

TECHNICAL MEMORANDUM

DATE September 28, 2021

Reference No. 20449445-895-TM-Rev0

FROM Andrea Ortega

EMAIL andrea_ortega@golder.com

MELIADINE EXTENSION PROJECT – FIELD SUMMARY – VEGETATION PROGRAM

1.0 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) owns and operates the Meliadine Gold Mine (the Project or the Mine), located 25 km north of Rankin Inlet, Nunavut. The Mine 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 (IOL). The Mine received a Project Certificate (No. 006) from the Nunavut Impact Review Board (NIRB) in February 2015, and was amended (Amendment No. 001) in February 2019. Agnico Eagle requested Nuqsana Golder provide support to understand the environmental conditions related to land cover types and rare plant occurrences for the Extension of the Meliadine Project, which includes a proposed air strip, wind farm and the Tiriganiaq-Wolf mining area (extension footprint). In addition, Golder performed land cover and rare plant surveys in 2018 in areas overlapping the Meliadine Extension footprint. Field data collected in 2018 and 2021 will be used to inform the land cover mapping for the Meliadine Extension Final Environmental Impact Statement (FEIS) addendum.

2.0 OBJECTIVE

The objective of the 2021 field program was to describe and characterize vegetation that occur in the proposed Meliadine Extension footprint associated with a proposed airstrip, wind farm and the Tiriganiaq-Wolf mining area. Information on vegetation with potential to interact with the proposed new infrastructures was collected, including land cover classification, listed (i.e., species at risk), and invasive/exotic plant species surveys.

3.0 METHODS

Prior to undertaking the vegetation surveys, preliminary plot locations were identified through a review of 1:10 000 airphotos and the Meliadine Extension proposed footprint. Sites were accessed by helicopter and on foot between July 25 and 29, 2021. Vegetation data were collected using Survey123 (ESRI) on iPads, and tracks and waypoints on GPS units. Wildlife and wildlife sign observed incidentally during vegetation surveys were also recorded.

3.1 Land cover classification

Locations selected for land cover classification vegetation plots were established in a representative location within a given plant association type and care was taken to avoid transitional areas. A square plot (10 m x 10 m) was used for the classification of the land cover types where the following variables were measured and documented:

- Ecoregion
- Species inventory and percent cover of shrub, forb, grass, bryophyte, and lichen species

- Surface substrate percent cover (e.g., moss, lichen, surface water, litter)
- Qualitative assessment of plant vigour (health)

Percent cover was estimated as the percentage of the ground surface covered when the plant foliage was projected vertically, following the outside perimeter of the foliage, and subtracting distinct holes in the foliage from the estimate. Percent cover was estimated to the nearest 0.5% for vascular plant species, and to the nearest 0.1% for non-vascular plant species with cover less than 1%.

Vascular and non-vascular plant species that could not be field identified to the species level were collected for subsequent identification by a qualified taxonomists. Photographs were taken at each plot in the four cardinal directions, and of typical ground cover/vegetation.

3.2 Rare plant surveys

Rare plants are those species listed as “At Risk”, “May be at Risk” or “Sensitive” in Nunavut, or listed as “Endangered”, “Threatened” or “Special Concern” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or on Schedule 1 of the *Species at Risk Act* (SARA). Furthermore, rare plant species can be defined a native species that exists in low numbers or in very restricted areas, for example because of its biological characteristics, or because it occurs at the fringe of a plant species range (ACIMS 2018). Rare plants may be disproportionately affected by Project activities. Prior to field work, a list of rare plants potentially occurring in the Meliadine Extension footprint was compiled from available sources and reviewed to determine potential of the species or associated habitat to occur in the Meliadine Extension footprint (Table 1).

Table 1: Rare Plants that may Occur in the Southern Arctic Ecozone

Scientific Name	Common Name	Rank		
		Nunavut ^(a)	COSEWIC ^(b)	Nature Serve ^(c)
Forbs				
<i>Ranunculus cymbalaria</i>	alkali or shore buttercup	Sensitive	Not listed	G5
<i>Ranunculus pallasii</i>	Palla's buttercup	Sensitive	Not listed	G5
<i>Woodsia alpina</i>	northern woodsia	Sensitive	Not listed	G4
Grasses				
<i>Calamagrostis deschamsioides</i>	circumpolar reedgrass	Sensitive	Not listed	G4
<i>Puccinellia deschamsioides</i>	polar alkali grass	Sensitive	Not listed	G3
Bryophytes				
<i>Sphagnum fimbriatum</i>	sphagnum moss	Sensitive	Not listed	G5

