AGNICO EAGLE

MELIADINE GOLD PROJECT

SD 2-9
Roads Management Plan

APRIL 2014
VERSION 3

TABLE OF CONTENTS

Figures and Tables iii

Document Control iv

Executive Summary v

Acronyms vii

Section 1 • Introduction 1

1.1 Project Description 1

1.2 Access Roads, Service Roads and Haul Roads 3

1.2.1 Road Routes 4

1.2.2 All-weather Access Road 5

1.2.3 Access (Spur) Road to the Discovery Deposit 5

1.2.4 Hamlet Bypass Road 6

1.2.5 Traditional ATV and Ski-doo Trails 6

1.2.6 Haul Roads 7

Section 2 • Regulatory Setting 11

2.1 Land Tenure 11

2.2 Permitting Regime 11

Section 3 • Related Documents 16

Section 4 • Consultation 17

4.1 Road Use by Nunavummiut and Other Developers 17

Section 5 • Measures to Prevent Permafrost Degradation 19

Section 6 • Traffic Management on Access Roads 20

6.1 Management of AEM Traffic on the Access Roads 20

6.2 Management of Non-AEM Traffic on the Access Roads 21

6.3 Intersections of Access Roads with Haul Roads 21

6.4 Intersection of the Discovery Spur Road with the Rankin - Meliadine AWAR 22

6.5 Other Access Control Procedures 22
6.6 Projected AWAR Traffic between Itivia and the Meliadine Site 23
Section 7 • Inspection and Maintenance of Access, Service and haul Roads 25
7.1 Sedimentation Control 25
7.2 Watercourse Crossings Inspections and Maintenance 27
7.2.1 Regular Crossing Inspection and Maintenance 27
7.2.2 Event Crossing Inspection and Maintenance 28
7.2.3 Culvert Location Inspection 28
7.3 Snow Removal and Snow Management – Winter Maintenance 28
7.4 Dust Suppression 29
Section 8 • Road Safety 31
8.1 Road Signage 32
8.2 Policing of Road Safety Rules 33
Section 9 • Accidents, Spills, Malfunctions and Emergency Response 35
9.1 Accidents and Malfunctions 36
Section 10 • Wildlife Management 38
10.1 Wildlife Monitoring Program 38
Section 11 • Reclamation 40
11.1 Reclamation of Quarries and Borrow Pits Sites 44
References 45

Appendix A • AEM Consultation on the All-weather Access Road

Appendix B • Applicable Acts, Regulations, and Guidelines for the Access, Service and haul Roads

Appendix C • Dust Management Plan

FIGURES AND TABLES

Figure 1-1 Meliadine Access Road Network with Quarries and Drainage 2

Figure 1-2 Itivia General Arrangement and Access 8

Figure 1-3 Meliadine Haul Roads Network 9

Table 2-1 Licenses and Permits held by AEM – Roads 12

Table 2-2 Approvals and Authorizations for All Roads 13

Table 6-1 Estimated Average Daily Traffic on the AWAR 24

Table 8-1 Road Signage 33

Figure 11-1 Schematic Showing the Ripping of the Road upon Closure 43

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	September 2012			First draft of the Roads Management Plan	John Witteman, Env. Consultant, AEM
2	March 2013			Additions made throughout the Plan	John Witteman, Env. Consultant, AEM
		6.4	17	Addition of Section 6.4	
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		1.2.5	6-7	Details on snowmobile trails	
			8	Added new Figure 1-2 (Itivia)	
		2.2	12-14	Update including *Navigation Protection Act*	
		4	17	Added details on consultation wrt road mgmt. and use	
		6.1	20	Details on emergency reporting	
		6.5	23	Territorial Park	
		6.6	24	Periodic survey of road use	
		7.1	25-26	Section on sedimentation control	
		7.2.1	28	Protection of archaeological sites	
		7.3	29	Meadowbank experience wrt winter maintenance	
		8.2	34	Role of the RCMP	
		App. C		New Appendix: Dust Management Plan	John Witteman, Env. Consultant, AEM

EXECUTIVE SUMMARY

The Roads Management Plan is equally applicable to access roads and service roads. Operations and maintenance of both types of roads will largely be the same. This Plan was done in association with the Spill Contingency Plan (SD 2-16) and the Terrestrial Environment Management and Monitoring Plan (SD 6-4).

Land and environmental management in this area are generally governed by the provisions of the Nunavut Land Claims Agreement. A list of anticipated permits, licenses, agreements, authorizations, and approvals for all roads is presented in this Plan. The Nunavummiut and other in the community saw the utility of the AWAR and the access road to Discovery in providing easy access to Meliadine Lake where community members have a number of cottages and camps.

This Plan includes all access, service and haul roads proposed in the Meliadine Project area covering construction, operations, and temporary and final closure phases of the project. Access roads will be used by AEM but will also provide an unrestricted access to the public, if it is safe to do so. Access roads include:

1. A 23.8 km All-weather Access Road (AWAR) from Rankin Inlet to the Meliadine site. The AWAR will be used to transport the building materials, construction/mining equipment, fuel, reagents and supplies, workers and contractors to the proposed mine site;
2. A 5.1 km bypass road around the hamlet of Rankin Inlet from Itivia to the AWAR; and
3. A 9.8 km Discovery access (spur) road from the AWAR to the Discovery gold deposit, including an access to Meliadine Lake for community use.

Gates will be installed on the access roads near Meliadine (main site) and Discovery mining areas to prevent public entry. There will be an unmanned gate at the south end of the AWAR. It will be closed during periods of bad weather, in the event of a road accident, and during periods of major road maintenance. Average daily traffic on the AWAR including, for example, the type and numbers of vehicles to be used depending on the season is included in the following Plan.

This Plan presents mitigation measures and protocols to be implemented during construction and operations to preserve wildlife, to prevent permafrost degradation, to control surface runoff and to control sedimentation. AEM will put in place operational procedures for daily operation and maintenance of the roads including dust suppression methods, snow removal, de-icing and snow drift/banks management.

Protocols for accidents and anticipated use of police services are presented in the sections below. AEM will put the procedures in place and will keep resources close at hand to respond to emergencies on the roads in a timely manner. AEM will also report all reportable scale incidents to the appropriate Government authority.

Reclamation of the access, service and haul roads will follow the completion of all mining. For a third party to take over the road(s), that third party would have to complete its own arrangements with the land owner (the KIA and the hamlet) and then complete its own environmental assessment and permitting process covering future use.

ACRONYMS

AEM	Agnico Eagle Mines Limited
ARD/ML	Acid Rock Drainage/Metal Leaching
ATV	All-Terrain Vehicle
AWAR	All-weather Access Road
CGS	Department of Community and Government Services, Government of Nunavut
CLARC	Community Lands and Resources Committee
DFO	Department of Fisheries and Oceans Canada
GN	Government of Nunavut
HTO	Hunters and Trappers' Organization
INAC	Indian and Northern Affairs Canada
IOL	Inuit Owned Lands
IQ	Inuit Qaujimajatuqangit
KIA	Kivalliq Inuit Association
MDAG	Multidisciplinary Advisory Group
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NTI	Nunavut Tunngavik Incorporated
NU	Nunavut
NWB	Nunavut Water Board
RCMP	Royal Canadian Mounted Police
SD	Support Document

SECTION 1 • INTRODUCTION

1.1 Project Description

Figure 1-1 provides an overview of the Meliadine Project access road network. There is presently a controlled access, single lane All-weather Access Road (AWAR) between the proposed mine site and Rankin Inlet[1] (constructed in 2013/2014). The remote location of the Meliadine Project necessitates that access, service and haul roads be built to support the development.

The following structures and facilities located near the Tiriganiaq gold deposit include:

- Open pits;
- Underground and ancillary facilities;
- Tailings storage facility;
- Overburden/waste rock storage facilities;
- Plant site and ancillary facilities;
- Storage areas;
- Fuel tank;
- Quarries and granular borrow pits;
- Water management facilities;
- All-weather access, service and haul roads;
- Incinerator building;
- Biopile for fuel stained soils; and
- Industrial waste landfill.

The following structures and facilities located in Rankin Inlet include:

- Spud barge located at Itivia and serving as a dock;
- Tank farm at Itivia;
- Laydown yard at Itivia;
- Bypass road around the community;
- Two kilometres of the AWAR located on municipal land;
- Bridges over the Char and Meliadine Rivers on municipal land; and
- Reclaimed rock quarry (R19) on municipal land.

[1] The Meliadine Phase 1 AWAR was authorized under a separate process (Golder Associates 2010, 2011a, 2011b) and subject to separate monitoring and management plans (AEM 2011, 2012). The concepts and monitoring and management plans are being merged with the current project.

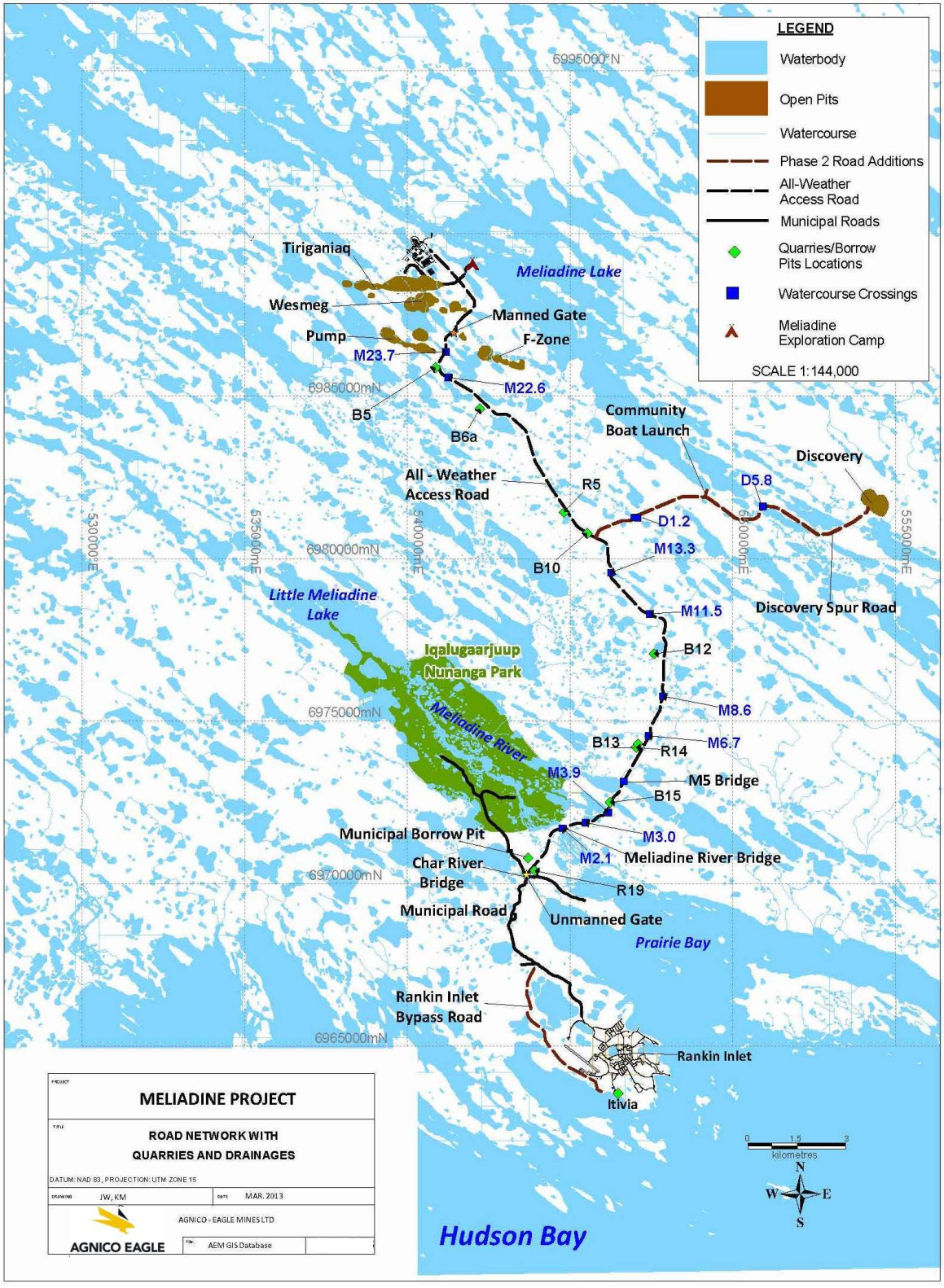

Figure 1-1 Meliadine Access Road Network with Quarries and Drainage

1.2 Access Roads, Service Roads and Haul Roads

What is the difference between access roads, service roads and haul roads?

Access Roads will have public access. The public can use small vehicles such as ATVs, skidoos, and pick-up trucks on these roads, providing use is done in a safe manner. Small mine and contractor vehicles will frequently use access roads. Large vehicles such as fuel tankers, buses, transport trucks, graders, and snow plows can also be expected. If oversized vehicles were to use an access road, they will be accompanied by escort vehicles. Access roads will have two-way traffic, be 8 metres wide with pull offs approximately every 350 metres.

Service Roads will not have public access. These roads will be restricted to mine and AEM contractor vehicles. All mine and contractor drivers using service roads will be trained to do so. Large equipment will on occasion use service roads but will normally use haul roads if they are available. Service roads will have two-way traffic and be 8 metres wide.

Haul Roads will not have public access. All mine and contractor drivers using haul roads will be trained to do so. Haul roads will essentially be reserved for haul trucks transporting waste rock and ore from open pits. Haul roads will be 26 metres wide for two way traffic, 16 metres for one way traffic, and will have safety berms where required.

Access, service and haul roads are needed in the operation of the Meliadine Gold Project. Access roads will be used by Agnico Eagle Mines Limited (AEM) but will also have unrestricted access by the public, if it is safe to do so. Access roads as presented on Figure 1-1 include:

- A 23.8 km AWAR from Rankin Inlet to the Meliadine site;
- A 5.1 km bypass road around the Hamlet of Rankin Inlet to transport fuel, supplies and reagents from Itivia to the AWAR; and
- A 9.8 km Discovery access road from the AWAR to the Discovery gold deposit, including a boat launch on Meliadine Lake for community use[2].

Gates will be installed on the access roads near the Meliadine main site and the Discovery mining area[3] to prevent public entry. There will be an unmanned gate at the south end of the AWAR. It will be manually closed during periods of bad weather, in the event of a serious road accident, and during periods of major road maintenance.

Service roads will be exclusively for AEM and its contractors use; the public will not have right of entry to these roads. These will service mine areas. They will be found in and around open pits, leading to waste rock storage facilities, on dikes, around the mill site, to the landfill and Emulsion

[2] The Discovery access road will be constructed in advance of mining the Discovery gold deposit.
[3] The final location of the gate on the Discovery access road remains to be determined.

Plant, to mention a few. Service vehicles, trucks carrying explosives, and small trucks with mine personnel will use the service roads. All AEM workers and its contractors using the roads will receive training before doing so.

Haul roads will largely be restricted to haul trucks, loaders and other heavy machinery. Small vehicles operated by AEM and its contractors could also use haul roads when it is safe to do so and only after the drivers have been trained to do so.

The Roads Management Plan applies equally to access roads, service roads and haul roads. Operations and maintenance of all types of roads will largely be the same. While public safety is emphasized in the use of the access roads, the safety of its workers and contractors will be of no less importance to AEM in their use of all roads.

