlife	Limit access during closure Remove all facilities and restore natural/compatible terrain as much as possible Remove all hazardous material	Place signs to limit access Dismantle and reclaim all infrastructure, fuel reservoirs and hazardous wastes Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in the pieces and buried Soil and water monitoring Physical inspection
Restore natural drainage patterns where surface infrastructure has been removed	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote natural drainage

Closure Objectives	Closure Criteria	Action / Measurements
Restore the area for natural use by wildlife or traditional use by the community	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote the use for wildlife and safe access for traditional activities
Consider community land use expectations and traditional knowledge	Community engagement and traditional knowledge will continue to be implemented in closure planning	Community engagement during closure planning

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Support infrastructure, such as fuel storage tanks, pipelines, conveyors and underground services, should be removed. (from R517).

5.2.1.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for Rankin Inlet facilities closure are provided by the AANDC/ MVLWB (AANDC/ MVLWB, 2013). Closure activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Recycling or reusing building materials and equipment where possible to reduce waste;
- Dismantle all buildings that are not necessary to achieve the future land use target;
- Drain, dismantle, and remove tanks and pipelines from the site;
- Cover foundations with materials conducive to vegetation growth;
- Where approved, break or perforate concrete floor slabs and walls to create a free draining condition in order that vegetation can be established;
- Bury materials in the unsaturated zone or below the active layer;
- Cut, shred, crush, or break demolition debris to minimize the void volume during disposal;
- Decontaminate equipment (free of any batteries, fuels, oils, or other deleterious substances) and reuse or sell it to local community interests;
- Remove all hazardous materials and chemicals prior to demolition to national approved hazardous material treatment facilities, or recycle, reuse, or dispose of in an appropriate manner upon approval from the regulatory authorities.

All the options listed above will be required to address closure and reclamation of the Rankin Inlet facilities belonging to the Project. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.1.5 Engineering Work Associated with Selected Closure Activity

At closure, it is planned to offer the infrastructures located in Rankin Inlet to local interests. If there is no local interest or agreement, the facilities and equipment will be decommissioned, dismantled and removed appropriately.

Agnico Eagle will return, if possible, the Rankin Inlet area where the facilities are located to pre-development conditions. The site may also be left in a semi-industrial condition if consistent with a different end land use agreed upon with regulators, the community of Rankin Inlet, and other local interest.

All remaining bulk fuel located at Itivia will first be cleaned and then removed and offered to local interests. Infrastructure, including floating dock and portable equipment will be emptied, and also offered for local use and/or relocation. In the case that there is no local interest for the tanks or remaining infrastructure and equipment, the infrastructure will be dismantled, decontaminated and demolition waste will be either transported to the mine site landfill disposal or barged out of Rankin Inlet to a southern waste disposal, recycling facility or sale for scrap metal.

At closure, scarification of all disturbed areas, including storage pads and roads, is planned to loosen the compacted material to promote surface drainage. Areas will be profiled, and water management structures will be removed from the roadways to re-establish natural drainage patterns.

The saline water tank and diffuser for trucked groundwater will be decommissioned, dismantled and removed as appropriate. The pump, piping, tanks and other components will be either transported to the mine site landfill disposal or barged out of Rankin Inlet.

During mine closure, the waterline system for treated groundwater discharge will be decommissioned; the pipeline network components will be dismantled, removed and disposed on-site in a landfill. The water effluent diffuser will also be dismantled and removed from the shore area and water, using best practices to minimize disturbance, and disposed on-site in the landfill.

It is important to note that any contaminated soils from the facilities will be removed and placed in sealed drums. These will then be transported to the mine site landfarm for treatment or barged out of to a southern destination for treatment and disposal.

5.2.1.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the supporting facilities in Rankin Inlet, but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the natural terrain or loss of plant populations.

5.2.1.7 Uncertainties

The main uncertainty is related to the local interest for the Rankin Inlet facilities or equipment.

5.2.1.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the Rankin Inlet facilities and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Periodic inspections will be performed to visually assess the reclaimed areas; and
- All buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed to the mine site landfill disposal or barged out to a southern waste disposal or recycling facility or for sale or sold as scrap metal.

5.2.1.9 Contingencies

There are no activities proposed as contingencies for the closure of the facilities in Rankin Inlet.

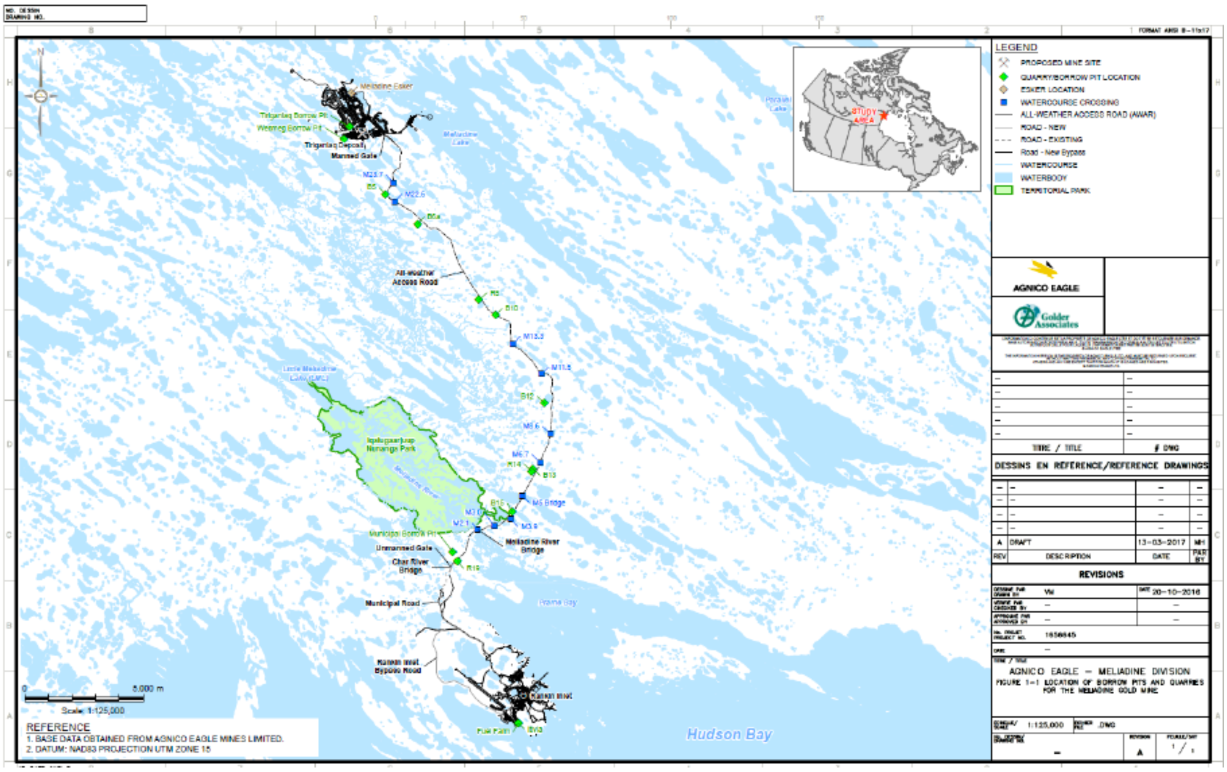
5.2.2 Transportation Roads and Quarries

5.2.2.1 Description of the components

Transportation Routes considered for the Project are listed below:

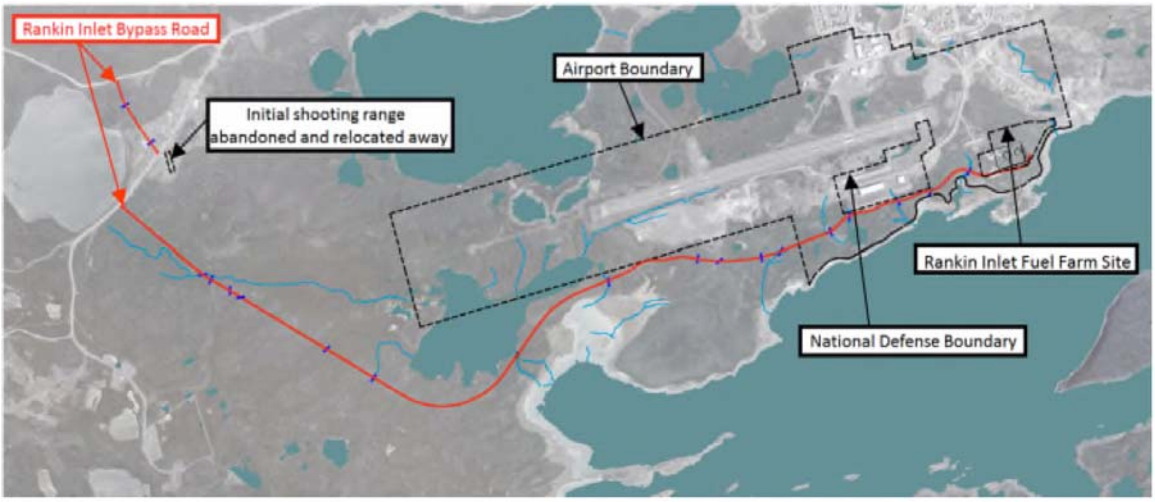
- Access Road (AWAR): The AWAR connects Rankin Inlet to the Mine site. The AWAR is a 23.8 km private road built with a 6.5 m running surface between the Char River bridge turn-off and the Mine site and has passing turnouts approximately every 400 ± 50 m (9.5 m total road width at passing turnouts). The first 2.3 km of the AWAR between Rankin Inlet and the Meliadine mine site are located on municipal land; the first 2 bridges on the AWAR (over the Char and Meliadine rivers) are also located on municipal land. There are eight (8) culverts along the AWAR, and two (2) bridges under the responsibility of the Meliadine Mine. A total of eight (8) quarries and borrow pits are located along the AWAR. The road alignment is presented on Figure 5-1 (AEM, 2019b).
- By-Pass Road: A bypass road is built around the south of the airstrip to Itivia as shown on Figure 5-2. The length of the bypass road is approximately 6.17 km long and allows traffic from Itivia to bypass the hamlet. Its design and width are similar to the AWAR (6.5 m, 8.0 m from chainage 0+222 to 1+492). There are 19 groups of culverts along the bypass road (Tetra Tech, 2019).
- Internal Access and Haul Roads: A network of roads (service roads and haul roads) of approximately 15 km on the mine site connects the various mining areas and to access the various Project facilities.
- Roads to Future Operation Areas (deposits): Upon regulatory approval, a network of roads to other deposits, included in the Meliadine FEIS, will be built. The road to Discovery is approximately 15.8km long with a width of 17m and includes four (4) water crossings, as presented on Figure 5-3. The roads to the other deposits represent approximately a network of 9.3 km with an average width of 17m. The roads are presented on Figure 5-4.
- Quarries and Granular Borrow Sites: required for AWAR, by-pass, internal access and haul roads construction. There are 15 quarries located along the AWAR. There are also 3 quarries located directly on site.

Figure 5-1 : All Weather Access Road (AWAR) General Map



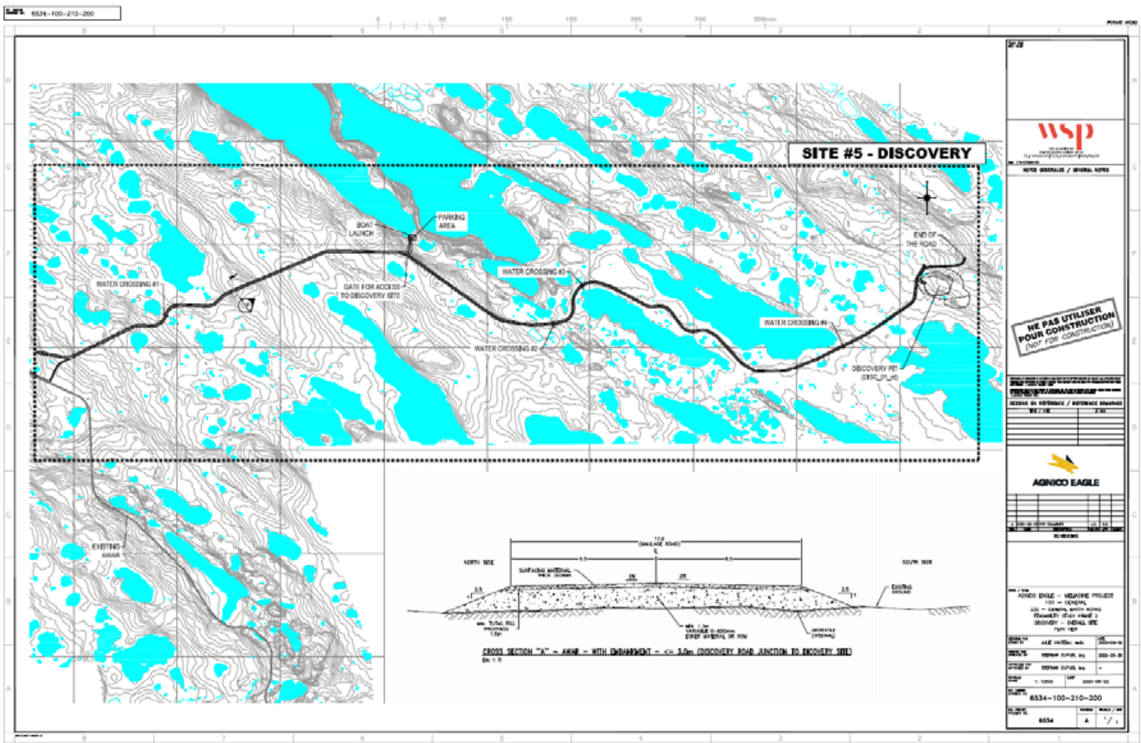
Source: (AEM, 2019b)

Figure 5-2 : Bypass Road General Location



Source: (Tetra Tech, 2019)

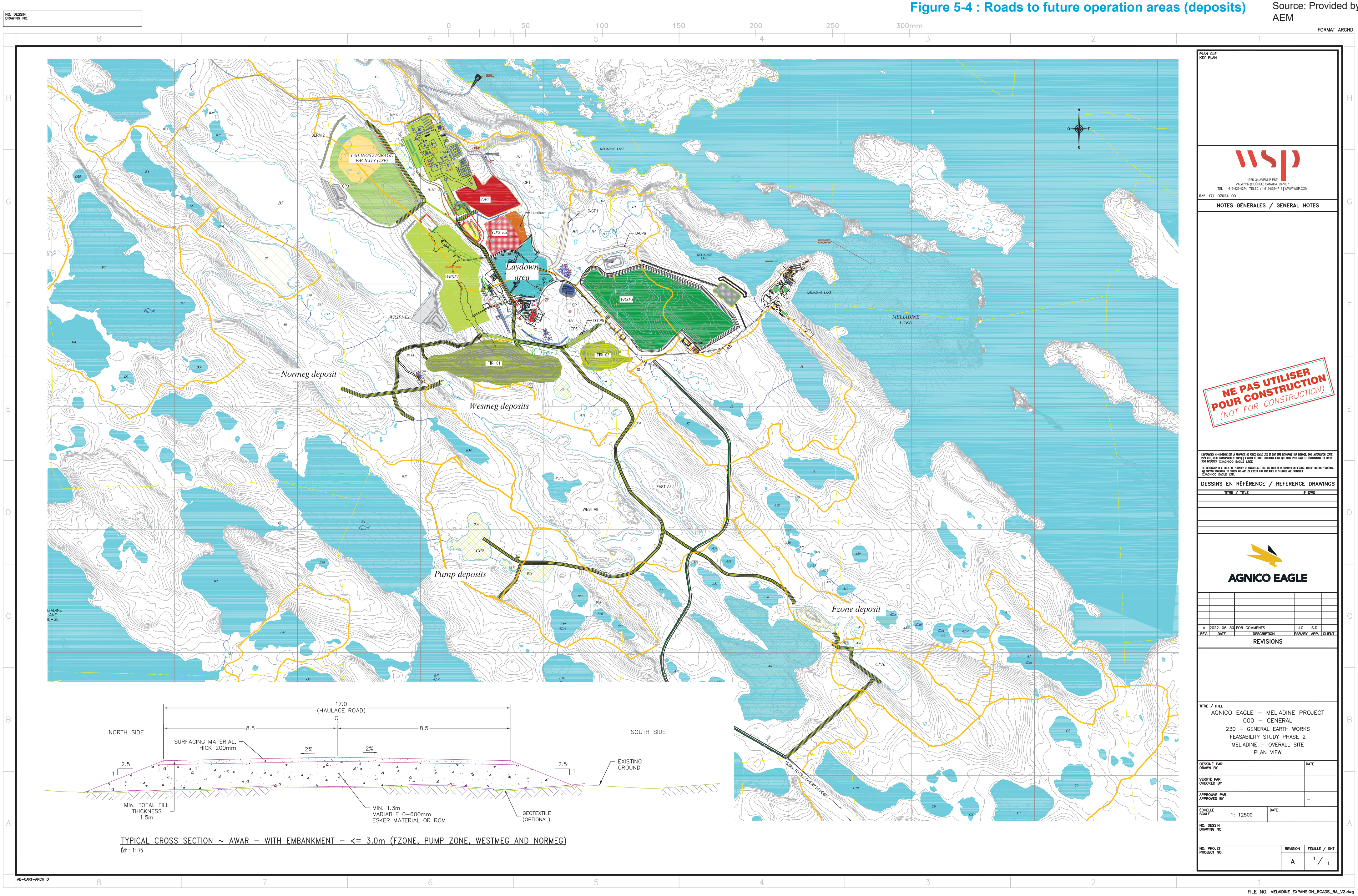
Figure 5-3 : Road to Discovery



Source: Provided by AEM

Figure 5-4 : Roads to future operation areas (deposits)

Source: Provided by AEM



5.2.2.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The transportation roads are currently in use and will be until post-closure, at least for the AWAR to access the site. The quarries will be maintained until material is no longer required.

At post-closure, the AWAR and by-pass road embankment will be reclaimed, and the natural drainage and terrain will be restored as much as possible. The culverts and the bridges all along the AWAR and the bypass road will be dismantled. Upon local interest and regulatory approval, the AWAR and the bypass road could be transferred to the local community.

The internal access roads, roads to the different deposits and haul roads on site will be reclaimed and the natural drainage and terrain will be restored as much as possible during closure.

The quarries and granular borrow sites no longer required for operations will be progressively reclaimed during operation, as equipment and resources are available.

5.2.2.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the transportation routes are listed in Table 5-2, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-2: Closure Objectives and Criteria – Transportation Roads and Quarries

Closure Objectives	Closure Criteria	Action / Measurements
Maintain access to site during post-closure for monitoring	Preserve the main access road to the site in a sufficient condition to allow post-closure access for monitoring, inspection and maintenance activities	Reclaim the AWAR and the by-pass once post-closure monitoring and site maintenance can be completed with helicopter access
At closure and post-closure, reclaim road to its original state or to a condition compatible with the end land-use targets	Restore natural/compatible terrain as much as possible and promote revegetation	Remove bridges, culverts and pipes; restoring natural stream flow and drainage patterns; stabilizing stream banks by using rip-rap Road embankment will be regraded and surface scarified Remove other infrastructures along the road, including communication towers
Restore natural drainage patterns	Restore natural/compatible terrain as much as possible	Road embankment will be regraded to promote natural drainage Remove bridges, culverts and pipes; restoring natural stream flow and drainage patterns Visual inspection
Reclaim quarries and borrow area by providing safe long-term conditions	Promote natural drainage and ensure wall stability	Quarry walls will be drilled and blasted to ensure long term stability

Closure Objectives	Closure Criteria	Action / Measurements
		and safety of the quarry walls for wildlife Quarry area will be regraded to promote natural drainage Visual inspection
Control dust generation from reclamation activities	Best management practices for controlling dust, fugitive and exhaust emissions during active reclamation	Implement best management practices Routine air quality monitoring
Ensure the remaining surface areas are safe for wildlife use and access	Restore natural/compatible terrain as much as possible	Scarified surfaces will be re-graded Visual inspection and wildlife survey
Ensure reclaimed areas are safe for the community and support continuation of human land use activities	Restore natural/compatible terrain as much as possible Human land use of the reclaimed area at post-closure will not compromise people's health and safety Reclaimed area will be compatible with land use	Routine monitoring and physical inspection
Consider community land use expectations and traditional knowledge	Community engagement and traditional knowledge will continue to be implemented in closure planning	Community engagement during closure planning

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- The main access road to the site and other on-site roads, as required, should be preserved in a sufficient condition to allow post-closure access for monitoring, inspection and maintenance activities. (from R518);
- Roads that will not be preserved for post-closure use should be reclaimed. Bridges, culverts and pipes should be removed, natural stream flow should be restored, and stream banks should be stabilized by re-vegetating or by using rip-rap. Surfaces, shoulders, escarpments, steep slopes, regular and irregular benches, etc., should be rehabilitated to prevent erosion. Surfaces and shoulders should be scarified, blended into natural contours, and re-vegetated. (from R519).

