AGNICO EAGLE

MELIADINE GOLD PROJECT

SD 8-1
Shipping Management Plan

APRIL 2014

VERSION 3

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FIGURES AND TABLES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	December 2012			First draft of the Shipping Management Plan	John Witteman, Env. Consultant, AEM
2	March 2013			DEIS re-submission; rebranding	
3	April 2014	1.1	1	Anticipated increased shipping traffic	John Witteman, Env. Consultant, AEM
		1.2	4	Updated Figure 1-1	
		3	10-11	Added details on AWPPA and regs. and Shipping Safety Control Zone	
		4	14	Mention of marine birds and ship track data	
		4.2	16	Distance of release from Itivia Spill vs marine wildlife	

EXECUTIVE SUMMARY

The Shipping Management Plan (SD 8-1) was developed in accordance with federal legislation, notably the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act,* and associated regulations. It also recognizes the international conventions and protocols signed by Canada. AEM will provide the necessary human, material and financial resources to meet or exceed the legal requirements attributable to the company that arise from shipping-related activities. Shipping contractors will be encouraged to do the same. AEM and it shipping contractors will carry third party liability insurance.

All shipping will be carried out during the open water season and will follow established, well defined shipping lanes presently in use for the annual sea lift to Rankin Inlet and other Kivalliq communities. There will not be any ice breaking to extend the shipping season.

Upon arrival at Rankin Inlet, all vessels will anchor outside Melvin Bay. Dry cargo will be lightered onto barges for transport through the access passage using tugs. The barges will be docked alongside the spud barge located at Itivia harbour. Large fuel tankers will also anchor outside of Melvin Bay. Ship-to-ship fuel transfer will be the first step in moving the fuel to the Itivia tank farm. The small tanker will navigate the access passage and anchor off Itivia where a ship-to-shore floating pipeline will transfer the fuel to the tank farm.

It is AEM's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Meliadine site to avoid having such cargo remain in storage at the Itivia laydown yard. Other contingency measures associated with shipping-related activities include the Project's Spill Contingency Plan (SD 2-16), Risk Management and Emergency Response Plan (SD 2-15), and the Oil Pollution Emergency Plan (OPEP; SD 8-2). Risk and hazard assessments of shore-based marine response activities will be undertaken as part of training the Emergency Response Team (ERT).

AEM security personnel and the Master of the ship will be responsible for security matters related to the shipping-related activities. While it is anticipated that the RCMP will not be involved in security matters, all criminal activities or matters of a grave nature (e.g., smuggling) will be referred to the RCMP in Rankin Inlet. Mitigation measures to prevent smuggling will be put in place. Mitigation measures will also be employed to minimize potential negative socio-economic effects from shipping-related activities; positive socio-economic impacts are anticipated.

Navigation through the Labrador Sea, Hudson Strait and Hudson Bay is not challenging during the open water season. No major hazards were identified along the shipping and tug-barge routes under normal conditions. Shipping can be carried out without pilotage as the shipping lanes entail minor hazards not significantly reducing ship safety.

All ships, tugs and tankers use electronic charts and other electronic navigational aids to provide safety in transit, reduce the risk of accidents, and remain within established sea lanes. Within the near shore shipping lane leading up to Rankin Inlet, there will also be navigations aids on islands and reefs. Traffic through the access passage will be coordinated to avoid shipping conflicts, and speed will be reduced to ensure safety. To maximize the safety of the persons travelling boats near the Rankin Inlet access passage, AEM will inform the community of the shipping activities, promote actions that will allow the ship and the small boats to see one another, and, through the Community Liaison Committee, will recommend that all those in small boats wear personal floatation devices.

On board waste management (solid and hazardous wastes, sewage) will be the responsibility of shipping contractors. AEM will expect the shipping contractors to conform to the *Ballast Management Control and Management Regulations*, which should reduce the risk of invasive species being introduced as a result of shipping activities. AEM expects to contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

Care will be taken to avoid disturbing marine mammals within the shipping lanes as much as possible. As part of shipping companies' standard operating procedures, ship crew should monitor the shipping lane for marine mammals from the Hudson Strait to Rankin Inlet. Mitigation measures may comprise, if safe to do so, slowing the ship and stay at distance from marine mammals.

Vessels contracted by AEM will be expected to have an approved Shipboard Oil Pollution Emergency Plan (SOPEP). Shall an environmental emergency occur along the shipping routes, the SOPEP will be activated. Close coordination will be maintained with AEM's shore-based supervisors who can activate AEM Emergency Response Plan and OPEP in providing assistance to a vessel. Accidents or malfunctions during transit should be reported to Transport Canada. Spills would also be reported to the Environmental Emergencies 24-Hour Report Line and, if necessary, advice would be requested from the Regional Environmental Emergencies Team (REET). Assistance could be sought from nearby ships and the Canadian Coast Guard (CCG).

ACRONYMS

AEM	Agnico Eagle Mines Limited
BWMP	Ballast Water Management Plan
CCG	Canadian Coast Guard
EIA	Environmental Impact Assessment
ERP	Emergency Response Plan
ERT	Emergency Response Team
IMO	International Marine Organization
MARPOL	International Convention for the Prevention of Pollution from Ships
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
RCMP	Royal Canadian Mounted Police
REET	Regional Environmental Emergencies Team
SD	Support Document
SOLAS	International Convention for the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan
TEU	Twenty-foot Equivalent Unit, a measure used for capacity in container transportation (sea can)
TK	Traditional Knowledge

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (AEM) gained extensive experience in shipping fuel and dry cargo to the Meadowbank Gold Mine (Meadowbank) since its construction began in 2008 and commercial production in 2010. Similar shipping, lightering and ship-to-shore fuel transfer procedures developed and in use for Meadowbank will be employed for the proposed Meliadine Gold Project in Rankin Inlet.

A spud barge (a floating dock) will be located in Melvin Bay, at Itivia in Rankin Inlet. A tank farm, sea can storage and a laydown yard will also be located at Itivia (Figure 1-1).

1.1 Shipping Needs

A total of approximately 40,000 tonnes of dry cargo (equipment and supplies) and 122 million litres of diesel fuel will be required annually for the operations of the Meliadine Project. To meet these needs, a total of 4 to 6 vessels will annually deliver dry goods and 4 to 6 tankers will annually deliver diesel fuel for the Project.

All shipping will be carried out during the open water season (typically from early August to late October) and will follow established shipping lanes that are presently in use for the annual sea lift to Rankin Inlet and other communities. There will not be any ice breaking to extend the shipping season.

The priorities in shipping dry cargo and fuel will be:

- The protection of the crew and others in small boats that the ship may come across;
- The protection of the marine environment; and
- The preservation of the ship and its cargo.

All ships, tugs and tankers will be equipped with electronic navigational aids. Ships will not be serviced in Rankin Inlet and will arrive with enough fuel for the return voyage south.

The Meliadine Project is anticipated to contribute to shipping in Hudson Strait and Hudson Bay by about 9 to 14 ships during construction, and 8 to 12 ships during operations[1]. This will represent an increase in ship traffic in Hudson Strait, Hudson Bay and to Rankin Inlet, and extra care will be required in regards to marine safety. This would include ensuring there is adequate spill response equipment on the ships and at the Itivia Oil Handling Facility. Spill response personnel will need to have adequate training and equipment to effectively respond to a spill in the marine environment[2].

[1] Greater detail on shipping during construction and operations in relation to other operations and activities can be found in Volume 8 – Section 8.3.6.1 Relevant Project Components.

[2] Support Document 8-2 Oil Pollution Emergency Plan details spill response at the Itivia Oil Handling Facility.

1.2 Shipping Routes

The marine transport of dry cargo will be comprised of four main segments, all within established shipping lanes:

- Bécancour, Québec on the St. Lawrence River, along the coast of Labrador to the Hudson Strait;
- Through Hudson Strait to Hudson Bay (see Appendix A for marine hydrographic charts showing the shipping lanes);
- Across Hudson Bay to Marble Island, this being approximately 45 km offshore Rankin Inlet; and
- From Marble Island to the barrier islands, through the islands to an anchoring point outside the access passage to Melvin Bay and Itivia.

Dry cargo will be loaded on ocean-going barges and container ships in eastern ports, almost exclusively Bécancour, and delivered directly to Rankin Inlet[3][4]. The first vessels of the year will normally arrive in Rankin Inlet in the latter part of July or early August. This first ship will include two (2) loaded barges having dry cargo, and two (2) tugs. Once the barges and tugs arrive in Rankin Inlet, they will remain until the last of the annual dry cargo has been received and lightered from the ships.

Up to six (6) freighters will arrive throughout the open water shipping season delivering dry cargo[5]. All ships will follow the earlier route of the loaded barges and tugs and will also be equipped with a complete electronic navigation aids for navigation in restricted waters. These ships are too large to navigate the access passage and will anchor approximately 3 km from Itivia (Figure 1-1).

The port of departure for transporting fuel will be different from that for dry cargo. The first leg of the voyage will be from an east coast refinery along the coast of Labrador to the Hudson Strait with the remainder of the voyage being the same as for the ships carrying dry goods.

1.3 Lightering Procedures

1.3.1 Dry Cargo

Sea cans, large equipment, machinery and vehicles will be lightered onto the barges that arrived earlier for transport through the access passage using tugs before docked alongside the spud barge located at Itivia. During lightering onto the barges, attention will be directed to ensuring the barges are secured alongside or anchored, with due consideration being given to the prevailing and expected wind, weather, and tide conditions.