1.2.1 Road Routes

The routing of the AWAR and service roads were selected to minimize possible effects of construction and operation on the environment, and facilitate maintenance of the road, particularly during winter. Other considerations included the overall length of the road, the route's proximity to satellite ore bodies, a desire to minimize the number of stream crossings, the availability of quarries along the route, acid rock drainage/metal leaching (ARD/ML) potential of borrow materials, geomorphology, avoidance of archaeological resources, avoidance of the Iqalugaarjuup Nunanga Territorial Park, Inuit Qaujimajatuqangit, and avoidance of raptor nesting sites. One design consideration for access roads was to remain on the height of land to allow for drainage in the summer and for wind to assist in clearing snow in the winter.

The location of the Meliadine Bridge was in part determined by IQ. Inuit Elders spoke of graves on an esker downstream of the present bridge location, which ruled out crossing at this location.

The elevation of the bridge above the Meliadine River was based on IQ as Elders spoke of significant overflow at the selected location, which could impinge on the bridge. This caused AEM to raise the elevation of the bridge more than first described in the engineering design.

The routing of the access road to Discovery was selected for all the same reasons. The route remains as much as possible on high ground, minimizes the number of water crossings and is close to potential rock quarries. Additionally, it allows a boat launch to be built for community use just off the road (an area where local residents can lift their boats in and out of Meliadine Lake – no construction into Meliadine Lake itself is planned). Nunavummiut and others in the community saw the utility of the AWAR and the access road to Discovery in providing easy access to Meliadine Lake where community members have a number of cottages and camps. The lake and surrounding area are extensively used for traditional pursuits.

Haul roads will be proximal to open pits and used year round; they connect open pits to Waste Rock Storage Facilities, ore storage pads and the primary crusher. The routing of haul roads is dependent on the final size and configuration of the open pits. The density of haul roads will be greatest at the Meliadine site where open pits for the Tiriganiaq, Wesmeg, F Zone and Pump gold deposits are located.

The longest haul road will be from the Discovery gold deposit to the main site. The publically accessible section of the Discovery access road and the AWAR from the junction with the Discovery road to the mine site will parallel this haul road. For the combined length, a continuous safety berm will be installed between the roads to isolate haul trucks on the haul road from vehicles on the access roads.

The routing of the bypass road, as shown on Figure 1-1, avoids the built-up part of the hamlet thereby ensuring homes, businesses, recreation centres and schools are not disturbed by mine traffic. It does not interfere with the operation of the airport or the new hamlet landfill, and joins the municipal road leading to the AWAR, Iqalugaarjuup Nunanga Territorial Park and a community borrow pit.

1.2.2 All-weather Access Road

The All-weather Access Road (AWAR) as shown on Figure 1-1 connects Rankin Inlet to the Meliadine site with the route selected following consultation with Inuit. The AWAR is a private road to be built in two phases. Phase 1 was constructed as a 23.8 km long, single lane road (6.5 m wide running surface) between the Char River bridge turn-off and the Meliadine site, with access controlled by a single manned gate located on the AWAR just after the Char River. The gate will not be on the municipal road.

Phase 2 of the All-weather Access Road

Construction of Phase 2 AWAR will occur after successfully receiving the Project Certificate following the Article 12, Part 5 environmental review of the proposed Meliadine Gold Project being conducted by the Nunavut Impact Review Board (NIRB), and under relevant authorizations. If approved through the regulatory process, the Phase 2 AWAR will involve the widening of the 23.8 km long Phase 1 road to an 8.0 m wide running surface. All previously installed or constructed Phase 1 AWAR road, bridges and culverts will be managed and maintained as part of the Phase 2 AWAR.

There will be controlled access to both the Discovery gold deposit and the Meliadine Project sites by manned gates. The completion of Phase 2 will allow AEM to safely and efficiently support construction, operation, and ultimately decommissioning of the proposed Meliadine Gold Project.

1.2.3 Access (Spur) Road to the Discovery Deposit

A 9.8-km long all-weather access road to the Discovery gold deposit is to be built as part of the Phase 2 AWAR (ahead on development of the Discovery deposit). This road will intersect with the

proposed Meliadine AWAR at a junction located approximately at km 15 just south of Borrow Pit B10, as shown on Figure 1-1.The construction and design of the access road will be identical to the Meliadine AWAR – 8 m wide and 2 lanes. As a result of public consultation, part of the Discovery road will be open to public access. Also, AEM committed to initially build the Discovery access road as far as Meliadine Lake and to build a community boat launch area (an area where local residents can lift their boats in and out of Meliadine Lake) for use by the residents of Rankin Inlet. The remainder of the Discovery access road will be built in advance of mining the gold deposit. AEM will install a control gate on this road to prevent inadvertent access to the mine area to ensure public safety. AEM is aware that there are existing ATV trails used by local hunters located at the east end of Meliadine Lake and that these must be left accessible. Therefore, the proposed control gate will be located in consideration of the location of these trails.

1.2.4 Hamlet Bypass Road

A bypass road will be built around the south of the airstrip to Itivia as shown on Figure 1-1. Its design and width will be identical to the AWAR and Discovery access road. The bypass road will be approximately 5.1 km long and will allow traffic from Itivia to bypass the hamlet in delivering people, materials and fuel to the Meliadine site. By building the bypass road, use of municipal roads by AEM will be kept to a minimum.

Why a bypass road is preferable to using existing roads in the hamlet?

One hundred and twenty two million litres of fuel are required annually for mine operations and it is to be stored in the Itivia tank farm. All this fuel needs to be transported to the Meliadine site where a tank farm with single 5.6 million litre tank will be constructed. If each fuel tanker carries 45,000 litres, it will result in a total of 2,711 trips annually or, on average, 7.4 trips per day. Added to this would be moving 20,000 to 40,000 tonnes of dry cargo from Itivia to the site annually, and 350 workers to and from the airport for each two week work rotation.

A small amount of material will also be transported from the Meliadine site to Itivia for transport south by sea.

1.2.5 Traditional ATV and Ski-doo Trails

The building of roads and the infrastructure at Itivia will impact existing ATV and ski-doo trails. Where these trails cross a road, a ramp will be constructed to ease road crossing, and signage installed to alert road users of the crossing. Similarly, there will be a sign alerting ATVs and ski-doos that they are approaching a road. Maintenance of the roads would see no snow placed on the trails.

Rankin Inlet residents and the Rankin Inlet HTO have identified that there is an existing snowmobile trail in the area of the proposed Itivia laydown yard that local residents use in winter months to

access Melvin Bay. AEM is aware of this trail and will design its laydown area to allow continued unfettered snowmobile access along the east side of the proposed laydown yard to access the sea ice at Melvin Bay. The location of this trail in relation to the proposed laydown yard is shown in Figure 1-2.

While the laydown area may be fenced, this snowmobile trail will not be hampered or blocked by any fencing.

1.2.6 Haul Roads

The building of haul roads will be governed by the sequence of the open pits to be mined and their width determined by the size of the haul trucks and other equipment using the roads. The Meliadine Project anticipates using 100-tonne haul trucks. Haul roads will be kept separate from access and service roads to ensure road safety. The proposed layout of haul roads in the vicinity of the Meliadine site is presented at Figure 1-3.

Figure 1-2 Itivia General Arrangement and Access

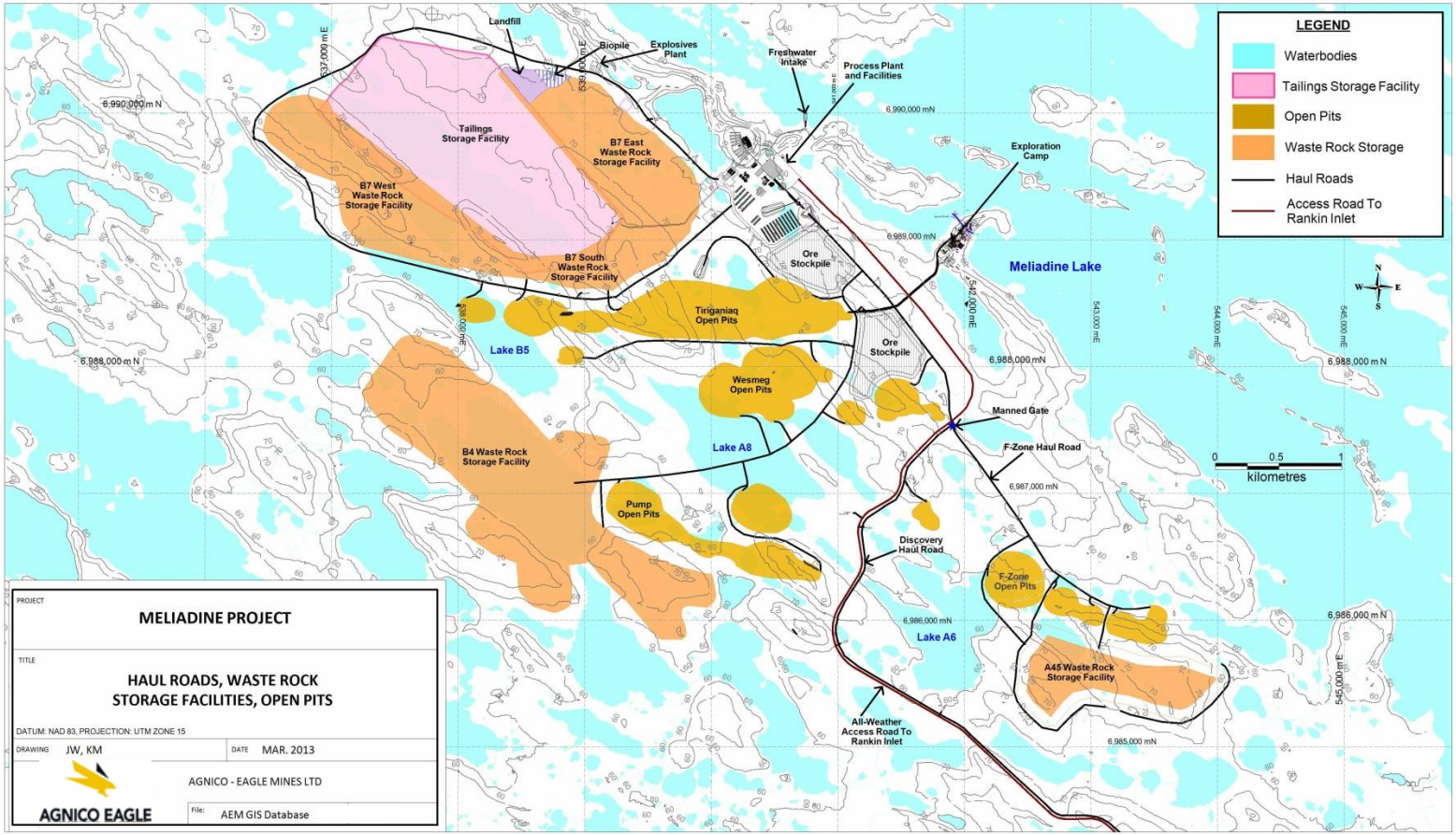

Figure 1-3 Meliadine Haul Roads Network

For two way traffic within an open pit, the minimum haul road width will be 26 m and will include a drainage ditch and a continuous safety berm. The safety berm on the outside edge of the ramp will be constructed of crushed rock to a height equal to half the rolling radius of the largest tire. To facilitate drainage of the roadway, a two percent cross slope on the ramp is planned. The maximum ramp gradient will be ten percent.

Haul roads outside the open pits will be 26 m wide to allow for two way traffic, or 16 m for single lane traffic with 26 m wide passing zones spaced accordingly. Safety berms will be installed where necessary along the haul roads.

The Discovery haul road will be the longest haul road on site; it will be approximately 20 km long and will be constructed between the Discovery mine site and the mill site. It will be single lane, 16 m wide, with passing zones set every 500 m to allow two trucks going in opposite directions to pass. This road will be constructed immediately parallel to and north of the Discovery access (spur) road, and east of and parallel to the Rankin - Meliadine AWAR between the intersection at km 15 and the proposed haul road from the F Zone mining area at approximately km 24. At this point, the F Zone mine haul road crosses over the AWAR and follows a separate alignment to the primary crusher and ore stockpile locations at the mill site.

Although the Discovery haul road and the access roads will be combined in a single road corridor, the two types of roads will be separated from each other by continuous safety berm 1.5 to 2 metres high to isolate the haul truck traffic from vehicles on the access roads.

SECTION 2 • REGULATORY SETTING

2.1 Land Tenure

The larger part of all proposed access, service and haul roads are to be located on Inuit Owned Lands (IOL) administered by the Kivalliq Inuit Association (KIA). The surface ownership of the land encompassing the roads right-of-ways was transferred to the KIA when the Nunavut Land Claims Agreement (NLCA) came into effect. Land and environmental management in this area are generally governed by the provisions of the NLCA.

Closer to Rankin Inlet, 2.3 km of the AWAR and the bypass road will be on Commissioner's land held by the Department of Community and Government Services (CGS) for the benefit of the Hamlet of Rankin Inlet.

The Phase 1 AWAR was constructed under land use permits issued by CGS on municipal land, and the KIA on IOL; leases will follow the completion of construction and a legal survey of the road right-of-way. The width of the land leases will be 20 m for the length of the roads, wide enough to accommodate the 8 m width of all access roads.

Service roads will exclusively be constructed on IOL under the mine lease(s) issued by the KIA.

2.2 Permitting Regime

Federal, territorial and municipal laws and regulations that apply to the construction, operation and closure of all access, service and haul roads are itemized in Appendix B. No land use permit, operating permit, authorization, or license can be issued by any regulatory agency that would allow AEM to undertake Phase 2 construction on the AWAR or start construction on any other road until the NIRB has completed its environmental assessment and issued a Project Certificate.

Table 2-1 outlines the current licences and permits held by AEM in relation to the Phase 1 AWAR. At this time, this also includes winter roads between Rankin Inlet and the Meliadine site. Once the Phase 1 AWAR is complete, the winter roads right-of-way permits will be allowed to expire. After receiving a Project Certificate and all necessary authorizations, land use permits will be issued by CGS on behalf of the hamlet and by the KIA on IOL for the continued construction of the Phase 2 AWAR and also the construction of the Discovery access road and the bypass road. These will subsequently be taken to lease.

A list of anticipated permits, licenses, agreements, authorizations, and approvals for all roads is presented in Table 2-2.