5.2.2.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for the transportation roads closure are provided by the MVLWB/AANDC (MVLWB/AANDC, 2013). Closure activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Remove structures including bridges and culverts (not the culverts or bridges belonging to the Hamlet of Rankin Inlet);
- Reclaim areas to the original topography and drainage or to a new topography or drainage compatible with end land use targets;
- Scarify road surfaces to promote re-vegetation of indigenous species;

- Allow gradual slope failure of quarries involving rock masses or slope pit walls;
- Block quarry access routes with boulder fences, berms and/or inukshuks (guidance from local communities and elders would be sought); and
- Flatten berms and slopes at the side of roads to facilitate wildlife passage.

As mentioned in the preliminary closure plan (AEM, 2015a), migrating caribou protection is an important aspect of the AWAR closure. Agnico Eagle will work, during the operations and closure stages, with the KIA and HTO to monitor areas where the road may be impeding caribou migration. Heavy traffic on the AWAR and on-site roads will cease at closure. Traffic associated with reclamation will continue at a reduced level for the first years of closure. After that, there will be very little vehicle traffic.

All the options listed above will be required to address closure and reclamation of the transportation roads for the Meliadine Mine. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.2.5 Engineering Work Associated with Selected Closure Activity

Agnico Eagle is committed to manage the road as a private road with limited public access during the mine life and to fully decommission the road after post-closure. The transportation roads should be one of the last mining components to be reclaimed in post-closure to preserve access for monitoring.

As mentioned in the Roads Management Plan (AEM, 2019b), it is the responsibility of Agnico Eagle of decommissioning and reclaiming all roads once construction, operations, closure, and post-closure activities are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Rankin Inlet Hamlet) and then complete its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads. In the case that Agnico Eagle stays the owner of the AWAR and the bypass road, natural drainage courses and terrain will be restored by removing culverts and bridges, regrading road fill material and removing in-stream works down to the original channel bed.

The reclamation work presented in detail in the Roads Management Plan (AEM, 2019b) is summarized herein. The loosening of compacted surfaces will be accomplished by ripping of the road bed using a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult. It is anticipated that, in this way, the abandoned roads will not be useable by wheeled vehicles (i.e., cars, trucks, and pick-up trucks). The road bed would still be useable by ATV or snowmobile and, thus, even after final reclamation, the reclaimed roadbed would offer similar passage to the existing set of trails that currently exist and are used by the residents of Rankin Inlet for traditional use purposes.

The road deactivation works will be carried out as necessary to stabilize any slopes where potential for slope erosion may exist. Stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened out slopes using non-acid generating material. These measures would also be applicable to borrow pits/quarries that remained open following construction and are located adjacent to the roadway. As much as practical, deactivated surfaces will be graded to blend with the existing topography (AEM, 2019b).

To the extent practical, the reclamation would also restore the natural pre-road hydrology. Natural drainage courses would be restored primarily through the removal of all culverts and bridges (excluding the Char River bridge, which will belong to the Hamlet of Rankin Inlet), and through rehabilitation of channels and banks at the crossing sites. Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non ARD/ML for the protection of aquatic life. Where affected watercourses are fish bearing, the timing of work will have to be restricted to within the designated DFO fisheries work window (July 16th to April 30th). For these sites, appropriate fish exclusion measures will be undertaken prior to the in-stream works. All in-stream works will be carried out using best management practices for erosion and sediment control (AEM, 2019b).

Decommissioning of the roads will start from the Mine site and progress south towards Rankin Inlet and will include reclamation of the bypass road. Stream crossings will be rehabilitated as they are encountered during the progression of the work. The culverts and bridges, as previously mentioned, will be removed from the crossings using a backhoe and crane, and then removed materials (i.e., culvert steel, bridge decks, abutment steel, etc.) will be transported to Rankin Inlet using a semi-tractor and a low-boy trailer, for disposal and salvage (AEM, 2019b).

The decommissioning details of the 18 quarries are provided also in the Road Management Plan (AEM, 2019d). The quarries and borrow pits have gently sloping walls and are designed for positive drainage wherever possible. Reclamation and closure of quarries and borrow pits will depend on the individual site conditions. With a conservative initial design, the quarries should require little reclamation following completion of the roads. Loose rock will be pulled to the floor of the quarry and the entrance blocked with large boulders. Reclamation should lead to natural re-vegetation establishing on disturbed areas (AEM, 2019b). Similar process will be completed for the reclamation of the quarries on site.

All quarry sites and borrow sources developed during the construction of the roads have been selected to generate only non-acid generating/low metal leaching materials. During reclamation of the roads, should acid-generating bedrock be exposed along the roadway or in borrow pit/quarries, these areas will be covered with a minimum 2 m thick layer of non-acid generating soil or rock to direct water away from the surface (AEM, 2019b).

5.2.2.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the transportation roads and quarries but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the terrain and or loss of plant populations and plant communities. The reclaimed roadbed would offer similar passage to the existing set of trails that currently exist and are used by the residents of Rankin Inlet for traditional use purposes.

5.2.2.7 Uncertainties

The pre-disturbance terrain is covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil erosion and to promote re-vegetation by natural colonization. Re-vegetation studies will be completed to assess the potential for vegetation to establish in disturbed areas or on rockfill covers.

There are also some uncertainties regarding the transfer of ownership of the roads to the local community or a third party, upon interest. For a third party to take over the road(s), that third party would have to complete its own arrangements with the landowners (the KIA and the Hamlet) and then complete its own environmental assessment and permitting process covering future use.

5.2.2.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the roads and quarries and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Periodic inspections will be performed to visually assess the reclaimed areas; and
- All roads to be used during closure will be maintained until they are no longer required.

5.2.2.9 Contingencies

There are no activities proposed as contingencies for the closure of the transportation roads.

5.2.3 Underground

5.2.3.1 Description of the components

Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed as shown in Figure 4-4. Approximately 5.2 Mt of waste rock and 11.6 Mt of ore will be mined from underground. Tiriganiaq underground mine will be developed and operated from Year -5 (2015) to Year 7 (2026) (AEM, 2020c).

The ore is first being sourced entirely from underground with access by decline, using long-hole mining methods. The first three stopes were blasted and mucked out in late 2018. Each stope is backfilled, with cemented pastefill used in primary stopes and dry rockfill for the secondary stopes. Starting in 2020, the ore will be sourced from both the underground and open pits.

The description presented below for the underground mine is extracted from the Meliadine Mine Updated Technical Report (AEM, 2015b) and the Final Environmental Impact Statement (AEM, 2014, Volume 1).

Currently, underground mining is considered for the Tiriganiaq deposit. The selected mining rate from underground is set at 2500 to 3000 tpd on average. Geotechnical information was incorporated in designing the underground mine. This included the distribution of intact rock strength, distribution of rock mass classification values, and detailed structural geology information.

A numerical hydrogeological model was developed to estimate the quantity and quality of potential inflows to Tiriganiaq underground. The underground mine at Tiriganiaq is anticipated to extend below the permafrost zone. The deep groundwater flow system will be encountered in the deeper portion of the mine.

Ground support for underground will primarily be provided by bolting and screening, as well as cable bolting. Cable bolting requirements for intersections and stopes were estimated using typical cable bolting patterns. Mined-out workings will also be backfilled for reasons of ground stability, using coarse rock waste, cemented waste rock, paste tailings, or some combination of these.

The current Tiriganiaq underground reserves lie between 100 m and 650 m below surface. The main underground mine plan consists of 23 levels (level 100 through level 650) set at 25-m intervals. Access to all underground workings will be via one of two (2) decline ramps, which can be seen in Figure 4-3. The portal 1 is used as the initial mine access for pre-development, from which the existing ramp (decline 1) will be extended to the 300 level. A second decline developed in the hanging wall of the Tiriganiaq deposit from a second surface portal (portal 2) is used as the trucking ramp and the main access for the Meliadine mine. Decline 1 will remain as a secondary egress point and provide direct access to the upper parts of the mine. A third decline (decline 3) will be developed allowing access and mining of the Wesmeg 650 lode

Long-hole mining method was selected to mine the Tiriganiaq deposit due to the shape, thickness and orientation of the orebody. The stope height was set at 25 m to minimize drill deviation and waste rock dilution, and to maximize mine recoveries.

A conveyor belt has been built in the underground access ramp to deliver the ore from the underground to the surface ore stockpile dome. A crusher is located underground to reduce the ore to a size that can be accommodated on the conveyor belt. Underground waste rock is transported through the same system that transports the ore but at different times.

The maximum underground mine ventilation requirements were calculated at 544 m^3/sec (1,153,000 ft3/minute (cfm)). Two (2) 576-kcfm fan systems are required to ventilate the mine, one for the eastern part of the mine and another one for the western part. One 800-kcfm fan system is required in the return air raise. The mine-air-heating infrastructure for the Tiriganiaq underground mine consists of multiple indirect oil-fired air heaters and heat exchangers for each raise. The heat comes from both the heat recovery system at the power house and from the fuel heaters. The underground mine equipment fleet required during the peak period considering the development and production was selected in consideration of the quantities of material to be mined and moved, the geometry of the orebody and from the expertise Agnico Eagle gained at its other mines in operation. Trucks (60 t) are used to haul waste and ore at surface or rockfill into stopes. Scooptrams are used for mucking development headings or production stopes.

5.2.3.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The mining of the underground has started in 2015 and will continue until 2026. In 2018, the Meliadine Gold Project was still in the construction phase, developing the underground in preparation to operate the Tiriganiaq underground mine. A total of 688,069 t of waste was excavated, 3,134 t was used as underground backfill and the rest was used for construction purposes. A total of 39,216 t of marginal and 60,846 t of ore was mined (AEM, 2019a).

In 2019, a total of 482,736 t of waste rock was excavated from underground and a total of 1,108,666 t of ore was mined (AEM, 2020c).

The ultimate depth of the Tiriganiaq Underground at the end of operations is expected to be approximately 650 m below ground surface (bgs).

5.2.3.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the underground mine are listed in Table 5-3, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-3: Closure Objectives and Criteria – Underground

Closure Objective	Closure Criteria	Actions/Monitoring
Access to underground workings from surface openings has been limited, for the safety of humans and wildlife	The decline ramps and the portals will be capped to eliminate the access to the underground mine workings	Place signage Maintain or construct waste rock berm Inspection of berms
Uncontrolled surface water infiltration into underground workings has been minimized	The decline ramps and the portals will be capped, and area will be levelled to avoid water accumulation	Ramp will be dismantled and blocked Concrete structures will cap the raises Physical inspection and monitoring
Underground workings have been stabilized so that there is no surface expression of underground failure Controls that prevent collapse, stress transfer, and flooding of adjacent mines are in place	The underground will be designed and mined to be physically stable; stopes will be backfilled as needed during operation and closure	Proper backfilling procedure Meet appropriate design levels, physical inspection by a qualified engineer and monitoring
Contaminated mine water from underground workings is not and will not become a source of contamination to the surface environment, nearby taliks, surface water, or groundwater	Underground mine to flood with natural groundwater seepage	Water treatment systems in place until surface water meets discharge criteria to the environment Initial physical monitoring to check inflow, but limited once ventilation is turned off
Areas surrounding mine openings are suitable for future use targets	Ramp facilities at the surface will be removed Area will be levelled to avoid water accumulation	Ramp will be dismantled and blocked Concrete structures will cap the raises Physical inspection and monitoring
No hazardous material from underground will become a source of contamination	Remove hazardous materials from the underground mine	Fuels, oils, chemicals and all hazardous material will be removed for disposal by a licensed handler prior to flooding Physical inspection and monitoring
Consider community land use expectations and traditional knowledge in the closure planning	Community engagement and traditional knowledge will continue to be implemented in closure planning	Community engagement during closure planning

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- If it is technically and economically feasible to do so, infrastructure (e.g., crushers, metal structures and air pipes) and equipment (e.g., pumps) should be removed from the site. Any equipment to be left in the pit should be inspected and remediated as appropriate to ensure that there is no risk of leakage of any contaminants (R506);

- During the decommissioning of underground and open pit mines, any contamination associated with vehicle and equipment operations and maintenance should be identified and remediated, as appropriate (R507);
- Underground mine workings should be secured, and signs should be posted warning the public of potential dangers associated with the facility (R508);
- The risk of subsidence in underground mines should be assessed. Appropriate measures should be taken to prevent subsidence in cases where the risk of subsidence is determined to be significant. The primary measure used to prevent subsidence is the backfilling of underground voids (R509);
- The potential for mine water discharges should be assessed. For underground mines, this should be done using a hydrogeological assessment (R511);
- Where there is the potential of mine water discharge after mine closure, the quality of the discharge should be predicted. Mine water quality should be assessed once closure has been completed to verify the accuracy of the predictions (R512);
- Where there is the potential of mine water discharge of poor quality, measures should be implemented to prevent or control that discharge and to collect the mine water for treatment. Prevention methods may include capping of mine openings to prevent mine water discharge (R513).

5.2.3.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for open pit closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the pit were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Minimize the number of mine openings to the surface;
- Include long-term geotechnical and geothermal stability in the design of mine openings and crown pillars;
- Develop a ground stability monitoring plan.

Capping the top of the decline ramps and portals are considered to be the only viable option for eliminating access to the underground mine workings.

Geotechnical monitoring, thermal monitoring and underground water quality monitoring is part of the underground operations and will be used for the closure planning of the underground mine.

5.2.3.5 Engineering Work Associated with Selected Closure Activity

All surface openings will be sealed; the decline ramps and the portals will be capped to eliminate access to the underground mine workings. The sealed surface opening areas will be contoured to prevent natural surface flows to the underground, and disturbed surface areas will be re-contoured to establish positive natural drainage patterns and blend in with the surrounding topography to the extent possible. The raises will be capped with concrete. Any equipment or infrastructure left underground will be cleaned, drained of fluids, inspected, and remediated as appropriate to eliminate the risk of contaminant leakage. All hazardous materials from underground shops, equipment, and magazines (fuels, oils, glycol, batteries, explosives, etc.) will be removed and disposed off-site at an approved disposal facility. Contamination associated with vehicle and equipment operations at work areas will be identified and remediated (AEM, 2015a).

Every stope will be backfilled, with cemented pastefill used in primary stopes, and dry rockfill for the secondary stopes. The paste backfill will be made by mixing pressed filtered tailings, cement and water in a facility (AEM, 2015b). Backfill will be done during the operation and will be completed in closure.

Passive flooding of the Tiriganiaq Underground Mine will occur following the completion of mining. The estimated total flooding volume of the underground workings is 1,372,000 m^3. Seepage water into the underground mine will be the main water source for flooding. At the predicted seepage rate, it is estimated to take six (6) years to flood the underground mine (AEM, 2020b).

5.2.3.6 Predicted Residual Effects

No significant long-term effects are expected for the underground mine workings. After closure, the only surface expression of the underground workings will be the sealed vent raises and portals and the area graded and levelled to avoid erosion and water accumulation.

5.2.3.7 Uncertainties

There are no currently identified uncertainties associated with the closing of the surface openings to the underground or flooding the underground works.

5.2.3.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the underground mine, and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Visually inspect reclaimed openings for signs of physical deterioration or settlement;
- Vary the frequency of inspections, with increased frequency following construction and decreased frequency upon establishment of stable conditions;
- Check for surface expression (subsidence) of underground failure;
- Test underground mine water quality and monitor volume from controlled discharge points of workings to ensure water quality is as predicted;
- Identify unanticipated mine-related drainage discharge points (volume and quality);
- Install thermistors where appropriate to monitor the ground thermal regime in permafrost areas;
- Establish special monitoring provisions for mines that have become flooded and are retaining water under pressure by means of plugs. These provisions can include visual inspection, piezometers, seepage measurement weirs, and sampling to check water quality parameters;
- Inspect areas surrounding mine openings to ensure they are suitable for future use targets;
- Inspect passive water treatment systems for maintenance requirements.

5.2.3.9 Contingencies

Backfilling of certain underground areas will be completed during operation. This will ensure ground stability that potential ground collapse into these tunnels does not progress to surface, creating a subsidence or sinkhole.

5.2.4 Open Pits

5.2.4.1 Description of the components

Two (2) open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) will be developed as shown in Figure 4-4. Approximately 20.7 Mt of waste rock, 6.3 Mt of overburden material and 3.3 Mt of ore will be mined from Tiriganiaq Pit 1. Approximately 5.5 Mt of waste rock, 0.63Mt of overburden material and 0.53 Mt of ore will be mined from Tiriganiaq Pit 2 (AEM, 2020c). The following mining development sequence is planned:

- Tiriganiaq Pit 1 will be mined from Year 2 (2021) to Year 7 (2026); and
- Tiriganiaq Pit 2 will be mined from Year 1 (2020) to Year 3 (2022).

A conventional truck/shovel operation is anticipated for the open pits.

The description presented below for the open pits is summarized from the Meliadine Mine Updated Technical Report (AEM, 2015b) and the Final Environmental Impact Statement (AEM, 2014, Volume 1).

The Project lies within an area of continuous permafrost where two (2) groundwater flow regimes can be observed: a shallow (active layer) and a deep (beneath permafrost) groundwater flow regimes. No hydraulic connection is anticipated between the systems because of the presence of the permafrost. Depth of permafrost in the Mine site is estimated to be about 360 to 495 m. In the deepest open pit design all of the pits are expected to remain in the permafrost layer. The bench height for Tiriganiaq open pits will typically be 20 m (two 10 m benches) and the face angle will vary from 64 to 70 degree depending on the pit wall. The catch bench width in the rock varies from 8 m to 10 m resulting in inter-ramp angles of 48 to 49 degree. Ultimate pit shells were used to make detailed pit plans, production schedules, equipment and labor requirements, operating cost estimates, and equipment capital cost estimates. Resources located close to surface are to be mined by open pit methods.

A conventional truck/shovel operation for both pits is planned with different mining approaches for ore and waste. The mining method must be suited to Arctic conditions and provide a good daily production in waste zones. To maximize the recovery of economic material and minimize dilution in the ore zones, the method must be very selective.

The drill and blast activity will take place using 10 m bench heights, with 165-mm (6.5-inch) diameter holes. The emulsion will be prepared on site by an explosives supplier who will also be responsible for delivering explosives to the bore holes. Once blasted, the rock material will be loaded in rigid trucks by hydraulic excavators.

Rock material will be transported by haul truck to either the primary crusher dump area for ore material or the designated WRSFs for waste rock. Temporary ore stockpiling pads will be sited near the primary crusher.

No physical surface constraints have been considered in defining the ultimate pit limits within the Tiriganiaq deposit. The presence of different watercourses located within or near the pit footprints will require some water management including dewatering, drainage and water retention dykes. However, the ultimate pit limits have been controlled by the presence of the underground mine, which limits the deepening of the pits. Potential future Tiriganiaq pit expansion could interact with and/or be constrained by the development of surface infrastructure such as vent houses and raises that will be installed in the vicinity of the current/final pit walls.

Any water reporting to the open pits will be collected in sumps and ultimately directed to the main attenuation pond CP1. Dust will be managed for environmental and safety reasons on pits haul ramps by spraying water whenever needed during the non-freezing periods.

5.2.4.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The mining of the open pits is planned to start in Year 1 (2020) with Tiriganiaq Pit 2 to Year 7 (2026).

The open pits are designed to have stable slopes during the mine life and post-closure. At the end of active mining operations, the pits will be flooded and rock berms will be placed around exposed perimeters of the pits to restrict access and minimize hazards to people and wildlife.