[3] AEM's shipping routes within Nunavut are non-compulsory pilotage areas during the ice free shipping season.
[4] The contractor for shipping dry cargo remained to be selected at the time of preparing this Plan.
[5] To this point there are no alternative routes under consideration, however future routing may include Churchill to Rankin Inlet on occasion.

Most dry cargo will be transported in marine shipping containers (TEUs; Twenty-foot Equivalent Unit) stacked on the deck of general cargo vessels fitted with cranes. Most materials will arrive in sea cans, which will be stacked in the Itivia laydown yard or moved immediately to site. The use of sea cans provides secondary protection against spills and facilitate rapid transfer from ship to shore.

The tug-barge used to ferry the dry cargo to shore will be highly manoeuvrable and capable of transiting the access passage with its changing current patterns. The tidal current in the area is half a knot (0.93 km/h). Navigation will be during daylight hours and will proceed at a slow speed in periods of low visibility. Traffic through the access passage will be coordinated through communication between the tugs to avoid shipping conflicts and to ensure safety.

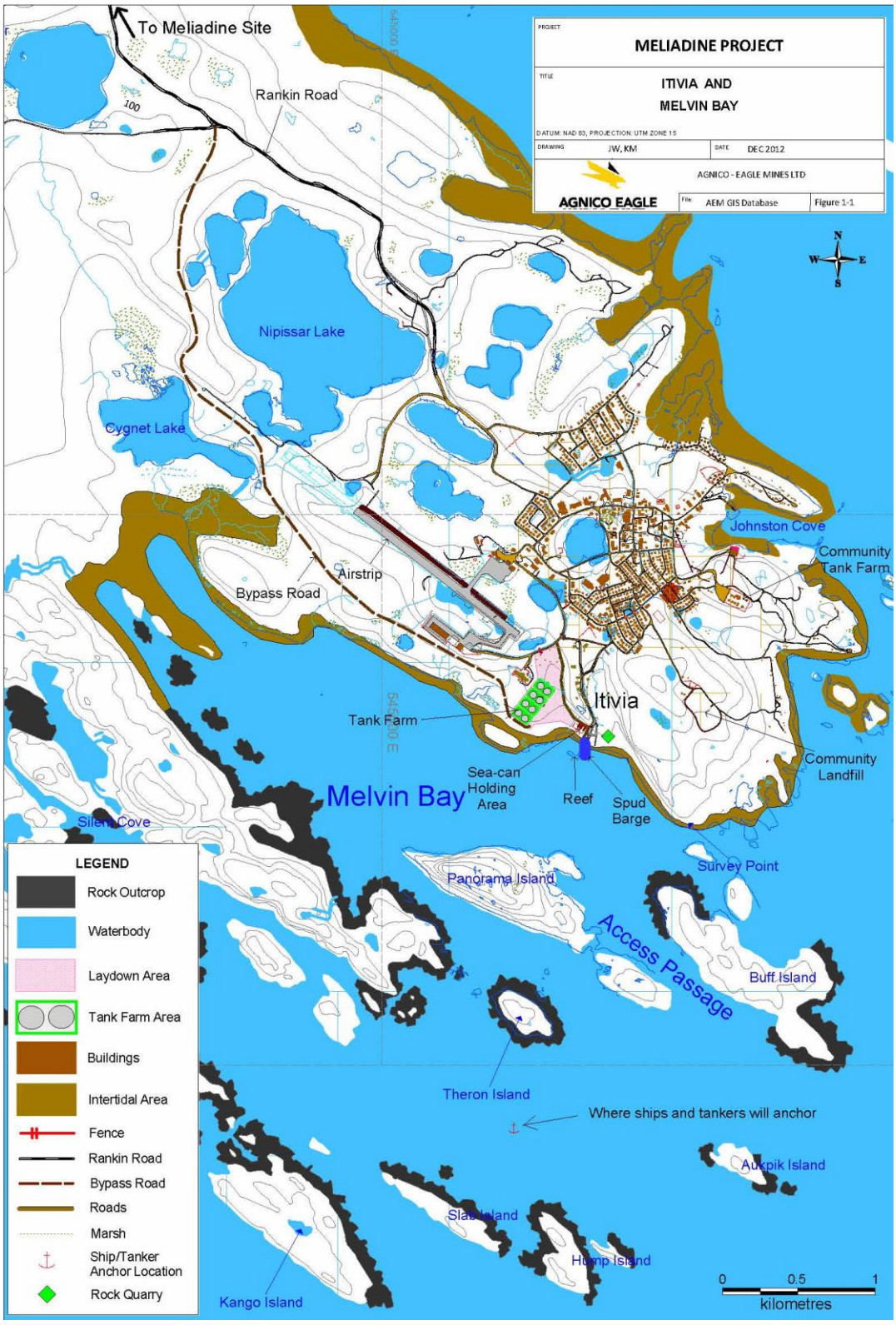


Figure 1-1 Itivia and Melvin Bay

Masters of tugs, large and small tankers, and dry cargo ships will be responsible for their vessels at all times – for the safe navigation of their vessels from the port of departure to Rankin Inlet. For tugs this also includes responsibility for the barge they are towing or pushing. When a barge is laid alongside a dry cargo vessel for lightering containers or equipment from the cargo ship to the barge, a loading supervisor on the ship will take charge of the barge. When a cargo barge is secured to the spud barge, a shore supervisor will take charge of the cargo barge.

One end of the spud barge will be connected to the shore while the other end will have spuds allowing the barge to rise and fall with the tide. The spud barge[6] will have a crane with a capacity of about 200 tonnes thereby allowing it to lift sea cans, other containers and equipment directly off the delivery barges and place them onto trucks. The gateway to link the spud barge with the shore will be about 6.5 m wide by 21 m long, which allows trucks to drive onto the spud barge from the shore. Sea cans[7] and equipment will be stockpiled on the laydown yard before being transported to the Project site.

At the end of the shipping season or when all the dry cargo has been received by AEM for the year, outgoing cargo will be loaded on the barges for the return trip to southern ports. Outgoing cargo could include construction equipment being demobilized following the completion of construction and/or hazardous or other waste being sent to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction. No barges, no fuel vessels or no tugs will remain at Rankin Inlet over the winter; all will return to southern ports. The only exception will be the spud barge which will remain at Itivia harbour for the duration of the Project (this is similar to the facility operated by AEM in Baker Lake for its Meadowbank Mine). The spud barge will not hold fuel or hazardous materials.

1.3.2 Diesel Fuel

It is expected that the large tankers delivering diesel fuel will anchor in the same general location as the dry cargo vessels (Figure 1-1). Ship-to-ship transfer of fuel will occur at this location from the larger tanker to a smaller tanker that can navigate the access passage. The carrying capacity of the small tanker will be either 7,300 m^3 or 10,500 m^3. The one selected at any one time will be subject to its availability when large fuel tanker is set to deliver fuel to AEM. The smaller tankers will be able to navigate the access passage into Melvin Bay while the large tanker cannot. The small tanker will anchor opposite Itivia[8]. From there a floating pipeline of some 300-500 m will connect to a shore-based pipeline for transfer of fuel to the tank farm. Contingency measures related to the transfer of fuel are described in the Oil Pollution Emergency Plan (SD 8-2).

[6] The barge model anticipated for that facility would be a barge series 1500b, type deck/bulk (length 76 m, breath 17 m, deadweight 2,190 tonnes.

[7] Some sea cans such as those having explosives will be transported directly to the mine site after being brought ashore.

[8] The anchoring location will vary based on a number of factors such as tide, wind and draught of the small tanker.

1.3.3 Explosives and Hazardous Materials

Part of the dry cargo received each year will be ammonium nitrate, which will be used on site to manufacture explosives. Bulk ammonium nitrate will be shipped as prill, which is inert and will not require special handling during transit. The ammonium nitrate will remain in sea cans at the mine site until needed[9]. Other needed raw materials and blasting related products will arrive in sea cans and will end up being stored in secure locations at the mine site.

It is AEM's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Meliadine site to avoid having such cargo remain in storage at the Itivia laydown yard. Sensitive products such as explosives, boosters and caps will be transported directly to the Project site. However, in the eventuality of a delay in their transit to the mine site, these products will be temporarily stored in Rankin Inlet according to applicable regulations which imply locked storage under constant surveillance. All handling, transport, storage, manufacture and use of explosives will be subject to federal approval under the *Explosives Act*, and the *Nunavut Mine Health and Safety Act*.

Hazardous waste and contaminated soil will be managed continually; consequently there will be little to no accumulation of such wastes during the operation of the mine, subject to seasonal shipping considerations. Hazardous waste that cannot be managed on site will be appropriately packaged for transport in sea cans and sent via a dry cargo vessel to a certified hazardous waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

Itivia is presently connected to the hamlet by a single road; AEM is proposing to build a bypass road for the transport of all its dry cargo and fuel around the community. This will include explosives and dangerous goods.

[9] An on-site Emulsion Plant will be constructed for the manufacturing of explosives. More details on that subject are available in the Explosives Management Plan (SD 2-14).

SECTION 2 • RELATED DOCUMENTS

The Shipping Management Plan covers the scope of shipping activities for the Meliadine Project. It is part of the Environmental Management and Protection Plan (SD 2-5).

Management and monitoring plans for the Meliadine Project that provided input to the Shipping Management Plan include the following:

- Spill Contingency Plan (SD 2-16);
- Risk Management and Emergency Response Plan (SD 2-15);
- Oil Pollution Emergency Plan (SD 8-2);
- Shipboard Oil Pollution Emergency Plan (shipping companies); and
- Occupational Health and Safety Plan (SD 9-6).