Table 2-1 Licenses and Permits held by AEM – Roads

License Number	Explanation	Issued By	NIRB File	Remarks
KVL100B195	Meliadine Prospecting – Land Use	KIA		General land use permit applying to exploration and drilling
KVL302C268	NTI Parcel Drilling	KIA		Drilling on RI-01 Inuit Owned Lands
KVL308C07	Mel E Exploration RI01	KIA		Drilling on RI-01 Inuit Owned Lands
N2010C0002	PB1, Drilling Permit	INAC	10EN006	
N2013-C002	Exploration, drilling claims CWM	AANDC		
KVCL102J168	Commercial Lease	KIA	07EN044	Commercial lease for exploration and underground activities
KVRW98F149	Meliadine Right-of-Way	KIA		Winter road across Prairie Bay & various Lakes (renewed annually)
KVRW07F02	Overland Right-of-Way	KIA	07AN063	Winter road along proposed all-weather road route (renewed annually)
KVRW11F02	Permanent Road Right-of-Way	KIA	11RN017	
KVCA07Q08	Mainland Esker Quarry Permit	KIA		Tiriganiaq Esker quarry
KVCA11Q01	Permanent Road Quarries	KIA	11RN017	
	WCB Program Authorization	WCB		Annual renewal
2BB-MEL0914	Bulk Sampling - Water License	NWB	07EN044, 11RN017	
2BE-MEP0813	Exploration – Water License	NWB	08EN043	
2BW-MEL1215	Road – Water License	NWB	Approved under 12.10.2(b) NLCA	To allow for the use of water and disposal of waste during water-crossings and road construction activities at the Phase 1 – AWAR

Table 2-2 Approvals and Authorizations for All Roads

Authorization	Authority	Basis
Conformity determination with Keewatin Regional Land Use Plan	Nunavut Planning Commission	Allows Project to proceed to screening
Article 12, Part 5 Environmental Assessment	Nunavut Impact Review Board	Allows Project to proceed to authorizations to build and operate roads
Type A Water License	Nunavut Water Board	Allows for construction of the Meliadine Gold Mine and related roads
Navigable Waters Protection Act application	Transport Canada	AEM did provide a list of water crossings for the Phase 1 AWAR and requested a navigability determination for each. A similar request will be prepared for other water crossings as necessary.
Inuit Impact and Benefits Agreement	Kivalliq Inuit Association	Impacts are compensated and benefits provided to Inuit
Water Compensation Agreement	Kivalliq Inuit Association	Compensation for Inuit Water Rights under NLCA Section 20
Land Use Permit	Kivalliq Inuit Association	Allows construction of the Discovery access road
Right-of-way Lease	Kivalliq Inuit Association	Allows right-of-way for AWAR and Discovery access road across Inuit lands
Land Use Permit	Rankin Inlet and Community and Government Services	Allows construction of the bypass road
Right-of-way Lease	Rankin Inlet and Community and Government Services	Allows right-of-way for AWAR and bypass road across municipal lands
Quarry License	Kivalliq Inuit Association	Various quarry and borrow pit sites along the right-of-way for building the roads to the Meliadine and Discovery sites
Explosive Magazine Permit Renewal	Workers' Safety and Compensation Commission	Permits an explosive magazine on-site and at other approved locations
Class 2 Permit for Heritage Sites (obtained by qualified professional archaeologist)	Department of Culture, Language, Elders and Youth	Unavoidable impacts of roads on heritage sites have been mitigated

Amendments to the *Navigable Waters Protection Act* are anticipated to come into force in April 2014 as part of the Federal Government's 2012's Bill C-45. These amendments will:

- Change the name of the *Navigable Waters Protection Act* to the *Navigation Protection Act*;
- Include a schedule which clearly lists the major waterways for which regulatory approval is required prior to the placement or construction of a work;
- Allow proponents of works in non-scheduled waters to opt-in and seek approval of their proposed work to give them additional legal certainty; and
- Expand the list of low risk works (e.g., minor repairs on bridges) that can be pre-approved because they pose very little impact on safe navigation.

Schedules listing major water bodies requiring regulatory approval include Schedule 2 Part 1 – Oceans and Lakes, and Schedule 2 Part 2 – Rivers and Riverines. Schedule 2, Parts 1 and 2 do not include any water bodies found within the Meliadine Project's footprint. As such, all are non-scheduled water bodies and AEM undertook to determine if they are or are not navigable.

Using the *Navigable Protection Act*, AEM assessed the navigability of the small lakes, ponds and streams within the Project's footprint by asking the following questions[4]:

- Are the water bodies within the Project's footprint capable of being navigated by floating vessels for the purpose of transportation/recreational use?
    - If the answer is "no" to this question, the water bodies are not navigable.
    - If the answer is "yes", then additional questions were asked.

- Is there a public right to travel?
- Is there any historical use of the water bodies for navigation?
- Is there any proposed future use of the water bodies for navigation?
- Is the water body part of a navigational network or transit route to other water bodies?
- Is the water body a self-contained route for fishing or recreation?
- Will AEM's roads offer access to water bodies with the Project's footprint?

Based on all these questions, AEM determined that:

- Navigation of streams found within the Project's footprint is not feasible;
- Navigation to and between water bodies is not feasible;
- The water bodies within the Project's footprint do not form part of a navigational network or transit route;
- There is no evidence of historical use of the water bodies for navigation or recreation; and
- There is no anticipated future use of the water bodies for navigation.

[4] The questions being asked are in part based on the *Draft Working Framework for determining a Navigable Water under the Navigable Protection Act* prepared by Transport Canada.

At this time, AEM does not believe that the small lakes, ponds and streams within the Project's footprint are navigable water bodies. AEM does recognize that Meliadine Lake, Meliadine River and Melvin Bay[5] in Rankin Inlet are navigable water bodies.

[5] Melvin Bay is in Hudson Bay and the port of Itivia is located there.

SECTION 3 • RELATED DOCUMENTS

Environmental Impact Statement documents that provided input to the Roads Management Plan include the following:

- Terrestrial Environment Management and Monitoring Plan (SD 6-4);
- Spill Contingency Plan (SD 2-16);
- Occupational Health and Safety Plan (SD 9-6);
- Mine Closure and Reclamation Plan (SD 2-17); and
- Borrow Pits and Quarries Management Plan (SD 2-10).

The Roads Management Plan, including the Dust Management Plan available in Appendix C, is part of the Environmental Management and Protection Plan (SD 2-5) for the Meliadine Project and will be in effect during the construction, operation and closure of the Project.

SECTION 4 • CONSULTATION

Consultations on the road route with the community of Rankin Inlet, Elders, Hunters' and Trappers' Organization (HTO) and KIA was ongoing from as early as 2004. A chronological record of consultation on the AWAR is provided in Appendix A. Extensive details on all consultation can be found in the Public Engagement and Consultation Baseline Report (SD 3-1).

On several occasions in 2013, AEM met with the KIA and with the Rankin Inlet HTO to discuss how the Phase 1 AWAR should be managed and to develop a plan on how limited public access would be provided. The HTO have told AEM that they believe the AWAR should be open to unlimited public access but acknowledge that for Phase 1 the AWAR must be operated with controlled limited public access until NIRB has the time and opportunity to assess the impact of such open public access. In the interim AEM and the HTO have been discussing how to control and manage limited public access on the Phase 1 AWAR beginning in the summer of 2014. It has been agreed that access will be limited to ATVs only unless otherwise permitted and be via a pass system where the HTO have involvement over who is granted a pass. AEM and the HTO have also been discussing a program that would see the HTO provide wildlife monitoring services for AEM along the Phase 1 AWAR.

AEM has presented its proposed management procedures for the Phase 1 AWAR along with the proposed further development of the Rankin Inlet by-pass road options and the plan for the Phase 2 AWAR extension to the Discovery site at public meetings held in Rankin Inlet in 2012 (mid-October) and 2013 (mid-February). The public clearly indicated their frustration that the Phase 1 AWAR is not open for unlimited public access now. The public generally supported the proposed Discovery Deposit access road routing. There were some elders who would have preferred the AWAR be built on a different alignment that ran west of the Iqalugaarjuup Nunanga Territorial Park and then cut back towards the Meliadine site. This would have given them better access to the Diana River and traditional hunting and fishing area to the northwest. AEM explained that this was a much longer route as it moved away from the site (i.e. was not a straight line to the Project site) and involved numerous more water crossings and was thus not an acceptable route from AEM's needs and perspectives. The community spoke to its preference to the Rankin Inlet by-pass route going along the west side of the Rankin Inlet airport and not along the east side as proposed as one option by AEM as this put the road in conflict with the entry to the airport terminal and conflict with future housing development areas.

4.1 Road Use by Nunavummiut and Other Developers

The AWAR and the Discovery spur road partly covers existing ATV and snowmobile trails, which are currently used as access to traditional areas for hunting, fishing, and recreation in the Meliadine Lake and Machum and Twin Lakes areas. The Nunavummiut of Rankin Inlet were adamant that the Discovery access road include an access area to Meliadine Lake for the purpose of putting in and out of the lake. AEM agreed to build the Discovery access road as far as the boat launch area at the

same time the AWAR is being widened to 8.0 m. The boat launch area will provide access to the lake and surrounding area for traditional use, and to camps and cabins built around the lake.

It is possible that the trail/road being built from Chesterfield Inlet to Rankin Inlet may at some point in time join the Discovery access road. The community is continuing to extend the trail/road south each year. Chesterfield Inlet has now built approximately 17 km of trail/road south from their community toward Rankin Inlet and now occasionally drive their ATVs/snowmobiles to Rankin Inlet.

AEM is unaware of any possible future developments in the vicinity of the Meliadine or Discovery sites that could make use of the access and/or service roads.

However, it is AEM's responsibility to decommission and reclaim the roads once its activities in the area are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the land owners (the KIA and the hamlet) and then complete its own environmental assessment and permitting process covering future use. AEM does not own the land on which the roads are constructed on and, thus, cannot transfer future ownership or use privileges to any third party. AEM must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the land owners and other regulatory agencies who issued permits/authorizations for the roads.

SECTION 5 • MEASURES TO PREVENT PERMAFROST DEGRADATION

Roads have been designed with a minimum fill thickness to maintain permafrost conditions within the subgrade soils. The thermal modeling indicated a minimum road fill thickness of 1 m is required above ice poor subgrade soils to maintain the soil in a frozen condition. Similarly, a minimum road fill thickness of at least 1.3 m is required above ice rich subgrade soils.

To the greatest extent possible, roads will be constructed in the winter when the subgrade soils are frozen in order to prevent insulation of thawed subgrade soils. The rough base would be advanced at the full road width so that the base of the roads will be laid down in winter frozen ground conditions. The stream crossing culverts would also be installed in the winter. Once the rough base and stream culverts are installed, the remainder of the construction will be completed by building up the rough base primarily under winter conditions, and placing the final topping materials during the spring and early summer.

Mitigation and environmental design features to reduce the potential for permafrost degradation are as follows:

- The road alignment avoids, where possible, fine-grained, poorly drained, ice-rich, frost susceptible soil conditions as noted by geomorphologic mapping, due to susceptibility to thaw related settlement;
- Regions of high ground relief (higher elevations) were sought to provide better drainage conditions, to minimize the potential for snow drifting on the road and to avoid organic depressions and/or other poor ground conditions, which are more abundant in the low lying areas;
- Road fill material will be placed directly over the existing soil layer without cutting, stripping, or grubbing to avoid disturbing the subgrade soils;
- Only thick drifted snow will be removed before the road fills are placed;
- The road fill thickness should be a minimum of 1 m in thaw-stable soils, and 1.3 m in thaw-sensitive soils; and
- To prevent insulation of thawed subgrade soils, to the greatest extent possible, the access, service, and haul roads will be constructed in the winter when the subgrade soils are frozen.

The road and its shoulders will be inspected weekly (at a minimum) during the summer period for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment. Such movements are expected and may lead to longitudinal cracking and thaw settlement especially for portions of the road founded on thaw susceptible (ice rich) soils. When such areas are discovered, the affected area will be repaired using granular material and/or crushed rock. AEM will maintain stockpiles of such material in select borrow/quarry areas along the road.

SECTION 6 • TRAFFIC MANAGEMENT ON ACCESS ROADS

6.1 Management of AEM Traffic on the Access Roads

All of the required fuel, supplies, equipment and workers for the mine will be transported to the Meliadine and Discovery sites via the bypass road, AWAR, and Discovery access road. All drivers transporting these materials and personnel will either be AEM employees or employees of contractors directly hired by AEM, and must possess a valid driver's license from a Canadian province or territory, for the appropriate class of vehicle, in order for them to be allowed to operate vehicles on the access roads. AEM will educate all of its employees and all of its contractor's employees on road safety rules during the safety introduction training that occurs when first start work at the Meliadine site.

All AEM vehicles that travel routinely on the access roads will be equipped with a radio set to the requisite road frequency. Similarly contractor's vehicles that routinely travel on the access roads will be equipped with a radio set to the requisite road frequency. Consequently AEM traffic on the road will always have radio contact with the northern gatehouse, security, and other AEM and AEM contractor traffic. This system will be used to report any unusual conditions along the roads such as: location of other vehicles, presence of wildlife on the roadway, presence of non-AEM traffic such as ATVs, snowmobiles or other vehicles on the access roads, any special road conditions, any special weather conditions, etc. All AEM drivers using the road will be required to monitor and report to the northern gatehouse by radio any observed unauthorized or unsafe use of the road.

Once the AWAR is open to unrestricted public access, AEM will implement a process to inform the public using the AWAR on how they can communicate with AEM in the event of an emergency on the road. AEM is hoping that it will be able to establish full cell phone service along the full length of the AWAR at some point in time during the construction phase of the project and continuing into the operational phase. Thus the prime mechanism for contacting AEM in the event of an emergency will be by cell phone. Once such service capability is in place AEM will take the following action to communicate how the public can contact AEM to report an emergency on the AWAR:

- Signage at the Rankin Inlet end of the road and at the mid-point emergency shelter (at a minimum) that provide the public with the AEM phone contact number (probably site security) to which the public can report an emergency along the AWAR;
- Include this information on periodic public information sessions on the road safety procedures delivered in Rankin Inlet; and
- Include this information in periodic community radio and TV announcements.

6.2 Management of Non-AEM Traffic on the Access Roads

AEM will work with the KIA and the Hamlet of Rankin Inlet to devise a system for unrestricted public access by non-AEM traffic and will have this in place before construction is completed on the Phase 2 AWAR, the bypass road and the Discovery access road. AEM will also consult with the local HTO on this issue. Until this system is in place, traffic on the access roads will be controlled by AEM through a manned gate.

The safety rules[6] developed for the roads will apply to all users of the road, including AEM employees, AEM contractor employees, and public. AEM will hold public information sessions in Rankin Inlet for users of the roads prior to their opening and on a regular basis thereafter (minimum of twice per year). A copy of the road safety rules will be presented at these sessions.

AEM will also hold public information sessions in Chesterfield Inlet for users of the roads prior to the roads opening and on a regular basis thereafter (minimum of once per year). A copy of the road safety rules will be presented at these sessions. This is required because Chesterfield Inlet has now built approximately 17 km of trail/road south from their community toward Rankin Inlet and occasionally drive their ATVs/snowmobiles to Rankin Inlet.

AEM will also use other communication tools to get the road access procedures and road safety rules out to the public in Rankin Inlet. These will include community radio, community TV, and postings around town, through the Meliadine Project office in Rankin Inlet, and via an AEM Project website. The communication will be in both English and Inuktitut. All non-AEM road users will also be encouraged to monitor and report any observed unsafe use of the roads to AEM.

6.3 Intersections of Access Roads with Haul Roads

There will be two locations where vehicles on access roads will need to cross over haul road; these are:

i. at km 3.7 on the Discovery access (spur) road where public vehicles will cross over the haul road to reach the south-east corner of Meliadine Lake and the community boat launch as shown on Figure 1-1; and
ii. at the intersection between the Meliadine AWAR and the haul road to the F Zone mining area (see Figure 1-2). This crossing will not be accessible to the public as it would be located north of the planned gate controlling public access to mine working areas.