5.2.4.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meliadine open pits are listed in Table 5-4, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-4: Closure Objectives and Criteria – Open Pits

Closure Objective	Closure Criteria	Actions/Monitoring
Access to the pits are limited, for the safety of humans and wildlife	Install physical barriers to limit access	Maintain or construct waste rock berm until pit area is flooded Inspection of berms during flooding period
Allow emergency access and exit during flooding stage	Safe access and route will be established during flooding for inspection and emergency	A plan will be developed to allow for reasonable exit should inadvertent access occur Proper signage will be installed
The open pit mine walls, slopes and pit shorelines are physically and geotechnically stable or minimize access to unstable areas	Ensure walls and slopes are stable prior to flooding Install physical barriers to limit access	Inspection of berms, walls, slopes and shorelines before and during flooding period Maintain or construct waste rock berm until pit area is flooded
Meet water quality objectives for any discharge from pits Water quality in flooded pits is safe for humans, aquatic life, and wildlife	The water quality will meet the Water Licence requirements	Water treatment will remain on site until water quality criteria are met Routine monitoring as per the Water Licence requirements

Closure Objective	Closure Criteria	Actions/Monitoring
Migration and discharge of contaminated drainage has been minimized and controlled Controlled flooding rate of the open pits	The water quality will meet the Water Licence requirements Ensure safe water level during flooding to avoid uncontrolled discharge Minimize erosion during flooding	Water treatment will remain on site until water quality criteria are met Integrate water management plan and water balance to control flooding rate and water level Routine monitoring as per the Water Licence requirements
Dust levels are safe for people, vegetation, aquatic life, and wildlife Meet Canadian Ambient Air Quality standards	Control dust emissions during active reclamation period Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices and conduct air quality monitoring during active reclamation period
Consider community land use expectations and traditional knowledge in the closure planning	Community engagement and traditional knowledge will continue to be implemented in closure planning	Community engagement during closure planning

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- During decommissioning, any contamination associated with vehicle and equipment operations and maintenance should be identified and remediated, as appropriate (R507);
- Open pits should be backfilled or flooded to the extent practicable to prevent unauthorized access and to protect public safety. In cases where backfilling or flooding is not practically feasible, fencing should be installed to protect the public. In all cases, signs should be posted warning the public of potential dangers associated with the site (R510);
- The potential for mine water discharges should be assessed. For open pit mines, this may be done using water balance calculations and, in some cases, hydrogeological assessment. Where mine water discharge is predicted, the flow rate should be estimated (R511);
- Where there is the potential of mine water discharge after mine closure, the quality of the discharge should be predicted. Mine water quality should be assessed once closure has been completed to verify the accuracy of the predictions (R512);
- Where there is the potential of mine water discharge of poor quality, measures should be implemented to prevent or control that discharge and to collect the mine water for treatment. Prevention methods may include capping of mine openings to prevent mine water discharge (R513).

5.2.4.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for open pit closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the pit were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Excavate rock and soil slopes will remain stable during closure and post-closure;
- Flood the pit, with natural and pumped inflows;
- Block open pit access routes and control access.

All the options listed above will be required to address closure and reclamation of the open pits. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.4.5 Engineering Work Associated with Selected Closure Activity

The description of the closure flooding activities for the open pits as presented herein is taken from the Water Management Plan (AEM, 2020b). When flooding the open pits for closure, the maximum pumping rate from Meliadine Lake shall not exceed 4,000,000 m^3/year during closure of the Mine, as stated in Part E, Item 2 of the Water Licence 2AM-MEL1631. The planned pumping period will occur during the open water season from mid-June to end of September for each year. Table 5-5 summarizes the pit volume and expected water elevations at the completion of flooding activities. It will take approximately three (3) years to fill the pits with an assumed pumping rate of 0.44 m^3/s (38,300 m^3/day). The assumed pumping rate of 0.44 m^3/s from Meliadine Lake during closure will have negligible effect to Meliadine Lake when compared to the average outflow rate at the outlet of Meliadine Lake. The pumping rate will be evaluated further to validate that any possible negative effects to Meliadine Lake do not occur.

Table 5-5 : Pit and Underground Flooding

Pit	Volume (Mm^3)	Final Water Elevation (masl)	Water Source
Tiriganiaq Pit 1	9.20	64.14	Freshwater from Meliadine Lake
Tiriganiaq Pit 2	2.25	64.38	Freshwater from Meliadine Lake
Tiriganiaq Underground	1.40	Groundwater level	Groundwater Seepage

Source: AEM, 2020b

The water quality model results indicated that water quality in the flooded pits will meet the discharge criteria and post closure treatment will not be required. The water quality within the pits will be monitored during flooding to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system (AEM, 2020b).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

The open pit may be hazardous to wildlife species as wildlife may be injured by inadvertent access into the open pit. Wildlife management and protection practices will be implemented to limit wildlife injury and morbidity during closure and post-closure. A rock berm will be constructed around the open pits to limit or prevent access by people and to discourage access by wildlife. The rock berm(s) was selected over a fence based on feedback received from communities in regards to concerns relating to wildlife behaviour (AEM, 2015a). Proper signage will also be placed around the flooded pits to mark access points.

The open pits are designed to have stable slopes during the mine life and post-closure. The slopes are monitored as part of mine operations and will be progressively modified as required to maintain stability during closure and post-closure.

5.2.4.6 Predicted Residual Effects

As presented in the Preliminary Closure Plan (AEM, 2015a), the following residual effects are predicted for the open pits after reclamation:

- The extent of the effect on terrain and soil quantity will consist of a total of approximately 35 ha of non-reclaimed land (i.e., residual ground disturbance). This non-reclaimed land is associated with the flooded open pits;
- The flooded open pits will be a permanent feature on the landscape. The impacted vegetation communities that formerly occupied the open pit footprints will be permanently lost;
- Although wildlife species will be discouraged from using the flooded open pits, some may still do so and they could potentially ingest metals dissolved in the surficial water.

5.2.4.7 Uncertainties

The following uncertainties have been identified with respect to closure planning of the open pits:

- The open pit slopes are designed to be stable under operating conditions, but the walls of the open pits will have been exposed for several years during mine operations, therefore the long-term stability of the open pit walls represents an uncertainty in closure planning design;
- While surficial water quality within the flooded open pits is predicted to meet requirements for direct discharge to the environment (Meliadine Lake), actual water quality conditions will not be known with certainty until flooding is complete;
- Flooding rate for filling the open pits at closure, including natural inflows and lake water transfers, will have to be evaluated to determine the length of time to achieve target water levels.

Water quality monitoring will continue during operations to expand the available water quality database. Water quality forecast for pit lake water will continue to be performed to predict the water quality at closure. The water balance and water management will also be reviewed in operation and in closure to estimate the lake water transfer volume required for flooding, as well as the natural inflows, to ensure adequate water levels are maintained into the pits.

5.2.4.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following flooding of the open pits as presented by AANDC/MVLWB (2013):

- Monitor water level in pit to confirm closure objectives are being achieved;
- Sample water quality and quantity at controlled pit lake discharge points;
- Inspect aquatic habitat in flooded pits where applicable.

5.2.4.9 Contingencies

The water treatment facilities are included as a contingency measure should water on site not be suitable for release to the environment. Water quality monitoring will occur during mine operation to include in the site water quality and to provide additional information for future closure water quality prediction and planning modifications if required. Prior to flooding of the pits, the quality of surface water and any groundwater seepage reporting from the pit walls will be sampled to assess potential for contamination of the pit water during re-filling. Water quality monitoring will continue in closure and post-closure.

If the results of water quality monitoring indicate that water in the flooded open pits is not suitable for direct discharge, in-pit treatment and active treatment prior to discharge into the receiving environment will be considered as contingencies for the treatment of the flooded pit water (AEM, 2015a).

5.2.5 Waste Rock Storage Facilities and Overburden

5.2.5.1 Description of the components

As described in the Mine Waste Rock Management Plan (AEM, 2020c), the design locations of the WRSFs took into consideration the environmental, social, economic, and technical aspects of waste rock management, including long-term physical stability of the facility, the availability of storage capacity, maintaining minimum distances between the toe of the WRSFs and the open pits, haul and access roads and adjacent lakes.

To achieve the above considerations, the following areas will be utilized for the combined storage of waste rock and overburden material. These areas are located as follows:

- WRSF1: located north of Tiriganiaq Pit 1; and
- WRSF3: located north of Tiriganiaq Pit 2.

In addition to the permanent WRSFs, two (2) temporary waste rock storage pads will be generated in the area around the future open pits: one from construction of Saline Pond 2 (within the Tiriganiaq Pit 2 footprint) and one from construction of Saline Pond 4 (SP4) (between the Tiriganiaq Pits 1 and 2 footprints). The material from these temporary facilities will be used for construction of haul roads, access roads and thermal protection of the saline ponds and open pits (AEM, 2020c).

Two (2) areas are identified for the combined storage of waste rock and overburden material as shown in Figure 4-4. Originally, four (4) main areas were proposed as the waste rock storage areas in the baseline study for the project during the FEIS to store the waste rock and overburden generated.

The description presented below is extracted from the Mine Waste Rock Management Plan (AEM, 2020c).

- WRSF1: The facility is located north of Tiriganiaq Pit 1 with an approximate footprint of 30.7 ha and will be located to the north of Tiriganiaq Pit 1. One small shallow pond (Pond A17) is located within the footprint of WRSF1 and will be covered by the facility. A portion of overburden and waste rock from the SP4 excavation (within Tiriganiaq Pit 1 footprint) and waste rock from underground will be placed in WRSF1 in Year -1 (2019) and Year 1 (2020). The majority of WRSF1 construction however, will occur from Year 2 (2021) to Year 5 (2024), when the facility will accommodate all of the overburden from Tiriganiaq Pit 1 and a portion of the waste rock. WRSF1 is expected to reach its design capacity in Year 5 (2024).
- WRSF3: The facility is located north of Tiriganiaq Pit 2, covering Lake H20 and partially former Lake H19. The proposed footprint extension of WRSF3 (upon regulatory approval) is approximately 28.6 ha, for a total approximate footprint of 51.3 ha. The runoff water from WRSF3 will be collected within Pond CP6 (former Pond H19) and CP2, to be located to the northwest of Lake J1. Two (2) diversion

channels (Channel 9 and Channel 10), along the north and east sides of the WRSF3 will be constructed to divert the contact water from the WRSF3 to CP2. WRSF3 will accommodate all waste material from Tiriganiaq Pit 2 in Years 1 (2020) to 3 (2022), as well as portions of waste rock from Tiriganiaq Pit 1 from Year 3 (2022) to Year 6 (2025) until capacity is reached.

With the start of operations, additional surface laydown and storage space in a centralized location to the portals and open pits was required. The footprint of the former WRSF2 was chosen to provide this additional storage area (AEM, 2020c).

Table 5-6 summarizes some of the key physical parameters used for the design of the WRSFs. The design parameters adopted for the proposed extension of WRSF3 are similar to the parameters used for the detailed design of the WRSF3. These will be further refined during the update of the detailed design phase. Each WRSF will be constructed in a similar fashion, with material placed in controlled lifts and compacted by traffic. The side slopes of each lift of material will be at the angle of repose, while the overall side slopes of each facility will be determined by stepping in each lift of material (AEM, 2020c).

Based on the presented design criteria, the WRSFs will provide a 5.6 Mm^3 and 9.2 Mm^3 design capacity for WRSF1 and WRSF3, respectively, which provides sufficient capacity to store waste generated during mine development (AEM, 2020c).

Table 5-6 : Design Parameters for Waste Rock Storage Facilities

<table>
<tr><th>Design Parameters</th><th>WRSF 1</th><th>WRSF 3</th></tr>
<tr><td>Maximum height of each overburden and waste rock bench (m)</td><td colspan="2">5</td></tr>
<tr><td>Side slope of each lift of waste rock</td><td colspan="2">Angle of repose (approximately 1.3H:1V)</td></tr>
<tr><td>Typical width of the horizontal offset between adjacent waste rock lifts (m)</td><td>16.5</td><td>14.5</td></tr>
<tr><td>Average overall side slopes of each WRSFs (from bottom toe of first lift to top crest of final lift)</td><td>3(H):1(V)</td><td>3(H):1(V)</td></tr>
<tr><td>Side slope for each lift of overburden</td><td colspan="2">Angle of repose (approximately 1.8H:1V)</td></tr>
<tr><td>Typical width of horizontal offset between adjacent overburden lifts (m)</td><td>20.5</td><td>NA</td></tr>
<tr><td>Internal overburden setback distance from toe of WRSF for the first lift (m)</td><td>40</td><td>tbd</td></tr>
<tr><td>Maximum crest elevation above the sea level (masl)</td><td>112.0</td><td>97.0</td></tr>
<tr><td>Assumed waste rock in place bulk density (t/m³)</td><td colspan="2">1.88</td></tr>
<tr><td>Assumed overburden in place bulk density (t/m³)</td><td colspan="2">1.62</td></tr>
</table>

Source: (AEM, 2020c)

As presented in the Mine Waste Rock Management Plan (AEM, 2020c), updated slope stability analyses for WRSF1 and WRSF3 was conducted during the detailed design of these facilities. The results of the stability analysis indicate that the calculated minimum factors of safety for the WRSFs meet or exceed the industry and Agnico Eagle acceptable factors of safety. The performance of the WRSF3 which involves an extended footprint is expected to be similar as the previous WRSF3 as the design parameters and geometry are comparable. Furthermore, the foundation conditions of the extended footprint of WRSF3 are expected to be better than the footprint of the initial design of WRSF3 since there are no lake beds nor partial taliks. Thermal analyses were also updated to estimate the thermal regime of the WRSFs and foundations during mine operations and after closure. Although the results for both facilities indicate that material placed in the winter period will likely stay in a frozen condition while the material placed in the summer period will eventually freeze back, the stability of both facilities is closely linked to the temperatures of the underlying ground.

Seepage and runoff water from the WRSFs and the temporary overburden stockpile will be managed by a series of water diversion channels, water retention dikes/berms, and water collection ponds (AEM, 2020c). If the water quality does not meet the discharge criteria as per the Type A Water Licence 2AM-MEL1631 requirement, the collected water will be treated accordingly prior to being discharged to the receiving environment (AEM, 2020c) .

5.2.5.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The WRSF 1 is currently in operation. From Year -1 (2019) to Year 5 (2024), most of the waste rock and overburden produced will be placed at WRSF1. WRSF3 will accommodate overburden and waste rock produced from Year 1 (2020) and Year 6 (2025).

Geochemical testing indicates that the waste rock and overburden from the Meliadine Mine is non-potentially acid generating (NPAG) and non-metal leaching (NML). No cover is planned for the WRSFs.

5.2.5.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meliadine waste rock storage facilities are listed in Table 5-7, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-7: Closure Objectives and Criteria – Waste Rock Storage Facilities

Closure Objectives	Closure Criteria	Action / Measurements
The pile is physically and geotechnically stable for human and wildlife safety in the long-term: minimize erosion, thaw settlement, slope failure, collapse, or the release of contaminants or sediments	The WRSFs are designed for closure and will account for seismic and permafrost conditions	Ensure proper design and stable slopes Physical and geotechnical inspection by a qualified engineer Thermal monitoring
Build to blend in with current topography, be compatible with wildlife use, and/or meet future land use targets	Limit WRSFs elevation to blend into local topography WRSFs at post-closure will not compromise wildlife safety and safe land use	Ensure proper design and stable slopes Physical and geotechnical inspection by a qualified engineer

Closure Objectives	Closure Criteria	Action / Measurements
Generation of poor water quality has been minimized, including ARD/ML Confirm runoff and seepage from the WRSFs meet water licence criteria Surface runoff and seepage water quality is safe for humans and wildlife	The runoff and seepage from the WRSFs will continue to be collected in the designated collection ponds and pumped to CP1 for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for direct discharge	The runoff and seepage from the WRSFs will continue to be collected and monitored as needed and transferred to CP1 for treatment Routine water quality monitoring and sampling Physical inspection, thermal monitoring
Dust levels are safe for people, vegetation, aquatic life, and wildlife in the long-term	Best management practices for controlling dust during active reclamation	Implement best management practices as during operation Routine air quality monitoring
Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Carry out detailed inspections and assessments of waste rock piles. The objective of these inspections and assessments is to evaluate the actual performance against design projections related to anticipate post-closure conditions. (R524);
- Conduct a comprehensive risk assessment for mine closure to evaluate the long-term risks associated with possible failure modes for waste rock piles. Identify possible impacts and critical parameters and develop control strategies. If warranted, implement a long-term monitoring plan. (R525/526);
- Re-evaluate, and revise as necessary, plans for the management of waste rock to prevent, control and treat metal leaching and acidic drainage to ensure that they are consistent with the objectives and plans for mine closure and post closure. If warranted, implement a long-term site-specific monitoring program (R527/538).

5.2.5.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for rock storage facilities closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the WRSFs were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Construct the WRSFs in lifts with slopes where individual lifts can be set back to provide long-term stability;
- Controlled runoff water by having sediment collection ponds where required for use during operation and possibly for the initial portion of the closure phase until seepage water quality is proven to be acceptable and stable;

- Design and operate the WRSF during operation to promote permafrost aggradation.

The WRSFs were designed to be stable in operation and closure, in consideration of both frozen and unfrozen foundation conditions. Thus, the stability of the facilities does not rely on the presence of permafrost foundations even though permafrost foundation conditions are expected to be present over long term based on the geothermal analyses that consider long-term climate change, waste rock placement schedule, and annual thaw of the active layer.

5.2.5.5 Engineering Work Associated with Selected Closure Activity

The description of the closure activities for the WRSFs as presented herein is taken from the Mine Waste Management Plan (AEM, 2020c). Reclamation of the WRSFs will use currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards. Geochemical testing indicates that the waste rock and overburden from the Tiriganiaq area is non-potentially acid generating (NPAG) and non-metal leaching (NML). Kinetic tests completed on all waste rock type and at various scales show that drainage water quality is expected to meet MDMER monthly mean effluent limits, including results for arsenic. Therefore, a closure cover system is not proposed for the WRSFs (AEM, 2020c).

The WRSFs were designed for long-term stability and no additional re-grading will be required at closure. Reprofiling could be required if waste rock material is excavated for reclamation work such as TSF cover or rock berms around the open pits.

The contact water management system for the WRSFs will remain in place until mine closure activities are completed and that monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for discharge to the environment with no further treatment required. Once water quality meets the discharge criteria established through the water licensing process, the water management infrastructures will be decommissioned to allow the water from the WRSFs to naturally flow to the receiving environment (AEM, 2020c).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

Dust suppression measures, which are typical of the current mine practices and consistent with best management practices, will be considered through design, operation and closure phases to control the dust. Dust is expected to be a minor issue during the operation of the WRSFs as the waste rock produced at the mine generally comprises large pieces of rock that is not be susceptible to wind erosion. The overburden will be surrounded by waste rock in the WRSFs; therefore, dusting is not expected to be an issue. The need for dust control at closure will be further evaluated during closure activities.

It is anticipated that the native lichen community will naturally re-vegetate the surface of the WRSFs over time.

5.2.5.6 Predicted Residual Effects

The following residual effects are predicted at the WRSFs after reclamation:

- The WRSFs will be permanent features on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that some of the native community will re-vegetate the RSFs cover surface over time;

- No significant adverse impact on the continued opportunity for traditional and non-traditional use of wildlife in the region is anticipated with the closure of the WRSFs;
- Runoff from the WRSFs will eventually be discharged in the receiving environment, once water quality demonstrates that water flowing from the facilities is acceptable for direct release. It is predicted that concentrations will meet discharge criteria.

5.2.5.7 Uncertainties

The thermal conditions within the WRSFs will depend on the actual waste placement plan and schedule, initial waste temperatures when placed, and thermal conditions of the original ground before the waste materials are placed. Therefore, thermistors will be installed in each WRSF to monitor the rate of freeze back and permafrost development progress in the facilities during the operations stage (AEM, 2015a). Thermal monitoring will be done during operation and closure.

The WRSFs will be allowed to naturally re-vegetate. It is anticipated that the native lichen community will naturally re-vegetate the surface over time. As part of a research project at Meliadine, re-vegetation studies will be completed to assess the potential for vegetation on rockfill surfaces.

5.2.5.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSFs as presented by AANDC/MVLWB (2013):

- Periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the WRSFs. Geotechnical monitoring will be carried out during all stages of the mine life, including closure and post-closure, to demonstrate geotechnical stability and the safe environmental performance of the facilities. If any non-compliant conditions are identified throughout the process, corrective measures will be completed to ensure stability of the structures;
- Ground conditions in the WRSFs will be monitored to confirm permafrost conditions are being established as predicted;
- The placed waste rock and overburden are expected to freeze back and permafrost is likely to develop within the WRSFs with time. Thermistors will be installed in each WRSF to monitor the rate of freeze-back and permafrost development progress in the facilities during closure;
- Water quality from the WRSFs will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment;
- Any seepage areas from the toe of the WRSFs will be identified and monitored.

5.2.5.9 Contingencies

The contact water management system for the WRSFs will remain in place until mine closure activities are completed, and monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for the discharge of all contact water to the environment with no further treatment required. Treatment systems will remain on site until suitable water quality is reached.

5.2.6 Tailings Storage Facilities

5.2.6.1 Description of the components

The tailings storage facility at Meliadine consists in a dry stack tailings pile. Dry stack tailings produced in the mill at Meliadine will be dewatered to a solids content of approximately 85% and will be trucked to either the TSF or to the paste plant for use underground as backfill. The tailings will be spread out at the TSF and compacted into thin lifts using a dozer and vibratory compactor.

The description presented below is extracted from the Mine Waste Rock Management Plan (AEM, 2020c).

The TSF is located on high ground west of the mill and east of Lake B7, as shown in Figure 4-4. The direct distance from the mill to the tailings stack ranges from 400 to 800 m. The minimum setback distance from the edge of Lake B7 is approximately 200 m.

The TSF is designed to accommodate approximately 10.9 Mt of tailings. The two (2) cells system (Cell 1 and Cell 2) is designed to limit dust generation, control tailings surface erosion, and to facilitate the progressive reclamation and closure of the TSF. As the tailings reach final elevation, the tailings will be progressively encapsulated with either waste rock or a layered combination of waste rock and overburden (AEM, 2020c).

