AGNICO EAGLE

Meliadine Division

Meliadine – Greenhouse Gas Reduction Plan

JANUARY 2019
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Project), located approximately 25 km north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

The impacts of climate change have the potential to affect a wide range of environmental, social and economic systems of value to Inuit, as indicated by the observations and changes experienced by rankin Inlet traditional land users. Climate change is a global issue caused by emissions of greenhouse gases (GHG).

This document presents the Greenhouse Gas Reduction Plan as per Nunavut Impact Review Board (NIRB) Project Certificate No.006, Condition 9. It discusses predicted emissions for the Project, sources of GHG, as well as monitoring measures and energy reduction initiatives.

The emissions for the Project are predicted to result in a 57% increase in GHG emissions for Nunavut (FEIS Volume 5, April 2014). When compared to Canada's national emissions (704,000 kt CO2e/yr), the Project contributes to a less than 0.05% increase in national GHG emissions. The project will emit GHGs from combustion sources related to production, heating and transportation

Emissions of GHG for the Meliadine Mine will be calculated on a monthly basis and reported annually through Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP) and NIRB Annual Report. This report will also include a discussion on the monthly variations of GHG emissions, as well as a comparison with FEIS emission predictions.

A number of initiatives are planned to reduce project-related GHG emissions over the Project lifecycle. Some strategies have already been implemented while others are currently being assessed.

DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	January 2019	ALL	-	Comprehensive plan for the Meliadine Project.

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
ANFO	Ammonium nitrate/fuel oil
FEIS	Final Environmental Impact Statement
GHGRP	Canada's Greenhouse Gas Emissions Reporting Program
NIRB	Nunavut Impact Review Board
Project	Meliadine
TSM	Towards Sustainable Mining
CO_2	carbon dioxide
CH_4	methane
N_2O	nitrogen dioxide

UNITS

<=	less than
%	percent
CO_2e/yr	carbone dioxide equivalents per year
kt CO_2e	kilotonnes of carbone dioxide equivalents
kt CO_2e/yr	kilotonnes of carbone dioxide equivalents per year
t CO_2e/yr	tonnes of carbone dioxide equivalents per year
L	liters
km	kilometre(s)
km^2	square kilometre(s)
kW	kilowatt

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a 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 Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The mine will produce approximately 14.9 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 14.9 Mt of tailings. There are four phases to the development of Tiriganiaq as presented in Table 1.1: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Mining facilities include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), and a water management system that includes collection ponds (CPs), water diversion channels, and retention dikes/berms, and a Water Treatment Plant (WTP). The general mine site location for the Project and the site layout plan are shown in Figures 1.1 and 1.2, respectively, as attached in Appendix A.

Table 2.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -5 to -1	• Construct site infrastructure • Develop underground mining • Stockpile ore
Operations	Year -1 to 8	• Underground and open pit operations • Transport ore to Meliadine Mill • Stockpile ore • Deposition of dry stack Tailings in Meliadine TSF
Closure	Year 9 to 11	• Remove non-essential site infrastructure • Flood mined-out open pit
Post-Closure	Year 11 forwards	• Site and surrounding environment monitoring

The impacts of climate change have the potential to affect a wide range of environmental, social and economic systems of value to Inuit, as indicated by the observations and changes experienced by Rankin Inlet traditional land users. Climate change is a global issue caused by emissions of greenhouse gases (GHG). Changes to weather and climate have the potential to affect environmental, social and economic systems of value to the Inuit and other regional stakeholders.

This document presents the Greenhouse Gas Reduction Plan. The purpose of this Plan is to provide consolidated information on the management and monitoring of GHG for the Project, by presenting predicted emissions for the Project, sources of GHG, followed by monitoring measures and initiatives taken to reduce emissions.

As per Nunavut Impact Review Board (NIRB) Meliadine Project Certificate No.006 Condition 9, the Greenhouse Gas Reduction Plan should be submitted to the NIRB at least 90 days prior to the commencement of operations

- An estimate of the Project's GHG baseline emissions;
- A description of monitoring measures to be undertaken, including the methods, frequency, parameters, and a description the analysis;
- A description of reduction initiatives planned and taken, to reduce project-related GHG emissions over the Project lifecycle.