Stop signs will be installed and routinely maintained at both of these sites, along with warning signs requiring vehicles on the access roads to stop and give way to the mine haul trucks on the haul

[6] See Section 8 for complete details on safety measures proposed for access roads.

roads. Drivers will have to stop and look both ways before proceeding across the haul roads. Under no circumstances will public vehicles share haul roads with haul trucks.

6.4 Intersection of the Discovery Spur Road with the Rankin - Meliadine AWAR

The Discovery spur road will intersect the Rankin-Meliadine AWAR at approximately km 15. Vehicles on the Rankin – Meliadine AWAR will have the right-of-way. A stop sign will be installed and routinely maintained on the Discovery spur road along with warning signs requiring vehicles on the Discovery spur road to give way to vehicles on the Rankin – Meliadine AWAR. Drivers will have to stop and look both ways before proceeding.

6.5 Other Access Control Procedures

There will be occasions when access to the one or more of the access roads needs to be curtailed for short time periods for special reasons, such as bad weather, unsafe road conditions, maintenance activity on the roads, heavy project related truck traffic, movement of oversized loads, and/or presence of large numbers of caribou on or adjacent to the road. A road could also be temporarily closed in the event of an incident, accident or other event requiring mitigation or response. Typically these short-term closures will be required to ensure safety.

In communicating such short-term closures, AEM will take the following actions:

- AEM will issue a daily road condition bulletin by means of email to a subscriber list, through a project related website, and through community radio. The bulletin will provide information on current road and weather conditions and on special activity planned for that day on one or more of the access roads;
- AEM (with the consent of the Hamlet of Rankin Inlet) will set up and maintain a sign in English and Inuktitut to be sited close to Rankin Inlet on the existing municipal road out to the Char River and the Territorial Park that indicates whether the AWAR is “open” or “closed” at that specific point in time;
- AEM will limit access and, in certain conditions, close the roads to all traffic during bad winter weather (blizzard or white out conditions). In the worst weather, the southern gate on the AWAR near the Char River will be closed and signed accordingly;
- AEM will limit access to one or more of the roads when it is not safe as a result of an accident or a road maintenance problem;
- AEM will limit access to the roads when large numbers of caribou are crossing the road. This will occur in consultation with the local HTO;
- AEM will work with the KIA and HTO to establish of an appropriate no shooting zone along the roads to ensure that project workers and all other road travelers are not inadvertently exposed to risk of accidental shooting; and
- AEM reserves the right to refuse access to individuals who do not respect the rules on safety, speed and the no shooting zone when using the road.

The GN Department of Environment (GN-DoE) has expressed a valid concern that there is potential for unauthorized trails/access routes to be created from the AWAR into a designated preservation zone within the Iqalugaarjuup Nunanga Territorial Park at an area to the northeast of the Meliadine River just past the new Meliadine River Bridge. The AWAR is in close proximity to the park boundary in this location. GN-DoE have pointed out that such an unauthorized use of this designated preservation zone could cause irreparable damage to the natural and cultural features mean to be protected within this territorial park. AEM acknowledges this concern and commits to work with the GN-DoE to reduce/prevent this potential unauthorized access to this part of the park.

In this respect AEM will take the following actions:

- AEM commits that it will not allow any of its employees or contractors to construct any side roads/trails off of the east side of the AWAR between Km 1 and Km 8. In actual fact AEM has no intent of constructing any side roads and/or trails off of the designated AWAR corridor at any point along its length and thus additional regulatory approval would be needed under the Terms of the Road Use Lease with the KIA before any side road/trail could be constructed;

- AEM will task its Road Supervisor with keeping an eye on this critical section of the AWAR as part of its regular road inspections (as outlined in Section 7 of this Roads Management Plan) with the objective of identifying any signs of unauthorized trails/access routes leading from the AWAR into this area of the Park. If any evidence of unauthorized access trails is discovered the Road Supervisor will contact GN-DoE Park Staff in Rankin Inlet to a) inform the GN-DoE Park staff of the discovery and to jointly work on a plan to prevent any further use of such access points. AEM would then take the agreed upon measures to implement the plan provided that such measures are reasonable; and

- AEM will meet with GN-DoE Park staff to jointly discuss what other measures can be taken to dissuade/prevent such potential unauthorized access into this area of the Park (e.g. possibly signage, public educational measures, placement of barriers, etc.). AEM will then implement such measures where reasonable. AEM will continue to periodically meet with GN-DoE park staff (at least annually but more frequently if required) to discuss protection of this designated preservation zone within the Park.

6.6 Projected AWAR Traffic between Itivia and the Meliadine Site

AWAR use by AEM and its contractors between Itivia and the Meliadine site is not expected to vary as much as the public traffic between summer and winter. Table 6-1 provides the projected traffic for the bypass road and AWAR. AEM and contractor vehicles expected to use the road will include, but not be limited to: pick-up trucks, cube vans, buses, fuel trucks, tractor-trailers, snowplows and graders. However, the amount of traffic will be highly dependent on the level of activity on site and the time of year, such as when supplies and materials arrive by sea, as well as on the weather

(virtually no traffic is to be expected when the weather is bad). Also, should flights not be able to get into Rankin Inlet, passenger vans/buses would only transport local employees to the site, which would reduce the number of vans/buses by half.

Summer traffic is expected to be moderately higher than winter traffic as more contractual work can be expected over the summer. Fuel deliveries and passenger van/bus traffic are not expected to vary a great deal between winter and summer.

Table 6-1 Estimated Average Daily Traffic on the AWAR

Type of vehicle	Winter		Summer	
# of vehicles	Week Days	Weekends	Week Days	Weekends
Mine-related Traffic				
Pick-up Trucks	10-12	4-8	12-14	6-10
Cube Vans	6	2	8	2
Passenger Vans/Buses	4	1	4	1
Fuel Trucks[1]	8	8	8	8
Transport Trucks[2]	1	1	6-14	6-14
Public Road Use				
Pick-up Trucks	4-6	2-4	6-8	12-16
ATVs/Snowmobiles	4-8	4-10	10-16	10-20

[1] Transport of fuel will be continuous, year round. A fuel truck will carry on average 45,000 litres.

[2] Transport of dry goods will largely take place over a 4-month period, from August to November.

Projected private traffic on the access roads has greater uncertainty as it will be weather dependent. We estimate that 25-50 % of the anticipated trips will be incremental to current access, which is by ATVs and snowmobiles. On nice days, more traffic can be expected as those living in Rankin Inlet may travel to Meliadine Lake for a day of fishing or hunting. During bad weather, public traffic on the road can be expected to fall to zero.

During Phase 1 operation of the FEIS, AEM will start to collect information on volume of people using the road (expected to start in the summer of 2014) but useful information is not yet available as during winter months public will be able to access the Meliadine area using snow mobiles, tracked vehicles and dog sleds which do not need to pass through the AWAR access gate. AEM commits to conduct periodic spot checks of public use of the AWAR once the Phase 2 is complete to gauge the accuracy of the predictions contained in Table 6-1. These will be periodic surveys conducted by AEM and not continuous monitoring.

SECTION 7 • INSPECTION AND MAINTENANCE OF ACCESS, SERVICE AND HAUL ROADS

Inspection precedes maintenance. AEM recognizes that a good inspection program will lead to the early identification of areas of the roads where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface and to water crossings.

AEM has sole responsibility for the ongoing inspection and maintenance of all of the components of the access, service and haul roads, including the road beds, the bridges, the culverts and the borrow/quarry sites used in the construction and maintenance of the roads. AEM will apply the experience that it has gained from the ongoing operation of the Meadowbank All-weather Road, which has now been in operation for 3 years. This experience will be applied in the planning of the day-to-day operation, inspection and maintenance of the Meliadine roads. AEM will have a road supervisor who will be responsible for the ongoing road inspection and maintenance of the access, service and haul roads. The operation and maintenance of all roads will largely be the same.

The road supervisor will conduct periodic inspections (minimally on a weekly basis) of the roads to ensure that the roads are maintained for safe travel of personnel, equipment, and supplies. These inspections will be recorded and any deficiency recorded and followed up by a corrective plan. These periodic inspections will include an inspection of the bridge abutments and a visual observation of the road surfaces to assess the status of road foundation.

During the summer period, the road surface will be maintained with gravel being spread as required and regular grading of the road. In the fall, winter and spring time the maintenance will be adjusted according to the weather conditions. Snow clearing along the road will be done to ensure that the road can be operated safely. The manner in which the snow is cleared will also take into account the road configuration to ensure that snow accumulation will not cause any particular problem during the freshet.

All roads will be inspected for signs of accumulation of ponded water either on the road surface or along the sides of the road. Where noticed, the AEM road supervisor will evaluate and monitor the accumulation to determine why water is accumulating in these areas. Based on these evaluations, the road supervisor will take remedial action where and when necessary to correct the cause of such ponding, such as grading of the road surface to remove areas of ponding or installation of additional culverts if the road is causing excessive water ponding.

7.1 Sedimentation Control

The running surface of the Phase 1 AWAR is a single lane road (6.5 m width) with passing turnouts (9.5 m total width at passing turnouts). For the Phase 2 AWAR, only the running surface will be widened to a double lane road (8.0 m width). Locations and hydraulic characteristics of water crossings will remain unchanged with the widening of the Phase 2 AWAR running surface

to 8.0 metres. No changes are expected to the present culvert configurations excepting that they will be lengthened to accommodate the wider road. Mitigation measures will remain unchanged for the Phase 2 AWAR.

Construction of the Phase 2 AWAR will take place in winter with all or the majority of the road completed under winter conditions when there is no water to cause sedimentation problems. However, surface dressing may extend into summer. Should this occur, this last step in road construction by itself will have negligible effects. Various mitigations and best practices that will be followed during road construction to control sedimentation are as follows:

- No in-water work will take place from 1 May to 15 July, to protect fish spawning and nursery periods of local fish populations; this would apply to all stream crossings;
- Sediment and erosion control measures will be implemented prior to the start of work and maintained during the work phase to prevent entry of sediment into the water or the movement of re-suspended sediment into the stream crossings;
- Sediment and erosion control measure will be left in place until all disturbed areas have been stabilized;
- All disturbed areas will be physically stabilized as soon as possible following construction using rock and/or vegetation;
- Machinery used near stream crossings will arrive on site in a clean condition and be maintained free of fluid leaks to keep contaminants out of the water;
- The equipment will be re-fuelled, serviced, and washed away from the stream crossings to prevent deleterious substances from entering the water. Fuel, lubricants, hydraulic fluids, etc., will not be stored within 31 m of the high water mark of any waterbody and will be kept in an area where spillage can be contained, and in a manner inaccessible to all wildlife; and
- An emergency spill kit will be kept at the work site in case of fluid leaks or spills from machinery.

In addition to those listed above, the following mitigation measures will be used to minimize potential effects on water resources should road construction activities occur in non-winter months:

- Regular inspection of the road to identify areas of ponding, erosion, or sedimentation, will be conducted;
- Where applicable, construction runoff will be captured and managed to minimize suspended solids in the watercourses; and
- Instream construction work will be avoided, or limited, to the minimum extent possible.

During the operational phase, routine periodic inspections of the AWAR will continue to be conducted as discussed previously in this Section. These inspections will include looking to identify areas of ponding, erosion, or sedimentation. If identified any such areas will be addressed using the same mitigation measures described in this section for the construction phase.

7.2 Watercourse Crossings Inspections and Maintenance

The watercourse crossing inspection and maintenance program has three main components:

- A regular inspection program to identify issues relating to watercourse crossings, such as structural integrity and hydraulic function;
- An event inspection program to track the impacts of large storm events on watercourse crossings, such as structural integrity and hydraulic function; and
- A culvert location inspection program to ensure that culverts have been installed in the right location with respect to the watercourse and that culvert capacity is adequate to ensure that the culvert(s) pass the water under all hydraulic conditions. In most cases there will be multiple culverts installed at different elevations at each stream crossing to ensure that these culverts can adequately pass normal summer flows as well as spring freshet and heavy rainfall flows.

7.2.1 Regular Crossing Inspection and Maintenance

Just prior to spring freshet, all culverts and stream crossings (including the bridge crossings at the Char River, lower Meliadine River and at the Bridge at crossing M5) will be inspected to confirm that they are in good state to accommodate the rapid spring thaw that is seen in the north. During the freshet period, crossings inspections will be performed twice a week (mid-May thru June) and weekly during the remainder of the ice-free period prior to fall freeze-up (July through October).

These inspection activities for each watercourse crossing will consist of:

- Visual inspection of its infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required;
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible; and
- Visual inspection of upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will be paid to bridge abutments and abutment foundations as they will be vulnerable to scour and erosion during flood events. Particular attention will also be paid to potential sources of sediment transport at the crossing.

Inspection results will be recorded by AEM to help track changes in conditions over time. Maintenance operations will consist of undertaking remediation of any detected problems and repairing damage as soon as possible.

AEM acknowledges that the GN Territorial Archaeologist has concerns that potential ice buildup at the site of the lower Meliadine River crossing bridge could cause water to back up and flood

important archaeological sites upstream from the bridge in the Iqalugaarjuup Nunanga Territorial Park. AEM has committed to work with the GN to inspect and mitigate where possible such risks. To this effect AEM has committed to provide copies of its twice weekly inspections at the lower Meliadine River Bridge to the GN Territorial Archaeologist in the spring/early summer freshet period via email or FAX. The intention is to ensure that both AEM and the GN Territorial archaeologist monitor for this potential risk for the purpose of taking appropriate action in a timely manner should ice buildup reach the point where these sites are at risk of flooding. The intent is for action to be taken prior to harm being done. The action plan would be developed and implemented by AEM with consultation with the GN.

AEM has agreed to work with the GN to develop other protective measures to protect important archaeological sites upstream of the Meliadine River Bridge within the Iqalugaarjuup Nunanga Territorial Park if it is shown that these sites continue to be damaged by flooding caused by the bridge.

7.2.2 Event Crossing Inspection and Maintenance

Inspection frequency will increase just after heavy or prolonged rainfall storm events. Visual inspection of each watercourse crossing will be completed to identify potential risks to the crossing's structural integrity, debris accumulation and whether erosion and scour have occurred. Water accumulation along the road will also be monitored. Results will be recorded by AEM to help track changes in condition over time. The remediation of any detected problem and any necessary damage repairs will be undertaken as soon as possible, under the direction of AEM's road supervisor.

7.2.3 Culvert Location Inspection

Following their installation, the culvert crossings will be visually inspected to confirm they have been properly executed and installed. These culverts will initially be installed during winter conditions and thus it is possible that a culvert will not be sited correctly to pass all ponding of water through the road. The intent is to check for such conditions during the first snow melt and after rain events so that adjustments can be made accordingly. Additional culverts will be installed, if necessary, should the inspection indicate that the culverts were installed in a location that does not optimally route water flows.

7.3 Snow Removal and Snow Management – Winter Maintenance

Sections of the Meliadine roads are expected to experience snow drifts because of strong winds over the winter period. As much as possible, this snow will be cleared to the downwind side of the road to limit the wind re-depositing the same snow on the cleared road. Routine spring snow management will include the removal of any snow that accumulates at bridges and culverts so that water at freshet can move freely through the culverts and under bridges. In the case of culverts, snow will be removed from both ends but not from the inside.

Where ski-doo trails cross the road, snow clearing will be mindful of not placing snow on the trails thereby making crossing the roads easy. Snowmobile crossings will be identified by the HTO with signs identifying the trail placed along the road and a stop sign on the ski-doo track at the edge of the road.