The properties of the tailings and TSF operation parameters relevant to the design of the TSF are presented in Table 5-8. Based on the above design criteria, the TSF has a capacity for 6.61 Mm^3 (10.9 Mt) of filtered tailings (AEM, 2020c).

Table 5-8 : Design Parameters for the Tailings Storage Facilities Operations

Parameters	Value
Average height of TSF over original ground surface	33 m
Side slope for lower placed tailings (or below elevation 80.2 m)	4H:1V
Side slope for upper placed tailings (or above elevation 80.2 m)	3H:1V
Slope of the final tailings surface at crest	4%
Final top tailings surface area (Cell 1)	46,359 m^2
Final bottom tailings surface area (Cell 1)	179,741 m^2
Final top tailings surface area (Cell 2)	84,655 m^2
Final bottom tailings surface area (Cell 2)	149,632 m^2
Assumed moisture content of tailings to TSF	17.6%
Minimum target dry density of compacted tailings	1.65 t/m^3

Source: (AEM, 2020c)

Commissioning of the process plant started near the end the fourth quarter of 2018 and actual production commenced early in the second quarter of 2019. The production schedule, quantities, and distribution of tailings by year are presented in Table 5-9. Approximately 15.4 Mt of tailings will be produced over an 8.5-year period. Approximately 10.9 Mt or 71% of the tailings will be deposited within the TSF and the remaining 4.5 Mt or 29% will be used as underground cemented paste backfill (AEM, 2020c).

Table 5-9 : Schedule, Quantities and Distribution of Tailings per Year

Year	Mine Year	Tailings Solids from Mill (t)	Tailings Solids to be Used as Underground Backfill (t)	Tailings Solids to be Placed in Dry Stacked TSF (t)
2019	Yr -1	976,706	394,680	582,026
2020	Yr 1	1,519,200	634,163	885,037
2021	Yr 2	1,709,655	657,048	1,052,607
2022	Yr 3	1,775,614	778,607	997,007
2023	Yr 4	1,770,250	280,999	1,489,251
2024	Yr 5	2,013,000	302,926	1,710,074
2025	Yr 6	2,190,000	500,187	1,689,813
2026	Yr 7	2,190,000	521,941	1,668,059
2027	Yr 8	1,255,251	408,999	846,252
Total (t)		**15,399,676**	**4,479,550**	**10,920,127**

Source: (AEM, 2020c)

As presented in the Mine Waste Rock Management Plan (AEM, 2020c), the tailings disposition in the TSF follows a specific sequence. A starter waste rock berm is initially placed along the outside perimeter to contain the initial lifts of the tailings; the berm will become a part of the closure cover. Additional lifts of waste rock (with a maximum lift thickness of 1 m) will be placed as the tailings surface is brought up as erosion and thermal protection. Safety berms will be placed on each lift of the waste rock. The safety berm will also help to reduce dust generation from the tailings surface.

Tailings placement started in Cell 1 in the first quarter of Year -1 (2019). The filtered tailings are hauled to the TSF Cell 1 with haul trucks, end dumped, and bladed into thin lifts using a dozer. Thereafter, the tailings lifts are compacted using a vibratory drum roller. This compaction is intended to promote runoff, reduce the potential for oxygen ingress and water infiltration, and maintain geotechnical stability. The thickness of each lift is approximately 0.3 m (AEM, 2020c).

In order to promote freeze-back, the initial lift of tailings over original ground will be placed during winter conditions whenever feasible. Efforts to limit tailings thickness during the initial year of placement to 2.6 m while the total yearly thickness of the tailings placed in a cell will be limited to no greater than 10.3 m will also aid permafrost aggradation of the facility (AEM, 2020c).

The TSF is designed to minimize the impact to the environment and the design does not rely on freezeback of the tailings to meet the design intent of the structure. However, the freeze-back of the TSF and the foundations will provide additional benefits such as increasing stability and minimizing seepage from the TSF during operation and closure of the TSF (AEM, 2020c).

Based on the tailings production schedule, Cell 1 will reach its design capacity by Year 5 (2024) at an average height of 33 m above the original ground. Cell 2 will start operation from Year 4 (2023) and will reach design capacity in Year 8 (2027), at an average height of 33 m above the original ground (AEM, 2020c).

The TSF is located within the catchment of Lake B7 with a small portion straddling the water catchment of CP1. Site contact water from the TSF is collected by the perimeter water management system located to the northwest and south of the TSF. Seepage and runoff from the TSF will be collected within the CP1 catchment area and in Pond CP3, which will eventually be pumped to CP1. The contact water quality and the water management structures for the TSF will be monitored and assessed according to the Type A Water License 2AM-MEL1631 during operation, closure and post-closure periods.

5.2.6.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

In 2018, no tailings were sent to the tailings storage facility (TSF). Active tailings placement into the TSF began in winter 2019 and continued throughout the year. A total of approximately 582,026 t of tailings was placed in 2019 in the TSF (AEM, 2020c).

In addition to tailings, a total of 39,760 m^3 of waste rock was placed as progressive cover material around the side-slopes of the facility in 2019 (AEM, 2020c).

As the tailings reach final elevation, the tailings will be progressively encapsulated with either waste rock or a layered combination of waste rock and overburden.

5.2.6.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meliadine TSF are listed in Table 5-10, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-10: Closure Objectives and Criteria – Tailings Storage Facilities

Closure Objectives	Closure Criteria	Action / Measurements
Remnant embankments and surfaces of tailings containment areas are physically and geotechnically stable in the long-term	The TSF is designed for closure and will account for seismic and permafrost conditions A cover is placed during operation and closure for dust control (wind erosion), stability and water infiltration	Place cover in progressive reclamation and closure Physical /geotechnical inspection by a qualified engineer Monitoring
Surface runoff and seepage water quality is safe for humans and wildlife Ensure runoff and seepage is collected	Ensure runoff and seepage from the TSF is collected and meet water licence criteria for direct discharge	The runoff and seepage from the TSF will continue to be collected as needed and monitored as per operational practices, and until monitoring results demonstrate that water quality is acceptable for direct discharge Routine water quality monitoring and sampling Physical inspection

Closure Objectives	Closure Criteria	Action / Measurements
Ensure the TSF is safe for monitoring and physical inspections	TSF at post-closure will not compromise people's health	Ensure stability of the TSF Routine monitoring and physical inspection
Control dust generation from active reclamation activities Dust levels are safe for people, vegetation, aquatic life, and wildlife in the long-term	Best management practices for controlling dust, fugitive and exhaust emissions during active reclamation	Implement best management practices Routine air quality monitoring
Be compatible with wildlife use, and/or meet future land use targets	TSF at post-closure will not compromise wildlife safety TSF will be covered	Place cover in progressive reclamation and closure Physical /geotechnical inspection by a qualified engineer Routine monitoring and physical inspection
Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Carry out detailed inspections and assessments of Tailings Storage Facilities. The objective of these inspections and assessments is to evaluate the actual performance against design projections related to anticipate post-closure conditions (R524);
- Conduct a comprehensive risk assessment for mine closure to evaluate the long-term risks associated with possible failure modes for Tailings Storage Facilities. Identify possible impacts and critical parameters and develop control strategies (R525). If warranted, implement a long-term monitoring plan (R526);
- Re-evaluate and revise as necessary plans for management of tailings to prevent; and control and treat metal leaching and acidic drainage to ensure that they are consistent with the objectives and plans for mine closure and post closure (R527). If warranted, implement a long-term site-specific monitoring program (R528).
- At all mines that exist in permafrost conditions, downstream slopes of tailings containment structures should be revegetated (R529).

5.2.6.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for the TSF closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the TSF were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Construct a cover system to prevent surface erosion and create a stable landform in the long-term;

- Collect water that does not meet the discharge criteria for treatment.

The closure options considered different approaches to achieving a stable configuration for the TSF. Placing the cover in a progressive manner is considered the most appropriate approach to achieving a stable configuration for the TSF. The runoff and seepage from the TSF will continue to be collected as needed and monitored as per operational practices. Water treatment facilities will remain on site during closure if required, until water quality meets discharge criteria.

5.2.6.5 Engineering Work Associated with Selected Closure Activity

The description of the TSF reclamation presented below is extracted from the Mine Waste Rock Management Plan (AEM, 2020c).

Mine closure and reclamation of the TSF will utilize currently accepted management practices and appropriate mine closure techniques that will comply with recognized protocols and standards. Results of geochemical characterization indicates that most of the tailings produced to-date at the mine are either PAG or uncertain, while ML has not been observed to be an issue. Despite the PAG classification, the TSF is not considered to pose an ARD risk due to the placement methodology used, assumption of freeze-back within the facility and progressive reclamation cover placement (AEM, 2020c). Freeze-back of the tailings and cover placement are management actions being taken to ensure water from tailings does not impact the receiving environment.

The closure plan for the TSF is to progressively place an engineered cover over the tailings surface as the tailings deposit reaches the ultimate elevation. The proposed closure cover includes:

- A minimum thicknesses of 4.5 m waste rock cover over the lower toe of the final tailings side slopes and a minimum thicknesses of 4.0 m waste rock cover over the upper side slopes, placed during operation along with tailings deposition;
- A minimum thicknesses of 2.5 m waste rock cover over 0.5 m thick select overburden till fill over the top surface of final tailings. The top closure cover material will be placed when each cell reaches its operational capacity and sloped 4% to discourage ponding and surface infiltration.

Waste rock cover will consist of 600 mm minus NPAG waste rock. Select overburden till will be placed and compacted over the top surface of the tailings, in unfrozen conditions. The till material is intended to reduce surface infiltration and will meet the following specifications:

- Inorganic, sandy silt or silty sand with a fines content of 20% to 60% and maximum particle size of 300 mm;
- Placed in an unfrozen condition and have a minimum thickness of 0.5 m.

About 0.1 Mt of selected ice-poor overburden will be stored in a temporary overburden stockpile as TSF closure cover material.

The contact water management system for the TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the TSF are acceptable for the discharge of all contact water to the environment with no further treatment required. Once the water quality meets the discharge criteria established through the water licensing process, the TSF water management infrastructure will be decommissioned to allow the water to naturally flow to the receiving environment (AEM, 2020c).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or site-specific water quality objectives (SSWQO). The final SSWQO that will be applied for closure will be developed prior to closure.

An adaptive closure strategy has been adopted for the Meliadine Mine. The preliminary closure cover design adopted for the TSF at this stage will be further evaluated and updated based on the TSF performance monitoring, water quality monitoring and evaluation, and the overall mine closure plan. The final closure cover design for the TSF will be developed before mine closure (AEM, 2020c).

Dust suppression measures, which are typical of the current mine practices and consistent with best management practices, will be considered through design, operation and closure phases to control the dust. The surface compaction of the filtered tailings lifts and limiting traffic over the compacted surface will significantly reduce the potential for wind erosion of the tailings surface. The placement of the engineered cover will also help prevent dust production. TSF will be operated by cells to limit the tailings surface area exposed to wind and facilitate progressive closure for the cover.

It is anticipated that the native lichen community will naturally re-vegetate the TSF cover over time (AEM, 2015a).

5.2.6.6 Predicted Residual Effects

The following residual effects are predicted at the TSF after reclamation (AEM, 2015a):

- The TSF will be a permanent feature on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that some of the native community will re-vegetate the TSF cover surface over time;
- No significant adverse impact on the continued opportunity for traditional and non-traditional use of wildlife in the region is anticipated with the closure of the TSF.

5.2.6.7 Uncertainties

The main uncertainties for the closure planning of the TSF are related to the cover design, the water quality from the TSF, the permafrost development and the re-vegetation.

Long-term, post-closure water quality in the containment ponds, including CP3, and in the flooded open pit lakes are anticipated to meet MDMER limits and CCME-WQG for the protection of aquatic life or the SSWQO developed for the Mine for aluminum, fluoride, and iron. Arsenic concentrations in CP3 could slightly exceed the SSWQO post-closure, a criteria that is conservatively protective of the receiving aquatic environment (Golder, 2013). If arsenic levels exceed post-closure SSWQOs then water arsenic treatment will be implemented accordingly until arsenic levels decrease below the SSWQO concentration.

The cover design will consider infiltration and potential metal loadings in surface runoff. If necessary, water quality analysis through hydrogeological (groundwater) modelling, unsaturated flow modelling in the cover layer, and field trials will be undertaken to assess the water quality from the TSF at closure (AEM, 2015a). The water quality modelling will be completed during operations and will be considered in the design of the final closure concept for the TSF.

The thermal conditions within the TSF will depend on the actual tailings placement plan and schedule, tailings temperatures when placed, and thermal conditions of the original ground before the tailings are placed. Based on ground temperatures and climate data for the Mine site, it is anticipated that the TSF will freeze back in the long term. Tailings placement strategies will be adopted during mine operation to promote freeze back. Thermistor cables will be installed in the TSF to monitor the permafrost development progress within the facility during the operations stage.

It is anticipated that the native lichen community will naturally re-vegetate the TSF cover over time. As part of a research project at Meliadine, re-vegetation studies will be completed to assess the potential for vegetation on the TSF cover surface.

5.2.6.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSFs as presented by AANDC/MVLWB (2013):

- Periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the TSF;
- Ground conditions in the TSF will be monitored to confirm permafrost conditions are being established as predicted;
- Thermistor data will be monitored to determine thermal conditions within the TSF to confirm predicted permafrost aggradation;
- Water quality from controlled discharge points around the TSF will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- Any seepage areas from the toe of the TSF will be identified and monitored.

5.2.6.9 Contingencies

The contact water management system for the TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the TSF are acceptable for the discharge of all contact water to the environment with no further treatment required. Treatment systems will remain on site until suitable water quality is reached.

Freeze-back of the tailings and cover placement are management actions being taken to ensure water from tailings does not impact the receiving environment. Monitoring will continue until freeze-back of the tailings has been achieved.

5.2.7 Water Management Structures

5.2.7.1 Description of the components

As presented in the Water Management Plan (AEM, 2020b), a network of berms, dikes, containment ponds, channels, culverts and sumps are in place and maintained to facilitate water management. The Figure 4-4 shows a general view of the major components listed below.

- Water containments ponds and associated dikes or berms: Six (6) water containment ponds (CP1, CP2, CP3, CP4, CP5, and CP6) and their associated dikes or thermal berms (D-CP1, Berm-CP2, Berm-CP3, Berm-CP4, D-CP5, and D-CP6) are included in the water management system to manage contact water. Four (4) water containment ponds (CP1, CP3, CP4 and CP5) have been constructed to date as part of the water management infrastructure. Two (2) more water containment ponds (CP2 and CP6) will be constructed in the future. Table 5-11 presents the locations and the required operational period of the containment ponds. Table 5-12 and 5-13 presents the as-built or design parameters of the ponds. Water retention dikes D-CP1, D-CP5, and future D-CP6 have been designed as a zoned earth fill dam with a geomembrane liner keyed into the expected permafrost foundation to limit the seepage through the dike and its foundation.

Table 5-11 : Location of Containment Pond and Required Operation Periods

Containment Pond	Relative Location	Required Operation Period
CP1	Pond H17	Year 2017 to Mine Closure
CP2	East of WRSF3	Year 2024 to Mine Closure
CP3	North of Lake B7 and southwest of TSF	Year 2019 to Mine Closure
CP4	Southeast of Lake B7 and south of WRSF1	Year 2019 to Mine Closure
CP5	North of Tiriganiaq Pit 2	Year 2017 to Mine Closure
CP6	Pond H19 and north of WRSF3	Year 2020 to Mine Closure

Source: AEM, 2020b

Table 5-12 : As-built Parameters for CP1 and CP5

Pond	CP1	CP5
Pond Volume at Maximum Operating Elevation under Normal Operating Conditions and Mean Precipitation Years (m^3)	742,075	46,674
Maximum Operating Water Elevation (m)	66.2	66.0
Maximum Water Elevation during IDF (m)	66.6	66.3
Estimated Pond Volume for Water Elevation at Maximum Operating Water Elevation during IDF (m^3)	855,245	70,000
Dike for pond	DCP-1	DCP-5
As-Built Crest Elevation of Dike Containment Element (liner system) (m)	67.37	66.72

Source: AEM, 2020b

Table 5-13 : Design Parameters for CP3, CP4 and CP6

Pond	CP3	CP4	CP6	CP2
Elevated Pond Bottom Elevation (m)	56.0	56.0	54.0	45.0
Estimated Maximum Water Elevation during IDF (m)	63.0	63.0	60.0	52.0
Pond Volume for Water Elevation at Estimated Maximum Water Elevation during IDF (m^3)	28,800	35,093	32,757	64,000
Pond Surface Area at Estimated Maximum Water Elevation during IDF (m^2)	6,583	8,805	8,602	17,004
Thermal Berm for Pond	Berm-CP3	Berm-CP4	Berm-CP6	Berm-CP2

Source: AEM, 2020b

- P-Area: The P-area includes three P-Area containment ponds (P1, P2, and P3), four (4) containment berms (DP1-A, DP1-B, DP2-A, and DP3-A) and five (5) evaporators. It is part of the surface water management system dedicated to saline water. The total storage capacity of the P-Area ponds is 46,041 m^3. P1 is divided by a berm; P1-A (6,131.8 m^3) is the southern section of P1 and P1-B (14,649 m^3) is the northern section. P2 is adjacent and located south of P1-A. P3 was constructed east of the existing south access road, with the primary purpose of collecting seepage originating from the P2 confining berm and its abutments. Water which accumulates in P3 is pumped to either P1 or CP5, depending on water quality within P3 and the operation status of the RO in CP5. P1, P2 and P3 are contained by berms DP1-A, DP1-B, DP2-A, and DP3-A. The evaporators have been installed on DP1-B, to accommodate the quantity of excess saline water before saline water treatment options and disposal plans have been implemented. In Q2 of 2019, SP3 was installed within southwestern portion of P3. SP3 acts as the final treatment pond for saline water that is to be discharged to sea. Table 5-14 summarizes the as-built capacities for the P-Area ponds and Figure 5-5 illustrates the P-Area plan view and general location. Eventually, by the end of 2020, the P-Area will be covered by a laydown area including various supporting facilities.

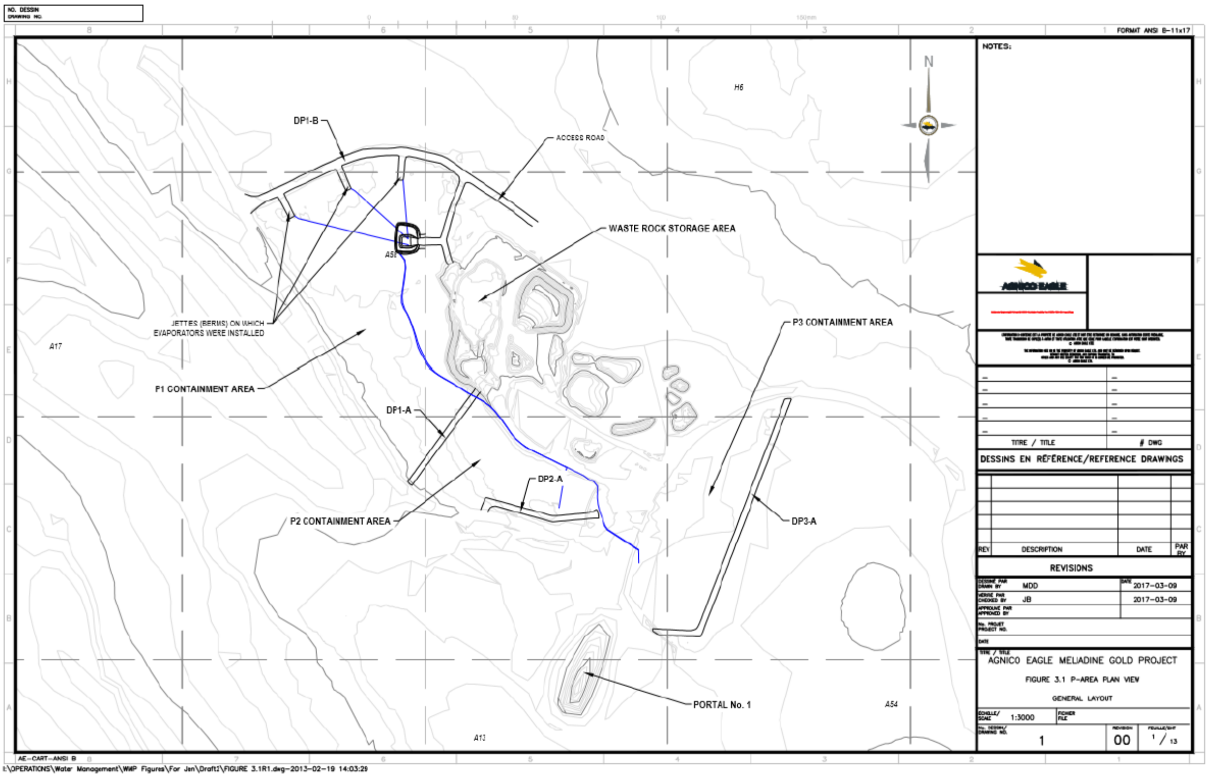
Table 5-14 : As-Built Capacity for P-Area Ponds

Pond	P1	P2	P3
As-Built Capacity (m^3)	20,781	6,828	2,912*
Maximum Design Water Elevation (m)	68.5	67.5	66.22*
Total P-Area Capacity (m^3)	30,521		

*Former as-built volume reduced from 18,432 m^3 due to construction of SP3 within the P3 footprint.