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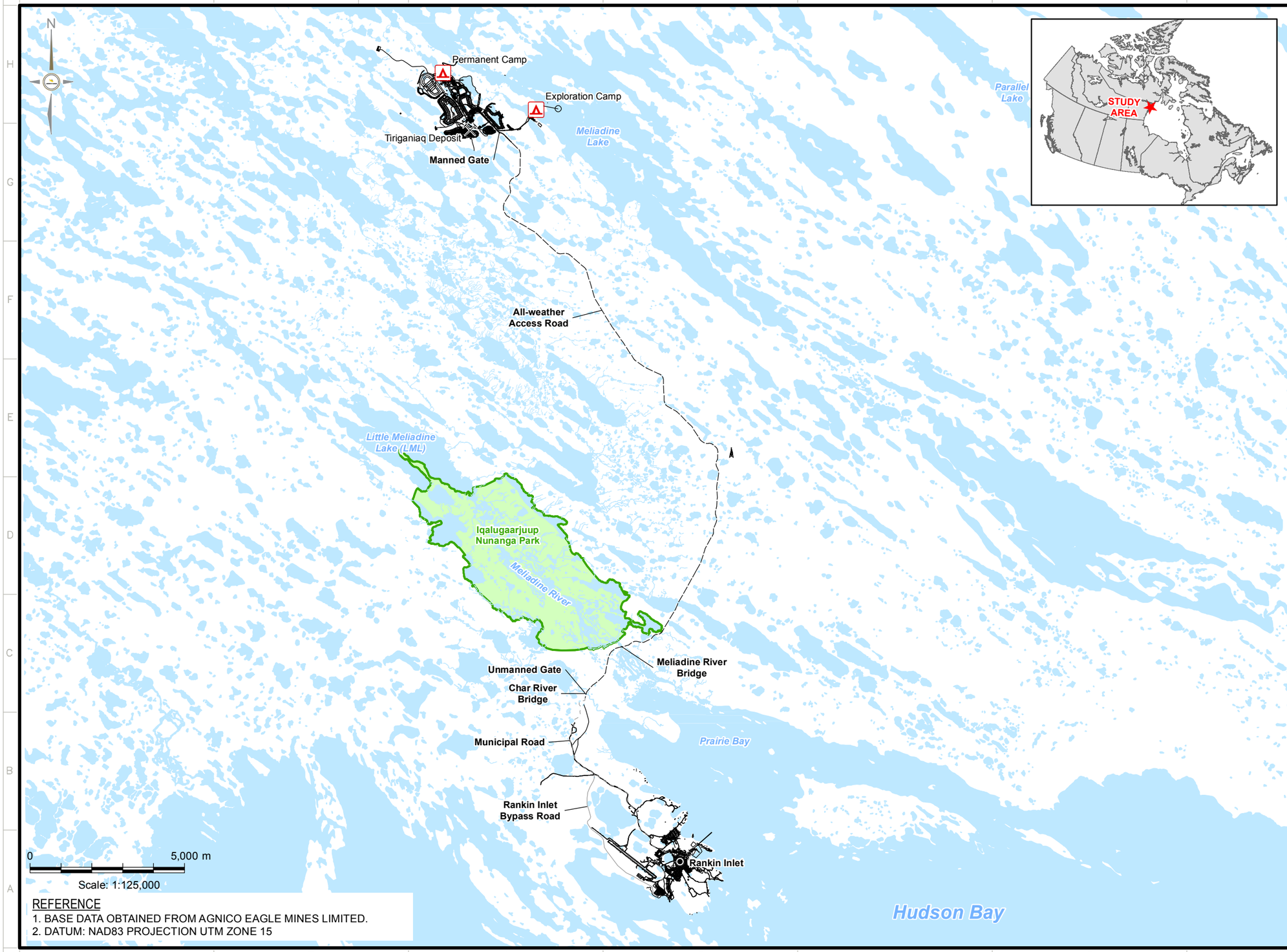

LEGEND

- CAMP
- PROPOSED MINE SITE
- ALL-WEATHER ACCESS ROAD (AWAR)
- ROAD - NEW
- ROAD - EXISTING
- WATERCOURSE
- WATERBODY
- TERRITORIAL PARK