The report, "Preliminary Snow Drift Assessment of the Meliadine All Weather Road from Rankin Inlet to the Meliadine Site, Nunavut" (Golder Associates 2011c) provides an assessment where snow drifts can be expected. It states:

> *"Observations seem to indicate that snow drifts can be expected on the lee of short, steep slopes and along lake shores."* and
>
> *"Maintenance will be required during operations to manage snow accumulation along the road alignment; however, most of the alignment appears to be located along the windward slopes and ridge crests where there should be a limited tendency for snow to build up."*

The design of the AWAR between the Meliadine site and Rankin Inlet factored in snow accumulation and this is one of the reasons the road is located along the height of land as much as possible and in a northerly alignment.

At Meadowbank, the AWAR is periodically closed under bad icing conditions until the road can be graded and/or sanded. AEM does have road sanding equipment at its Meadowbank operation to address icing road conditions. Similar procedures will be used on the Meliadine AWAR.

7.4 Dust Suppression

The amount of dust generated along a road is dependent on the dryness of the road surface, the number of vehicles, weight and speed, and maintenance of the driving surface. Regular grading of the roads combined with the addition of granular material to the driving surface will be needed. This will improve road safety and also reduce the amount of dust. Dust will also be mitigated by maintaining posted speed limits.

In areas or times identified by the AEM road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition could impact fish habitat and/or water quality, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, placement of new coarser topping, and/or watering of the road surface. Use of chemical dust suppressants will be only used as a last resort and only in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment (GN 2002).

Dust control measures along the AWAR and at all haul roads and yards at the mine site have been identified by the community of Rankin Inlet as an important health concern. Following the technical review and community roundtable sessions held by the NIRB on the Draft EIS, NIRB directed AEM to

prepare a separate Dust Management Plan for inclusion with the Final EIS. This Dust Management Plan has been prepared and is included as Appendix C to this Roads Management Plan. It addresses the actions that AEM will take to manage dust generated by road traffic during the non-winter months when dust becomes an issue.

SECTION 8 • ROAD SAFETY

AEM security personnel along with AEM's road supervisor will monitor activity on all roads through radio contact with both staff at the gatehouse and drivers on the roads, and through periodic patrols of the roads. All AEM vehicles that routinely travel on the roads will be equipped with a radio set to the requisite road frequency. Similarly contractor's vehicles that routinely travel on the roads will be equipped with a radio set to the requisite road frequency. Consequently, AEM traffic on the roads will always have radio contact with the gatehouse, security, and other AEM and AEM contractor traffic. This system will be used to report any unusual conditions along the roads such as: location of other AEM vehicles; presence of wildlife on the roadway; presence of non-AEM traffic such as ATVs, snowmobiles or other vehicles; non-AEM vehicles broken down on the roads; any unsafe practices noticed; any special road conditions; any special weather conditions; etc.

AEM will work to develop partnerships with the residents of Rankin Inlet, community organizations, and government departments in educating the non-Project related users on road safety, shaping good driving practices, and influencing people's behaviour on the roads. Emphasis will be directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc.

These are the same safety rules that will apply to all users of the roads, including AEM employees, AEM contractor employees, and public users of the roads:

- Maximum speed limits:
    - On access roads: 50 km/h;
    - On the bypass road: from 30 to 50 km/h dependant in location;
- Use of seat belts by all drivers and passengers is mandatory;
- Driving under the influence of alcohol or intoxicating drugs is prohibited;
- Wildlife has right-of-way on the roads, and no harassment of wildlife is allowed;
- All hunting activity must avoid shooting across the road and should respect a safe shooting distance from the road (suggested at 1 km);
- Hunting is not allowed within 1 km of mining areas and the Meliadine site;
- Vehicles are not to park on the travelling surface of the roads but pull off the road at a safe location such as passing turnouts to prevent accidents (passing turnouts are spaced approximately every 400 ± 50 metres along AWAR length); and
- No public traffic is allowed within mining areas; these are industrial work sites and, thus, non-Project related vehicles will be stopped at the gates. Signs will be posted warning of an upcoming gate[7].

[7] Gates will be installed on the AWAR near the Meliadine mine site and the Discovery mining area.

AEM will hold public information sessions in Rankin Inlet for users of the roads prior to the roads opening and on a regular basis thereafter (minimum of twice per year). A copy of the road safety rules will presented at these sessions.

AEM will also hold public information sessions in Chesterfield Inlet for users of the roads prior to the road opening and on a regular basis thereafter (minimum of once per year). A copy of the road safety rules will presented at these sessions. This is required because Chesterfield Inlet have now built approximately 17 km of trail/road south from their community toward Rankin Inlet and now occasionally drive their ATVs/snowmobiles to Rankin Inlet.

AEM will also use other communication tools to get the road access procedures and road safety rules out to the public in Rankin Inlet. These will include community radio, community TV, and postings around town, through the Meliadine Project office in Rankin Inlet, and via an AEM project website. The communication will be in both English and Inuktitut.

AEM will place an emergency refuge station approximately half way between Rankin Inlet and the Meliadine site. The refuge will have the necessary safety supplies to allow stranded travelers to wait out an event such as a prolonged blizzard.

8.1 Road Signage

AEM will post appropriate road signs along the roads in both English and Inuktitut. Typically, signs will advise drivers of the posted speed limit, of approaching bridges, of approaching curves, and/or areas of lower visibility (blind hills or obstructed curves).

English and Inuktitut signs will be posted at the southern and northern ends of the Rankin – Meliadine road, at an appropriate mid-point, and past the boat launch on the Discovery road to advise any public travelling by ski-doo or ATV along the road that they are entering an area that may be potentially hazardous due to the presence of heavy truck traffic on the roads. This recognizes that snowmobiles and ATVs can enter and leave the road from any point along the roads. Signs will also be posted to advise the public that they are approaching the gate at the northern end of the Rankin – Meliadine road and the gate on the Discovery road where public access is not allowed. This will be just before entering the Meliadine and Discovery sites; these are areas of heavy industrial activity that are potentially hazardous due to heavy traffic and large mining equipment.

Speed limit signs will be posted at intervals of approximately every 5 km along the roads. Reflective flags will be installed along one side of the roads to help drivers identify the road shoulder during blizzard, white out conditions or dense fog. Typically, these flags will be black in colour to help them stand out in white-out conditions, and are nominally set at intervals of 100 to 200 m apart. Kilometre markers will be posted at intervals of at least 1 km along the roads.

A list of road signage is presented in Table 8-1.

Table 8-1 Road Signage

Element	Location
Safety precautions and users advice	At the southern and northern ends of the road, and at an appropriate mid-point along the road
Stop signs	Where required at roads junctions
Give way	At haul and access roads junctions and at junction between the AWAR and Discovery access road – priority to haul and AWAR traffic
Blind hill	200 m ahead of the beginning of a blind hill
Speed limit	Nominally at 5 km intervals
Curve	200 m ahead of a curve
Bridge announcement	200 m ahead of a bridge
Bridge side sign	On each side of the bridge
Flexible delineators (flags)	Nominally at 100 to 200 m intervals
Kilometres markers	Nominally at 1 km intervals

8.2 Policing of Road Safety Rules

As privately operated roads, responsibility for "policing" will not fall under the RCMP. Responsibility for all operating and maintenance activity on roads will rest solely with AEM. For the access roads, AEM will concentrate on raising public awareness and commitment to road safety, and improving communication, cooperation and collaboration among all stakeholders on the safe use of the roads. For all roads, all AEM employees and its contractors who will use the roads will be required to take road safety training before being allowed to venture on the roads.

AEM will use its road supervisor and site security to monitor what is occurring on the roads. They will monitor activity on the roads through radio contact with the staff at the gatehouse, through periodic patrols of the roads, and in conversation with drivers on the roads at the time. AEM will monitor speed limit infractions by direct observation of drivers seen to be driving too fast. AEM will also rely on radio contact with all AEM and AEM contractor vehicles on the roads to monitor unsafe conditions or activity. AEM does not have any special policing powers. AEM staff cannot issue tickets or use other methods to address unsafe operation. AEM can record unsafe practices, warn the person causing the infraction, and in severe or repeated cases of violation, remove all privileges for future access to the roads by an offending driver.

Regulatory inspectors can inspect the roads and any associated infrastructure at will. AEM will abide with the recommendations and directives provided by the inspectors.

However, it is worth noting that the *Criminal Code* of Canada applies to private roads. For example, if an accident were to occur on a road and alcohol was involved, that person could be charged by the RCMP. Under their current mandate, while the RCMP is not responsible for policing of the AWAR as it is a privately operated road, the RCMP will have the right to access the AWAR at any time to investigate any accident or incident where they believe there is a need.

SECTION 9 • ACCIDENTS, SPILLS, MALFUNCTIONS AND EMERGENCY RESPONSE

Emergency response is reactive whereas prevention lowers the frequency of emergency response. AEM's emphasis will be on the latter, while at the same time keeping resources close at hand to respond to emergencies on the roads in a timely manner.

Three possible causes of road emergencies are the road, vehicle, and people. It is the interplay of these three elements that lead to either safe use of the roads or emergency response. AEM is fully responsible for the design, construction, and maintenance of the roads for project related use, and public use of the access roads. This will include regular inspection and maintenance of transportation infrastructure, including access roads, service roads, haul roads, road crossings, water crossings, signage, the refuge station located half way between the Meliadine site and Rankin Inlet on the AWAR, and the boat launch at Meliadine Lake.

AEM will ensure its vehicles are in good working order before they venture out on the roads. As well, AEM will train its employees on road safety and emergency response (first aid, firefighting, spill response, etc.). By educating and protecting its workers, they will lead by example in road safety. However, AEM can only influence the non-Project users in their choice of vehicle and behaviour on the access roads through education.

AEM will work to develop partnerships with the public, community organizations, and government departments in educating the public on road safety, shaping good driving practices and influencing people's behaviour on the roads. Emphasis will be directed to the use of helmets, seat belts, observing the posted speed limits, improving one's visibility by wearing reflective clothing when on a snowmobile or ATV, not drinking and driving, dealing with driver inexperience, etc. This will also include encouraging all drivers to abide with a driver code of conduct to control speeds and advance considerate driving.

AEM, however, will have little influence on the condition of the non-AEM owned vehicles that will use the access roads. Vehicles could suffer from poor maintenance, and individuals could also make poor choices such as using an ATV in winter when a snowmobile would be more appropriate. Nonetheless, AEM will provide emergency assistance where the health or safety of people is at risk when travelling on the access roads or on the land near Project facilities.

An AEM trained site-based emergency response and spill clean-up team[8] will be available on site with appropriate equipment to respond to all spills and road accidents. The Emergency Response Team will be trained in emergency response (firefighting, first aid, mine rescue, spill response, vehicle accidents, etc.). In addition, emergency response equipment is to be carried in all AEM

[8] For more details on emergency and spill response, please refer to the Risk Management and Emergency Response Plan (SD 2-15) and Spill Contingency Plan (SD 2-16), respectively.

vehicles using the roads to improve response in the event of an incident or accident. This equipment includes survival gear, emergency first aid equipment, and initial spill response equipment. Spill response will be implemented by environmental staff who will advise, document, and report on initial response and clean-up actions. The Spill Contingency Plan (SD 2-16) will be activated in responding to a spill.

In urgent circumstances, where appropriate, AEM will request assistance from other parties in Rankin Inlet. However, based on AEM's experience with the Meadowbank access, service and haul roads, AEM does not believe that its Meliadine roads will result in any increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Rankin Inlet.

9.1 Accidents and Malfunctions

AEM understands that accidents can occur, but the prevention and proposed mitigation measures along the roads, emergency response planning, training, and preparation will substantially reduce the risk, frequency, and severity of such incidents. Such unfortunate events can occur no matter how much effort is devoted to preventing them. However, mitigation measures and response plans will be in place that will be applied to reduce the frequency and severity of such events. AEM emergency response personnel are tasked with responding to any vehicle accident resulting in personal injury or spillage of harmful material. AEM will initiate extraction and transport to medical assistance at the mine's health centre or Rankin Inlet's medical center. AEM staff will follow the procedures in place in SD 2-15 Risk Management and Emergency Response Plan. The types of accidents and malfunctions that may occur are as follows:

- Vehicle collisions that may result in personal injury and spillage of potential harmful materials such as fuel, lubricating fluids, antifreeze, etc.;
- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury and spillage of potentially harmful materials, etc.;
- Single vehicle accidents that may result in personal injury and spillage of potentially harmful materials;
- Risk of people getting stuck on the roads in bad weather such as in blizzard, white out or dense fog conditions, or due to mechanical breakdown;
- Risk of accident due to an intoxicated or impaired driver on the roads; and
- Spills of harmful materials onto the land or into water through a vehicle rollover or tipping during bad weather.

AEM will report all reportable scale incidents to the appropriate Government authority (e.g., Mines Inspector, RCMP, Nunavut Water Board (NWB), NU Spill Line, Environment Canada, GN Department of Environment, Fisheries and Oceans Canada (DFO), KIA and Hamlet of Rankin Inlet).

The following actions are to be taken in the event of an accident on the roads involving other vehicles (including ATVs), or in the event of an accident involving contact with wildlife such as caribou, muskox, bear, wolf, etc.:

- Check the condition of people involved in the accident and provide immediate first aid if appropriate;
- Call the Meliadine road dispatch by radio and report the location and nature of the accident and indicate the type of assistance required (medical help, environmental cleanup, fire and/or mechanical help);
- Secure the accident site so that the vehicles do not continue to present a hazard to others. This may involve moving the vehicles to the nearest pull off in the event of a minor accident, or blocking off the road in both directions in the event of a more serious accident; and
- If safe to do so, secure the site to prevent continued spill or leakage of contaminants into the surrounding environment.

Upon receiving the accident call, the road dispatch will initiate the emergency response procedure passing along the information to the emergency response coordinator. The emergency response coordinator will then call out the required emergency response personnel to assist at the accident site.

Once the accident site is secured and all people requiring assistance have been removed to medical care, the emergency coordinator will turn the scene over to the mine's safety personnel so that an appropriate accident investigation can be initiated.

In the event of an incident involving contact with wildlife, the road dispatch will notify the site security personnel and the environmental representatives. Security and the site environmental team will then initiate an appropriate accident investigation. The Environmental Department will ensure that appropriate reporting of such incidents is made on a timely basis to the KIA, the Rankin Inlet HTO, and the GN Conservation Officer in Rankin Inlet.

In the event of a serious accident, the RCMP will be contacted and advised of the incident. The RCMP will then decide on whether they will become involved or take the lead on any subsequent accident investigation.

SECTION 10 • WILDLIFE MANAGEMENT

Wildlife is expected occasionally to be observed on or immediately along the side of the access, service and haul roads. Caribou and other wildlife will have the right-of-way at all times. In case of problems (e.g. aggregations of caribou), the environmental personnel on-site will be in charge of managing the situation and, with the collaboration of the security department, will advise road users by patrolling the roads. The project personnel will be notified by dispatch radio if any wildlife is observed on the roads.