2.1 Spill Contingency Plan

The cornerstone of spill contingency planning for AEM is the Spill Contingency Plan (SD 2-16) covering all spills on land, water and ice. It forms part of the Environmental Management and Protection Plan (SD 2-5). It, coupled with the Risk Management and Emergency Response Plan (SD 2-15), describe the processes followed in responding to a spill to the environment.

2.2 Risk Management and Emergency Response Plan

The Risk Management and Emergency Response Plan (SD 2-15) focuses on responding to all emergencies in a timely and adequate manner. It commits AEM to being prepared for and providing adequate resources - qualified personnel and equipment - to handle a wide variety of emergencies situations, spills at Itivia being just one possible emergency.

Risk and hazard assessments of shore-based marine response activities will be undertaken as part of training the Emergency Response Team (ERT).

2.3 Oil Pollution Emergency Plan (OPEP)

The Oil Pollution Emergency Plan (SD 8-2) complements the Spill Contingency Plan (SD 2-16) and should not be construed as superseding it. The OPEP only provides contingency planning for the Oil Handling Facility (OHF) at Itivia.

The OPEP complies with the requirements for procedures, equipment and resources as set out in the *Canada Shipping Act* (s.s. 660.2(4)) specific to the fuel handling facility, the bulk incoming transfer of fuel from ship-to-shore and spill scenarios directly relating to this operation. The OPEP provides direction to AEM personnel and/or contractors at the Itivia laydown yard and tank farm, and to AEM's ERT in emergency spill response situations, in developing oil pollution scenarios, defining the roles and responsibilities of management and responders, and outlining the measures

taken to prevent spills. The OPEP seeks to minimize potential health and safety hazards, environmental damage and cleanup costs.

Spills resulting from ship-to-ship fuel transfer will be the responsibility of the ships contracted by AEM and ship's Master. While AEM will provide assistance wherever possible in these instances, the ERT will not have the training nor the equipment to respond to emergencies on a ship or spills outside the shore area of Itivia. Assistance would be provided by AEM when an incident cannot be dealt with by the ship's crew alone.

2.4 Shipboard Oil Pollution Emergency Plan

The Shipboard Oil Pollution Emergency Plan (SOPEP)[10] will contain all information and operational instructions as required by the International Marine Organization's "*Guidelines for the Development of the Shipboard Marine Pollution Emergency Plan*". Vessels contracted by AEM will be expected to have an approved SOPEP. Its preparation is the responsibility of the shipping company and is maintained by the vessel's Master. However, close coordination will be maintained with AEM's shore-based Itivia supervisors who can activate the Emergency Response Plan (ERP) and OPEP in providing assistance to a vessel in the near-shore area. These two plans will have close links to the SOPEP and, as required, will include exercises at regular intervals to ensure ship and shore can cooperate in responding to any spill of fuel or any other hazardous product in the immediate vicinity of Itivia.

Accidents or malfunctions during transit will be reported to Transport Canada. If the accident involves the loss of fuel or chemicals, the SOPEP would be activated and on-board spill response materials and equipment put to use. This would include containment booms, absorbent pads and oil spill dispersant[11]. Spills would also be reported to the Environmental Emergencies 24-Hour Report Line and, if necessary, advice would be requested from the Regional Environmental Emergencies Team. Assistance could be sought from nearby ships and the Canadian Coast Guard (CCG). Spill response resources such as those maintained by the Canadian Coast Guard at select locations along the Kivalliq coast would be dispatched to the spill site. A sea can having spill response materials is maintained by the CCG in Rankin Inlet.

Outside help could be requested for major accidents such as accidental grounding/stranding of a vessel. Under these circumstances, the safety of the crew and maintaining the integrity of the vessel would be paramount.

[10] Spills and their effect on Marine Wildlife are addressed in SD 8-2 Oil Pollution Emergency Plan.
[11] Dispersants will not be used without first consulting regulatory agencies responsible for spill response.

2.5 Occupational Health and Safety

All activities carried out by AEM must consider the attendant risks and be carried out with safety first in mind. Regular meetings of an Itivia safety committee would support a proactive program to identify and correct potential hazards before an accident happens. This will include on-board vessels and barges, and also while working ashore.

SECTION 3 • APPLICABLE FEDERAL ACTS, REGULATIONS AND GUIDELINES

The Plan was prepared in accordance with federal legislation outlined in Table 3-1. Numerous regulations exist under the *Canada Shipping Act* and these can be found at www.tc.gc.ca. The regulations included here are most relevant to the environment and the Shipping Management Plan.

Table 3-2 lists international conventions and protocols signed by Canada. Canada is a signatory to International Marine Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) and International Convention for the Safety of Life at Sea (SOLAS). As such, Canadian marine laws, regulations and guidelines rules are a reflection of these international conventions, protocols and agreements.

At this time, AEM has not contracted the company(ies) to be used in shipping to Rankin Inlet. Even so, the shipping companies could change over the construction, operation and closure phases of the Meliadine Project. It is understood that the shipping contractors to be used by AEM will abide by Canadian laws and regulations, applicable MARPOL 73/70 annexes, and international conventions. Inspections and possibly audits carried by federal inspectors will ensure that all applicable statutes are followed. This could include the review of required plans, an audit of the emergency response equipment carried by the vessel, and the means to prevent the discharge of any oil, oily water or other hazardous waste in Arctic waters. As soon as reasonably possible, AEM will provide Transport Canada with a list of shipping contractors before construction begins on the Meliadine Project.

All vessels transiting through and operating in Canadian Arctic waters are required to comply with the *Arctic Waters Pollution Prevention Act* (AWPPA), the *Canada Shipping Act* 2001 (CSA 2001), the *Marine Liability Act* (MLA) and their associated regulations, including requirements for vessel construction and operations (see Table 3-1). While the provisions of the CSA 2001 apply in all Canadian waters, vessels in Arctic waters north of 60°N and out to the 200 nautical mile limit of Canada's Exclusive Economic Zone are also subject to the provisions of the AWPPA. The AWPPA prohibits discharges of oil, chemicals, garbage and other wastes generated onboard vessels. It does allow for the discharge of untreated sewage[12]. The *Marine Liability Act* sets out a regime that requires vessels operating in Canadian jurisdiction, including Arctic waters, to carry insurance to pay for damages from oil spills.

Two vessel control systems are established under the *Arctic Shipping Pollution Prevention Regulations* – the Zone/Date System and the Arctic Ice Regime Shipping System, which provide for operational safety by taking into account the vessel's capability to operate safely by virtue of ice strengthening, and the ice conditions it will encounter[13].

[12] Ships are to only discharge gray water and treated sewage when the ship is at least 50 km from Rankin Inlet.
[13] AEM will only ship dry goods and fuel during the open water season.

Vessels servicing the Project will have to comply with the AWPPA and regulations while in a Shipping Safety Control Zone[14].

The various shipping companies contracted by AEM will have an approved SOPEP, and verify that equipment and operating procedures are consistent with Canadian Marine laws, regulations and guidelines, and with IMO agreements to which Canada is a signatory. It is the responsibility of the Master of the ship to ensure safe passage through Canadian waters and to maintain up-to-date charts and publications[15].

AEM will provide the necessary human, material and financial resources to meet or exceed the legal requirements attributable to the company that arise from shipping. The marine equipment used on the Meliadine Project will meet task specifications for reliability, safety and capability of meeting or exceeding environmental requirements and guidelines. Shipping contractors will be encouraged to do the same.

Table 3-1 Applicable Acts, Regulation and Guidelines

Acts	Regulations	Guidelines
Federal Legislation		
Canada Shipping Act, 2001 (S.C. 2001, c. 26) [An Oil Pollution Emergency Plan is required under the Act (168(1)d)]	*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*	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)
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Marine Liability Act (S.C. 2001, c. 6)	*Marine Liability Regulations* (SOR/2002-307)	
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)	

[14] Rankin Inlet is in Zone 16.
[15] Transport Canada is not the source to provide up-to-date information on changing sea levels or on emergence of new reefs or shoals.

Acts	Regulations	Guidelines
Transportation of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Oceans Act (S.C. 1996, c. 31)		
Navigable Waters Protection Act (R.S. 1985 c. N-22)		
Canada Water Act (1985 c.11)		
Fisheries Act (R.S.C. c. F-14)	*Marine Mammal Regulations* (SOR/93-56) *Marine Mammal Regulations* (SOR/93-56)	
Species at Risk Act (2002 c.29)		Species at Risk Policies
Canadian Environmental Protection Act (1999 c.33)	*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* *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (SOR/2008-197	

Table 3-2 International Conventions and Protocols Signed by Canada

Conventions	
International Convention for the Prevention of Pollution from Ships MARPOL 73/78 Annexes	
	Objective of Annex is to Prevent Pollution from:
Annex 1	Oil from ships
Annex 2	Noxious liquid substances carried in bulk
Annex 3	Harmful substances carried by ships in packaged form
Annex 4	Sewage treatment and disposal
Annex 5	Garbage handling
Annex 6	Air Pollution from Ships
International Maritime Dangerous Goods Code	
International Convention for the Safety of Life at Sea, 1974, SOLAS 74	

SECTION 4 • MARINE WILDLIFE

> Marine mammals have been the basis of the Inuit economy for over 4,000 years. They provide meat, fat, oil, leather, tools and materials for fabrication of arts and crafts. The top layers of the skin yield "muktuk", which is still highly prized as a food rich in vitamin C and high in energy content. *(Fisheries and Oceans Canada http://www.dfo-mpo.gc.ca/Science/publications/uww-msm/articles/beluga-eng.htm)*

The reaction of marine wildlife to vessel traffic is predicted to not be significant and, providing mitigation measures are employed, should not lead to any residual effects (see Volume 8, Marine Environment and Impact Assessment). The effects of vessel traffic on marine mammals and birds were assessed in the Environmental Impact Assessment (EIA). This included a Traditional Knowledge (TK) study of the marine environment between Chesterfield Inlet and Whale Cove. Together, scientific and traditional knowledge were used to develop mitigation measures to eliminate potential residual effects. Of greatest interest in the TK study was the distance vessels remained from Marble Island, this being an important area for whales, seals, marine birds, and, on occasion, walruses.