REFERENCE
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

AGNICO EAGLE

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TITRE / TITLE	# DWG

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REV	DESCRIPTION	DATE	PAR BY

REVISIONS

DESSINÉ PAR DRAWN BY	CDB	DATE 08–12–2014
VÉRIFIÉ PAR CHECKED BY	IM	08–12–2014
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AGNICO EAGLE – MELIADINE DIVISION
FIGURE 1.1 GENERAL PROJECT
SITE LAYOUT LOCATION PLAN

ECHELLE/ SCALE	1:125,000	FICHIER FILE	.DWG
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N:\Client\Agnico_Eagle_Mines_Ltd\Meliadine_Gold_Project\99_PROJECTS\1405283_Meliadine_Water_License\02_PRODUCTION\3000_Application_Preparation\MXD\3200\Report\Mine_Plan\1405283_Figure_1.1_General_Project_Site_Location_Plan.mxd

SECTION 2 • PROJECT BASELINE EMISSIONS

2.1 Project Baseline Emissions Predictions

As presented in the Meliadine FEIS, Volume 5 – Atmospheric Environment, Section 5.4.5 (Agnico Eagle, 2014), an assessment was completed in order to estimate the GHG emissions related to the Project. As part of this assessment, Project-related GHG emissions were calculated using methods consistent with Canada's Greenhouse Gas Emissions Reporting Program (GHGRP).

Table 2.1 includes an explicit quantification of both FEIS (Agnico Eagle 2014) and the FEIS addendum emissions of black carbon, a short a short-lived climate forcing agent (Forster 2007; Myhre 2013), and a compound whose emissions have recently been quantified for Canada (ECCC 2018c). Black carbon's radiative effects in Earth's atmosphere are similar to GHG's, i.e., positive radiative forcing (Hansen et al. 2007; Bond et al. 2013). Of relevance to Nunavut and Arctic Canada, the radiative effects of black carbon are most pronounced over permanent snow and ice found at high altitudes and high latitudes where soot-on-snow has the potential to enhance these effects (Clarke and Noon 1985). The following assumptions regarding black carbon have been adopted.

- Black carbon content of particulate matter produced from the combustion of diesel fuel is assigned a value of 79% by weight (ECCC 2018c).
- Black carbon is assigned a GWP of 900 (Bond et al. 2013).
- Canada's black carbon emissions in 2016 were 34,921 tonnes (ECCC 2018c).

Reportable GHG emissions for the FEIS (Agnico Eagle 2014) were 318 kt CO_{2e}/yr and are 449 kt CO_{2e}/yr when emissions of black carbon are included.

Table 2.1 FEIS GHG Emissions, including Black Carbon

Source	GHG Emissions (kt CO_{2e}/yr)	The Mine as %	GHG's with Black Carbon (kt CO_{2e}/yr)	The Mine as %
Mine Site (Case 3)	305		421	
AWAR	<1		<1	
Marine Shipping (within RSA)	13		28	
The Mine Total	**318**		**449**	
Nunavut - GHGRP (2016)	260	57%	no data	
Nunavut - NIR (2016)	700	25%	no data	
Canada (2016)	704,000	0.05%	735,000	0.06%

2.2 Main Sources of Greenhouse Gas for the Project

There are four (4) main sources of GHG identified for the Project predicted emissions:

- Off-road vehicle exhaust emissions;
- On-road vehicle exhaust emissions;
- Power plant related GHG emissions;
- Camp heater related GHG emissions,

SECTION 3 • DESCRIPTION OF MONITORING MEASURES

3.1 Greenhouse Gas Emission Monitoring

Emissions of GHG for the Meliadine Mine are calculated on a monthly basis. Emissions related to the four (4) main sources described in Section 2 are calculated. Although considered minimal compared to the other sources, emissions produced by the following activities are also calculated and compiled:

- Helicopter transportation
- light truck transportation using gasoline;
- blasting (use of emulsion - ammonium nitrate/fuel oil (ANFO));

Quantity of diesel (in liter) used for the generation of electricity, heating and for light and heavy equipment are recorded on a monthly basis for the Project. The quantities of aviation fuel (liter) and ANFO explosive (tonne) are also recorded on a monthly basis. From those quantities, the direct emissions based on ``Standard Emissions Factors`` are calculated. For each sources, carbon dioxide (CO_2) emissions are calculated (in tonnes), as well as methane (CH_4) and nitrogen dioxide (N_2O) in tonnes of carbon dioxide equivalent (CO_2e tonnes). Emissions calculated for each sources are added to obtain a monthly total Project related emissions in tonnes of carbon dioxide equivalents (t CO_2e/yr).