Source: AEM, 2020b

Figure 5-5 : P-Area plan view and general location



Source: AEM, 2020b

- Saline ponds: Four (4) saline ponds (SP1, SP2, SP3 and SP4). The Saline Pond (SP1) was constructed in Q3 2016 to accommodate excess saline water from underground. SP1 is located east of P3 and north of CP5, as presented on Figure 4-4. Approximately 7,500 m^3 capacity should be available to accommodate precipitation that may accumulate throughout winter and at freshet. The Project required a second saline water storage pond (SP2). SP2 was constructed in bedrock within the footprint of Tiriganiaq Pit 2. SP2 was constructed to have a maximum storage volume of 78,000 m^3, of which 10,000 m^3 is reserved for precipitation accumulation over winter and runoff at freshet. SP2 was decommissioned and replaced by Saline Pond 4 (SP4) in Q2 2020. The addition of SP4 has two purposes. First, to replace SP2 and allow the mining of Tiriganiaq Pit 2, and second, to supply additional storage for saline water on site. SP4 will be temporary in nature and will be constructed in bedrock within the footprint of Tiriganiaq Pit 1. The SP3 arrangement is described in the P-Area section above.
- Water diversion channels and berms: Ten (10) water diversion channels (Channel 1 to Channel 8, Channel 9 and 10) are part of the water management system. Seven (7) water diversion channels (Channels 1 to 5, 7 and 8) have been constructed and three (3) remaining channels (Channels 6, 9 and 10) have yet to be constructed. Construction of Channel 6 is tentative based on future water management strategies. Channel 9 and 10 are part of the WRSF3 water management system. The as-built and design parameters for the water diversion channels are presented in Table 5-15. Three (3) diversion berms (Berm 1, Berm 2, and Berm 3) can manage or contain water overflowing from the channels.

Table 5-15 : As-Built and Design Parameters for Channels

Item	Channel									
	1 (As-Built)	2 (As-Built)	3 (As-Built)	4 (As-Built)	5 (As-Built)	6	7 (As-Built)	8 (As-Built)	9	10
Approximate Total Length (m)	528	269.5	656	930	429†	69	240	114	660	220
Bottom Width (m)	3	1.257	1.2 to 2.4 or 0.8 to 3.3*	1.0 to 1.7 or 0.8 to 4.5*	2.3 to 2.9	1	2.0	2.4	2.0	2.0
Side Slopes	3H:1V88	1.82H:1V	1.8H:1.0 V to 3.5H:1.0 V	1.8H:1.0 V to 5.0H :1.0 V	1.9H:1V	3H:1V	3H:1V	3H:1V	2.5H :1V	2.5H :1V
Rip-rap Thickness (m)	0.3 to 0.5	0.277	0.3†	0.37	0.2	0.3	0.59	0.3	0.3	0.3
Minimum Bottom Slope Gradient (%)	0.20	0.30†	5.3 (upper) 0.4 (lower)	2.1 to 5.3 (upper) 0.1 to 4.2 (lower)	0.17†	0.44	0.8 (Avg.)	1.4 (Avg.)	0.3	1.3

* 1 m bottom width for first 100 m upstream section, and 2 m bottom wide for the remaining channel section
** Except from Sta. 0+050 to 0+130: 2(H):1(V)
† As-built parameter values not available; value displayed is from design
Design parameters presented in this table for Channels 9 and 10 are based on the prefeasibility design by Tetra Tech (Tetra Tech, 2020).

Source: AEM, 2020b

- Water Treatment Plants: Contact water will be treated (if necessary) to meet Water Licence requirements prior to being discharged to the environment. Water for potable use is also treated.
    - An effluent water treatment plant (EWTP): The purpose of the EWTP (Actiflo® model ACP-700R) is to reduce Total Suspended Solids (TSS) to a maximum concentration of 15 mg/L from the influent water pumped from CP1 prior to its discharge through the diffuser into Meliadine Lake. Throughout operation of the EWTP in 2018 and 2019, the maximum capacity (nominal flow) of the discharge system was 520 m^3/h. In Q2 2020, the system underwent upgrades to improve discharge capacity to 916 m^3/h, which is within the range of the predicted discharge rates to Meliadine Lake over the life of mine.
    - A saline water treatment plant (SWTP): The SWTP is used to treat saline water stored in the underground mine and saline ponds. The SWTP removes excessive total suspended solids (TSS), calcium chloride (CaCl2), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds from the influent saline water. The influent and effluent from the SWTP are monitored every 12 hours (night shift and day shift) for pH and TDS, and bi-weekly for chloride (Cl), ammonia (NH4), nitrite (NO2), nitrate (NO3), TDS, TSS, total phosphorus (P), total cyanide (Cn), total metals and total mercury (Hg). Effluent from the SWTP is intended to be discharged to CP1. In February 2019, the discharge point was moved, temporarily directing effluent to CP5. Over the open water season of 2020, the discharge point will be reverted back to CP1.
    - A saline effluent treatment plan (SETP): Prior to discharge of saline effluent to sea at Melvin Bay, excess saline contact water stored on site is treated at the SETP for ammonia and total suspended solids. The main feed source to the SETP will be from the saline ponds (SP1 and SP4). Treated saline water will meet MDMER end-of-pipe discharge criteria. Initial treatment will include a clarification unit for TSS removal. Next, break-point chlorination treatment will be applied to remove elevated ammonia levels, which are inferred to be the result of the use of explosives and washing of development faces/muck underground. Excess free chlorine will be removed with activated carbon filters. Following treatment, saline water will be pumped to Saline Pond 3 (SP3) for final settling and storage. The SETP will be designed for 2020 to treat 1,600 m^3/day of saline water for TSS and ammonia.
    - A reverse osmosis (RO) treatment plant: Beginning July 2018, water stored in pond CP5 was treated through a Reverse Osmosis (RO) system and then pumped through the EWTP for treatment (prior to discharge into Meliadine Lake).
    - A sewage treatment plant (STP): Wastewater from the accommodation complex and from satellite sewage tanks is treated in the STP before being directed to CP1.
    - A potable water treatment plant (WTP): Freshwater from Meliadine Lake will be treated in the WTP before being directed to the camp areas for potable (domestic) water uses. The design flow rate for freshwater for the main camp and accommodations is 216 m^3/day.
- A freshwater intake: Freshwater usage includes potable uses, fire suppression, make-up water for the mill, and other operational requirements, such as drilling water, dust suppression, batch plant use, and use at the wash bay. The main freshwater intake and its causeway are located northeast of the industrial pad in Meliadine Lake, as shown on Figure 4-4 and an additional freshwater intake

pump is located at Lake A8. The intakes consist of vertical filtration wells fitted with vertical turbine pumps that supply water on demand. Both intake pipes are fitted with a screen.

- An effluent diffuser located in Meliadine Lake for the CP1 effluent;
- Sixteen (16) water passage culverts to convey water (Culverts 1 to 8, 10, 11, 13, 14 to 16, 18, 19).
- A network of surface pumps and pipelines, two (2) jetties and pumping infrastructure (CP1 and CP5), five (5) evaporators.

As outlined previously in section 5.2.1, the following facilities are in place or will be constructed (upon regulatory approval) for the groundwater management:

- A saline water tank and diffuser: The effluent discharge system consists of a truck discharge pump, a back-up discharge truck pump, a 100 000-litre storage tank, as well as suction, discharge pipelines and a diffuser. A pumping station including two (2) pumps is installed on the containment area. Treated saline water stored in SP3 is hauled by tanker trucks to Itivia. Truck loads are up to 36 m^3 per truck and will be unloaded using a flexible 4" HDPE suction pipe. The truck discharge pump transfers the treated effluent into the 6'' discharge HDPE pipeline and through the diffuser. The truck discharge pump is also used to transfer effluent into the storage tank until the next day before it is pumped into sea, when necessary (AEM, 2020d).
- A waterline for treated groundwater effluent discharge into marine environment: For groundwater management, Agnico Eagle is proposing, upon regulatory approval, to convey water through waterlines. The groundwater will be treated at the mine in compliance to the water quality effluent guidelines for safe discharge in the ocean. The discharge of treated groundwater from the mine into Melvin Bay will occur every year during open water season (summer months from May to October), while there is mining activities at the Meliadine Mine. The waterline will be constructed along the AWAR and the bypass road. The proposed discharge volume of treated groundwater effluent to the ocean ranges from 6,000 to 12,000 m^3/day. The treated groundwater will be conveyed through two (2) waterlines (two (2) 16-inch diameter HDPE pipes) along the 34 km of the AWAR and 7 km of bypass road between Rankin Inlet and the Meliadine Mine. The waterlines will be located on the side of the roads and attached to the bridges. The proposed diffuser system will leave the Itivia Fuel Storage Facility through a Horizontal Directional Drilling (HDD) corridor before daylighting at a depth of 7m. The outfall will connect with the HDD section and terminate with a diffuser at 20 m depth in Melvin Bay. The diffuser system includes a 75 m length (diameter of 12-inch HDPE DR-11) of outfall and a 25 m length diffuser. The diffuser located into Melvin Bay is approximately 20 m below the water surface (AEM, 2020g).

The saline water tank at Itivia and the waterline for treated groundwater effluent are part of the Groundwater Management Strategy. As presented in the Groundwater Management Plan (AEM, 2020d), based on the groundwater inflow volume, the following options were considered and form part of the short-, medium- and long-term management of groundwater inflows to the underground mine:

- Short-term Strategy: Store saline contact water on site;
- Medium-term Strategy: Treat saline groundwater for discharge to receiving environment in Meliadine Lake and Melvin Bay via trucking;

- Long-term Strategy: Treat saline groundwater for discharge to receiving environment in Melvin Bay via waterline.

5.2.7.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The water management components are required during the operation phase of the Meliadine Mine. The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine. Water management structures are in place or will be constructed as needed during operation to contain and manage the contact water from the areas affected by mining activities. All mining components have been located to avoid or minimize impact on the local environment to the extent possible.

As mentioned in the FEIS Addendum for the treated groundwater waterline (AEM, 2020g), for the most part, discharge into the ocean does not have much impact on the environment via waterlines from Meliadine Mine. Most effects from the Project related to the waterlines, such as discharge to the marine environment has been reviewed and approved. The waterlines will be built close to the road on the tundra, impacting the vegetation where the waterlines will lie. There is a possibility that the waterlines could spill on the tundra or into the ocean. The effluent is treated groundwater, with a quality similar to ocean water. Even if the waterline or diffuser had a leak, it would still be safe and Agnico Eagle would fix any leaks in the waterline and stop the spill (AEM, 2020g).

All water management facilities will be decommissioned at different stages of closure, the open pits will be flooded, and natural drainage will be restored as much as possible. Once the underground mining activities are completed, the source of saline groundwater will be eliminated.

5.2.7.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the dikes and dams are listed in Table 5-16, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-16: Closure Objectives and Criteria – Water Management Structures

Closure Objectives	Closure Criteria	Action / Measurements
Ensure physical stability of residual earth structures for environmental, human, and wildlife safety	Stabilize slopes to minimize erosion, failure and slumping Ensure long-term stability	Routine monitoring and sampling Physical and geotechnical inspection
Dismantle and remove as much of water management systems as possible and restore natural or establish new drainage patterns	Re-establish natural grade and drainage where possible Runoff is channelled through the watershed Restore natural/compatible terrain as much as possible	Dismantle all water management systems Surface will be regraded to promote natural drainage Physical inspection, routine monitoring and sampling
The systems are dismantled and removed/disposed of (i.e. pipelines, culverts, pump systems).	Remove all components above ground or buried	Components or materials will be cleaned up and salvageable

Closure Objectives	Closure Criteria	Action / Measurements
		materials removed, shipped or disposed at the landfill Concrete slabs on grade will be perforated and covered or removed and the area re-graded to avoid erosion and promote natural drainage Physical inspection to confirm removal
Remove all hazardous wastes to avoid contamination	All hazardous wastes are removed and disposed properly	Hazardous wastes will be removed for disposal by Licenced handler as per operation practices
Meet water quality objectives for the site surface water	Water licence criteria for direct discharge to the receiving environment	Routine monitoring of water quality as per the Water Licence requirements
Remove treatment facilities when water treatment is no longer required	Water licence criteria for direct discharge to the receiving environment Collected runoff and seepage will be treated until water quality meets licence criteria for direct discharge When water quality from the mine components is deemed suitable for direct discharge to the environment berms and dikes will be breached	Dismantle all water management and treatment systems when possible Routine monitoring of water quality as per the Water Licence requirements
Stable release of water discharge to the environment is maintained at designated discharge points	Maintain water management components until they are no longer required Long term water management structures are properly designed for long term stability	Design and construct structures for long term water management with adequate dimensions at proper locations Routine monitoring and inspection
Return area to its original state or to a condition compatible with the end land-use targets	Remove all facilities and restore natural/compatible terrain as much as possible	Dismantle and reclaim all infrastructure, regrade surface to promote natural drainage Physical inspection to confirm removal, routine monitoring
Discourage wildlife from entering the facilities	Wildlife will be discouraged from entering the facilities until water quality is acceptable	Limit access to facilities with berms Routine monitoring and sampling

Closure Objectives	Closure Criteria	Action / Measurements
Systems are physically and geotechnically stable for the safety of humans and wildlife	Limit access until water quality is acceptable and meet required criteria	Place berms and signs to limit access Physical inspection
Consider community land use expectations and traditional knowledge	Community engagement will continue to be implemented	Public engagement

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Support infrastructure, such as fuel storage tanks, pipelines, conveyors and underground services, should be removed. (from R517).

5.2.7.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for the water management facilities closure are provided by the AANDC/ MVLWB (AANDC/ MVLWB, 2013). Closure activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- For any water management structures that may be required post-closure, select design parameters to reflect the need to maintain stability in the long term;
- Design water management systems to minimize the migration of potential contaminants;
- Treat non-compliant water in storage and subsequently release upon achievement of discharge criteria;
- Open and level/contour of embankments, berms, dikes and culverts not required for long-term use and restore the pre-disturbance drainage network to the extent possible;
- Locate permanent spillways in competent rock or material;
- Drain and backfill all sumps and collection trenches;
- Drain, dismantle, and remove tanks and pipelines from the site;
- Ensure any remnant embankments or other water management structures have appropriate erosion control measures in place to maintain stability post-closure;
- Stabilize embankments by removing weak or unstable materials from slopes and foundations and/or construct toe berms to flatten overall slope;
- Open water retention dams and drain impoundments, avoid post closure impoundment of water when possible.

All the options listed above will be required to address closure and reclamation of the water management system. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.7.5 Engineering Work Associated with Selected Closure Activity

The description of the closure activities for the water management structures as presented herein is taken from the Water Management Plan (AEM, 2020b). During mine closure, the water management infrastructure on site will remain in place until mine closure activities are completed, and monitoring demonstrates that the water quality is acceptable for environmental discharge without treatment. Once water quality meets the discharge criteria, the water management systems will be decommissioned to allow the water to naturally flow to the environment.

The open pits will be flooded at closure and passive flooding of the Tiriganiaq Underground Mine will also occur. These activities are detailed respectively in section 5.2.4 and 5.2.3 of this plan.

The containment ponds, dikes and berms will remain in place to collect the surface runoff water and seepage from the mine until the water quality meets discharge criteria. Once the water quality meets discharge criteria, dikes/berms will be breached to allow runoff to follow natural (topographically induced) flow paths. Dikes/berms breaching will involve the removal of a portion of the dikes to a minimum depth of 1 m below average water level or back to original ground levels. Consideration will be given to breach staging, with the above water portions of the dike/berm in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighboring waterbodies. The remainder of the breach would be conducted during the open water season following freshet. Turbidity curtains would be deployed to minimize any potential sediment release to surface water (AEM, 2020b).

Once monitoring results have indicated that contact water conveyed in channels and sumps meets acceptable water quality, the infrastructure will be graded and/or surface treated according to site specific conditions to minimize wind-blown dust and erosion from surface runoff, if required. This closure activity is intended to enhance site area development for re-colonization by native plants and wildlife habitat (AEM, 2020b).

Culverts will be maintained as required in closure until site water quality monitoring results indicate that water can be released to the environment without further management and without erosion. Culverts on site will be dismantled and disposed of in the on-site landfill and the areas will be re-graded to promote natural drainage.

The long-term, post-closure water quality in the containment ponds and in the flooded open pit lakes are anticipated to meet Metal and Diamond Mining Effluent Regulations (MDMER), Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) for the protection of aquatic life and/or the Site-Specific Water Quality Objectives (SSWQO) developed for the Mine (AEM, 2020b).

Overall, the water quality objectives for closure and post-closure will represent baseline conditions or national water quality objectives such as the CCME or SSWQO. The final SSWQO that will be applied for closure will be developed prior to closure.

The saline water tank and diffuser for trucked groundwater will be decommissioned, dismantled and removed as appropriate. The pump, piping, tanks and other components will be either transported to the mine site landfill disposal or barged out of Rankin Inlet. The waterline system will be decommissioned; the pipeline network components will be dismantled, removed and disposed on-site in a landfill. The water effluent diffuser will also be dismantled and removed from the shore area and water, using best practices to minimize disturbance, and disposed on-site in the landfill.

Water treatment facilities will remain on site until water quality is suitable for direct discharge to the environment. The water treatment and Meliadine Lake effluent diffuser will be maintained for three (3) water treatment seasons as a contingency before being dismantled and disposed of in an appropriate landfill.

5.2.7.6 Predicted Residual Effects

No significant residual effects have been identified for closure of the water management facilities, as it is predicted that concentrations in post-closure will meet discharge criteria. Changes to terrain caused by the construction and reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.7.7 Uncertainties

Uncertainties are related to water quality during closure and post-closure. However, water quality modelling will continue during operation.

5.2.7.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the water management facilities, and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Periodically inspect the remaining water management structures to assess their performance;
- Continue monitoring climatic conditions at site to compare them to design assumptions (e.g., regarding storm events) and performance of selected closure activities;
- Monitor the performance of erosion protection on embankment structures, such as riprap, and the physical stability of water management systems including permafrost integrity where applicable;
- Monitor water quality, quantity, and flows to ensure system is working as predicted and water quality objectives are being met;
- Sample surface water as per Water Licence requirement;
- Evaluate post-closure drainage patterns and confirm that they compare to pre-development patterns as described in the closure objectives;
- Periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the structures.

5.2.7.9 Contingencies

The water treatment facilities are included as a contingency measure should water on site not be suitable for release to the environment. The diffuser will be maintained in place for three (3) water treatment seasons as a contingency before being dismantled and disposed. Once the underground mining activities are completed, the source of saline groundwater will be eliminated.

Water quality monitoring will occur during mine operation to include in the site water quality and to provide additional information for future closure water quality prediction and planning modifications if required.