Table 1: Rare Plants that may Occur in the Southern Arctic Ecozone

Scientific Name	Common Name	Rank		
		Nunavut ^(a)	COSEWIC ^(b)	Nature Serve ^(c)
Lichens				
<i>Cladonia borealis</i>	Boreal pixie-cup	Sensitive	Not listed	G5
<i>Cladonia crispata</i>	organ-pipe lichen	Sensitive	Not listed	G3G5
<i>Cladonia squamosa</i>	dragon-funnel	Sensitive	Not listed	G5
<i>Peltigera didactyla</i>	alternating dog-lichen	Sensitive	Not listed	G5
<i>Stereocaulon tomentosum</i>	gray mealy lichen	Sensitive	Not listed	G5

a) CESCC (2011)

b) COSEWIC (2012)

c) NatureServe (2021)

The Meliadine Extension footprint was surveyed to provide reasonable geographic coverage of each representative plant community. Surveys were floristic in nature, meaning that areas of highest rare plant potential were covered more thoroughly while traveling between land cover plots.

A random meander search pattern was used to cover the habitat variations and microsites within the Meliadine Extension footprint. The transect meandered in an attempt to cover all habitat variations within the study area, and to focus on likely microsites as they were encountered.

If a rare plant population was located, its characteristics were documented. Characteristics documented included the species name, the number of plants, the precise location/GPS coordinates, the area covered by the population, plant community, aspect, slope, soil type, texture, drainage, date, and the habitat characteristics of the populations. Additional relevant information was recorded on phenology, vigor, size classes or age classes; and factors affecting the plant(s) such as moisture conditions, competition, insect pests, current land use, wildlife grazing pressure, or other threats.

If a population was too small to allow for collection of specimens, the observer took notes on the taxonomic features used to identify the plant, and photographs of the plant and its habitat. Close-ups were taken of diagnostic features that would help determine the identity of the plant. Plant material vouchers were collected only if:

- The immediate population could withstand the loss (<4% loss of individuals), and
- An appropriate collecting permit was obtained (where applicable).

4.0 RESULTS

The Meliadine Extension footprint is in the Maguse River Upland ecoregion within the Southern Arctic ecozone (Ecological Stratification working Group 1995). This ecoregion covers the uplands south of Chesterfield Inlet, Nunavut and extends as far south as Churchill, Manitoba and includes much of the northwest coast of Hudson Bay. It is characterized by a cover of shrubby tundra vegetation. Dwarf birch (*Betula nana*), willow (*Salix* sp), and alder (*Alnus* sp) occur on warm, dry sites; poorly drained sites are dominated by willow, sphagnum moss (*Sphagnum* sp), and sedges (*Carex* sp). Forbs, lichen and mosses are also widespread and are often interspersed with shrub cover (Smith et al. 1998). The region is associated with areas of continuous permafrost with medium ice content and with Turbic Cryosolic soils. Unfrozen Organic (Mesisol) and Regosolic soils also occur in this ecoregion. Crystalline Archean massive rocks form broad, sloping uplands and lowlands. Hummocky bedrock outcrops covered with discontinuous acidic, sandy, granitic tills are dominant (Smith et al. 1998).

A total of twenty-eight vegetation survey plots were completed during the July 2021 field program, of which seven plots were conducted in the wind farm layout and 21 in the airstrip (Figure 1). Vegetation plots, their location and associated land cover types observed (n=3) from the July 2021 field program are summarized in Table 2.