The following protocol will be implemented on the roads for the protection of wildlife:

- Vehicular traffic speeds on the access, service and haul roads will be limited to 50 km/h;
- Where small to moderate aggregations of caribou (i.e., 1-50 animals) are observed within 100 m of a road, travel speeds will be reduced to 30 km/h;
- Where large aggregations of caribou (i.e., 50 or more) are observed within 100 m of a road, at the discretion of the road supervisor, vehicle movements may be suspended, this includes closing the southern gate on the AWAR, until animals have moved away;
- Caribou and all wildlife will be given right-of-way on the road: vehicles must stop until the animal is off the road;
- Locations of large aggregations of animals must be reported to the road supervisor who will inform all potentially affected employees and the environmental representative. The environmental representative will inform the KIA, the hamlet, HTO, and the GN Conservation Officer in Rankin Inlet;
- All incidents between vehicles and wildlife must be reported to the AEM road supervisor and the environmental representative whether they are:
    - Near-miss;
    - Collision with injury to the wildlife; or
    - Accidental death;
- Each incident will be investigated by the road supervisor and the Environment Department, and measures taken to avoid re-occurrence put in place. Disciplinary measures will be taken against any employee if the investigation concludes that the accident is the result of negligence; and
- In the case of accidental death of an animal, the AEM Meliadine Project Environmental Coordinator(s) will contact the GN Conservation Officer in Rankin Inlet. The carcass will be removed from the road and incinerated to avoid attracting scavengers such as Arctic foxes, wolves, grizzly bears, and/or wolverines.

10.1 Wildlife Monitoring Program

Once roads are operational, AEM will implement a monitoring program to record on a systematic basis the prevalence of wildlife seen along the roads. The program will be developed with the input

of the local HTO and the KIA. The program will focus on caribou, muskoxen, bears, wolves, migratory birds, and raptors.

The program as envisioned will consist of a periodic ground survey of wildlife observed along the roads. At the current time, AEM thinks that the minimum frequency would be weekly. The survey would log type of wildlife observed, estimate of numbers and nearest kilometre marking along the roads. The data would be aggregated and presented in an annual report. Complete details on wildlife monitoring can be found in the SD 6-4 Terrestrial Environment Management and Monitoring Plan.

SECTION 11 • RECLAMATION

Reclamation of the access, service and haul roads will follow the completion of all mining. Progressive reclamation will, in some instances, lead to roads being reclaimed after they are no longer needed. As described in the Mine Closure and Reclamation Plan (SD 2-17), the access roads should be the last mining component to be reclaimed.

In most circumstances, the All-weather Access Road will continue to be open to public access during any temporary closure of the Meliadine Mine. The status of the road during such periods would be assessed by AEM on a case by case basis. For short duration temporary shutdowns the access road would continue to be operated and maintained in the same manner as proposed during the operational phase. While each case would be assessed on its own merits, shutdowns of less than 6 months duration (short duration) would not change the way the access road is operated or maintained. For temporary shutdowns of greater than six months in duration, and/or for indefinite shutdowns, AEM would have to change the way it operates and maintains the road. In such an instance AEM would have to look at what level of activity was to continue at the site during the shutdown period and adjust its care and maintenance of the access road accordingly. For example here are two possible scenarios:

Case 1: An Indefinite Shutdown of the Mine due to a low Gold Price

Under this case the duration of the event is unknown and beyond the control of AEM. AEM would likely wind down all mining and milling operations in an orderly fashion and put the facilities into a care and maintenance basis with a minimal site presence to protect the integrity of the facilities at the site. In this event AEM would likely suspend winter snow clearing along the AWAR and would significantly reduce summer maintenance. Winter use of the AWAR by public would stop; summer access would still be open but likely limited to ATVs as the road is no longer being maintained to its normal standard.

Case 2: A 1 Year Shutdown of the Mine due to a loss of say the Mill

Under this case the duration of the event is known and is within the control of AEM. AEM would reduce activity at the site while the mill was rebuilt and/or repaired. In this case there would be a continued presence on site and thus regular road access would still be required. In this event AEM would likely keep the road maintained in the same manner as during normal operations with maybe some extended shut downs during the worst winter conditions. In this event continued public access to the road would continue as normal except for periods when the road is closed due to severe winter conditions.

There are a number of scenarios that could fall between those presented above and each would be considered on a case by case basis. In general, if during the shutdown period there is ongoing activity planned at the site, the AWAR would for the most part remain open to public access.

However, if during the shutdown period there is no ongoing activity planned at the site, the road would not be maintained limiting public access to snowmobiles or tracked vehicles during winter and to ATVs during summer months.

The question as to how public use of the AWAR will be monitored and how road use rules and procedures will continue to be enforced during any temporary or indefinite closure of the mine has been raised as a valid concern.

- For short duration/temporary closures (those less than 6 months in duration) the AWAR would continue to be monitored, maintained and operated (enforcement of rules and procedures) in the same manner as those laid out in Sections 6 thru 10 of this Roads Management Plan for normal operations;
- For longer duration/temporary shutdowns (greater than 6 months) where AEM would continue to have ongoing activity at the site then the AWAR would continue to be monitored, maintained and operated (enforcement of rules and procedures) in the same manner as those laid out in Sections 6 thru 10 of this Roads Management Plan for normal operations;
- For longer duration temporary shutdowns or for Indefinite Shutdowns where further site activity is being curtailed then AWAR monitoring, maintenance and enforcement activities would be significantly reduced. In such circumstances a physical barrier would be established on the AWAR before the Meliadine River Bridge that prevents open public access by cars, trucks or other motorized vehicles larger than an ATV. This would likely be a rockfill barrier with appropriate signage. During winter months the road would not be kept open thus curtailing travel other than by snowmobile or tracked snow vehicle. In summer months AEM would continue to carry out environmental monitoring both along the AWAR and at the mine site but at a reduced frequency (possibly once or twice a month) in accordance with its license/permit requirements. During these inspections AEM personnel would continue to monitor for inappropriate use of the AWAR and for conditions along the AWAR that could result in risk to public safety or to the environment (e.g. wash outs, erosion, plugged culverts, etc.). This would include monitoring and addressing any unauthorized trails/access into the designated preservation zone of the Iqalugaarjuup Nunanga Territorial Park as discussed in Section 6.5 of this Plan.

As outlined in the Preliminary Mine Closure and Reclamation Plan, SD 2-17, the AWAR will remain available for use during final closure as access to the mining areas is required until closure and reclamation activities have been completed. The road surface will at this point be scarified to promote re-vegetation, water crossings removed, and natural drainages re-established.

AEM would like to emphasis that it has the responsibility of decommissioning and reclaiming all roads once its pre-development, construction, operating, and 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 land owners (the KIA and the hamlet) and then complete its own environmental assessment and permitting process covering future use. AEM does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. AEM must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the land owners and other regulatory agencies who issued permits/authorizations for the roads.

Decommissioning of the roads will be accomplished by loosening compacted surfaces, flattening side slopes, and removing all culverts, bridges (not including the Char River bridge as this would become the property of the Hamlet of Rankin Inlet), and other potential obstructions to drainages paths. The objective will be to make the road surface impassable by vehicular traffic by ripping the entire road bed and removing all bridges and culverts along the route.

The loosening of compacted surfaces will be accomplished by ripping of the road bed utilizing 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 (Figure 11-1). 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.

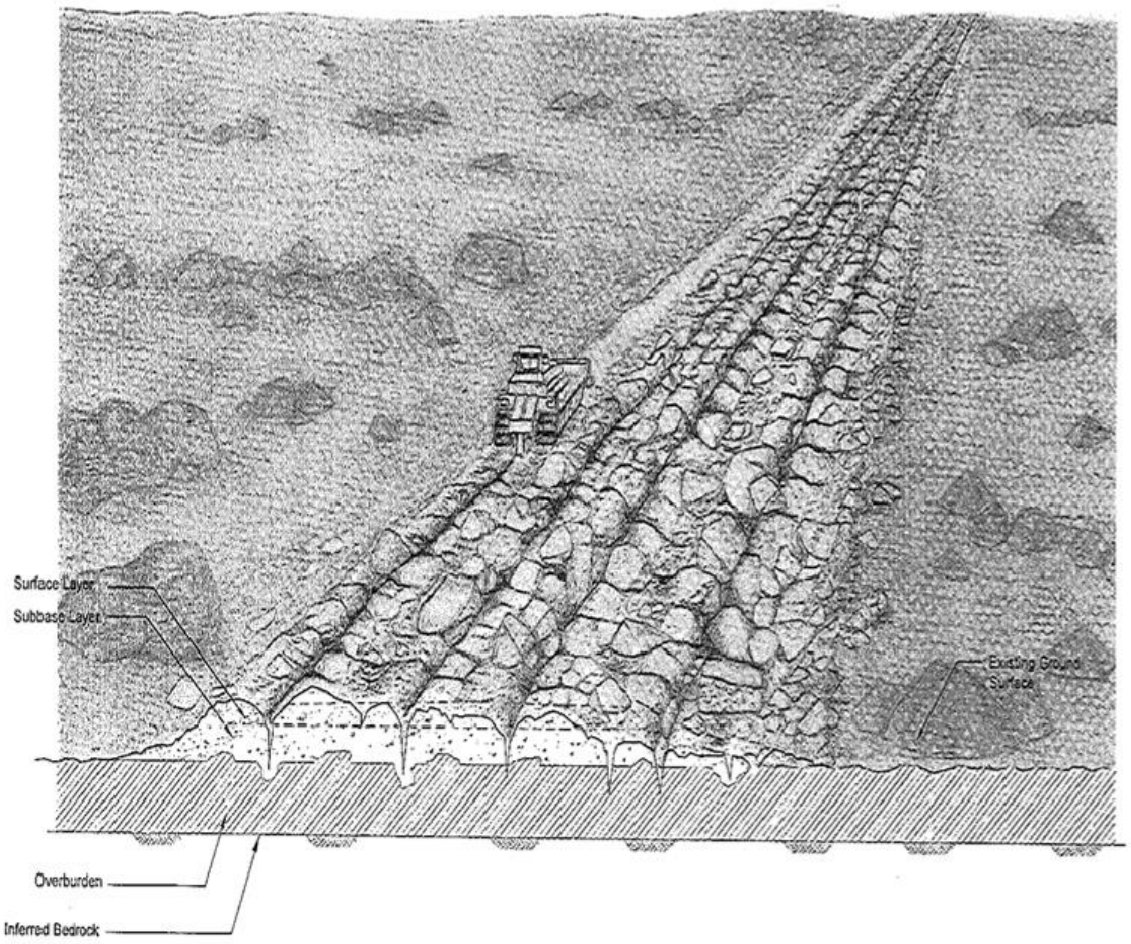

Figure 11-1 Schematic Showing the Ripping of the Road upon Closure

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 located adjacent to the roadway. As much as practical, deactivated surfaces will be graded to blend with the existing topography.

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 (16 July through 30 April). 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.

Decommissioning of the roads will start from the proposed Meliadine Gold Project end of the road and progress south towards Rankin Inlet stopping at km 15 to allow reclamation of the Discovery roads. Following this, reclamation of Meliadine – Rankin road will continue. The bypass road will also be reclaimed. Stream crossings will be rehabilitated as they are encountered during the progression of the work. The culverts and bridges will be removed from the crossings using a backhoe and crane, and the 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. To facilitate re-vegetation of the roadways, site preparation will be followed by seeding with native plant species (if they can be commercially located) as approved by the Government of Nunavut Department of Environment.

11.1 Reclamation of Quarries and Borrow Pits Sites

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. Water quality monitoring and testing will be undertaken periodically during the construction and operational period of the roads to measure the quality of water draining from the open quarry/borrow sites and from the road base materials.

The quarries and borrow pits will have gently sloping walls and be designed for positive drainage wherever possible. With prudent initial design, the quarries should require little reclamation following completion of the access roads. Loose rock will be pulled to the floor of the quarry and the entrance blocked with large boulders.

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, following which the surface will be re-vegetated.

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APPENDIX A • AEM CONSULTATION ON THE ALL-WEATHER ACCESS ROAD

A chronological record is provided of the consultation undertaken on the routing of the AWAR between Rankin Inlet and the Meliadine site.

Date	Place	Parties Present and Subject(s) of Meeting
21/10/2004	Rankin Inlet	Presentation on Project status to KIA Board of Directors with a request for a proposal of motion to support a future road from Rankin Inlet to the site.
26/03/2007	Chesterfield Inlet	Presentation to the KIA Board of Directors on the proposed underground program and 2007 Meliadine West exploration plans. Verbal Motion of Support from the Board.
27/03/2007	Rankin Inlet	Presentation of the proposed 2007 Meliadine West exploration program to the Rankin Inlet CLARC.
28/03/2007	Rankin Inlet	Presentation of the proposed 2007 Meliadine West exploration program to the Kivalliq Chamber of Commerce.
28/03/2007	Rankin Inlet	Town hall meeting - presentation of the proposed 2007 Meliadine West exploration program.
04/07/2007	Rankin Inlet	Briefing on Project status to Hamlet Council with specific discussions on road alignment and overwinter fuel storage in barge.
6-8/05/2009	Rankin Inlet	Multidisciplinary Advisory Group (MDAG), chaired by Bernie MacIssac, INAC: all regulatory groups in attendance. Presented the Project and All-weather Road to regulators. Met regulators who will work on Project, including Jackson Lindell and Stephen Hartman, KIA, and Keith Morrison and Jorgan Aitaok, NTI.
4/07/2007	Rankin Inlet	Elders Luncheon at Nunavut Arctic College. Project overview and immediate project plans for underground exploration was presented by Mark Balog with a slide show. Issues that were raised: - employment opportunities for young people, - all-season road location and utility for other projects, - soapstone from Newfoundland. Attendees: Hamlet Elders including Mr/Mrs Tatty, Mr/Mrs. Itinuar, Mr/Mrs Kabvitok, Mrs. Pissuk, others: Comaplex Minerals: Mark Balog, Ben Hubert. Arranged by John Hickes.
17/06/2009	Rankin Inlet	Meeting with Manager CED (Robert Connelly) and Nunavut Transport (Alan Johnson) regarding proposal to access federal infrastructure money for the Meliadine River bridge and Comaplex fund the road. Visit to the bridge site.
18/06/2009	Rankin Inlet	Discussion with Rankin Inlet Mayor John Hickes, the SAO, and several council members. Project update and proposed application for road and bridge funding.

Date	Place	Parties Present and Subject(s) of Meeting
01/06/2010	Chesterfield Inlet	Mark Balog and John Witteman, Comaplex sponsored a town hall meeting providing an update on the Project and the building of an All-weather Road. The road would link to the planned road to Chesterfield Inlet.
02/06/2010	Rankin Inlet	Mark Balog and John Witteman, Comaplex sponsored a town hall meeting providing an update on the Project and the building of an All-weather Road. The meeting was particularly well attended and there were no objections to the routing to the All-weather Road. There were no objections to the proposed road alignment.
01/09/2010	Meliadine site	John Witteman and Jacek Patalas (Golder Associates) met with Gary Cooper and Nicola Johnson of DFO to discuss fisheries habitat and compensation issues relating to the development of the Meliadine Gold Project. Discussions regarding compensation for road crossings were also discussed.
06/01/2011	Cambridge Bay	Eric Lamontange, Denis Gourde and John Witteman met with Ryan Barry, Kelli Gillard and one more staff member, NIRB, to describe the status of the Project and in particular the AWAR. AEM described what had been done in regards to gathering baseline information for the road, regulatory permits required and use of the road (having it open access).
07-09/02/2011	Rankin Inlet	Larry Connell and John Witteman met with the Lands Division of KIA to discuss the road and other matters. A meeting with the HTO was cancelled due to a blizzard.
01/03/2011	Rankin Inlet	John Witteman, Bertho Caron and Selma Eccles of AEM attended a meeting with the HTO, Rankin Inlet. The HTO raised a number of concerns with the route of the road, bridge location over the Meliadine River, wildlife monitoring along the road, plans for the Itivia port area, fish concerns with the bridge. AEM talked to each of the concerns raised and were subsequently informed that the HTO Board was satisfied with the responses received.