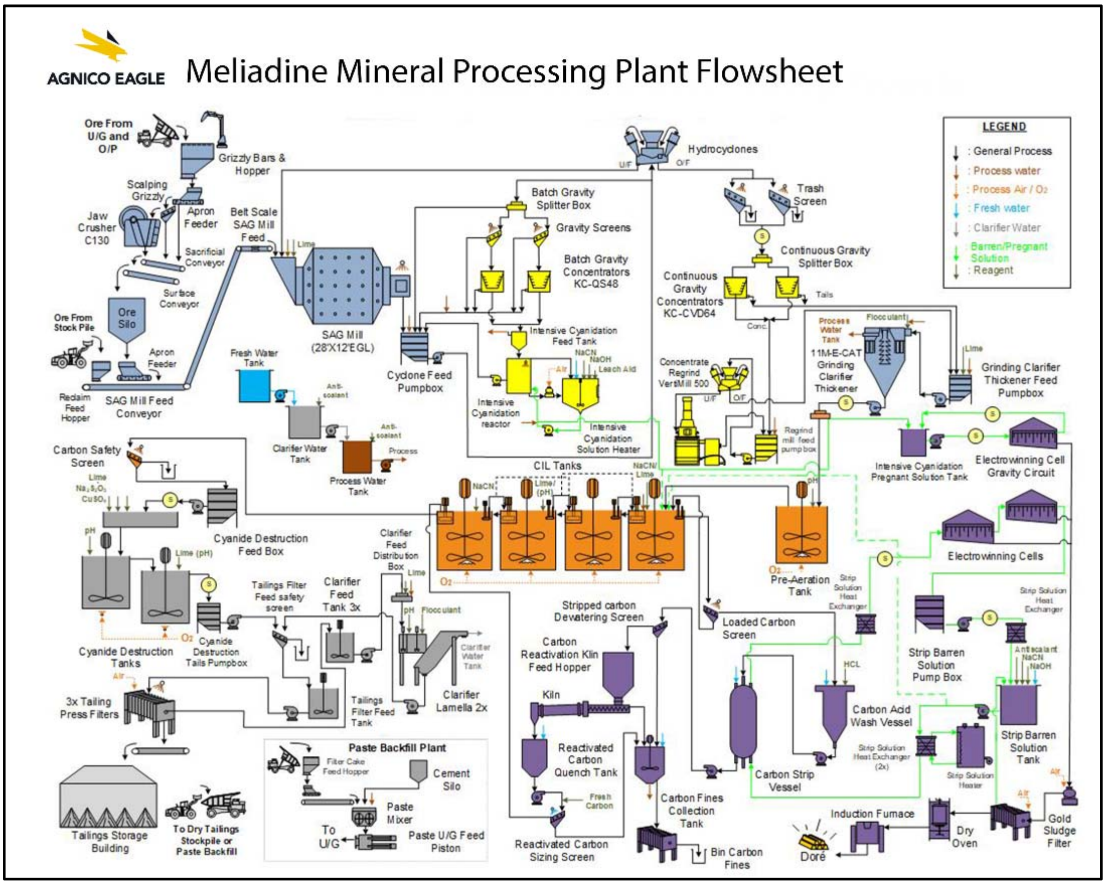
5.2.8 Site Buildings and Equipment

5.2.8.1 Descriptions of the components

During the life of mine, surface infrastructures are required at different periods for mining, processing, accommodation, fuel storage and electricity. Most of the infrastructures are located within the industrial site of Meliadine.

- Mill: The mineral processing facility consists of four (4) main components: a crusher plant, a belt conveyor from crusher to the ore bin, a process plant and a paste backfill plant. The ore processing facility is centrally located relative to the mining site. The facilities will comprise crushing, grinding, gravity recovery, cyanidation, and gold recovery in a carbon-in-leach circuit. The main ore processing streams will be continuous operations, while the carbon-handling and gold recovery circuits will be batch operations. The Figure 5-6 presents the Meliadine mineral processing flowsheet.

Figure 5-6 : Meliadine mineral processing flowsheet



Source : AEM website

- Ore Pads: The ore stockpile is located on a pad close to the process plant pad. No ore will remain in the ore stockpiles by the end of operations. The stockpile will have a maximum footprint of 10.3 ha. Upon regulatory approval, an extension of the ore pad (Ore Pad 2) of approximately 5.6 ha is planned within the laydown area.
- Accommodation and Service Building: Due to the remote location of the mine, it is necessary to provide catered accommodation on-site. The permanent camp includes individual rooms, shared bathrooms and recreational facilities. The camp complex is constructed out of insulated structural wood frames resting on a structural steel frame floor on piles. At full operational capacity, the camp will house approximately 680 people. The building houses also the kitchen, dry warehouse, and offices (administration offices, an engineering and training room, various departmental offices (e.g., human resources, training, geology, engineering, planning, environment).
- Laboratory and Core Shack: The assay laboratory and core shack will be designed to accommodate, but not be limited to, an average of 300 samples/day in a building located on the mine site. The assay laboratory and core shack are in a building near the south of the warehouse. The building is aa prefabricated steel frame (foldaway type) structure covered by cladding and roofing panels.
- Maintenance Shops: An industrial mine maintenance shop containing several maintenance bays, a wash bay, a machine shop, and a welding shop is in the industrial area on a concrete foundation. Upon regulatory approval, a wash bay close to the service building, temporary and permanent garage buildings (on concrete blocks or concrete slab) will also be built in the laydown area.
- Emulsion Plant: The Emulsion Plant, raw material storage, and magazines are located north west of the site, away from vulnerable facilities, as stipulated by the federal and territorial Explosives Use Act and Regulations. The explosives trucks are based at the Emulsion Plant. A garage is also included in the building for the maintenance and washing of trucks and equipment used to handle explosives.
- Fuel Storage: The main storage tanks include one (1) tank of 6 ML and one (1) tank of 3 ML. Smaller storage tanks are also located on site. The total diesel fuel storage capacity on site is in the range of 9.7 ML.
- Power Plants: The power plant is a diesel-fuelled facility using multiple medium-speed reciprocating engines housed in a building (Murox type building). A separate modular building is required to house all the switchgears, transformers, mechanical rooms, electrical rooms, and heat recovery systems.
- Pads and staging areas: Laydown areas for containers (sea cans) disposal of approximately 51,562 m^2. An approximate total area of 12.5 ha for additional pads and staging areas (within the laydown area) will be constructed upon regulatory approval. The new facilities include a garage area, a warehouse pad, container areas 1 and 2, an ore staging area, a waste staging area and a mobile crusher area. The site layout will be updated with this final infrastructure list.

Approximate dimensions of site infrastructures are available in the RECLAIM model and the cost calculations details presented in **Appendix N**.

The equipment fleet include mobile surface equipment and underground mining equipment. The list is provided in **Appendix N**. The list includes the equipment on site, but additional equipment will be mobilized in the future for the open pits exploitation. The list will be adjusted if required in next version of the ICRP.

5.2.8.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The existing supporting facilities are described in Section 5.2.8.1. The Figures 4-4 show the main existing infrastructure at the mine site. The mine site area is approximately 453 ha.

At closure, the facilities will be dismantled and reclaimed following best practices put in place during operation and in order to minimize long term disturbance. The facilities could also be transferred to the local community upon interest.

5.2.8.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meliadine buildings and equipment are listed in Table 5-17, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013 and AEM, 2015a).

Table 5-17: Closure Objectives and Criteria – Site Buildings and Equipment

Closure Objectives	Closure Criteria	Action / Measurements
Return area to its original state or to a condition compatible with the end land-use targets	Remove all facilities and restore natural/compatible terrain as much as possible	Dismantle and reclaim all infrastructure, fuel reservoirs, chemicals and industrial wastes Surface will be regraded to promote natural drainage, revegetation and to suit the surrounding topography Physical inspection
Transfer of usable surface infrastructure	Any above-ground infrastructure will be offered to the Kivalliq Inuit Association (the land owner) at closure for potential re-use elsewhere, or will be dismantled and demobilize from site	Agreement with the Kivalliq Inuit Association
Remove surface infrastructure Buildings and equipment will not be a source of contamination to the environment or a safety hazard to humans and wildlife	Limit access during closure Remove all facilities and restore natural/compatible terrain as much as possible Clean up and remove machinery, materials and equipment	Place signs to limit access Machinery and equipment will be removed off-site for salvage Dismantle and reclaim all infrastructure and fuel reservoirs Approved demolition waste will be placed in on-site landfill Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site, salvageable material will be remove off-site for salvage

Closure Objectives	Closure Criteria	Action / Measurements
		Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in the pieces and buried Soil and water monitoring Physical inspection
Remove all hazardous wastes to avoid contamination	Remove all hazardous material	Remove all hazardous material for disposal by licensed handler
Maintain required site infrastructure during active reclamation	Promote early decommissioning	Reduce the use of facilities as much as possible after closure
Ensure the remaining surface areas are safe for wildlife use and access	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote the use for wildlife Physical inspection
Ensure contaminated soil is removed from site	Remove and remediate contaminated soils	An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons A more detailed investigations will be carried out of the potential soil contaminated areas (i.e., Phase 1 and 2 ESA investigations) to determine the extent of the contamination Selected hydrocarbon contaminated soils will be excavated and hauled to the landfarm for remediation
Control dust generation from demolition and active reclamation activities	Best management practices for controlling dust, fugitive and exhaust emissions during active reclamation	Implement best management practices Routine air quality monitoring
Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Dismantle and reclaim all infrastructure Surface will be regraded to promote natural drainage, revegetation and to suit the surrounding topography Routine monitoring and physical inspection
Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- On-site facilities and equipment that are no longer needed should be removed and disposed of in a safe manner. Efforts should be made to sell equipment for reuse elsewhere or to send equipment for recycling, rather than disposing of it in landfill facilities. (from R514);
- The walls of on-site buildings should be razed to the ground. Foundations should be removed or covered with a sufficiently thick layer of soil to support re-vegetation. (from R515);
- Any remaining structures and foundations should be inspected to ensure that no contamination is present. If contamination is found, it should be remediated as necessary to ensure public health and safety for post-closure land use. (from R516);
- Support infrastructure, such as fuel storage tanks, pipelines, conveyors and underground services, should be removed. (from R517);
- Electrical infrastructure, including pylons, electrical cables and transformers, should be dismantled and removed. (from R520).

5.2.8.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for the buildings and equipment dismantling are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Reclamation activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Recycling or reusing building materials and equipment where possible to reduce waste and importation of materials to site;
- Dismantle all buildings that are not necessary to achieve the future land use target;
- Raze/level all walls to the ground and remove foundations;
- Remove foundations where possible or cover with natural materials to blend into natural surroundings. Cover materials should be conducive to vegetation growth (this may include lichen) where possible;
- If disposing on site, decontaminate building materials (free of any batteries, fuels, oils, bulk process chemicals, or other deleterious substances), and use toxicity characteristic leaching procedure testing to confirm suitability for non-hazardous disposal;
- Cut, shred, crush, or break demolition debris to minimize the void volume during disposal;
- Maintain photographic records of major items placed into landfills, as well as a plan showing the location of various classes of demolition debris (e.g., concrete, structural steel, piping, metal sheeting, and cladding);
- Remove and dispose of concrete in an approved hazardous waste landfill if it contains contaminants that may pose a hazard over time;
- Backfill/grade all excavations to achieve the final desired surface contours to re-establish the original drainage or a new acceptable drainage;
- Backfill excavations in permafrost to limit permafrost degradation;

- Control dust emission during demolition of buildings that contain or contained asbestos, lead paint, hazardous chemicals, or other deleterious material;
- Remove buried tanks, where they already exist, to prevent subsidence;
- Remove hazardous waste to an approved on- site waste storage facility prior to shipping for off-site disposal;
- If possible, transport equipment off the site for reuse at other locations. This may include sale or salvage to local communities if sufficient interest exists;
- If sale or salvage of equipment is not possible, dispose of decontaminated equipment in an approved landfill or as recommended by the regulatory authorities;
- Decontaminate equipment (free of any batteries, fuels, oils, or other deleterious substances) and reuse or sell (local communities may have interests in some of the materials);
- Reclaim areas to the original topography and drainage or to a new topography or drainage compatible with end land use targets.

5.2.8.5 Engineering Work Associated with Selected Closure Activity

Prior to closure, infrastructure and equipment will be offered to the Kivalliq Inuit Association (the land owner) at closure for potential re-use elsewhere.

At closure, all buildings and structures will be decontaminated, decommissioned and dismantled. Demolition waste that cannot be reused, recycled or provided to local interests will be disposed of in the on-site landfill. Salvageable material will be removed off site and metals will be separated and shipped off-site as scrap if economical to do so.

Any above grade concrete structures or foundation will be demolished, and the rubble will be disposed of in the landfill. Any slabs on grade will be punctured and then left in place and covered with soil or non-potentially acid generating/non-metal leaching waste rock. Any subgrade foundations will be left in place. All disturbed site areas will be re-graded to promote natural drainage, revegetation and to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control.

Remaining bulk fuel and empty portable fuel storage tanks will be offered to community interests. The tanks will be emptied, cleaned, and dismantled for disposal in the site landfill or shipped south. Fuel not required during the closure and reclamation activities will be sold, returned to suppliers, disposed by a licensed handler, or incinerated.

All hazardous wastes will be removed for disposal by a licensed handler during the dismantling of buildings and infrastructure. An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons. Any contaminated soil will be excavated and taken to the landfarm for treatment.

Most of the mobile equipment will be removed once the closure stage is complete. Equipment used for closure activities and long-term maintenance will be removed from the site once they are no longer required. A small subset of equipment will be retained on-site for a portion of the post-closure stage, in order to complete corrective work if required. The equipment selected to be left on site for the post-closure period will be reviewed with qualified personnel, to ensure adequate equipment is available for corrective work.

Mobile equipment and local contractors may also be available in the municipality of Rankin Inlet located near the Meliadine site.

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas with depressions and if subsidence occurs. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Meliadine Mine to limit wildlife injury such as re-contouring reclaimed areas to reduce hazards to wildlife. Proper reclamation is also required to leave the site in appropriate conditions that do not present safety risks for humans.

5.2.8.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the supporting buildings but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the natural terrain and alteration or loss of plant populations and plant communities.

5.2.8.7 Uncertainties

No major uncertainties are related to the closure activity of the site building and equipment. The pre-disturbance terrain was covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil stability and promote re-vegetation by natural colonization. Re-vegetation studies will be completed to assess the potential for vegetation to establish in disturbed areas or on rockfill covers (AEM, 2015a).

5.2.8.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSFs as presented by AANDC/MVLWB (2013):

- Periodic inspections will be performed to visually assess the reclaimed areas; and
- All buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed in the on-site landfill.

5.2.8.9 Contingencies

There are no activities proposed as contingencies with regards to the closure of the buildings and equipment.

5.2.9 Waste Management Facilities

5.2.9.1 Description of the components

The waste management facilities include the landfill, landfarm and incinerator. Hazardous waste management is also part of the global waste management. At the Mine site, wastes are safely managed from the time they are produced to their final disposal. All waste is segregated at the mine site and will predominately be landfilled, incinerated, or recycled. Used oil burning will be maximized as much as possible using the secondary chamber of the incinerator. Remaining wastes on site, including hazardous waste, will be packaged for shipment to a certified waste management facility for treatment, recycling, and/or disposal.

Waste management begins by keeping all materials that can be economically recycled out of the waste stream destined for the landfill or incineration. The three (3) R's of waste management - reduce, reuse, and recycle - is encouraged within the waste management program. Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste incinerated or directed to the landfill. To support this initiative, operating procedures will be developed to maximize the volume of materials that are recycled and/or reused. This will include eliminating the use of disposable materials where possible, and segregating waste destined for reuse, and recycle alternatives.

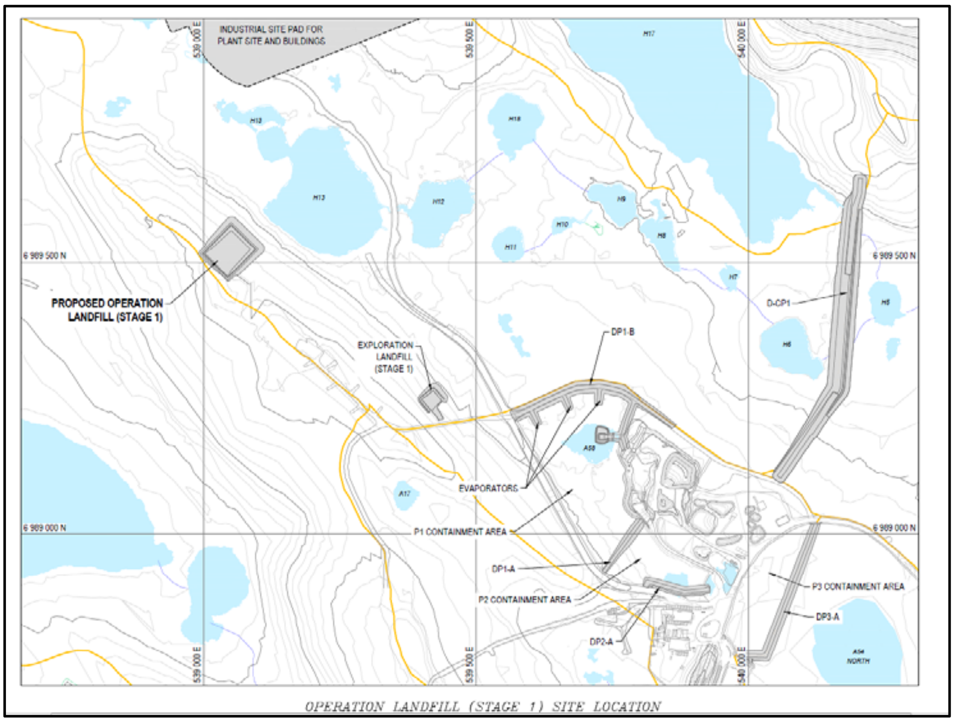
Similar to the waste management philosophy, plans are to actively work towards minimizing spills through suitable work procedures. Plans developed from the environmental impact study address the management of spills on land, ice, water, and into the marine environment. When spills do occur, the goal is to limit the spread of the spill, and then manage contaminated material resulting from the spill.

The major components of the waste management system are described below.

Landfill:

As described in the Landfill Management Plan (AEM, 2019g), a landfill is required on site for the disposal of non-salvageable, non-hazardous, non-putrescible solid industrial wastes that cannot be incinerated and that result from construction, operations, and closure of Meliadine Mine. An operation landfill (Stage 1) is required to permanently store acceptable waste materials during mine preproduction and early operation. The acceptable waste materials are non-salvageable, non-hazardous, nonputrescible solid industrial wastes that have a low leachate and low heat generation potential and cannot be incinerated in the site's incinerator. As presented on Figure 5-7. The landfill is situated at the northeast corner of the WRSF1. This location was selected to facilitate site drainage management, minimize overall environmental footprint of the project, facilitate easy access and final closure/reclamation, and provide enough storage capacity and operation flexibility (Tetra tech, 2017b).

Figure 5-7 : Operation Landfill (Stage 1) Location



Source: (Tetra tech, 2017b).

The active WRSF 1 sets the boundary of the landfill on its south and west sides, while berms were constructed on the north and east sides of the landfill. The purpose of the berms is to confine the area for waste disposal and to act as a wind shield to reduce windblown debris. The landfill is a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste will be protected from the wind by the berm. The design of the berms does not assume that they will be in a frozen state or permanently impermeable to leakage. The final design will consider berm and subgrade stability (AEM, 2019g).

The landfill will be used for the construction, operations, and closure phases. It will not be required for post-closure. The schedule for the landfill is as follows:

- Year -3 (2017) to Year -1 (2019): Construction of the landfill occurred directly after the placement of minimum 1.2 m of waste rock or rockfill to serve as a base or foundation;
- Year 1 (2020) to Year 8 (2027): The landfill will be used continuously during operations;
- Year 9 (2028) to 11 (2030): The landfill will be one of the last parts of mine infrastructure to close. It is expected to be extensively used during closure for demolition waste and will remain operational until it is no longer needed.

As mentioned in the Landfill Management Plan (AEM, 2019g), the following materials are acceptable for disposal in the landfill:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron;
- White goods;
- Wire;
- Wood;
- Fiberglass insulation and fiberglass;
- Roofing;
- Asphalt;
- Concrete;
- Carpet;
- Bricks;
- Ceramics;
- Rubber;
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Air filters;
- Glass, including light bulbs;
- Waste Asbestos;
- Small appliances (with batteries removed);
- Gyproc;
- Ash, provided it has cooled to 60 degrees Celsius or less;
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed;
- Treated soils from landfarm.

An estimate of waste volume is required to determine the appropriate size of the landfill. However, an exact waste volume is not a critical parameter in the design because of the flexibility of the design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) within WRSF 1. Table 5-18 indicates the estimated mass of waste destined for the landfill each year and cumulatively for the life of the Meliadine Mine.

Table 5-18 : Estimated Waste in Landfill

Project Phase	Waste Not Incinerated (t/year)	Ash From Incinerator (t/year)	Estimated Volume of Non-Hazardous Waste and Ash Produced (m^3/year)	Approximate Treated Soil From Landfarm (m^3/year)	Maximum Accumulated Waste Material in Landfill (m^3)
Construction	100	30	260	0	1,040
Operations	340	102	884	446	37,043
Closure	25	7.5	65	525	25,226
Total					**63,309**

Source: (AEM, 2019g).

The landfill will progressively be filled in an orderly manner. Specifically, waste is placed to full height at one end of the landfill and then the active waste area will progressively advance. An "area method" of dumping is used such that materials is dumped in rows and covered as required. Wastes are deposited directly onto the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier. Areas where the waste has been placed to full height, compacted and levelled is progressively covered by placement of a minimum of 0.3 m thick of rock fill on top of the waste to reduce windblown debris. Owing to its placement within the WRSF 1, the landfill will become encapsulated within waste rock. Upon closure, the entire landfill will be covered with 3.7 m of waste rock (AEM, 2019g).