AEM will include in its contracts that ships should remain mindful of marine areas having a high density of marine mammals and birds and stay within shipping lanes, wherever possible[16]. AEM will make its best effort to have ships provide their ship track data for inclusion in annual reporting.

4.1 Interactions and Potential Effects

Vessel discharges (sewage, solid wastes, ballast water), the sight of the vessels and their movement, vessel noise, as well as accidental spills and releases have the potential to interact with and disturb marine wildlife and affect life cycle activities. Possible interactions between shipping and marine wildlife can have the following potential effects:

- Marine mammals may retreat to the water should a vessel pass too close to an island or reef where they have pulled themselves out of the water;
- The foraging of marine birds and mammals may be interrupted when vessels approach and pass them in the shipping lanes;

[16] Frobisher Bay and Button Islands key marine habitat sites overlap with the proposed shipping route at their southern and northern boundaries, respectively. This overlap is unavoidable as these two sites almost completely cover the entrance to Hudson Strait from the Atlantic Ocean (see Volume 8 for more details).

- The improper treatment and release of ballast water, grey water and bilge water could alter the water quality and contaminate the food supply;
- Mammal mortalities may result from collisions with the ship; and
- Fuel and/or oil spills could result in mortalities and, for marine birds, could lead to the loss of foraging and brood rearing habitat.

4.2 Mitigation Measures

As part of shipping companies' standard operating procedures, ship crew will monitor the shipping lane for marine mammals from the Hudson Strait to Rankin Inlet. The ship's Master will be notified if there is a concern of the ship striking a marine mammal. Ship personnel will make a decision if actions are required to avoid a possible collision. This may include, if safe to do so, slowing the ship until the animal has travelled clear of the ship's course. As safe navigation allows, ships shall take every precaution to avoid harassment of marine wildlife by employing the following mitigation measures:

- Under no circumstances, other than in the case of an emergency, will ships approach within 300 m of a walrus or polar bear observed on sea ice[17];
- Ships will remain at least 2 km from Marble Island to avoid disturbing seals, walrus and marine birds that might be in the vicinity. This would significantly reduce interactions between marine wildlife and vessels, and also reduce the noise in near-shore areas;
- Vessels shall maintain a minimum distance of 300 m from marine mammals engaged in feeding activities;
- For all other marine mammal encounters, vessels will not approach within 100 m of a marine mammal;
- If marine mammals approach within 100 m of a vessel, the vessel shall reduce its speed and, if possible, cautiously move away from the animal;
- If it is not possible for a vessel to move away from or detour around a stationary marine mammal or group of marine mammals, the vessel shall reduce its speed and wait until the animal(s) move to the side and remain at least 100 m from the vessel prior to resuming speed;
- The vessel shall not be operated in such a way as to separate an individual member(s) of a group of marine mammals from other members of the group. When weather conditions require, such as when visibility decreases, the vessel shall adjust its speed accordingly to avoid the likelihood of the ship striking an animal;
- Ballast water will only be released in designated areas and if there is no marine wildlife in the area; and
- Bilge water, grey water and sewage will be properly treated and only released in areas where no marine wildlife is present and at least 50 km from Itivia.

[17] As all shipping will occur during the open water season, collision with young seals in liars will not happen.

Spills from ships in transit could affect marine wildlife coming in contact with any petroleum product spilled. In the event of a spill, the ship personnel will discourage marine wildlife from coming in contact with the spilled material. The product most likely to be spilled would be diesel fuel, which floats on the water surface and has a high rate of evaporation. However, these occurrences are expected to be rare and the activation of the SOPEP would significantly reduce their impact. Preventive and contingency measures already in place substantially reduce the risk to marine wildlife from spills.

Adaptive management will allow mitigation measures to be modified in response to new information arising from monitoring carried out by the vessel crews and from traditional knowledge.

4.3 Monitoring and Reporting

AEM will discuss with contracted vessel operators the monitoring of marine wildlife. Contracted vessels by AEM will be encouraged to collect incidental monitoring data during their voyage and to report it to AEM. The bridge would be on the outlook for mammals during the vessel's transit through Hudson Strait and Hudson Bay. Standard monitoring and data collection protocols for marine mammals would be provided to the crew. A proposed data sheet is provided in Appendix B. This remains to be finalized following consultation with Inuit organizations, shipping companies and government departments.

If available, AEM will pass the data to Inuit organizations and/or government agencies for their information.

SECTION 5 • SAFETY OF PERSONS USING SMALL BOATS IN THE SHIPPING LANES

The most likely areas where interactions may occur between small boats and barges-tugs and/or ships or vessels are:

1. Melvin Bay, particularly in the access passage;
2. Where the ship is transiting through the near shore islands and reefs; and
3. The area between Marble Island and the near shore islands.

Mitigation measures to safeguard the safety of those in small boats will include the following:

- AEM will consult with the community members mooring or beaching their boats in Melvin Bay on the shipping activities that can be expected over the ice free shipping season. Protocols will be developed to minimize the interaction between barge-tug or ship and small boats;
- Barge-tug or ship will travel at a slow speed (2 knots or less) when transiting through the near shore islands and reefs to reduce the wake and not compromise the safety of people travelling in small boats along the shipping route. The slower speed will reduce the wake of the ship while also providing an opportunity for the small boats to move to the side;
- Barge-tug or ship would only travel through the near shore islands and reefs when there is good visibility or adjust their speed according to the conditions. This would allow the ship and the small boats to see one another;
- Barge-tug or ship will restrict themselves to the shipping lanes thereby not surprising any small boat travelling outside the shipping lanes;
- The ship will sound its horn if a small boat seems unaware of its presence; and
- AEM, through the Community Liaison Committee, will recommend that all those in small boats wear personal floatation devices.

SECTION 6 • SMUGGLING PREVENTION AND POLICE SERVICES

Smuggling, particularly alcohol and prohibited substances, could have negative socio-economic effects on the community, something AEM wants to avoid.

Measures to prevent smuggling will include:

- The crew of the ship will not be allowed to take any tobacco or alcohol ashore;
- Any crew member under the influence of alcohol, or attempting to take alcohol ashore will be disciplined by the ship's Master; and
- AEM security will send any crew member having alcohol back to the ship for disciplinary action, or refer the matter to the Royal Canadian Mounted Police (RCMP) if prohibited substances are involved.

While it is anticipated that the RCMP will not be involved in security matters, all criminal activities or matters of a grave nature will be referred to the RCMP in Rankin Inlet.

SECTION 7 • IDENTIFIABLE THIRD PARTY LIABILITIES

AEM and it shipping contractors will carry third party liability insurance. Identifiable third party liabilities related to shipping include but are not limited to:

- Hamlet of Rankin Inlet in the event of spill in Melvin Bay that adversely impact the marine environment;
- Hunters and trappers should a ship or tanker run aground and adversely impact the marine environment in spilling fuel or other chemicals into the marine environment;
- Small boat owners should a ship or tanker collide with a small boat in the shipping lanes; and
- Hunters and trappers should a vessel collide with a large marine mammal such as a whale along a shipping route.

Mitigations for possible third party liabilities are identified in Section 11 of this Plan (Hazard Identification Analysis of Marine Routes).

SECTION 8 • ON BOARD WASTE MANAGEMENT

The six (6) annexes of MARPOL promote the elimination of deliberate, negligent or accidental discharge of ship-source pollutants into the marine environment (see also Transport Canada 2009). The list of harmful ship-source discharges includes: oil, noxious liquid substances and dangerous chemicals, sewage, garbage and air pollution. Canadian laws and regulations mirror the MARPOL annexes and conventions.

AEM expects to contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

8.1 Sewage

Vessels are to have an approved sewage treatment plant meeting Canadian standards[18]. Holding tanks with the capacity for all grey and treated sewage while in port are expected to be part of the ship's infrastructure. AEM will advise ships that disposal of waste water into the environment is to be avoided within 50 km of Rankin Inlet.

Sewage sludge from the sewage treatment plant can be incinerated in the on-board incinerator.

8.2 Solid Waste

Solid waste materials are to be incinerated, not disposed of in the marine environment. Modern incinerators operating at very high combustion temperatures are expected on all vessels. These will be capable of incinerating food and other domestic waste, residual oil separated from bilge water, waste oil and, in most cases, sewage. Ash from incineration will remain on board and be taken south for treatment, recycling and/or disposal in a certified waste management facility. By incinerating waste on board, the risk of introducing invasive non-aquatic species to the Rankin Inlet area is reduced. This would not be the case if the waste was transferred onshore for incineration/disposal.

The design and operation of shipboard incinerators in Canada are specified under the International Marine Organization, Marine Environmental Pollution Committee 76 (40), Annex V. Standard specification for shipboard incinerators allow for the incineration of solid wastes approximating in composition to household waste and liquid wastes arising from the operation of the ship, e.g., domestic waste, cargo-associated waste, maintenance waste, operational waste, cargo residues, and fishing gear. Operating temperatures are similar to those for the incinerator at the Meliadine site, and flue gases are cooled rapidly to limit the *in vivo* formation of dioxins. Ash from the incinerator is stored on-board. The ash is transported south to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

[18] If all sewage is to be incinerated, there will not be any need for sewage treatment.