3.2 Data Analysis and Reporting

Estimated GHG emissions for the Project are compiled and analysed on a monthly basis. Data will be reviewed and variations will be correlated to factor of causes such as seasonal climate, production activities or other factors of influence identified.

GHG emissions will be reported on an annual basis, as per the requirements of the Meliadine NIRB Project Certificate No.006, in the Meliadine Annual Report and to Environment and Climate Change Canada via the GHGRP. The Annual Report will also include a discussion on GHG emissions monthly variations, as well as a comparison with FEIS emission predictions. Emissions related to aviation, blasting, and light truck transportation using gasoline will also be presented and analysed.

SECTION 4 • REDUCTION INITIATIVES

A number of reduction initiatives are planned to reduce project-related GHG emissions over the Project lifecycle. While some have already been implemented others are currently being assessed.

4.1 Strategies to Reduce Fuel Consumption

4.1.1 Diesel Generator – Efficiency

One of the most efficient diesel generators available for procurement on the market were obtained for Meliadine Mine. The purchase of the Model 12V34DF-LQO generators (Wärtsilä, Finland), which each produce 5,564 kW are 5% more efficient than the generators operating at Agnico Eagle's Meadowbank Mine. This efficiency translates to a diesel reduction of approximately 2.5 million litres (ML) per year when compared to the gensets operating at Meadowbank.

The Wärtsilä generators are also configured for 'duel-fuel use', meaning that they can easily be converted to be fueled by liquified natural gas if/when it becomes available for use at the Mine. Use of LNG instead of diesel fuel is would reduce GHG emissions but also result in large reductions of criteria air contaminants, especially diesel particulate matter containing a high proportion (79%), by weight, of black carbon.

4.1.2 Heat Recovery

Operational experience from Agnico Eagles' Meadowbank Mine were incorporated during the construction/operation of the heat recovery system for Meliadine. The improved design/operation of the heat recovery systems results in a heat recovery rate of 0.85 kWth / kWe as compared to the Meadowbank's heat recovery rate of 0.50 kWth / kWe. The improved heat recovery and use of water rather than glycol as the working fluid in the system, is predicted to result in an annual reduction of 2.0 ML of diesel fuel. This represents a 22% reduction in heating-related diesel fuel consumption compared to a predicted total 9.0 ML of diesel fuel required in the absence of heat recovery system.

4.1.3 Strategy to Replace Fuel Consumption by Renewable Energy

Renewable energy alternatives are being assessed and validated on a continuous basis. Windfarm viability is being assess

4.1.4 Strategy Development and Awareness

4.1.4.1 Energy saving staff committee

This committee is formed by a group of employees from various departments, who work together to identify areas of improvement for energy consumption savings and to find innovative ideas to improve energy consumption and reduce GHG emissions.

4.1.4.2 Towards Sustainable Mining flow chart

The Towards Sustainable Mining (TSM) flowchart has been implemented with the Strategic Optimization Group and intends to create a visual approach for employees to understand the energy system and consumption on site, in order to create a venue for discussing energy-savings opportunities.

4.1.4.3 Raising Awareness

On a regular basis, the Environment and Camp Departments send emails and memos, or install posters to remind employees about the importance of saving energy. For example, the Camp Department staff place individual reminders in rooms during cleaning when the lights are left on by guests. The Environment Department sends regular communications about the ``no idling policy`` for vehicles on site, to avoid having vehicles left on idle mode while not in use. Inspections on site are also completed to raise awareness and enforce this policy.

SECTION 5 • REFERENCES

Agnico Eagle, 2014. Final Environment Impact Statement (FEIS) Volumes 1 to 11, Meliadine Project, Volume 5 – Atmospheric Environment

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