Table 2: Plots and associated Land Cover Types from 2021 vegetation surveys

Plot Number	Easting	Northing	Vegetation Type
AMLCA01	535838	6990806	Mesic dwarf-shrub tundra
AMLCA02	535384	6991177	Mesic dwarf-shrub tundra
AMLCA03	534837	6991694	Mesic dwarf-shrub tundra
AMLCA04	533098	6990718	Mesic dwarf-shrub tundra
AMLCA05	533098	6990549	Water sedge marsh
AMLCA06	533414	6990369	Water sedge marsh
AMLCA07	533554	6990340	Mesic dwarf-shrub tundra
AMLCA08	533749	6989958	Water sedge marsh
AMLCA09	533947	6989818	Mesic dwarf-shrub tundra
AMLCA10	533025	6989458	Mesic dwarf-shrub tundra
AMLCA11	533467	6989324	Water sedge marsh
AMLCA12	534437	6989339	Willow-sedge fen
AMLCA13	537723	6985720	Mesic dwarf-shrub tundra
AMLCA14	537544	6985992	Mesic dwarf-shrub tundra
AMLCA15	537444	6985852	Cottongrass-sedge fen
AMLCA16	535629	6989072	Cottongrass-sedge fen
AMLCA17	535385	6988451	Mesic dwarf-shrub tundra
AMLCA18	535493	6988868	Mesic dwarf-shrub tundra
AMLCA19	536943	6986490	Mesic dwarf-shrub tundra
AMLCA20	536623	6987083	Mesic dwarf-shrub tundra
AMLCA21	536406	6987378	Mesic dwarf-shrub tundra
AMLCA22	536748	6987587	Water sedge marsh
AMLCA23	537186	6987726	Mesic dwarf-shrub tundra
AMLCA24	536413	6988046	Mesic dwarf-shrub tundra
AMLCA25	536549	6989816	Mesic dwarf-shrub tundra
AMLCA26	536912	6989461	Mesic dwarf-shrub tundra
AMLCA27	537383	6989267	Mesic dwarf-shrub tundra
AMLCA28	537164	6990271	Mesic dwarf-shrub tundra

A complete species list is provided in Appendix A (Table A1). The July 2021 surveys documented:

- 23 species of shrub
- 15 species of forbs
- 22 species of graminoids
- 6 species of moss, including 6 samples awaiting identification.
- 18 species of lichen, including 12 samples awaiting identification.

A combination of field data collected during land cover surveys in 2018 and 2021 and satellite imagery interpretation will be used to map areas of the Meliadine Extension footprint and associated Local Study Area (LSA) that were not previously mapped for the initial FEIS.

No rare plant species were observed. The absence of listed plant observations does not preclude the potential for listed plants to inhabit the area. Therefore, a survey for listed plant species cannot confirm the absence of listed plants or listed plant communities; it can only confirm their presence.

Golder Associates Ltd.

Original Signed by:

Andrea Ortega, P.Biol.
Vegetation and Wetlands Biologist

AO/CDLM/CB/pls

Original Signed by:

Corey De La Mare, P.Biol.
Principal, Senior Biologist

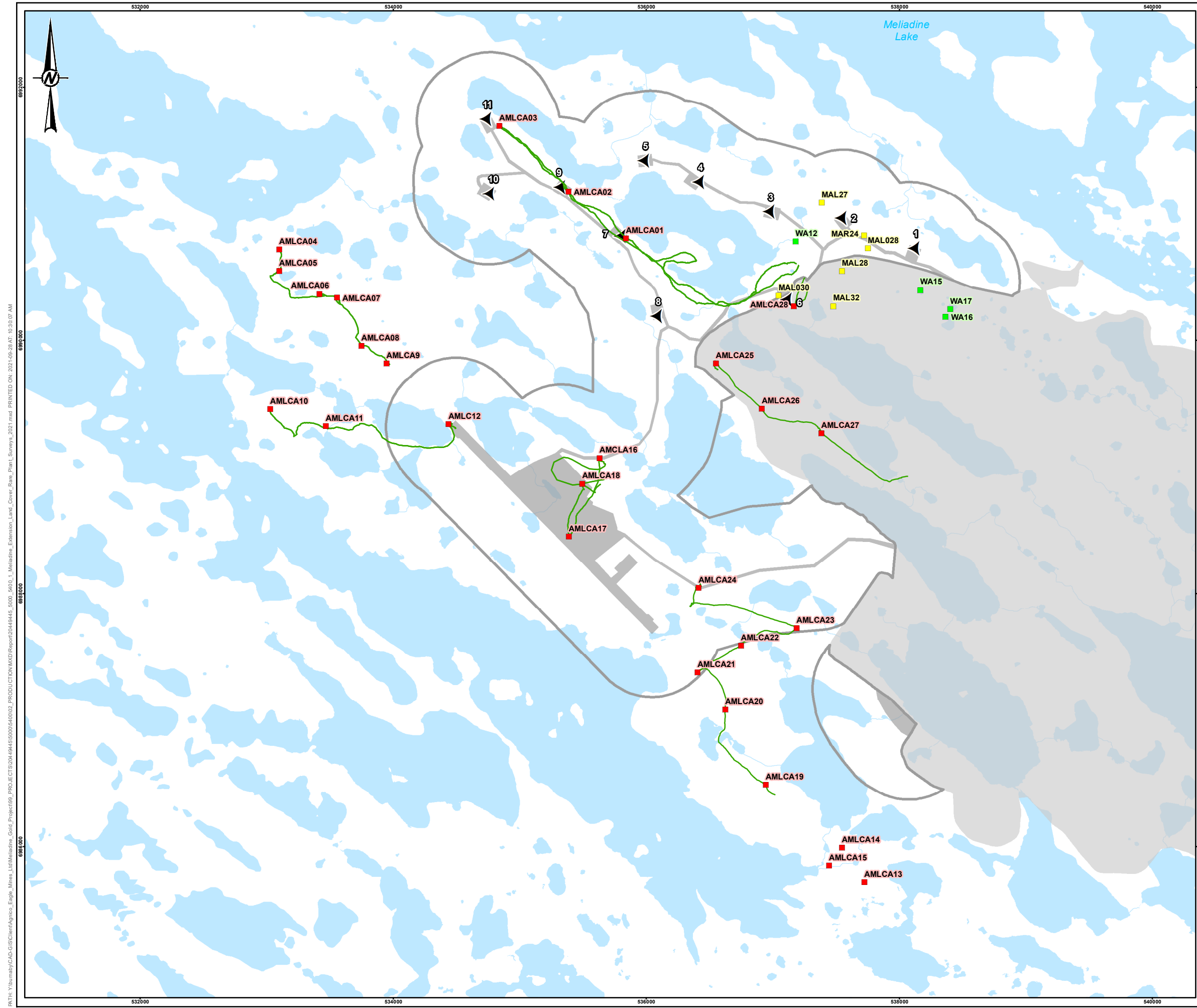
Attachments: Figure 1: Meliadine Extension Land Cover and Rare Plant Surveys (2021)
Appendix A – Species List