Tugs will remain on site for the duration of the shipping season. Their waste will be incinerated with the ash stored in containers, which will be shipped south at the end of the shipping season for treatment, recycling and/or disposal in a certified waste management facility.

Hazardous waste will not be incinerated but returned south for treatment, recycling and/or disposal in a certified waste management facility.

SECTION 9 • BALLAST WATER MANAGEMENT

Ballast water is essential to control trim, list, draught, stability, and/or stresses of a vessel. Ballast water control and management regulations protect waters under Canadian jurisdiction from non-indigenous aquatic organisms and pathogens that can be harmful to ecosystems. AEM recognises that when a new organism is introduced to an ecosystem, negative and irreversible changes may result, including a change in biodiversity. The *Ballast Management Control and Management Regulations* are intended to minimize the probability of introductions of harmful aquatic organisms and pathogens from vessels' ballast water while also protecting the safety of vessels (Transport Canada 2007).

While an exemption exists in the regulations for vessels operating exclusively in waters under Canadian jurisdiction or certain adjacent waters, any Canadian vessel that has operated outside these waters may carry harmful aquatic organisms or pathogens in their residual ballast and, as such, is not eligible to exemption.

AEM expects to use vessels largely active in the coasting trade that operate almost exclusively in waters under Canadian jurisdiction. However, these vessels do on occasion venture into waters outside Canadian jurisdiction and, as such, will require a Ballast Water Management Plan (BWMP). The regulations require the preparation and carriage of a BWMP for each vessel, and for copies to be submitted to Transport Canada. The BWMP will be specific to the vessel.

If AEM were to contract vessels originating from waters outside the jurisdiction of Canada, a BWMP would be requiredAll BWMP (reviewed by the National Administration) carried on ships of foreign origin would be based on the following international guidelines and guiding principles:

- IMO Resolution A.868(20): *Guidelines for the Control and Management of Ships Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens*, in particular Section 7.1;
- The *Model Ballast Water Management Plan* developed by the International Chamber of Shipping and the International Association of Independent Tanker Owners;
- Regulation B-1 of the IMO's *Regulations for the Control and Management of Ships' Ballast Water and Sediments*; and
- Part B of the Annex to Resolution MEPC.127(53): *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*.

AEM will expect contracted vessels not eligible to exemption to have a BWMP and provide AEM with a copy.

9.1 Ballast Water Exchange

It is recognised by the IMO that the exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability that harmful aquatic organisms and pathogens be transferred from/in vessels ballast water. If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care should be taken to avoid unnecessary discharge of ballast water that has been taken up in another port as this could introduce harmful aquatic organisms. In particular, sediment found in the vessel's ballast tanks should be disposed of at sea in areas outside 200 nautical miles (370 km) from land and in water depths exceeding 2,000 m.

Vessels take on ballast water in segregated chambers for the main purpose of stabilizing the vessels by adding the weight of the water and maintaining a specified draught. Vessels laden with dry cargo or fuel will take on less ballast water than empty vessels. As all ships on the inward voyage to Rankin Inlet will be laden, they will have a minimum of ballast water. However, on the outward journey, these vessels will take on ballast water. This will occur while on anchor outside the access passage after the lightering of dry cargo or fuel.

In the event that a ship is contracted from waters outside jurisdiction of Canada, ballast exchange is to occur at least 200 nautical miles from shore where the water is at least 2,000 m deep. If the foreign vessel undertakes this ballast exchange outside Canadian waters, it can undertake further ballast water exchanges within Canadian waters. If safety or other reasons dictates that the ballast exchange cannot occur outside waters under Canadian jurisdiction, an alternate designated area is available in Hudson Strait, east of 70°west longitude, where the water is over 300 m deep.

In the case of non-transoceanic navigation, and where ballast water is taken on-board outside waters of Canadian jurisdiction, the water is to be exchanged before entering Canadian waters at a location at least 50 nautical miles offshore, in water at least 500 m deep. If this is not possible due to safety or other reasons, the ballast water exchange can occur in the alternate designated area in Hudson Strait, east of 70°west longitude, where the water is over 300 m deep.

All coastal trade vessels will in all likelihood not venture more than 200 nautical miles from shore and will not exchange ballast water outside waters of Canadian jurisdiction. All the same, ballast water exchanges for all vessels operating in waters under Canadian jurisdiction are expected to meet the provisions of the Regulations, and to follow Part A of the IMO *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*, and the IMO *Guidelines for Ballast Water Exchange*.

It is believed that ballast water management will be required. The waters taken on-board at Bécancour, Québec, will be dissimilar to waters in Hudson Bay so ballast exchange could occur in Hudson Strait as noted above where the water salinity is approximately 30 parts per thousand.

After lightering their dry cargo or fuel at Rankin Inlet, the ships and tankers will be empty and will likely take on ballast water for the return voyage.

SECTION 10 • SAFETY

Safety is a top priority for AEM. It begins with all personnel (AEM, contracted employees and contractors) wearing the appropriate personal protection equipment suitable for the task at hand and for the weather conditions at the time. Secondly, personnel are to understand the hazards associated with the task, the safe procedures in carrying it out, and how not to place oneself in harm's way. Ship's employees and contractors will participate in inductions and be aware of the physical hazards along the shipping routes and also the hazard associated with chemicals being transported by the ship. Accident prevention will be supported by a proactive program to identify and correct potential hazards before an accident occurs.

AEM or contracted supervisors will ensure that the interactions between ship and shore are carried out with the safety and the health of the employees first in mind. Job safety analysis will be carried out on all tasks to be carried out at Itivia and safety guidelines developed for procedures associated with the tank farms, unloading of cargo, and other shipping-related activities.

SECTION 11 • HAZARD IDENTIFICATION ANALYSIS OF MARINE ROUTES

Hazard: Anything that has the potential to cause harm.

Likelihood: The probability/chance of harm occurring as a result of exposure to a hazard.

Severity: The level of harm that may occur as a result of exposure to or contact with a hazard.

Navigation through the Labrador Sea, Hudson Strait and Hudson Bay is not challenging during the open water season[19]. No major hazards were identified along the shipping and tug-barge routes under normal conditions. Electronic charts combined with electronic navigation aids for the shipping lanes ensure the vessel remains on course where bathymetry and physical hazards are known.

The average speed of the vessels in open waters is expected to be less than 14 knots (26 km/h). Once ships approach the offshore islands and reefs off Rankin Inlet, the ship's speed will be slowed to 2 knots or less (3.7 km/h) to navigate the shipping lane through the islands to their anchor point outside Melvin Bay. Within the near shore shipping lane, there will be navigations aids on islands which will provide an extra measure of safety for the ships. Shipping can be carried out without pilotage as the shipping lanes entail minor hazards that do not significantly reduce ship safety. Any actions required by the crews of the ships and tugs are expected to be well within their capabilities.

At the anchor point, cargo will be lightered from the ships onto barges and be delivered to the spud barge via the access passage. The tugs-barges will be highly manoeuvrable and capable of transiting the access passage with its changing currents and will not require pilotage. The tidal current in the access passage can be half a knot (0.93 km/h). Navigation will be during daylight hours and will proceed at a slow speed in periods of low visibility. Traffic through the access passage will be coordinated to avoid shipping conflicts and to ensure safety.

However, out of the ordinary events have been identified that could increase the level of hazard and necessitate associated mitigation measures:

- Mechanical failure occurring on the ship or tug thereby placing it in jeopardy in the shipping lane;
- Tug-barge or ship running aground due to a navigational error or mechanical failure;
- Loss or damage to sea cans in heavy seas;

[19] AEM's shipping routes within Nunavut are non-compulsory pilotage areas during the ice free shipping season

- Barge tow line breaking in heavy seas;
- Collision of tug-barge or ship carrying dry cargo and fuel to Itivia through the access passage;
- Tug-barge or ship sinking upon hitting ice; and
- Tug-barge or ship colliding with a small boat.

The access passage deserves special attention as:

- Dry cargo for AEM and the hamlet and fuel for AEM could all be unloaded at the same time; and
- The access passage is 150 m wide at its narrowest point and, although two-way traffic is theoretically possible, it raises the risk of collisions and groundings. To reduce the risk, it is best that a single tug-barge or ship be in the access passage at any one time.

SECTION 12 • RISK ANALYSIS OF MARINE ROUTES

All ships, tugs and tankers use electronic charts and other electronic navigational aids to provide safety in transit, reduce the risk of accidents, and remain within established sea lanes. The shipping lanes used are well defined. For an extra measure of safety, buoys are present along the route within the barrier islands and reefs leading up to Rankin Inlet, and weather warnings are updated regularly. Also, shipping companies likely to be employed by AEM commonly sail in Hudson Bay and to Rankin Inlet and are aware of its marine hazards.

The potential severity of shipping hazards[20] cannot be changed in most circumstances, what can be reduced is their likelihood. This is possible through the application of mitigation measures. And the level of risk can be defined as the likelihood of harm posed by a hazard combined with its potential severity. The objective is, through the use of mitigation measures, to reduce the risk as low as practically possible. Residual risk is what remains after mitigation measures have been applied. And those having the highest potential residual risk would be aggressively managed.