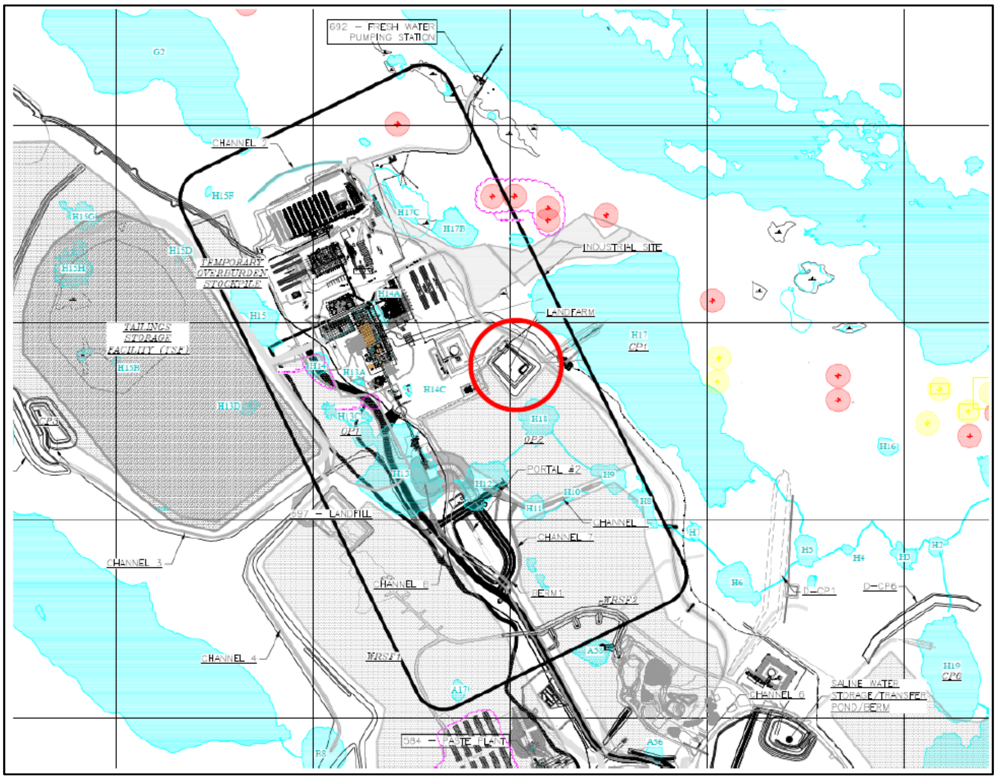
The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill, and, as a result, site-specific landfill leachate management is not considered necessary. In the event there is leachate from the landfill during periods of heavy rainfall or spring freshet, the runoff will be collected and directed to CP1.

Landfarm:

As described in the Landfarm Management Plan (AEM, 2019h), on site storage and remediation has been established as the preferred method for treatment of light petroleum hydrocarbons (PHC) contaminated soil that may be generated at the mine. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this contaminated soil management plan. It is estimated that soils contaminated with light end PHCs would require three (3) full summer seasons for complete remediation. The general location of the landfarm is presented on Figure 4-4, and the specific location is shown on Figure 5-8. The area has no exposed bedrock and up to 20 m of glacial-fluvial till that has little ground ice and shows no permafrost degradation. The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations.

Upon regulatory approval, a landfarm extension (Landfarm C) will be constructed to accommodate additional contaminated soil to be treated. The planned landfarm extension area is within the laydown area, adjacent to the ore pad extension and the warehouse pad. The area of the landfarm extension is presented on Figure 4-4.

Figure 5-8 : Landfarm Location



Source: (AEM, 2019j)

The landfarm was designed to have an engineered rockfill pad and perimeter berms with a geomembrane liner system. The geomembrane liner crest elevation was installed at an elevation of 74.80 m, it does allow for 0.45 m of freeboard before reaching the geomembrane liner crest elevation. Its footprint is approximately 10,040 m^2, with a perimeter berm that is approximately 1.4 m to 5.2 m high over the landfarm surface (Tetra Tech, 2018).

The landfarm is located on land that slopes towards the southwest corner, which results in any rainwater or snowmelt draining to temporary water storage having the capacity to store a 1:100 wet year spring freshet plus 500 m^3 of water from melting of contaminated snow/ice. Drainage from the landfarm may be used as water in the turning of the windrows during the remediation process. Excess water is collected within a sump inside the landfarm and will be pumped to an oil separator plant for removal of excess oil. The treated water will then be discharged into the CP1 (AEM, 2019h).

The landfarm was built with the expectation of effectively treating up to 5,000 m^3 of contaminated soil over the construction, operations, closure, and 500 m^3 of snow and ice annually. Table 5-19 outlines the estimated volumes of contaminated soils and rock, and contaminated snow and ice expected during each phase of the mine (AEM, 2019h). For the planned landfarm extension area (Landfarm C), it is assumed for now that the design and capacity of the new landfarm will be similar to the existing operation landfarm. Additional details on the new landfarm design and capacity will be added to the next version of the ICRP.

Table 5-19 : Estimated Volume of Petroleum Hydrocarbon Contaminated Soil and Ice/Snow to be Managed

Project Phase	Volume of PHC Soil/Rock (m³)	Annual PHC Snow/Ice (m³)
Advanced exploration	2,209 (volume in exploration landfarm to date)[1]	500 per year
Predevelopment (2 years)	350 (175 per year)	
Construction (3 years)	1,050 (350 per year)	
Operations (7 years)	2,450 (350 per year)	
Closure and Reclamation (2 years)	700 (350 per year)	
Total	**4,970**	

[1] The contaminated soil in the advanced exploration landfarm will be transferred to the mine landfarm upon its completion and commissioning.

Source: (AEM, 2019h)

Diesel and aviation fuel, gasoline, hydraulic oil and other light oil are acceptable for treatment in the landfarm if generated on-site and spilled on soil. Remediation of fine grained PHC contaminated soil in the landfarm occurs naturally through volatilization and aerobic microbial degradation. Soil aeration, nutrient amendment and water addition, are recognized as methods for improving rates of remediation. Agnico Eagle commissioned the National Research Council Canada to undertake the bioremediation research study to optimize the biodegradation process. Agnico Eagle will look at increasing biodegradation rates through potential opportunities such as nutrient amendment (AEM, 2019h).

Landfarm windrows are sampled annually at the end of the summer season to determine if remediation objectives have been met. Parameters are compared with the GN industrial remediation criteria to determine whether PHC contaminated soil has been adequately remediated. When remediated, the soils will be removed from the facility and can be used for construction purposes such as part of the cover of the Tailings Storage Facility (TSF) or stacked in the Waste Rock Storage Facility (WRSF). Based on a remediation period of three (3) seasons, it would be possible to close the landfarm facility three (3) years after the end of the process plant operation (AEM, 2019h).

Incinerator:

Incineration is an essential part of waste management at the proposed mine site. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunch rooms, shops, warehouses, and offices will divert waste from directly reporting to the on-site landfill. It will have the advantage of eliminating putrescible waste that could potentially attract wildlife to the landfill, thereby reducing possible dangerous interactions between humans and wildlife.

The incinerator is in its own building on the south end of the infrastructure pad, downwind of other mine infrastructures. Figure 4-4 shows the location of the incinerator. The ECO 1.75 TN 1PVC100L incinerator system consists of a primary chamber and a secondary chamber. Both chambers are vessels constructed of steel with a special insulating liner known as refractory. Incinerator components also include a main control panel, diesel fuel (4,500L) and used oil (5,000L) tanks (AEM, 2017).

The ashes collected from the incinerator are disposed into the landfill. Ash testing protocol is implemented to ensure that the incinerator ash is suitable for disposal in the landfill. The incinerator stack design includes two (2) sampling ports with caps, as well as an in-line opacity meter to allow for stack testing to be undertaken during incinerator operation. Performance limits for the incinerator at Meliadine are in accordance with the emission guidelines set out by the CCME: Canada-Wide Standard for Dioxins and Furans, and Canada-Wide Standards for Mercury Emissions.

Hazardous material storage area:

As presented in the Hazardous Waste Management Plan (AEM, 2018), all hazardous materials are stored in secured areas to prevent tampering, as well as access by unauthorized personnel. Hazardous materials that become waste will be stored and/or disposed of in accordance with specific government regulations and guidelines. The Environment Department monitors the movement of hazardous waste, from the generator to final disposal, through use of a tracking document known as a Waste Manifest. Hazardous wastes at the Itivia docking site in Rankin Inlet will be managed according to the appropriate regulation(s). The Project requires the use of the following types of hazardous materials:

- Petroleum products and lubricants – diesel fuel, oil, grease, anti-freeze, and solvents used for equipment operation and maintenance;
- Process Plant consumables – chemicals for mineral extraction;
- Water treatment consumables – chemicals;
- Explosives – emulsion, caps, explosives, surfactants, and sodium nitrate used for blasting; and
- Laboratory consumable and wastes – various by-products classified as hazardous waste and chemicals used in the assay laboratory.

5.2.9.2 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meliadine FEIS (AEM, 2014). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The landfill and landfarm are currently in use at Meliadine and will be until post-closure. The incinerator and the hazardous waste management area are also operating and will be until the end of active closure.

The waste management facilities will be reclaimed following best practices put in place during operation and in order to minimize long term disturbance.

5.2.9.3 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meliadine waste management facilities are listed in Table 5-20, along with the specific actions and monitoring associated (modified from AANDC/MVLWB 2013 and AEM, 2015a).

Table 5-20: Closure Objectives and Criteria – Waste Management Facilities

Closure Objectives	Closure Criteria	Actions/Monitoring
Inadvertent access to landfill debris by humans and wildlife has been prevented	Limit access to facility Dispose only appropriate waste type in landfill	Limit access to the WRSF with berms and signs Avoid food waste in landfill that could attract wildlife Routine inspection of the facilities
Waste disposal areas are not and will not become a source of contamination to the environment	Dispose only appropriate waste type in landfill Treat light hydrocarbon contaminated soil Remove all hazardous waste	Manage and dispose waste in landfill as per operation best practices Treat light hydrocarbon contaminated soil in the landfarm Hazardous wastes will be removed for disposal by licensed handler as per operational practices Routine inspection of the facilities
Erosion and effects to the ground thermal regime have been controlled to ensure physical stability	Appropriate cover and drainage over the landfarm and landfill	The landfill and landfarm area will be covered with waste rock at the end of active closure stage Surfaces will be re-graded to promote natural drainage Inspection during cover construction
Surface runoff and seepage water quality is safe for humans and wildlife	Water quality meets Water Licence requirements Appropriate cover and drainage over the landfarm and landfill	Water quality monitoring
Return area to its original state or to a state compatible with the desired end land use	Human land use of the reclaimed area at post closure will not compromise people and wildlife health	Routine monitoring and physical inspection

The Code of Practice for Metal Mines also provides the following recommendations related to the closure of waste facilities and to the handling of contaminated materials (adapted from EC 2009):

- Waste from the decommissioning of ore processing facilities and site infrastructure, such as waste from the demolition of buildings and the removal of equipment, should be removed from the site and stored in an appropriate waste disposal site or disposed of on site in an appropriate manner in accordance with relevant regulatory requirements. If material is disposed of on site, the location and contents of the disposal site should be documented. (from R522);
- Sampling and analysis of soils and other materials should be conducted to ensure that none of the material is contaminated, e.g., with asbestos and mercury from buildings. If contaminated materials are identified, they should be handled and disposed of in an appropriate manner in accordance with all applicable regulatory requirements. (from R523)

5.2.9.4 Consideration of Closure Options and Selection of Closure Activities

Considerations for waste management facilities closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the waste management facilities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Plan activities to limit the amount of waste generated throughout the life of the mine;
- Locate waste management facilities away from waterways to minimize environmental impacts that could result from leachate generation/migration;
- Select location and design that will have minimal impact on wildlife habitat and therefore require minimal reclamation effort;
- Divert runoff around waste disposal area with ditches or berms to minimize migration of contaminants;
- Burn domestic waste and special waste (i.e., waste oil) in an approved incinerator;
- Remove hazardous waste to an approved on-site waste storage facility prior to shipping for off-site disposal;
- Cover landfill/landfarm with an appropriately designed cover system to limit infiltration to acceptable levels. The surface of the landfill cover should comprise erosion resistant materials, and the surface landform should be sustainable in the long-term.

5.2.9.5 Engineering Work Associated with Selected Closure Activity

Landfill:

The closure activities planned for the landfill presented herein are taken from the Landfill and Waste Management Plan (AEM, 2019g).

The location of the landfill in the WRSF1 serves to minimize the area of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is chemically and physically stable, and consistent with past traditional pursuits and wildlife habitat. While waste rock will be disposed on land and in a manner that encourages total freezing. The design, operation, and/or closure of the WRSFs and landfill do not rely on total freezing. Any unacceptable leachate that is generated following closure of these facilities will be contained, collected, and/or treated, if necessary.

Upon closure, it is estimated that the landfill will have a volume of approximately 63,000 m^3 of waste. The landfill will be covered with a minimum of 3.7 m of waste rock and should thereafter be stable. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The cover surface will be left irregular to capture snow, windblown sediment, and collect seeds.

Contact water from the landfill at its closure will continue to be managed using best management practices as in operation. The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill. Moreover, drainage from the landfill is largely expected to freeze within WRSF1, with little to none reporting to the water collection infrastructure (FEIS, 2014).

Landfarm:

The closure activities planned for the landfarm presented herein are taken from the Landfarm Management Plan (AEM, 2019j).

After removal of all remediated soil and prior to closure and reclamation of the landfarm, the berm and base will be sampled on a 10 m grid, to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN criteria. No excavation will be necessary if agricultural/wildlife criteria are met. If industrial criteria are used, the landfarm will be covered with 2 m of waste rock or other material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm. The liner put in place at the base of the landfarm during construction, is covered by a layer of granular fill material and rockfill, will be left in place and covered with additional material if required.

Incinerator:

Approved waste will be burned in the incinerator during operation and closure. At the end of the active closure phase, the incinerator will be emptied and offered for local use and/or relocation. If there is no local interest, the infrastructure will be demolished and taken to the on-site landfill for disposal or barged out to a southern waste disposal facility.

Hazardous Material:

The hazardous materials will be managed in operations such that minimal quantities remain on site at closure. Any remaining hazardous materials that cannot be used during closure activities will be transported to licensed disposal facilities in the south, as per operation procedures, in accordance with the Hazardous Material Management Plan (AEM, 2018). Any remaining cyanide reagents will be packaged and transported to licensed facilities in the south or other Agnico Eagle divisions in accordance with the International Cyanide Management Code, and the Hazardous Materials Management Plan.

5.2.9.6 Predicted Residual Effects

No significant residual effects have been identified for closure of the waste management facilities other than changes to terrain caused by the construction and subsequent reclamation of the facilities.

5.2.9.7 Uncertainties

No major uncertainties have been identified regarding closure of the waste management facilities.

5.2.9.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Meliadine Mine are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSFs as presented by AANDC/MVLWB (2013):

- Test water quality and quantity to measure the success of the selected closure activities for landfills and waste disposal areas;
- Monitor the ground thermal regime and the cover system performance to determine if permafrost has aggraded into the landfill;
- Inspect surface of landfill cover systems for cracking or slumping of the cover and for the underlying waste material’s migrating to surface;

- Monitor wildlife and human use to ensure the selected closure activities have been effective in preventing access to these areas.

The landfill and landfarm monitoring programs completed in operation will continue during the closure period.

Hazmat disposal will be audited in closure or post-closure to ensure all material have been disposed off site in appropriate facilities.

5.2.9.9 Contingencies

No specific activities are proposed as contingencies for the closure of the waste management facilities.

6.0 Progressive Reclamation

6.1 Definition of Progressive Reclamation

Progressive reclamation takes place prior to permanent closure to reclaim components and/or decommission facilities that no longer serve a purpose. These activities can be completed during operations with the available resources to reduce future reclamation costs, minimize the duration of environmental exposure, and enhance environmental protection. Progressive reclamation may shorten the time for achieving closure objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure (AANDC/MVLWB 2013).

The Code of Practice for Metal Mines includes the following recommendations related to progressive reclamation (adapted from EC 2009):

- Progressive reclamation, including that of waste rock piles, tailings management facilities and mine site infrastructure, should be undertaken during the mine operations phase to the extent feasible;
- Progressive reclamation activities should be consistent with the site-specific objectives and intended post closure land use for the site. Planning and implementation should consider final contouring, final drainage, cover requirements, and re-vegetation;
- The project schedule should be used to monitor the status of progressive reclamation, and the schedule should be updated on a regular basis.

6.2 Opportunities for Progressive Reclamation

The key closure activities that have been identified for progressive reclamation are summarized in the following sections for each individual component of the Meliadine Mine. The progressive reclamations activities provided in this ICRP will be updated in future versions of the plan to include new opportunities for progressive reclamation identified during operations.

Details related to schedule of progressive reclamation is included in the closure schedule presented in **Appendix M**.

6.2.1 Rankin Inlet Site Facilities

No progressive reclamation activities have been identified for the Rankin Inlet site facilities at this time, as the facilities will be required throughout the operation period and the active closure.

6.2.2 Transportation Routes and Quarries

No progressive reclamation activities on the roads are planned as they will be required for transportation throughout the operation period and the active closure.

The quarries and granular borrow sites no longer required for operations will be progressively reclaimed during operation, as equipment and resources are available. Specific timeline for quarries progressive reclamation during operation will be eventually defined.

In 2018, reclamation work occurred at the Itivia quarry. Agnico Eagle proceeded to the reclamation according to the quarry conditions by removing all equipment and material, stabilizing and gently sloping the walls (AEM, 2019a). In 2019, the following eskers were reclaimed and regraded to re-established natural drainage along the AWAR: B5, B5a, B6, B10, B11a, B12, B13, B15 and B15a (AEM, 2020a).

6.2.3 Underground

Mined-out work specific areas are being backfilled for reasons of ground stability, using coarse rock waste, cemented waste rock, paste tailings, or some combination of these during operations. Following completion of underground mining in Year 7 (2026), the flooding of the underground mine workings with natural groundwater seepage will start as progressive reclamation in Year 8 (2027).

In 2018, a total of 3,134 t of waste rock was used as underground backfill (AEM, 2019a). In 2019, a total of 90,024 t was used as underground backfill (AEM, 2020c).

6.2.4 Open Pits

Following completion of open pits mining in Year 7 (2026), the flooding of the open pits with water from Meliadine Lake will start as progressive reclamation in Year 8 (2027).

6.2.5 Waste Rock Storage Facilities

The waste rock and overburden storage facilities will be closed during operations with the deposition of the waste rock, based on the current deposition plan. The WRSF1 is expected to reach its design capacity at the end of Year 5 (2024). The WRSF3 is expected to reach their design capacity by the end of Year 6 (2025).

6.2.6 Tailings Storage Facilities

Additional lifts of waste rock will be placed as the tailings surface is brought up as erosion, stability and thermal protection. At the final elevation, the top of the tailings stack will be progressively capped with a layered combination of overburden and waste rock. Based on the tailings production schedule, Cell 1 will reach its design capacity by Year 5 (2024) and Cell 2 will start operation from Year 4 (2023) and will reach design capacity in Year 8 (2027).

Active tailings placement into the tailings storage facility (TSF) began February 2, 2019 and continued throughout the year. In 2019, a total of 75,082 m^3 (141,154 t) of waste rock was placed as progressive cover material around the side-slopes of the facility (AEM, 2020a).

6.2.7 Water Management Facilities

No progressive reclamation activities have been identified for the water management facilities at this time. Water management facilities or equipment not used or deemed not necessary will be evaluated and could be removed during operations.

6.2.8 Site Buildings and Equipment

Potential progressive reclamation activities could include removal of equipment and facilities as they are identified as no longer being required for operations. Efforts could also be made to reduce inventories of consumables and sea containers (sea cans) leading up to the end of operations.

6.2.9 Waste Management Facilities

The landfill will be in active use throughout the operation and closure period in order to receive debris from decommissioning. The landfill will be covered with waste rock progressively over time. The final closure of the landfill will occur at the end of the active closure stage. The landfarm will be required in operation and active closure for soil decontamination, so no specific progressive reclamation is identified for the landfarm. The hazardous material will be managed throughout operation and closure.

7.0 Temporary Closure

Temporary closure occurs when an advanced mineral exploration or mining operation ceases with the intent of resuming activities in the near future. Temporary closure could be due to an unplanned closure or a planned closure of certain facilities in a complex mining project (AANDC/MVLWB, 2013).

The Meliadine Mine operation is planned to be continuous for the full proposed operating period. However, the mine may need to shut down for a short-term or indefinitely (long-term) due to economic, environmental and/or social factors. The plans for both closure periods are discussed below.

Notification of temporary closure would be presented to the staff and the local population with at least 30 days of notice; if the conditions allow, a longer notice period will be provided where possible (AEM, 2015a).

As per the Water License 2AM-MEL1631, Part J, condition 2, the Licensee shall notify the NWB in writing, at least sixty (60) days prior to, or as soon as practically possible, the intent to enter into a Care and Maintenance Phase.