[https://golderassociates.sharepoint.com/sites/139711/project files/6 deliverables/working/20449445-895-tm-phase2_veg memo-rev0/20449445-895-tm-extension_veg memo-rev0.docx](https://golderassociates.sharepoint.com/sites/139711/project%20files/6%20deliverables/working/20449445-895-tm-phase2_veg%20memo-rev0/20449445-895-tm-extension_veg%20memo-rev0.docx)

5.0 REFERENCES

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Figure 1: Melidine Extension Land Cover and Rare Plant Surveys (2021)



LEGEND

- PROPOSED TURBINE LOCATION
- SURVEY LOCATION - LANDCOVER (2018)
- SURVEY LOCATION - WETLAND (2018)
- SURVEY LOCATION (2021)
- RARE PLANT MEANDER (2021)
- NIRB APPROVED PROJECT FOOTPRINT
- MELIADINE EXTENSION FOOTPRINT
- 500 m BUFFER OF MELIADINE EXTENSION FOOTPRINT
- WATERCOURSE
- WATERBODY



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

CLIENT **AGNICO EAGLE MINES LIMITED**

AGNICO EAGLE
 PROJECT
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
MELIADINE EXTENSION
LAND COVER AND RARE PLANT SURVEYS (2021)

CONSULTANT	YYYY-MM-DD	2021-09-28
GOLDER MEMBER OF WSP	DESIGNED	AO
	PREPARED	CDB
	REVIEWED	AO
	APPROVED	CDM

PROJECT NO. 20449445	CONTROL 5000/5400	REV. 0	FIGURE 1
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APPENDIX A

Species List

Table A1: List of Vegetation Species Recorded in 2021 Vegetation Surveys in the Meliadine Extension Footprint