Mitigation reduces the probability of occurrence and increases safety. The following mitigation/safety measures are proposed:

- Where available, electronic navigation aids be used in all instances;
- Ship speeds in open water remain less than 14 knots in the absence of marine mammals, and once within the barrier islands and reefs near Rankin Inlet, 2 knots or less;
- Shipping is only carried out during the ice free season. Should ice be encountered, the vessel will either sail around it at a reduced speed or proceed slowly through the ice;
- Tug-barge or ship will remain within defined sea lanes;
- Tug-barge or ship will be double hulled;
- Tug-barge operations will proceed when there is good visibility from the anchor point of the ships to the spud barge at Itivia and/or adjust their speed according to the conditions;
- Traffic through the access passage will be coordinated to avoid conflicts and ensure safety. Communication between tugs will coordinate movement through the access passage;
- AEM will provide emergency response equipment and materials as outlined in the OPEP for use by the tug or ship in dealing with spills;
- Crews will follow standard operating procedures and adherence to these will be monitored; and
- Tug-barge or ship crews are to be trained for responses to hazards that can normally be expected in northern waters.

[20] One hazard that can be reduced is shipping when ice is present. AEM has opted to only ship during the ice-free season thereby greatly reducing this hazard.

Appendix C outlines the methodology used in the risk analysis of the transportation routes and how various mitigation measures reduced the risk level.

SECTION 13 • SOCIO-ECONOMIC IMPACT OF SHIPPING

AEM does not believe that Project's related shipping activities will result in an increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Rankin Inlet. In most circumstances, any emergency response will be met by AEM personnel and/or the ship's crew. AEM security personnel and the Master of the ship will be responsible for security matters related to the shipping-related activities.

Shipping could impact present day socio-economic activities in Rankin Inlet. Itivia will be jointly used by the hamlet and AEM during the ice free shipping season, which will require coordination. Mitigation measures will be employed to minimize negative socio-economic effects:

- Communication between tugs will coordinate movement through the access passage to avoid conflicts and ensure safety;
- AEM will have a spud barge separate from the hamlet dock where the barges carrying the community annual sealift dock; and
- AEM will have a separate laydown and storage area from the community.

The mitigation of negative socio-economic effects in smuggling alcohol and prohibitive substances into the community were described earlier.

Positive socio-economic effects will arise from the increased number of dry cargo and fuel tankers coming to the community. The crews of these ships will in all likelihood come ashore when the boat is anchored and contribute to the local community through the:

- Use of restaurants, hotels and stores in the community;
- Purchase of local Inuit art; and
- Guided tours to the barrens for fishing and wildlife experiences.

SECTION 14 • PUBLIC AND MEDIA COMMUNICATIONS

When an environmental emergency occurs, the public will be provided timely and accurate information as to the nature of the incident, the steps being taken to correct the problem, and, if necessary, what citizens should do to protect themselves. This information is intended to protect human lives, to encourage understanding amongst the public, to ensure cooperation from all interested parties, and to reduce the spread of concern or alarm through the dissemination of inaccurate information.

Each agency involved in a major spill event may provide its own media communications, and may designate spokespersons for such; however, from the Arctic REET's (Regional Environmental Emergencies Team) perspective, a coordinated response is preferable. To that end, the government lead Agency is expected to act as the official spokesperson for the response, with support provided by personnel within the Arctic REET, as required.

Transport Canada guidelines will be followed to ensure proper authorities are informed without delay so that appropriate action may be taken when:

- Any incident occurs involving the loss, or likely loss, of dangerous goods into the marine environment; or
- Any incident occurs giving rise to pollution or threat of pollution to the marine environment; or
- Any oil pollution incident occurs involving the loading or unloading of oil to or from tanker-to-tanker and from tanker to the OHF.

REFERENCES

Transport Canada. 2007. A Guide to Canada's Ballast Water Control and Management Regulations. Guideline. TP 13617E

Transport Canada. 2009. Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants. Guideline TP 9834E.

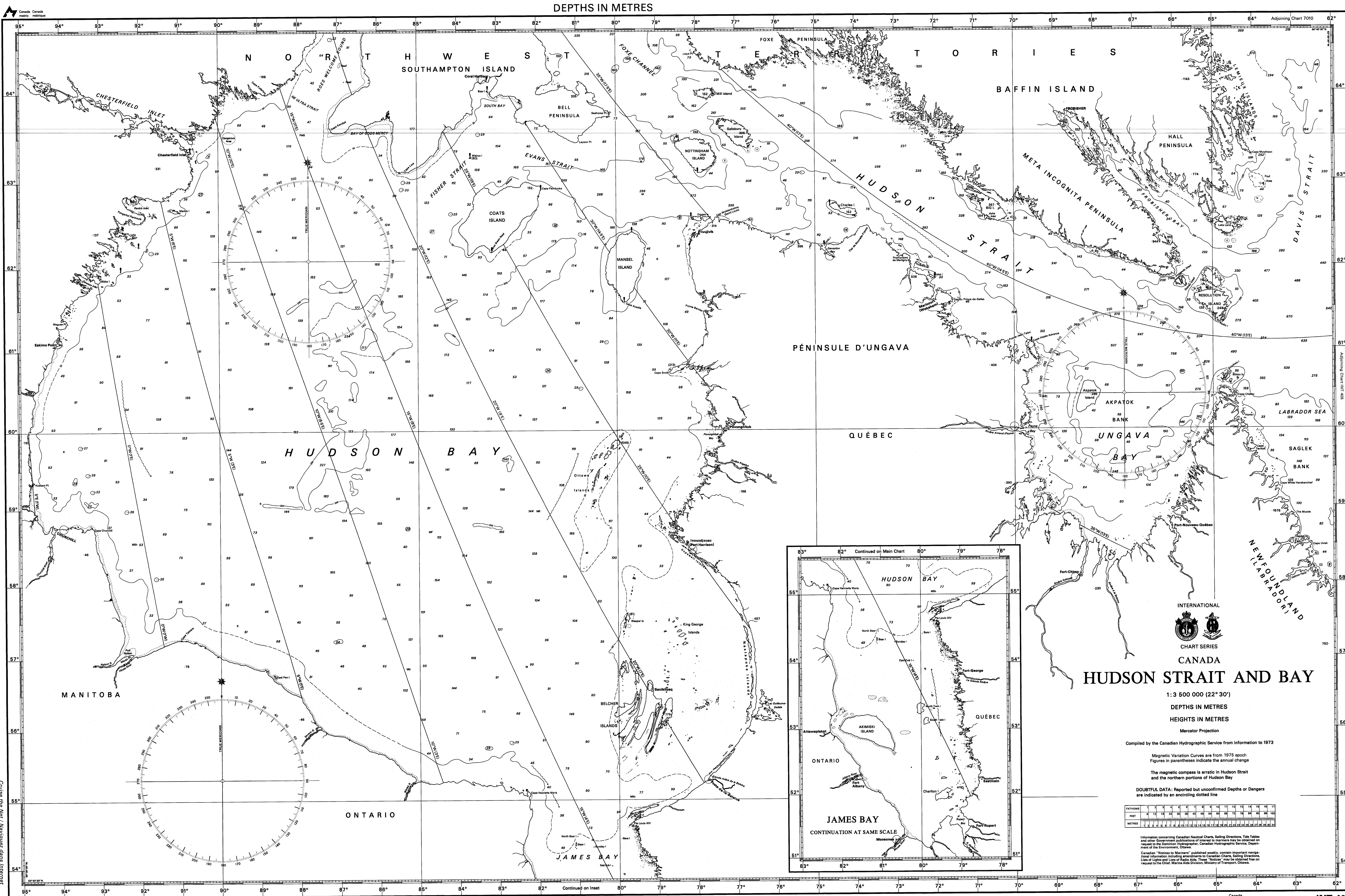
APPENDIX A • MARINE HYDROGRAPHIC CHARTS

Chart 5002 Hudson Bay and Hudson Strait

Chart 5629 Marble Island to Rankin Inlet

Chart 5628 Rankin Inlet including Melvin Bay and Prairie Bay

INT 406
5002



Cruise the Net / Naviguez dans Internet www.charts.gc.ca www.cartes.gc.ca

NEW CHART July 25 1975
Corrected to NOTICES TO MARINERS / Corrigé jusqu'à l'AVIS AUX NAVIGATEURS : *2008-02-08*
See *Notices to Mariners* for subsequent corrections / Voir *Avis aux navigateurs* pour les corrections subséquentes

Corrected Through Notices to Mariners 2012-06-29 Corrigée par le biais des Avis aux navigateurs à la date susmentionnée

WARNING

Mariners may find port hand buoys painted black or green and fairway buoys painted black and white or red and white. In both cases, either presentation is to be interpreted as having the same navigational significance. See Notice to Mariners No. 430 of 1982.

AVERTISSEMENT

Les navigateurs peuvent trouver les bouées de bâbord noires ou vertes et celles de mi-chenal noires et blanches ou rouges et blanches. Dans ces deux cas, les présentations communiquent la même signification en ce qui concerne la navigation. Voir Avis aux navigateurs No. 430 de 1982.