APPENDIX B • APPLICABLE ACTS, REGULATIONS, AND GUIDELINES FOR THE ACCESS, SERVICE AND HAUL ROADS

Applicable Acts, Regulations, and Guidelines for the Access, Service and Haul Roads

Act	Regulation	Guideline
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197) *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* (SOR/2011-90)	CCME - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory (threshold for hydrochloric acid 6.8 tonnes) Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Migratory Birds Convention Act (1994 c.22)	*Migratory Birds Regulations* (C.R.C., c. 1035)	
Canada Water Act (1985 c.11)		
Oceans Act (S.C. 1996, c. 31)		
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	*Arctic Waters Pollution Prevention Regulations* (C.R.C., c. 354) *Arctic Shipping Pollution Prevention Regulations* (C.R.C., c. 353)	
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Canada Shipping Act, 2001 (S.C. 2001, c. 26)	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405) *Pollutant Discharge Reporting Regulations*, 1995 (SOR/95-351) *Environmental Response Arrangements Regulations* (SOR/2008-275) *Ballast Water Control and Management Regulations* (SOR/2006-129) *Vessel Pollution and Dangerous Chemicals Regulations* (SOR/2012-69)	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995 Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232) *Navigable Waters Bridges Regulations* (C.R.C., c. 1231)	

Act	Regulation	Guideline
Marine Liability Act (A.C. 2001, c.6)	*Marine Liability Regulations* (SOR/2002-307)	
Fisheries Act (1985, c. F-14) 35. (1) No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. Projects that have the potential to obstruct fish passage, modify flow or result in the entrainment of fish may also cause serious harm to fish. In these situations, an authorization under Subsection 35(2) is required. Proponents are responsible for avoiding and mitigating serious harm to fish that are part of or support commercial, recreational or Aboriginal fisheries. When proponents are unable to completely avoid or mitigate serious harm to fish, their projects will normally require authorization under Subsection 35(2).	*Metal Mining Effluent Regulations* (SOR/2002-2222) *Marine Mammal Regulations* (SOR/93-56)	The Policy for the Management of Fish Habitat Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters Freshwater Intake End-of-Pipe Fish Screen Guideline Standard Operating Procedure – Clear Span Bridges The Fisheries Protection Policy Statement, 2013 Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Transport of Dangerous Goods Act (1992, c. 34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Explosives Act (1985 c.E-17)	*Explosives Regulations* (C.R.C., c. 599) *Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	
National Fire Code of Canada (2010)		
Nuclear Safety and Control Act (s.c. 1997, c.9)	*General Nuclear Safety and Control Regulations* (SOR/2000-202)	
Canadian Human Rights Act (R.S.C., 1985, c. H-6)	Canadian Charter of Rights and Freedom	
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986) *Canada Occupational Health and Safety Regulations* (SOR/86 304)	

Act	Regulation	Guideline
Territorial Lands Act (R.S. *1985, c. T-7)*	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c.10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c.29)		
Territorial - Nunavut		
Environmental Protection Act (RSNWT (nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003) [The removal of hazardous materials will require the registration with the Government of Nunavut, Department of Environment as a waste generator as well as carrier (if applicable) prior to transport.]	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Guidelines on Mercury-Containing Products and Waste Mercury Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Air Quality – Sulphur Dioxide and Suspended Particulates Guideline for the Management of Waste Antifreeze Guideline for the Management of Waste Batteries Guideline for the Management of Waste Paint Guideline for the Management of Waste Solvents Guideline for Industrial Projects on Commissioner's land Environmental Guideline for Ozone Depleting Substances
Scientists Act (RSNWT (Nu) 1988, c S-4)	*Scientists Act Administration Regulations* (NWT Reg (Nu) 174-96)	
Historical Resources Act (RSNWT (Nu) 1988, c. H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	

Act	Regulation	Guideline
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92)	
	Wildlife Licences And Permits Regulations (NWT Reg (Nu) 027-92)	
	Wildlife Management Barren-Ground Caribou Areas Regulations (NWT Reg (Nu) 099-98)	
	Wildlife Management Grizzly Bear Areas Regulations (NWT Reg (Nu) 155-96)	
	Wildlife Management Zones Regulations (RRNWT (Nu) 1990 c W-17)	
	Wildlife Regions Regulations (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Airport Lands Regulations (NWT Reg (Nu) 067-97)*	
	Commissioner's Land Regulations (RRNWT 1990, c C-13)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations (RRNWT (Nu) 1990 c S-1)*	
	Work Site Hazardous Materials Information System Regulations (RSNWT 1988, C 81 (Supp))	
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health And Safety Regulations* (NWT Reg (Nu) 125-95)	
Workers' Compensation Act (RSNWT, 1988, c. W-6)	*Workers' Compensation General Regulations (Nu Reg 017-2010)*	
Apprenticeship, Trade And Occupations Certification Act (RSNWT (Nu) 1988, c A-4)	*Apprenticeship, Trade And Occupations Certification Regulations* (RRNWT (Nu) 1990 c A-8)	
Labour Standards Act (RSNWT (Nu) 1988, c L-1)	*Annual Vacations Regulations* (RRNWT 1990, c.L-1)	
	Educational Work Experience Regulations (RRNWT 1990, c.L-2)	
	Employment of Young Persons Regulations (RRNWT 1990, c.L-3)	
	Labour Standards Meal Regulations (RRNWT 1990, c.L-4)	
	Notice of Termination Exemption	

Act	Regulation	Guideline
	Regulations (RRNWT 1990 c.L-5)	
	Pregnancy and Parental Leave Regulations (RRNWT 1990, c.8(Supp.))	
	Reciprocating Jurisdiction Order (RRNWT 1990, c.L-6)	
	Wages Regulations (RRNWT 1990, c.L-7)	
Electrical Protection Act (RSNWT (Nu) 1988, c E-3)	*Electrical Protection Regulations* (RRNWT 1990 c. E-21)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Petroleum Products Tax Act (RSNWT (Nu) 1988, c P-5)	*Petroleum Products Tax Regulations* (RRNWT (Nu) 1990 c P-3)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Hospital Insurance And Health And Social Services Administration Act (RSNWT 1988, c T-3)	*Territorial Hospital Insurance Services Regulations* (RRNWT (Nu) 1990 c T-12)	
Public Health Act (RSNWT (Nu) 1988, c P-12)	*Camp Sanitation Regulations* (RRNWT (Nu) 1990 c P-12)	
	General Sanitation Regulations (RRNWT (Nu) 1990 c P-16)	
All-Terrain Vehicles Act (RSNWT (Nu) 1988, c A-3)	*All-Terrain Vehicles Regulations* (RRNWT (Nu) 1990 c A-1)	
Motor Vehicles Act (RSNWT (Nu) 1988, c M-16)	*Large Vehicle Control Regulations* (RRNWT (Nu) 1990 c M-30)	
	Motor Vehicle Registration And Licence Plate Regulations (RWT Reg (Nu) 054-94)	
Public Highways Act (RSNWT (Nu) 1988, c P-13)	*Highway Designation And Classification Regulations* (NWT Reg (Nu) 047-92)	
Transportation of Dangerous Goods Act (1990. RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

APPENDIX C • DUST MANAGEMENT PLAN

AGNICO EAGLE

MELIADINE GOLD PROJECT

Dust Management Plan

Appendix C to SD 2-9 Roads Management Plan

APRIL 2014

VERSION 1

Document Control

Version	Date	Section	Page	Revision	Author
1	April 2014			Version 1 of the Dust Management Plan	John Witteman, Env. Consultant, AEM

Executive Summary

Agnico Eagle Mines Limited (AEM) will use best management practices to minimise dust generation from becoming airborne at the main mine site, the Discovery mine area, Itivia, and all access, service and haul roads. This includes identification of major sources of dust, implementation of dust mitigation measures, inspections for unacceptable levels of dust, and recording dust monitoring data to document AEM's success in controlling and reducing dust at the Meliadine Project.

Dust could potentially be generated by such activities as road use, drilling, blasting, crushing, conveying, loading, hauling, unloading, stockpiling, and by wind erosion of dry, exposed mine areas. Dust emissions will be prevalent during late spring and summer, while being much reduced in fall and winter.

Mitigation measures to control dust include mine design and operational procedures. Operational practices, such as speed limits and road maintenance, will assist in reducing dust. Water and, if necessary, chemical dust suppressants, will be used to control and reduce dust on roads and other mine areas when airborne dust becomes a safety hazard or impacts on sensitive natural areas.

Dust suppression measures will be in place during construction, operations and closure.

Table of Contents

1. Introduction C-1
2. Climate C-1
3. Related Documents C-1
3.1 Environment Management and Protection Plan C-1
3.2 Air Quality Monitoring Plan C-2
4. Environmental, Safety and Operational Effects of Dust C-2
4.1 Environmental Concern C-2
4.2 Safety Concern C-2
4.3 Operational Cost Concern C-3
5. Sources of Dust C-3
6. Dust Suppression C-3
6.1 Design-Based Dust Suppression Measures C-4
6.2 Operation-Based Dust Suppression Measures C-4
6.3 Closure-Based Dust Suppression Measures C-5
7. Access, Service and Haul Roads C-5
7.1 Dust Suppression using Water C-7
7.2 Chemical Dust Suppression C-7
7.3 Maintenance of the Road Surface for Dust Suppression C-9
8. Thresholds for Initiating Dust Suppression C-9
8.1 The Role of the Road Supervisor C-11
9. Dust Management Plan Update C-11
10. References C-12

List of Tables

Table 1. Comparison of Dust Suppressants C-8
Table 2. Thresholds and Mitigation Measures C-10

1. INTRODUCTION

The Dust Management Plan develops a framework for the management and control of dust[1] (airborne particulate matter) arising from mine activities. Best management practices are identified to minimize and reduce the impact of dust on the natural and human environment.

The Dust Management Plan identifies the sources of dust along with measures for their control during mine construction, operation and closure.

2. CLIMATE

The Meliadine Project (Project) is located in the low Arctic ecoclimate where winters are long and cold and summers, short and cool. The frost-free period can be as short as 90 days and have prolonged periods with no precipitation. The 30-year climate normals for Rankin Inlet (1971 to 2000) indicate that wind speeds are relatively high, averaging more than 19 km/h every month.

Dust can be a problem at certain times of the year. During the winter, dust does not pose a problem but in the late spring and summer and under the right conditions, dust generation could present an issue at the mine site and along its roads. In late spring when temperatures remain below freezing, sublimation tends to cause mine surfaces, including roads, to be dry leading to a potential for dust generation. In summer, when evaporation is high and with little rain, mine surfaces and roads can again be dry. The combination of low precipitation and drying winds are conducive to generating dust from developed areas where work is underway and vehicles moving, especially if mitigation measures are not employed. High winds by themselves can also erode dust from exposed mine surfaces.

3. RELATED DOCUMENTS

3.1 Environment Management and Protection Plan

The Environmental Management and Protection Plan (EMPP; SD 2-5) provides Agnico Eagle Mines Limited (AEM) with overarching direction to environmental and socio-economic management for the Meliadine Gold Project throughout its life (i.e., across all Project phases). It is a site-specific plan that describes the systematic means by which AEM will consistently manage and control potentially adverse impacts, and enhance potential project benefits identified through the Environmental Assessment process and the subsequent licensing and permitting of the Project.

The EMPP offers enough flexibility to respond to changes, for example, in the mining development plan, the regulatory regime, the biophysical and socio-economic environments, technology, research results, best management practices, and the understanding of the traditional knowledge. Threshold and

[1] Dust includes Total Suspended Particulates (TSP), Particulate Matter 10 microns or less in diameter (PM_{10}), and Particulate Matter 2.5 microns or less in diameter ($PM_{2.5}$).

indicators to trigger management actions are provided in the sub plans embedded in the EMPP, along with a system of accountability.

3.2 Air Quality Monitoring Plan

A proposed Air Quality Monitoring Plan (SD 5-1) is part of the Final Environmental Impact Statement (Golder Associates 2013). Dust monitoring is expected throughout all phases of the mine, at various locations on the mine site, along the All-weather Access Road (AWAR), and at the Itivia laydown area. The principle monitoring means is anticipated to be particulate fallout measurements.

The Air Quality Monitoring Plan outlines how dust monitoring data will help in verifying if the actual effects from air emissions are less than those predicted in the Environmental Impact Statement. The data collected will provide feedback for continuous improvement in dust mitigation measures. If dust monitored indicates more dust than expected, adaptive management will be used to find the reason for the elevated levels and recommend mitigation measures to reduce it.

4. ENVIRONMENTAL, SAFETY AND OPERATIONAL EFFECTS OF DUST

The Project is anticipated to generate dust representative of local overburden and rock type. There should not be enrichment of any metal in the dust. AEM will use all reasonable and practicable measures to minimise dust generated from the Project area.

4.1 Environmental Concern

Physical and chemical stresses on the tundra environment are commonly associated with unpaved roads. Dust generated by vehicle traffic along the roads is carried by the prevailing wind onto the surrounding tundra where it is deposited onto the vegetation and water bodies.

Chemically inert dust can have negative effects on sensitive receptors such as vegetation. It can accumulate on leaf surfaces and negatively affect leaf physiology. Dust has a shading effect, which reduces the amount of photosynthesis and increases the leaf temperature through incident solar radiation being absorbed by the dust, thus increasing the transpiration rate. Adverse impacts might occur on the wildlife that depend upon the vegetation as a food source. Dust carried off the roads can eventually wash into the local water bodies adding suspended solids to the water, which can adversely affect water quality and possibly the health of aquatic species.

4.2 Safety Concern

Dust generated by vehicle traffic along roads and other mine surfaces is typically fine inorganic particulate matter. It reduces visibility along roads, thereby increasing the risk of vehicle accidents. Inhalation of fine particulate matter can potentially cause adverse health effects, especially in persons with prior respiratory problems.

4.3 Operational Cost Concern

Excessive dust when drawn into a vehicle's engine can result in rapid clogging of vehicle air filters, diminishing engine performance and increasing maintenance costs. While the engines are equipped with air filters, the finer sized particulate matter can past through these filters, getting into the engine where it can cause premature scouring and wear on the pistons and other moving components, thereby leading to a need for more frequent maintenance and shortening the life of the engine.

5. SOURCES OF DUST

The greatest source of dust at mine sites is vehicle traffic on unpaved roads (Thompson 2001). Dust emissions will vary by the time of week, as well as the time of year. Dust will be more prevalent during the late spring and summer than during winter. Dust emissions are anticipated to be greatest during the operation of the Phase 2 All-weather Access Road (AWAR), when traffic along the road will be at its peak (e.g., on days when additional traffic is required due to barge unloading and transport to the mine site).