As per the Meliadine Inuit Impact and Benefit Agreement (IIBA), written notice of a temporary closure decision would be given immediately to the Kivalliq Inuit Association (KIA) and the Parties would “enter into good faith negotiations and use commercially reasonable efforts to conclude an agreement on appropriate implementation measures which shall be in keeping with the purpose and the objectives of” the IIBA (KIA, 2017).

7.1 Temporary Closure Goal and Closure Objectives

The goal of temporary closure is ongoing protection of the environment, and regulatory compliance during the shutdown period. Temporary closure measures deemed necessary will depend upon the duration and extent of site activities/presence during the temporary closure. It is anticipated that water management and treatment facilities will function at the same level during temporary shutdown periods as during operations.

The objectives of temporary closure activities are to:

- Maintain all operating facilities and programs necessary to protect humans, wildlife, and the environment, including necessary environmental monitoring;
- Make available appropriate financial resources to continue environmental monitoring and reporting during temporary closure;
- Keep care and maintenance staff at the site and in sufficient number and expertise to care for the site and any potential problems that may arise;
- Make available enough equipment and supplies on site for any maintenance or reclamation activities that may need to take place; and
- Comply with all applicable federal and territorial laws and regulations, in addition to the operator's Land Use Permits, Land Leases and Water Licence.

7.2 Temporary Closure Activities

The proposed short-term and long-term temporary closure activities are presented in the following subsections. The extent to which the activities listed will be implemented depends on the site conditions at the time of the temporary closure, and the anticipated length of the closure (short-term or long-term). In all cases, access to the sites, buildings, and all other infrastructures will be secured and restricted to authorized personnel only.

In most circumstances, planned temporary closure activities are expected to occur as described above and in the following sections. Should a situation arise in which temporary closure cannot be executed as planned (e.g. major fire or spill, major problem in the open pits or underground, etc.), the affected features will be subject to alternative temporary closure measures, with the planned temporary closure activities resuming as soon as practical.

In most circumstances, the AWAR will continue to be open to public access during any temporary closure of the mine. The status of the road during such periods would be assessed by Agnico Eagle on a case-by-case basis. For short duration temporary shutdowns (short-term temporary closure), the AWAR would remain open and be maintained in the same manner as proposed during the operational phase. While each case would be assessed separately, temporary shutdowns of less than 6 months duration would not change the way the access road is operated or maintained. For temporary shutdowns of greater than six (6) months and less than 12 months in duration, and/or for indefinite shutdowns (period greater than one year: long-term temporary closure), Agnico Eagle would have to change the way it operates and maintains the road. In such an instance, Agnico Eagle would evaluate what level of activity was expected to continue at the site during the shutdown period and adjust its care and maintenance of the access road accordingly (AEM, 2019b).

7.2.1 Short-term Temporary Closure

Short term shut down or closure period is defined as a period of less than one year and could last for a period of weeks or several months (up to 12 months) based on economic, environmental, and social factors. The following Table 7-1 summarizes the measures that will be taken as required during a short-term temporary closure (adapted from SLI, 2018 and AEM, 2015a).

Table 7-1 : Short-term Temporary Closure Activities

Sites	Closure Activities
Underground	Warning signs and berms will be erected as needed to block the entrance to underground
	Maintain required activities where possible to ensure stability. Dewatering underground areas will continue as conducted during operations since flooding and subsequent dewatering may adversely impact stability
Open pits	Warning signs and berms will be erected as needed around the pit perimeter
	Dewatering of open pits will continue as conducted during operations since flooding and subsequent dewatering may adversely impact stability.
Water Management	Surface water management facilities will be maintained to manage contact water runoff
	Unused water distribution lines will be drained, but would be left in place
	All water will be treated and discharged during a four-month period from June to September each year. If the temporary shutdown occurs during the October to May period (i.e., during the winter period), little or no water will need to be considered for storage or treatment
	The sewage treatment plant and potable water treatment plant will continue to operate as needed
Infrastructures and services areas	All mobile equipment except for small service equipment required for pit inspections will be removed and placed in secure on-site storage
	Fuel, lubricants, and hydraulic fluids will be removed from the site, open pit and underground area and stored in designated areas
	Fluid levels in all fuel tanks will be recorded and monitored regularly for leaks, or fuel will be removed from the site
	An inventory of chemicals and reagents, petroleum products, and other hazardous materials will be conducted. These materials will be secured appropriately, or the materials will be removed from the site
	All explosives will be relocated to the main powder magazine and secured, disposed of, or removed from the site
	Minimum staffing levels will be maintained to carry out care and maintenance
	The accommodations will be operated at reduced staffing level
	Critical facilities will have nominal heat to prevent freezing of the facilities and possible damage
	Hazardous wastes on-site will be collected and stored in an appropriate area for annual disposal to a registered disposal facility
	In most circumstances, the AWAR will continue to be open to public access. The status of the road during such periods would be assessed by Agnico Eagle on a case-by-case basis
Monitoring	Monitoring of water quality of the collection ponds will continue as per during operations
	Environmental monitoring and sampling will continue at regular intervals as set out in the Meliadine Mine operations and monitoring program and in accordance with all applicable Licences, permits, and authorizations
	Routine geotechnical stability monitoring and maintenance will continue at a reduced rate compared to that conducted during operations. The pit area will be inspected routinely to check for rock falls, changes to groundwater inflows and overall integrity. Underground will be inspected for geotechnical stability in area safe to do so

7.2.2 Long-term temporary closure

Long-term temporary closure (indefinite shutdown) is a cessation of mining and processing operation for an indefinite period greater than one year. The intention is that the mine will resume operations as soon as possible after the cause for the indefinite shutdown has been addressed. The site must maintain safety and environmental stability during this time. Possible causes for an indefinite shutdown could include prolonged adverse economic conditions or extended labor disputes. A decision on the estimated length of the indefinite shutdown would be made after the initial one-year period. Decisions on possible extensions to the indefinite shutdown would be made every 6 months thereafter and would be based on the conditions at that time. At present, the maximum length of time or number of extensions for interim shutdown before moving to final closure has not been defined. Table 7-2 summarizes the measures that will be taken as required **in addition** to the short-term temporary closure activities presented in Table 7-1 during a long-term temporary closure (adapted from SLI, 2018 and AEM, 2015a).

Table 7-2 : Long-term Temporary Closure Activities

Category	Closure Activities
Underground and open pits	Monitoring of the pumps in the underground and open pits will continue and the underground and open pits will be maintained in a dry condition to maintain dry, stable conditions to allow a restart of mining as appropriate
	Pumps in the pit will be relocated and the pit will be allowed to flood passively (from rainfall and groundwater inflow)
WRSF	If necessary, the working face of the WRSFs slopes will be graded to ensure stability and drainage to the contact water management system adjacent to the rock storage facilities. As the WRSFs will be designed and operated for long-term stability, it is anticipated that any grading required will be localized and minimal. The WRSFs will be monitored to ensure the site stays in compliance with any permits and/or licences
TSF	The tailings surface area will be re-graded, if needed, to promote slope stability. Erosion control measures will be implemented, if required, to reduce the potential mobilization of tailings by wind, such as a minimum 0.75 to 1 m cover of non-potentially acid generating waste rock placed over the exposed tailings to control dust
	The TSF will be subject to routine geotechnical stability monitoring and maintenance. Monitoring will be at the same frequency as that of operations, to ensure the site stays in compliance with any permits and/or licences. Maintenance will be completed as required
Water Management Water Management	The dikes/dams will be monitored and maintained, and none of the dikes/dams will be opened and reconnected to adjacent lakes
	Surface water control structures will be maintained as required. In areas where water quality is suitable for discharge, natural drainage courses may be re-established
	Unused water distribution lines will be drained. Unused lines on surface will be removed and placed in a secure lay down area to reduce impacts on wildlife
Infrastructures and services areas	Dependent on the cause of the closure, the AWAR may be inaccessible during the winter for cars and trucks. If continued presence on-site is required, then it is likely Agnico Eagle would maintain the road open in some manner over the winter
Monitoring	Environmental and geotechnical monitoring and sampling will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable Licences, permits and authorizations

7.3 Temporary Closure Monitoring, Maintenance, and Reporting

Monitoring and reporting during the short-term and long-term temporary closure will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable Licenses, permits and authorizations. Adjustment of monitoring frequencies for long term temporary closure might be made only following approval from the licensing and permitting authorities concerned.

As required by the Meliadine Water Licence 2AM-MEL1631, Part J, items 2, 3 and 4:

2. The Licensee shall notify the Board in writing, at least sixty (60) days prior to, or as soon as practically possible, the intent to enter into a Care and Maintenance Phase.

3. The Licensee shall provide the Board for review, within thirty (30) days of the Licensee providing notice of intent to enter into Care and Maintenance under Part J, Item 2, a Care and Maintenance Plan that details the Licensee's plans for maintaining compliance with the Terms and Conditions of the Licence.

4. The Licensee shall provide the Board for approval in writing, within ninety (90) days of the Licensee providing a notice of intent to enter into Care and Maintenance under Part J, Item 2, all operational revised Plans to reflect the Care and Maintenance status.

The reclamation security deposit will also be kept up to date during temporary closure.

The numbers of personnel on-site would be reduced to reduce operation costs. The staff present at site during temporary closure would be sufficient in number and expertise to successfully carry out care, maintenance and monitoring duties, and to address and remediate any potential problems that may arise. An adequate number of equipment and supplies/reagents would be left on-site for any maintenance or reclamation activities that may need to take place.

7.4 Temporary Closure Contingency Program

The key staff present at site during temporary closure would be sufficient in number and expertise to successfully address and remediate any conditions or unforeseen events that may arise through the monitoring programs. The key staff at the site would also have access to external consultants and advisors, as required. The contingency options and actions for events or incidents defined for operations would be also implemented during the temporary closure (i.e., spill responses and reports) (AEM, 2015a).

7.5 Temporary Closure Schedule

Mining activities during short-term closure are typically stopped. However, activities such as care-and maintenance, monitoring, intermittent testing, periodic operation of equipment and appropriate facilities will be on-going as described above. Activities related to ensuring public and wildlife safety would be a priority and would focus upon maintenance and monitoring of all facilities and equipment to maintain physical and chemical stability. A sufficient number of care-and-maintenance staff would be present on site, and an appropriate level of security would be implemented at selected facilities. Access to temporarily inactive facilities would be restricted to authorized personnel only.

The temporary closure schedule would depend on when temporary closure occurs (i.e., what year of the operations stage) and its duration, both of which are commonly uncertain. Therefore, the schedule for the activities presented in Section 7.2 would be developed as temporary closure advances. Establishing a temporary closure schedule inherently contains uncertainty as this is not a planned activity, and the duration of a temporary closure will vary based on the cause for closure. As a result, the schedule will be progressive (AEM, 2015a).

The sequence of activities for short-term and long-term temporary closure would, in summary, be as follows:

- Restrict access to the site, buildings, and infrastructures to authorized personnel as required;
- Carry out an inventory of chemicals and reagents, petroleum products, and other hazardous materials and secure the inventory appropriately or remove some of it from site;
- Post warning signs and berms as needed around the open pit's perimeter and underground openings;
- Remove all mobile equipment except for small service equipment required for open pits and site inspections and place them in secure on-site storage;
- Temporary closure of unnecessary facilities and systems;
- Continue with environmental and geotechnical monitoring and sampling required for care, maintenance and monitoring at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable Licenses, permits, and authorizations.

8.0 Integrated Schedule of Activities

Reclamation of the Meliadine site can be divided into the following three (3) general stages:

- Operations (Progressive Reclamation Stage): during which reclamation of the TSF will start with the initial placement of the cover material over the tailings surface. Reclamation of the open pits and underground mining will start at the end of operations;
- Active Closure: during which the decommissioning of major facilities will occur, and active flooding of the open pits will continue using water pumped from Meliadine Lake. Active care, maintenance and monitoring will be required for the decommissioned and remaining facilities throughout this stage;
- Post Closure: during which continued monitoring and maintenance will be carried out at a reduced frequency than during Operations and Active Closure stages, depending on the results of the monitoring and measures of success selected for closure.

The preliminary schedule of the Meliadine closure is presented **in Appendix M** and provides a schedule detailing the closure stages of major components of the Meliadine progressive closure, active closure and post closure. The main key periods included in the schedule are presented in Table 8-1.

Table 8-1 : Meliadine - Closure and Post-Closure Main Phases

Period	Operations/Closure Main Phases
2020 to 2027	**Mining and processing operations at Meliadine**
2028 to 2030	**Active Closure Monitoring**
2028 to 2037	**Post-Closure Monitoring**
2020 to 2028	Progressive reclamation of TSF
2027 to 2032	Passive flooding of underground mine
2027 to 2029	Active open pits flooding
2028 and 2029	Infrastructures and facilities demolition
2034	Decommission WTP and Meliadine Lake effluent diffuser
2037	Breach dikes/berms and reclaim channel and pond areas
2037	AWAR closure

It is anticipated that the schedule will be refined throughout the Meliadine Mine life as the designs for closure are advanced and the closure methods and strategies are further developed. The schedule is subject to changes following mine plan and development as well as market conditions.

9.0 Post-Closure Site Assessment

The ICRP is a live document and includes a commitment to adaptive management and monitoring during all stages of the mine life to demonstrate the safe performance of the Project facilities and to reduce any contamination on the site or in the adjacent area after operations cease. Monitoring during operations and in closure will identify non-compliant conditions, allow timely maintenance and clean up as needed, allow timely planning for adaptive and corrective measures, and enable successful completion of the ICRP. In this way, the Project is not anticipated to contribute residual impacts to the environment after closure and reclamation (SLI, 2018).

Monitoring programs is already ongoing and will continue throughout operation to provide additional baseline information on which to base the Final Closure and Reclamation plan (FCRP) document. The adaptive management plans to be used in closure will follow the actions completed during operations and will be coordinated with the existing operational monitoring programs to set appropriate trigger levels, and mitigation plans and actions.

Monitoring programs will be initiated during pre-development and operations to provide additional baseline information on which to base the ICRP and FRCP documents. The adaptive management plans to be used in closure and post-closure will follow the actions completed during operations and will be coordinated with the operational monitoring programs to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring to assess the performance of the reclamation and closure procedures, and to identify long-term maintenance requirements, if any. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection.

The general arrangement at the end of the closure stage and in post-closure is presented in **Appendix L**. As the engineering work for water management in closure and post-closure progresses, the general arrangement for closure and post-closure stages will be refined. Future versions if the Meliadine ICRP will include maps illustrating closure and post-closure drainage conditions to and from the pit lakes. The maps will also identify connectivity between surface waters and remnant water management structures in post-closure, and highlight connecting streams with potential for fish passage.

9.1 Operational Monitoring Strategies

The overall objectives during operations are to provide programs to identify and mitigate potential adverse Project related impacts so that construction and operational activities do not cause any undue harm to water quality, sediment quality, vegetation, biota, wildlife, and wildlife habitats. The various monitoring programs required during operation will be reviewed and updated during operation to reflect conditions at the site as the mine approaches closure. The changes would allow the basic portions of the monitoring plans to continue to be used to cover the closure period activities.

9.2 Closure and Post-Closure Monitoring Strategies

Guidance on monitoring and maintenance programs for closure and post-closure is provided in the guidelines for closure and reclamation (AANDC/MVLWB, 2013). «Post-closure monitoring will be required to confirm the success of the closure objectives once operations cease indefinitely. Closure criteria will assist in the development of post-closure monitoring programs and will provide clear interpretation of monitoring results. If it is determined that closure objectives were not met for individual project components (as demonstrated by the closure criteria not being met), the proponent will need to implement ongoing monitoring, maintenance measures, and possibly contingency plans. Where a catastrophic event or natural disaster occurs prior to relinquishment, additional monitoring and maintenance may be necessary. Proponents should consider establishing monitoring programs with involvement from local Aboriginal communities. If closure criteria are achieved, then a cessation in monitoring activities for the reclamation of an individual project component may be approved by the Boards. However, if risks to the site remain, additional monitoring may be necessary. When closure criteria have been achieved and verified by Inspectors for specific components, the proponent is then eligible to request the appropriate reduction in their security deposit».

Development of monitoring and maintenance programs is an iterative process in consultation with communities and regulators as the Project advances. The closure and post-closure monitoring and maintenance programs will be extensions of efforts undertaken during the operations phase and would reflect the success of the management of the site during operations to limit the effect on the environment.

The actual conditions or impact from the operations within the mine footprint will be analysed and this information will be integrated to modify monitoring plans moving to closure and post closure. It is anticipated that monitoring and maintenance will be carried out during the active closure stage at frequencies similar to those required during operations. Post closure monitoring and maintenance will be carried out at a reduced frequency depending on the results of the monitoring and the measures of success selected for closure. As the closure effort is completed and the post-closure period begins, the various monitoring programs will be reviewed and updated again to cover the remaining (post-closure) monitoring period. It is also anticipated that after several years in the post-closure period, monitoring would no longer be required. The monitoring plan for closure and post-closure will be included in the Final Closure and Reclamation Plan.

The review and update of the onsite water quality forecast for Meliadine will be done throughout operations to foresee water quality during operations, closure and post-closure, as per the Water License 2AM-MEL1631 requirement. The future versions of the Meliadine ICRP will include additional details on the closure and post-closure water quality monitoring program within the plan, as information becomes available from operational data. The Final Reclamation and Closure Plan will include the water quality in closure and post-closure monitoring program.

It is planned to maintain access to the site with the AWAR until maintenance requirements at the Project site are anticipated to be minor and could be achieved with small crews sent to site via helicopter in the summer. It is anticipated that the need for ongoing maintenance would be reduced with time and will not be required once the site is physically and chemically stable.

9.3 Reporting

The preparation of the following reports is suggested in the AANDC/MVLWB (2013) guidelines for closure and reclamation of all components of mine sites:

- **Annual Closure and Reclamation Plan Progress Report**: The general purpose of these annual reports is to provide an opportunity for all parties to track, modify, and report on reclamation. The annual review of research results also provides an opportunity to identify missing research tasks, which allows the research plans to continually evolve. The progress reports keep all parties informed about closure planning and allow the NWB to confirm that the proponent has remained on schedule. Any proposed changes to the Closure Reclamation Plan (CRP) should be presented with supporting rationale in these reports for NWB approval;
- **Reclamation Completion Report**: The general purpose of the reclamation completion report is to provide details, including figures, of the actual reclamation work completed, and an explanation of any work that deviated from the original or approved CRP. The report should also provide a preliminary assessment on whether appropriate closure objectives and criteria have been achieved. With each reclamation completion report, there may be an opportunity to revise the financial security estimate depending on the stage of the operation and the current CRP;
- **Performance Assessment Report**: A performance assessment report is prepared at the completion of the reclamation work and following submission of the reclamation completion report. The general purpose of the performance assessment report is to provide a detailed comparison of conditions at the site against the appropriate closure objectives and closure criteria. With each performance assessment report, there may be an opportunity to revise the security estimate depending on the stage of the operation and the current CRP.

The timelines for preparation and submission to NWB of the above described reports will be according to the Meliadine Mine approved Water Licence requirements.

10.0 Financial Security

A permanent closure and reclamation financial security cost estimate has been prepared with the present Project layout and infrastructure. The cost estimate covers the closure and reclamation of all Project facilities as described in this report and was prepared using RECLAIM Version 7.0 for permanent closure of the Project.

Agnico Eagle is required to submit a detailed financial security cost estimate for the Meliadine ICRP 2020 to Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and to the Kivalliq Inuit Association (KIA) to support land use and water licensing requirements. RECLAIM Version 7.0 workbook has been used for this estimate, as per the Guidelines for Closure and Reclamation Cost Estimates for Mines, issued by Crown-Indigenous Relations and Northern Affairs Canada, Mackenzie Valley Land and Water Board and the Government of the Northwest Territories (INAC, MVLWB, GNWT, 2017).

This cost estimate provides for the closure measures described in detail in the Meliadine ICRP 2019. Most closure activities will occur within the active closure period, from 2028 to 2030 inclusively. The schedule of closure activities presented in **Appendix M** outlines the major closure measures and their expected timeline considered for the cost estimate.

For the purpose of this financial security cost estimate, no progressive rehabilitation measures have been considered. It will be possible to consider these measures in the upcoming calculations of the financial security cost estimate if they have been completed.

The updated 2020 estimated closure and reclamation costs for the Meliadine Mine represents a total of $66,879,798. This total includes $39,999,695 of direct costs and $26,880,103 of indirect costs.

The financial security cost estimate assumptions and methodology used for the calculations, along with the complete RECLAIM 7.0 spreadsheets are presented in **Appendix N**. Differences between the Meliadine ICRP 2019 cost estimate and the Meliadine ICRP 2020 cost estimate are presented in detail in **Appendix N.**

11.0 Personnel

This report is an update version of the Meliadine ICRP 2019 (SLI, 2019). This report has been prepared by Érika Voyer, revised by Sandra Pouliot and approved by Érika Voyer.

We trust that this report is to your satisfaction. Should you have any question, please do not hesitate on contacting us.

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