PUBLISHED BY THE CANADIAN HYDROGRAPHIC SERVICE
DEPARTMENT OF THE ENVIRONMENT, OTTAWA

Nautical Charts Protect Lives, Property and the Marine Environment
Les cartes marines protègent la vie, la propriété et l'environnement marin

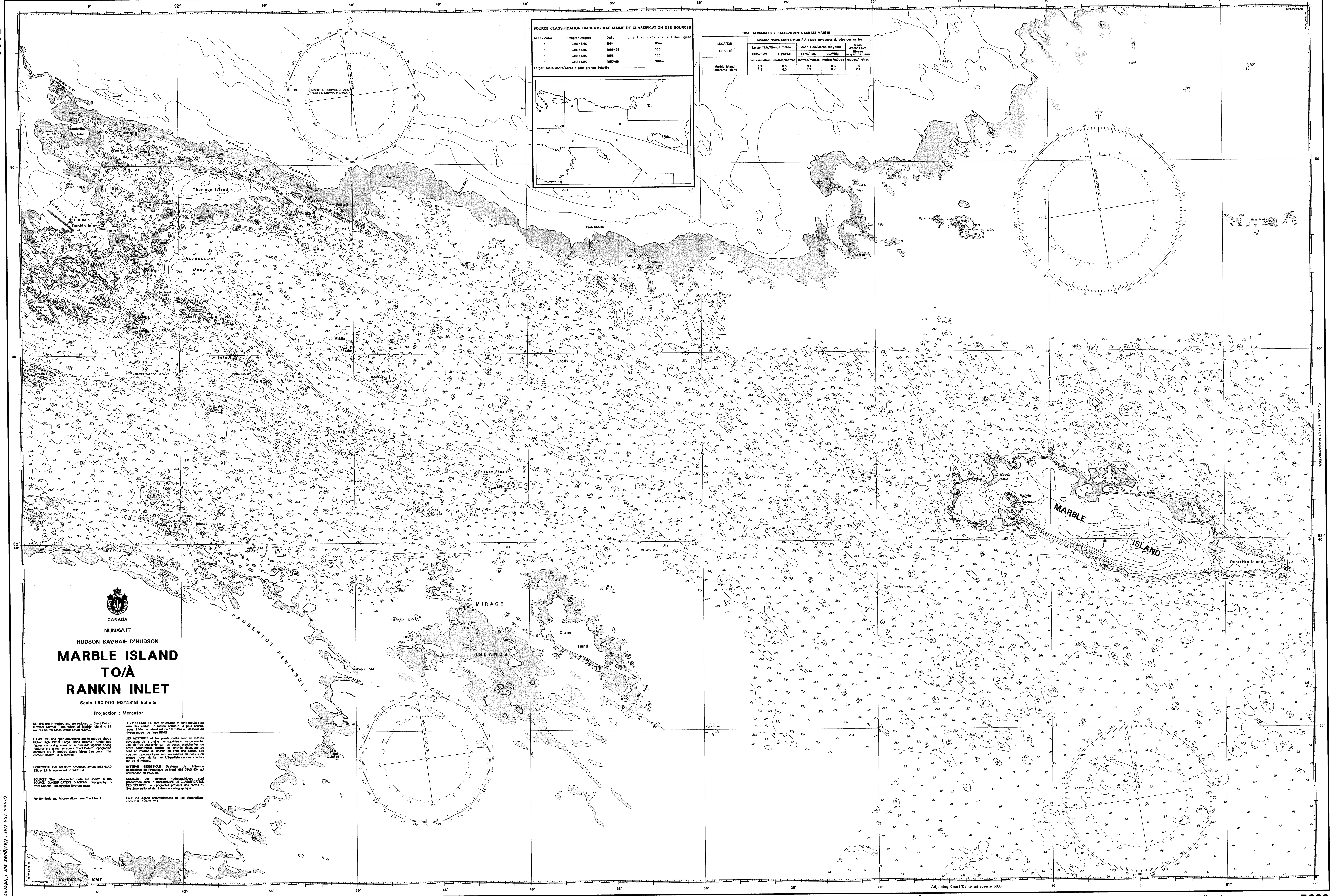
Canada
HUDSON STRAIT AND BAY

INT 406
5002

5629

Fisheries and Oceans Canada / Pêches et Océans Canada

Canada



SOURCE CLASSIFICATION DIAGRAM/DIAGRAMME DE CLASSIFICATION DES SOURCES

Area/Zone	Origin/Origine	Date	Line Spacing/Espacement des lignes
a	CHS/SHC	1954	65m
b	CHS/SHC	1995-96	100m
c	CHS/SHC	1958	180m
d	CHS/SHC	1957-98	300m

Larger-scale chart/Carte à plus grande échelle ————

TIDAL INFORMATION / RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum / Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level / Niveau moyen de l'eau
	HHW/PMS	LLW/BMI	HHW/PMS	LLW/BMI	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Marble Island	3.7	0.0	3.1	0.6	1.9
Panorama Island	4.6	0.0	3.9	0.7	2.4

CANADA

NUNAVUT

HUDSON BAY/BAIE D'HUDSON

MARBLE ISLAND TO/À RANKIN INLET

Scale 1:60 000 (62°48'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Chart Datum (Lowest Normal Tide), which at Marble Island is 1.9 metres below Mean Water Level (MWL).

ELEVATIONS and spot elevations are in metres above Higher High Water Large Tides (HHWLT). Underlined figures on drying areas or in brackets against drying features are in metres above Chart Datum. Topographic contours are in metres above Mean Sea Level. The contour interval is 15 metres.

HORIZONTAL DATUM: North American Datum 1983 (NAD 83), which is equivalent to WGS 84.

SOURCES: The hydrographic data are shown in the SOURCE CLASSIFICATION DIAGRAM. Topography is from National Topographic System maps.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites au zéro des cartes (la marée normale la plus basse), lequel à Marble Island est de 1.9 mètre au-dessous du niveau moyen de l'eau (NME).

LES ALTITUDES et les points cotés sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les zones asséchantes ou entre parenthèses contre les entités découvrantes sont en mètres au-dessus du zéro des cartes. Les courbes topographiques sont en mètres au-dessus du niveau moyen de la mer. L'équidistance des courbes est de 15 mètres.

SYSTÈME GÉODÉSIQUE : Système de référence géodésique de l'Amérique du Nord 1983 (NAD 83), qui correspond au WGS 84.

SOURCES : Les données hydrographiques sont présentées dans le DIAGRAMME DE CLASSIFICATION DES SOURCES. La topographie provient des cartes du Système national de référence cartographique.

Pour les signes conventionnels et les abréviations, consulter la carte nº 1.

NEW CHART / CARTE NOUVELLE OCT 27 2000
NOTICES TO MARINERS / AVIS AUX NAVIGATEURS 2004-06-18

METRES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	MÈTRES
FEET	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102															PIEDS
FATHOMS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17															BRASSES

PUBLISHED BY THE CANADIAN HYDROGRAPHIC SERVICE
PUBLIÉE PAR LE SERVICE HYDROGRAPHIQUE DU CANADA

Nautical Charts Protect Lives, Property and the Marine Environment
Les cartes marines protègent la vie, la propriété et l'environnement marin

METRIC/MÉTRIQUE

Fisheries and Oceans Canada / Pêches et Océans Canada

Canada

5628

Northwest Territories/Territoires du Nord-Ouest
Hudson Bay/Baie d'Hudson
RANKIN INLET
INCLUDING/Y COMPRIS MELVIN BAY AND/ET PRAIRIE BAY

CANADA

NORTHWEST TERRITORIES

TERRITOIRES DU NORD-OUEST

HUDSON BAY/BAIE D'HUDSON

RANKIN INLET

INCLUDING/Y COMPRIS MELVIN BAY AND/ET PRAIRIE BAY

Scale 1:15 000 (62°48'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Chart Datum (Lowest Normal Tide), which at Panorama Island is 2.4 metres below Mean Water Level (MWL).

ELEVATIONS, spot elevations and clearances are in metres above Higher High Water, Large Tide, which at Panorama Island is 4.6 metres above Chart Datum. Underlined figures on drying areas or in brackets against drying features are in metres above Chart Datum.

HORIZONTAL DATUM North American Datum 1983 (NAD 83). Positions taken from GPS may be plotted on this chart without datum adjustment. Positions on NAD 27 must be moved 1.08 seconds northward and 0.07 seconds eastward to agree with this chart.

SOURCES : Surveyed by the Canadian Hydrographic Service, 1954-1996.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites au zéro des cartes (la marée normale la plus basse), lequel à Panorama Island est de 2.4 mètres au-dessous du niveau moyen de l'eau (NME).

LES ALTITUDES, les points cotés et les hauteurs libres sont en mètres au-dessus de la pleine mer supérieure, grande marée, lequel à Panorama Island est de 4.6 mètres au-dessus du zéro des cartes. Les chiffres soulignés sur les zones asséchantes ou entre parenthèses contre les entités découvrantes sont en mètres au-dessus du zéro des cartes.

SYSTÈME GÉODÉSIQUE : Système de référence géodésique de l'Amérique du Nord 1983 (NAD 83). Les positions provenant du GPS peuvent être reportées sur cette carte sans compensation du système géodésique. Les positions basées sur NAD 27 doivent être corrigées de 1.08 seconde vers le nord et de 0.07 seconde vers l'est pour être en accord avec cette carte.

SOURCES : Levé par le Service hydrographique du Canada, 1954-1996.

Pour les signes conventionnels et les abréviations, consulter la carte n° 1.