The most significant sources of dust during construction, operations and closure include the following:

- Preparation of ground surface for construction through stripping, excavating, covering, and/or stockpiling;
- Wind erosion of exposed mine surfaces – e.g., roads, ore stockpiles, waste rock storage facilities, and exposed tailings beaches in the tailings storage facility;
- Vehicle traffic on unpaved roads and other mine surfaces – haul, service and access roads, pit ramps, other vehicle travel areas (e.g. waste rock storage facilities, storage pads, laydown pads, parking lots);
- Material handling and transfer – loading, hauling, unloading, crushing, conveying;
- Open pit mining activities – drilling, blasting; and
- Closure activities such as covering the tailings, decommissioning of other mine areas, and scarification of roads.

Dust from buildings where people are working such as the mill, maintenance shop and warehouse is expected to be minimal due to the use of bag houses or equivalent means to control dust within these facilities.

6. DUST SUPPRESSION

Dust suppression measures, which are considered to be typical of current mine practices and consistent with best management practices, are expected to achieve desired results through design, operations, and closure.

6.1 Design-Based Dust Suppression Measures

In assessing dust emissions associated with the Project, consideration was given to those mitigation measures that were considered integral in the mine design. Design-based means of dust suppression include:

- The mine site will be compact thereby reducing the area where dust generation can occur;
- Thickened tailings were selected as the preferred form of tailings. These will be pumped through a pipeline to the Tailings Storage Facility for a sub-aerial discharge where they will be maintained in a wet state. Tailings will most often be submerged, moist, or frozen, and as a result are not expected to generate significant dust. Also, tailings will be deposited below the crest of the containment dikes where they will be partially shielded, and where it will be difficult for wind to distribute any tailings dust beyond the containment dikes. Any exposed tailings beaches not protected by the dikes will be exposed to wind erosion;
- Roads were designed as narrow and short as possible while maintaining safe construction and operation practices. This reduces the surface area of roads and the potential to generate dust;
- To minimize dust during construction and operations, coarse sized rock will be used as much as possible in building roads, pads, and laydown areas;
- If possible, road construction will largely occur during the winter when the generation of dust is at its lowest;
- Sheds, enclosures, covers and/or bag houses will be used on most crushing and processing equipment to limit dust emissions; and
- Most outside conveyer belts will have dust covers.

6.2 Operation-Based Dust Suppression Measures

Best management practices will be used to control and suppress dust emissions from the Meliadine Project. Dust suppression practices to be implemented during operations include:

- Overburden stripped in opening the open pits is anticipated to be prone to wind erosion, and will be covered with waste rock in the waste rock storage facilities;
- Roads will be regularly graded to mix excessive silt found on the road surface with the coarser materials located deeper in the roadbed. This will reduce the percentage of silt in the road surface with the benefit of reducing related dust;
- As needed, roads and travel areas will be topped with aggregate and stabilized, which will minimize erosion and dust emissions;
- Where appropriate, larger sized aggregate will be used on the road surface to replace material lost due to wind and water erosion;
- Water and/or approved chemical dust suppressants will be applied as needed to reduce airborne dust and improve visibility on access, service, haul roads, pit ramps and other travel areas. This will remove a safety hazard;

- Dust aprons will be used on open pit production drills where practical during all open pit drilling to control dust emissions;
- Should further rock crushing occur in the quarries along the access roads, the crushers location will be best shielded from the prevailing wind, preferably behind a high wall in the quarry so as to reduce the quantity of wind-blown dust, and to have as much dust as possible fall within the bounds of the quarry;
- The maximum speed limit on the AWAR will be 50 km/hr but will be lower where required for safety reasons (e.g., approaches to bridges, intersections, etc.);
- The number of mine vehicles on the AWAR will be kept to a minimum (e.g., vans and buses are to be used to transport employees to and from the Rankin Inlet airport);
- Regularly inspect the road and undertake timely repairs to minimize the silt loading on the road surface;
- Where possible, avoid multiple handling of materials that have the potential to generate dust;
- Conveyor loads will be kept within designated load limits and conveyor dust covers used where practical;
- Stockpiles will be of a suitable height, width and slope to minimise wind effects; and
- Employees and contractors will be encouraged to report excessive dust to their supervisor.

6.3 Closure-Based Dust Suppression Measures

Closure will include the following dust suppression measures:

- The Tailings Storage Facility will be covered with waste rock thereby isolating it from the environment and preventing dust generation;
- Other exposed mine areas subject to wind erosion will also be covered with waste rock;
- Open pits will be flooded;
- All roads will be scarified and bridges and culverts removed thereby making the roads impassable to large vehicles and associated dust generation. Scarification will also allow plants to establish on the former roads and, in doing so, prevent wind and water erosion; and
- During operations, obsolete roads will be closed and scarified.

7. ACCESS, SERVICE AND HAUL ROADS

Mine roads deserve special attention. For the Phase 1 AWAR, AEM committed to apply active controls on the road surfaces to reduce dust. These controls could include actions such as using water or applying chemical dust suppressants. These controls are expected to achieve an average control efficiency of 70 percent. Although literature does not provide a control efficiency for regular maintenance of the road surfaces, the commitment by AEM to maintain the road surface is expected to have benefits with respect to the amount of dust generated (AEM 2011b). These same commitments will extend to the Phase 2 AWAR as well.

The nature of the road surface and the size distribution of the material, in particular the percentage content of silt and fine sand (2 – 75 µm), directly influences the potential to generate dust (Thompson and Visser 2001). The greatest sources of dust on a mine site are the disturbance of granular surfaces, and this normally occurs when materials are handled or when vehicles pass over an unpaved surface[2]. Of the two, by far the largest source of dust is vehicle traffic on unpaved roads; this has been estimated to reach 70 percent in some instances (Cecala 2012). The mechanical grinding of surface materials on the road and their breakdown under the weight of vehicle wheels creates dust, while the air turbulence created by the vehicle causes dust to become airborne. The amount of dust generated along a road is dependent on the dryness of the road surface, the percentage of silt on the road surface, the number of vehicles, weight and vehicle speed, weather conditions[3], and maintenance of the driving surface.

The composition of the road surface should be analysed to determine what dust suppression measures will work best. Different types of road surfaces dictate different approaches to dust control. Kissel (2003) makes the following recommendations based on the particle size distribution of material on the road surface:

- *Gravel with few fines.* In gravel road surfaces with not enough fines, only watering will be effective. Chemical dust suppressants can neither compact the surface (because of the poor size gradation) nor form a new surface, and water soluble suppressants will thus leach.
- *Sand.* In compact sandy soils, bitumens, which are not water-soluble, are the most effective dust suppressant. Water-soluble suppressants such as salts, lignons, and acrylics will leach from the upper road surface. However, in loose, medium, and fine sands, bearing capacity will not be adequate for the bitumen to maintain a new surface.
- *Good size gradation.* In road surfaces with a good surface particle gradation, all chemical suppressant types offer potential for equally effective control.
- *Silt.* In road surfaces with too much silt (greater than about 20% to 25%), no dust suppression program is effective, and the road should be rebuilt. In high-silt locations, chemical suppressants can make the road slippery, and there is an inability to compact the surface or maintain a new road surface because of poor bearing capacity. Further, rutting under wet conditions requires that the road be graded, which destroys chemical dust suppressant effectiveness. If the road cannot be rebuilt, watering is the best option.

Optimally designed and maintained roads offer the best means of controlling dust but it does not remove the potential for dust generation completely. The potential for dust generation decreases

[2] Volume 5 Atmospheric Environment and Impact Assessment, section 1.4 Emissions Estimation provides details on how dust emissions can be calculated for various mine sources.

[3] Humidity, frequency of days with rain, mean daily evaporation rates, and the prevailing wind speed and direction. Wind erosion contributes to road dust emissions, especially when strong winds combined with vehicle traffic moves the dust generated far afield.

significantly when road design and maintenance are combined with the application of water and/or chemical dust suppressants.

7.1 Dust Suppression using Water

Water remains the most readily available means of controlling dust in Nunavut. It is common at mine sites worldwide to apply water through fantail sprayers or spray bars attached to a haul truck or equivalent fitted with a large tank. AEM recognises that water is only a temporary measure, and reapplications could be necessary to achieve the desired dust control efficiency[4]. The control efficiency of water applications is dependent on the amount of water applied, the time between re-applications, penetration depth of the water into the road surface, the traffic volume, prevailing weather conditions, and the state of the road surface (e.g., excessive fines over coarse material). All these variables need to be considered before selecting water to control dust from roads and other mine areas. If water is selected to suppress dust, AEM will use it with a greater frequency near critical areas along the roads.

Watering the roads is only possible during frost-free days. In late spring significant sublimation can be expected when the temperatures remain below freezing, which can lead to dry roads and significant dust potential. If water is applied while the temperature is below freezing, it will turn to ice on the road and pose a safety hazard for travel. Dust suppression using water or chemicals will not be possible at this time of the year.

7.2 Chemical Dust Suppression

Chemical dust suppressants offer advantages over water under the right conditions. They tend to have the benefit of a reduced treatment frequency over water. However, use of chemical suppressants under all conditions does not necessarily lead to improved dust suppression over that of water. Presently, only DL10, calcium chloride and bunker C are approved for use in Nunavut, but other chemical dust suppressants can be approved for use in Nunavut following their assessment by the Government of Nunavut's Environmental Protection Service. However, AEM does not approve the use of bunker C due to its unacceptable environmental effects.

Numerous types of chemical suppressants are available; broad categories that encompass those approved for use in Nunavut are as follows:

- Wetting agents are designed to increase the ability of water to adhere to and spread over the dust particle. This increases the bulk density of the particle and leads to agglomeration. Calcium chloride ($CaCl_2$) is one such wetting agent.
- Binders hold particulates together and can provide long-term dust suppression on roads. DL10 and bunker C are examples of inorganic binders[5].

[4] Regular light watering is more effective than infrequent heavy watering (Thompson and Visser 2007).
[5] There are also organic lignosulphonates binders available but these are not approved for use in Nunavut.

- Crusting agents work best on inactive storage piles. They are reasonably long lasting, rain resistant and wind proof. None are yet approved for use in Nunavut but there is a process available to do so if a promising crusting agent is identified.

Table 1 provides a comparison of the advantages and disadvantages of using water, wetting agents and binders for dust suppression.

Analysis of the road surface will enter into the decision on whether to use chemical dust suppressants or not. The chemical dust suppressant most likely to be used by AEM is calcium chloride; however, its use will be kept to a minimum to prevent damage to vegetation adjacent to the road and to mitigate against creating an attractant to wildlife (salt lick effect). It will be used selectively where it will be more effective than water alone, and where it will not adversely affect the environment immediately next to the road. As calcium chloride is susceptible to leaching, AEM will not use it within 30 metres of water bodies or sensitive plant communities.

Table 1. Comparison of Dust Suppressants

Dust Suppressant	Advantages	Disadvantages
Water	- No environmental impacts - Readily available	- Short term dust suppression - Requires frequent reapplication - Works better than chemical dust suppressants on roads having greater than 20 – 25 % silt on the driving service or having a majority of sand - Can cause water erosion if too much is applied
Calcium chloride	-Effective in climatic areas when relative humidity greater than 30% -Less frequent applications required than water	- Possible impact on water and aquatic species when washed from the road and into the environment - Soil salinization and impact on plant life, attractant for wildlife - Not effective when road surface has greater than 20 – 25 % silt or has a majority of sand on the driving surface
Oil based binders (bunker C, DL10)	- Effective and long lasting	- May have adverse impacts on vegetation, soil, water and aquatic life

Adapted from Environment 2012

As part of its feasibility study, AEM will evaluate dust suppression techniques and chemical dust suppressants with the results to be used in selecting the chemical dust suppressant(s) that will work best at the Meliadine Project. If the selected dust suppressant is not calcium chloride, DL10, or some other approved product, AEM will request that the Department of Environment carry out an assessment.

7.3 Maintenance of the Road Surface for Dust Suppression

Inspection precedes maintenance. AEM recognizes that a good inspection program will lead to the early identification of areas of the roads where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface (AEM 2011a). It will also lead to less dust generation.

The amount of dust generated is a function of the composition of the road surface. If there is a significant percentage of silt size particles on the road surface, one can expect greater dust generation. Likewise, any reduction in the percentage of silt on the road surface leads to an equivalent reduction in dust. Grading roads provides relief from excessive dust by mixing silt sized material on the road surface with coarser road materials found deeper in the roadbed.

On an ongoing basis, unpaved roads and travel areas will be topped with new aggregate and graded, with goals of improving safety, minimizing erosion and reducing dust emissions. This is required as unpaved road constantly lose surface material through wind and water erosion, and from vehicles throwing material off the road.

8. THRESHOLDS FOR INITIATING DUST SUPPRESSION

Table 2 outlines the thresholds AEM will use at the Meliadine Project to initiate mitigation measures.

Table 2. Thresholds and Mitigation Measures

Location	Frequency	Indicator	Threshold	Mitigation Measure
Itivia laydown and Fuel Handling Facility	Routine inspection by Itivia supervisor during summer period.	- Measured dustfall. - Deterioration of visibility along road.	- Deterioration of visibility. - Safety concern. - Dust reaching hamlet.	- Use water and/or dust suppressant to control the dust.
AWAR, Bypass and Discovery roads	Regular weekly or more frequent inspection by road supervisor during the late spring and summer periods.	- Measured dustfall. - Deterioration of visibility along road.	- Deterioration of visibility. - Safety concern. - High dust levels evident near significant water bodies.	- Use water and/or dust suppressant in areas requiring attention. - Grade the road surface. - Add new granular material to the road surface. - Temporarily lower the speed limit on the road.
Mine site, including travel areas, haul and service roads	Regular weekly or more frequent inspection by site services supervisor during the late spring and summer periods.	- Measured dustfall.	- Deterioration of visibility. - Safety concern. - Dust reaching Meliadine Lake.	- Use water and/or dust suppressant on exposed surfaces such as parking areas, pads, haul, access and service roads. - Review mitigation measures in place. - Add new granular material to surface. - If applicable, grade the surfaces. - Temporarily lower speed limit on site.
Ramps in the open pits	Regular inspection by pit supervisor during summer period.	- Deterioration of visibility.	- Deterioration of visibility. - Safety concern.	- Use water as a dust suppressant.

Table adapted from Baffinlands 2010

Dustfall measurements will regularly be collected along the roads and other parts of the mine site using passive sampling methods to record the quantity of dust collected over time, and to allow the success of mitigation measures to be quantified. The monitoring data will be used to adjust mitigation measures to improve dust management strategies.

8.1 The Role of the Road Supervisor

The road supervisor[6] will conduct periodic inspections (minimum of weekly) of roads to ensure that they are maintained for safe travel of personnel, equipment, and supplies. These inspections will be recorded and any deficiency recorded and followed up by a corrective plan.

In areas or times identified by the AEM road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition could impact water bodies or the hamlet, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, addition of aggregate to the road surface, watering of the road surface and/or using an approved chemical dust suppressant.

Adaptive management will be used when inspections or monitoring shows the generation of dust to be greater than anticipated and that additional mitigation measures are required. As well, if dust is unexpectedly generated where it was not anticipated, adaptive management will be used to understand the source and find ways to reduce or eliminate the same.

9. DUST MANAGEMENT PLAN UPDATE

The Dust Management Plan will be reviewed annually and, if necessary, will be updated throughout the life of the Project to adapt to any changes in activities ongoing at the time and/or changes to mitigation measures.

[6] The open pit supervisor will do the same for the open pit ramps.

10. REFERENCES

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