Scientific Name	Common Name
Tree/Shrub	
<i>Arctous alpina</i>	alpine bearberry
<i>Arctous rubra</i>	red bearberry
<i>Betula glandulosa</i>	American dwarf birch
<i>Betula nana</i>	dwarf birch
<i>Cassiope tetragona</i>	Artic bell-heather
<i>Diapensia lapponica</i>	pincushion plant
<i>Dryas integrifolia</i>	Artic avens
<i>Dryas punctata</i>	mountain avens
<i>Empetrum nigrum</i>	black crowberry
<i>Kalmia polifolia</i>	bog laurel
<i>Kalmia procumbens</i>	alpine azalea
<i>Phyllodoce caerulea</i>	blue heath
<i>Pyrola asarifolia</i>	liverleaf wintergreen
<i>Rhododendron lapponicum</i>	lapland rosebay
<i>Rhododendron tomentosum</i>	marsh Labrador tea
<i>Rubus chamaemorus</i>	baked-apple berry
<i>Salix alaxensis</i>	Alaska willow
<i>Salix arctica</i>	Artic willow
<i>Salix reticulata</i>	net-leaved willow
<i>Salix richardsonii</i>	Richardson's willow
<i>Salix sp</i>	willow sp
<i>Vaccinium uliginosum</i>	bog bilberry
<i>Vaccinium vitis-idaea</i>	lingonberry
Forb	
<i>Astragalus alpinus</i>	alpine milkvetch
<i>Bistorta vivipara</i>	alpine bistort
<i>Campanula rotundifolia</i>	harebell
<i>Chamerion latifolium</i>	broad-leaved fireweed
<i>Pedicularis flammea</i>	flame-colored lousewort
<i>Pedicularis groenlandica</i>	elephant's head
<i>Pedicularis labradorica</i>	Labrador lousewort
<i>Ranunculus hyperboreus</i>	boreal buttercup
<i>Rubus chamaemorus</i>	cloudberry
<i>Saxifraga hirculus</i>	yellow marsh saxifrage
<i>Saxifraga oppositifolia</i>	purple saxifrage
<i>Silene acaulis</i>	moss campion

Table A1: List of Vegetation Species Recorded in 2021 Vegetation Surveys in the Meliadine Extension Footprint

Scientific Name	Common Name
<i>Silene involucrata</i>	aplina bladder catchfly
<i>Tofieldia coccinea</i>	Richarston northern asphodel
<i>Tofieldia pusilla</i>	dwar false asphodel
Graminoid	
<i>Arctagrostis latifolia</i>	reed polargrass
<i>Carex adusta</i>	browned sedge
<i>Carex albonigra</i>	black-and-white sedge
<i>Carex aquatilis</i>	water sedge
<i>Carex chordorrhiza</i>	prostrate sedge
<i>Carex diandra</i>	two-stamened sedge
<i>Carex fuliginosa</i>	nodding sedge
<i>Carex gynocrates</i>	northern bog sedge
<i>Carex membranacea</i>	fragile sedge
<i>Carex saxatilis</i>	rocky-ground sedge
<i>Carex scirpoidea</i>	rush-like sedge
<i>Carex sp</i>	sedge sp
<i>Carex vaginata</i>	sheathed sedge
<i>Eriophorum angustifolium</i>	narrowleaf cotton-grass
<i>Eriophorum gracile</i>	slender cotton grass
<i>Eriophorum scheuchzeri</i>	one-spike cotton grass
<i>Eriophorum vaginatum</i>	sheathed cotton grass
<i>Leymus mollis</i>	American dunegrass
<i>Poa arctica</i>	Artic bluegrass
<i>Carex gynocrates</i>	northern bog sedge
Bryophyte	
<i>Aulacomnium palustre</i>	tufted moss
<i>Drepanocladus fluitans</i>	warnstorfia moss
<i>Dricranum sp</i>	wind-blown moss
<i>Moss sp</i>	moss sp
<i>Pleurozium schreberi</i>	Screber's moss
<i>Tomentypnum falcifolium</i>	golden moss

Table A1: List of Vegetation Species Recorded in 2021 Vegetation Surveys in the Meliadine Extension Footprint

Scientific Name	Common Name
Lichen	
<i>Alectoria ochroleuca</i>	Witch's hair lichen
<i>Bryoria nitidula</i>	tundra horsehair lichen
<i>Cetraria cucullata</i>	Icelandic lichen
<i>Cetraria laevigata</i>	striped icelandic lichen
<i>Cetraria nivalis</i>	Icelandic lichen
<i>Cetrariella delisei</i>	snow-bed Iceland lichen
<i>Cladonia cornuta</i>	bighorn pixie lichen
<i>Cladonia fimbriata</i>	trumpeting pixie lichen
<i>Cladonia mitis</i>	reindeer lichen
<i>Cladonia rangiferina</i>	gray reindeer lichen
<i>Cladonia sp</i>	cladonia lichen
<i>Cladonia squamosa</i>	dragon pixie lichen
<i>Flavocetraria cucullata</i>	curled snow lichen
<i>Flavocetraria nivalis</i>	crinkled snow lichen
<i>Hypocenomyce scalaris</i>	common clam lichen
<i>Hypogymnia physodes</i>	monks-hood lichen
<i>Peltigera sp</i>	n/a