TIDAL INFORMATION / RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum / Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level / Niveau moyen de l'eau
	HHW/PMS	LLW/BMI	HHW/PMS	LLW/BMI	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Panorama Island	4.6	0.0	3.9	0.7	2.4

Nautical Miles (62°48'N) Milles marins

Metres (62°48'N) Mètres

PRAIRIE BAY

THOMSON PASSAGE

THOMSON ISLAND

Righthand Islet

Swan Island

Mittik Island

Bunting Island

JOHNSTON COVE

Bn Prim

Bn Sec

Floodlight / Lampe d'éclairage

RANKIN INLET

MELVIN BAY

FIST POINT

KUDLULIK PENINSULA

SURVEY POINT

PANORAMA ISLAND

TUDLIK PENINSULA

ACCESS PASSAGE

BUFF ISLAND

Theron Island

Cur Island

Kresik Island

HORSESHOE DEEP

Bell Island

MAGNETIC COMPASS ERRATIC / COMPAS MAGNÉTIQUE INSTABLE

007°W 1997 (12'W)

GUILLEMOT BANK

GUILLEMOT ROCKS

Guillemot Island

Aukpa Island

Slab Island

KANGO ISLAND

Hump Island

Hitloch Islet

Sickle Islet

Nest Islet

SEPARATION SHOALS

Big Pod Rock

Little Pod Rock

Tiny Rk

Smooth Island

Adjoining Chart / Carte adjacente 5629

Cruise the Net / Naviguez sur l'Internet
www.chs-shc.dfo-mpo.gc.ca

5628

NEW CHART/CARTE NOUVELLE AUG./AOÛT 8 1997
Corrected to NOTICES TO MARINERS / Corrigé jusqu'à l'AVIS AUX NAVIGATEURS : *2008-04-11*
See *Notices to Mariners* for subsequent corrections / Voir *Avis aux navigateurs* pour les corrections subséquentes

METRES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	METRES
FEET	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	PIEDS																	
FATHOMS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	BRASSES																	

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PUBLIÉE PAR LE SERVICE HYDROGRAPHIQUE DU CANADA

Nautical Charts Protect Lives, Property and the Marine Environment
Les cartes marines protègent la vie, la propriété et l'environnement marin

METRIC/MÉTRIQUE

APPENDIX B • DATA SHEET FOR MONITORING MARINE WILDLIFE

OBJECTIVE

The objective is to collect observations of marine wildlife to determine if they (particularly seals, walruses, and whales) are distributed by vessels.

Bridge Deck Procedures

Data on marine wildlife data will be collected by the ship's crew should wildlife be seen during the vessel's journey.

Observations of wildlife will be recorded using the following data sheet.

Date and Time of Sighting	Vessel Travel Direction and Speed	Weather / Sea State	Re-Sighting (Y or N)	Sighting Waypoint (Garmin GPS)	Species, Number of Individuals, and Certainty of Identification	Distance to Marine Mammal (metres)	Bearing from Bow (Clockface)	Animal Activity and Mitigation Required	Photo Number (if any)

Species	How Animal Was Spotted	Certainty of ID	Animal Activity
Narwhal Whale	By Eye	Definite	Slow Swimming
Beluga Whale	Reticle Binoculars	Probable	Medium Swimming
Bowhead Whale	Big-eye Binoculars	Possible	Fast Swimming
Atlantic Walrus			Blow
Bearded Seal			Looking - Seals
Ringed Seal			Feeding
Harbour Seal			Flipper Slapping
Hooded Seal			Surfacing
Harp Seal			Resting
Polar Bear			Diving
Killer Whale			Diving (Fluke Visible)
			Splashing
			Surfacing
			Fluking
			Lobtailing
			Bowriding
			Wake Riding
			Porpoising
			Spyhopping
			Breaching
			Acrobatic
			Startle Response
			Milling
			Unknown

APPENDIX C • RISK ANALYSIS OF MARINE TRANSPORTATION ROUTES

The approach used for the risk assessment draws on that of Areva for the Kiggavik Project[21].

A hazard is a condition with the potential to cause personal injury or death, property damage, environmental harm, or loss of service. Hazard severity along shipping and tug-barge routes can range from catastrophic resulting in fatalities and/or loss of the ship to minor where the incident does not significantly reduce ship safety and where mitigation measures are well within the crew's capabilities. A complete range of hazard severity is presented below in Table C-1.

Table C-1 Hazard Severity for Ship and Tug with Barge Routes

Hazard Severity and Rating Value	Definition
Catastrophic (Value 4)	Results in multiple fatalities and/or loss of the ship, tug or barge.
Hazardous (Value 3)	Reduces the capability of the ship or its operator's ability to cope with adverse conditions to the extent that there would be: • Large reduction in safety margin or functional capability; • Crew physical distress/excessive workload such that operators cannot be relied upon to perform required tasks accurately or completely; • Serious injuries to a small number of the crew; and • Possible fatality of one or more of the crew.
Major (Value 2)	Reduces the capability of the ship or its operators to cope with adverse operating conditions to the extent that there would be: • Significant reduction in safety margin or functional capability; • Significant increase in operator workload; • Conditions impairing operator efficiency or creating significant discomfort; • Physical distress to crew, including injuries; and • Major environmental damage, and/or major property damage.
Minor (Value 1)	Does not significantly reduce ship safety. Actions required by operators are well within their capabilities. Include: • Slight reduction in safety margin or functional capabilities; • Slight increase in workload such as routine ship navigation plan changes; • Some physical discomfort to the crew; and • Minor occupational illness and/or minor environmental damage, and/or minor property damage.

Likelihood ranges from probable where the incident is anticipated to occur one or more times in shipping and barge movements over the life of the Project, to extremely improbable where it is not anticipated to occur during the entire life-of-mine for the Project to any of the ships, tugs and barges contracted to AEM. Table C-2 provides a complete range of likelihoods.

[21] Areva. 2011. Kiggavik Project, Environmental Impact Statement, Marine Transportation, Tier 3 Technical Appendix 2J.

Table C-2 Likelihood of Mishap along Ship and Tug-Barge Routes

Likelihood and Rating Value	Definition
Probable (Value 4)	Qualitative: Anticipated to occur one or more times in ship or tug-barge operations over the life of the Project. Quantitative: Probability of occurrence per operational hour is greater than $1x10^{-5}$.
Remote (Value 3)	Qualitative: Unlikely to occur to each ship or tug-barge during its contract with the mine. May occur several times in the life of all ships and tankers for the life of the Project. Quantitative: Probability of occurrence per operational hour is less than $1x10^{-5}$ but greater than $1x10^{-7}$.
Extremely Remote (Value 2)	Qualitative: Not anticipated to occur to each ship or tug-barge while it is contracted by AEM during the life of the Project. May occur a few times in the life-of-mine to the ships and tankers contracted to AEM. Quantitative: Probability of occurrence per operational hour is less than $1x10^{-7}$ but greater than $1x10^{-9}$.
Extremely Improbable (Value 1)	Qualitative: So unlikely that it is not anticipated to occur during the entire life-of-mine for the Project to any of the ships and tankers contracted to AEM. Quantitative: Probability of occurrence per operational hour is less than $1x10^{-9}$.

The hazard severity value is multiplied by the likelihood value to determine the risk level. Table C-3 outlines the risk levels outcomes, which range from negligible to catastrophic.

Table C-3 Risk Levels

Severity and Value		Likelihood			
		Extremely Improbable	Extremely Remote	Remote	Probable
		1	2	3	4
Minor	1	1	2	3	4
Major	2	2	4	6	8
Hazardous	3	3	6	9	12
Catastrophic	4	4	8	12	16

Risk Levels 1-2 represent a negligible to low level of hazard to shipping. It does not significantly reduce the safety of the ship or tug-barge. Actions required by the ship's or tug's crew are well within their capabilities to avoid harm to the vessel, the crew and the environment.

Risk Levels 3-4 represent low to major risk. There is a significant reduction in the safety margin or functional capability of the ship or tug-barge. A great effort on the part of the crew will be required to avoid damage to the ship, major environmental effects and/or injuries to the crew.

Risk Levels 6-9 represent major to hazardous risk. The ship's or tug-barge's crew will have difficulty in coping with the adverse conditions to the extent the ship or tug barge will have a large reduction in its safety margin or functional capability, which could lead to serious injury to the crew and possible environmental harm.

Risk Levels 12-16 represent hazardous to catastrophic risk and is to be avoided. There could be fatalities, loss of the vessel, and/or major environmental harm.

Table C-4 Preliminary Risk Analysis of Tug-Barge and Ship Marine Routes

Preliminary Risk Analysis of Tug-Barge and Ship Marine Routes							
Hazard	Before Controls			Mitigation Measures	After Mitigation		
	Severity	Likelihood	Risk Level		Severity	Likelihood	Residual Risk
Tug-barge or ship runs aground	3	3	9	• Use electronic navigation aids; • Remain in shipping lanes; • Buoys within the near-shore islands; • Monitor adherence to standard operating procedures; and • One way traffic only in the access passage to Melvin Bay and Itivia harbour.	3	2	6
Loss of or damage to sea cans in heavy seas	2	3	6	• Lock sea cans to the deck; • Use appropriate stacking height for voyage; and • Slow tug tow speed in heavy seas.	2	2	4
Tug-barge or ship has mechanical failure	2	3	6	• Regular preventative maintenance schedule; • Maintain an inventory of critical parts on board; and • Have redundant critical systems.	2	2	4
Barge tow line breaks	2	3	6	• Have redundant tow line for safety purposes; and • Slow tow speed in heavy seas.	2	2	4
Collision or grounding of tugs between mooring location of large ships and Itivia harbour	3	4	12	• One way traffic only in the access passage to Melvin Bay and Itivia harbour; • Install Automatic Identification System on all tugs; and • Tugs proceed at a slower speed during low visibility periods.	3	2	6
Tug-barge or ship collides with a small boat from Rankin Inlet	2	3	9	• Education of public on use of shipping lanes; • Make public aware of incoming ships and tug-barge traffic in Melvin Bay; • Tugs-barge and ships proceed at a slow speed in periods of low visibility; and • Tug-barge and ships use horn in periods of heavy fog.	2	2	4
Tug-barge or ship sinks upon hitting ice	4	3	12	• Shipping is scheduled for open water; • Sail around ice; and • Slow vessel speed to avoid damage.	3	2	6