Appendices 5 through 14

Appendix 5:

Threshold Table

VEC - Key Indicator	Measurable Parameter for Determining Magnitude of Effect	Threshold for Magnitude of Effect		Precedent
		Level Set	Basis for Level Set	
Sea Ice - Landfast Ice	Surface Area - described as a percentage of LSA landfast ice per season	10%	A habitat disruption of 10% or less represents a low magnitude effect	Voisey's Bay Mine/Mill EIS (1997) describes a major residual effect on ice as one where vessel operations through fast ice are judged to alter the regional timing of freeze-up or break-up or the location of the fast ice edge such that the disturbance to the regional ice regime fall outside of the normal year-to-year variability in natural conditions. In the Canadian Coast Guard's (CCG) environmental evaluation of the Polar 8 Icebreaker (1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment (e.g. fast ice habitat). It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. While there are not many EA's that need to include landfast ice VEC, the magnitude of effect thresholds for other physical VECs (e.g. air or water quality) include: >25% (Long Harbour EIS, 2008), >25% (Lower Churchill EIS, 2008), as examples.
Water and Sediment Quality	Arsenic Cadmium Chromium Copper Lead Mercury Zinc Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(a)pyrene Chrysene Dibenzo(a,h)anthracene Fluoranthene Fluorene Naphthalene Phenanthrene Pyrene	Exceedance of Canadian Council of Ministers of the Environment Protection of Marine Aquatic Life Guidelines (CCME-PMAL) Values for CCME-PMAL guidelines can be found in Volume 8, Table 8-3.8	Regulatory Guidelines Canadian Council of Ministers of the Environment Protection of Marine Aquatic Life (CCME-PMAL) Includes Canadian Council of Ministers of the Environment Interim Sediment Quality Guidelines (CCME ISQG) and Canadian Council of Ministers of the Environment Probably Effects Levels (CCME-PEL)	Part of Canadian Council of Ministers of the Environment (CCME) revised and integrated Canadian Environmental Quality Guidelines. These guidelines are widely accepted across Canada. The Canadian Environmental Quality Guidelines are also widely respected outside of Canada - United Nations Environment Program and the World Health Organization have distributed them around the world.
Marine Fish Habitat	Productive Capacity - The maximum natural capability of habitats to produce healthy fish, safe for human consumption, or to support or produce aquatic organisms upon which fish depend. (Policy for the Management of Fish Habitat, DFO)	10%	A habitat disruption of 10% or less represents a low magnitude effect	Wolfden High Lake EIS (2006, active NIRB review) uses a threshold value of >10% for fish species population or habitat for its high magnitude. Long Harbour EIS (2006) uses a threshold value of >25% for its high magnitude. Lower Churchill EIS (2009) uses a threshold value of >25% for its high magnitude. Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold value of >10% for its high magnitude. In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment or size of a resource harvest. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies.. These values in other EAs are in line with the values used by Baffinland
Marine Habitat and Biota-Arctic Char	Arctic Char Health and Condition represented by water quality changes relative to CCME-PAL guidelines	1-10 times	Regulatory Guidelines Canadian Council of Ministers of the Environment Protection of Aquatic Life (CCME-PAL) Water quality change within 1-10 times the CCME PAL guidelines is considered a low magnitude of effect	Guidelines are widely accepted across Canada. Ecological factors and professional judgment will be used to determine exact magnitude of effect changes in water quality will have on Arctic Char. As well Wolfden High Lake EIS (2006, active NIRB review) has used a similar set of thresholds for its freshwater component (threshold value of >10% for high magnitude) and Doris North Gold Mine (2004, NIRB approved) uses a threshold value of >10% for high magnitude).

Ringed Seal	Habitat: Decrease in suitable pupping habitat in as a percentage of landfast ice area in the LSA per year	10%	A habitat disruption of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including decreases in habitat, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including loss of habitat. Wolfden High Lake EIS (2006, active NIRB review) uses a >30% decrease in air holes used by ringed seals near the dock site. Wolfden High Lake EIS also uses a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Disturbance by airborne and/or underwater noise: Change in occupancy of an area that has been identified as important for feeding, nursing, breeding, and hauling out as a percentage of ringed seals in the RSA per year	10%	A strong avoidance reaction and abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. Wolfden High Lake EIS (2006, active NIRB review) uses a >30% decrease in air holes used by ringed seals near the dock site. Wolfden High Lake EIS also uses a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Hearing Impairment: In water, pulsed sound: Ringed Seals exposed as a percentage present in the LSA per year to sound levels from blasting exceeding 180-190 dB re 1 uPa (rms) in water In water, "continuous" sound: Ringed Seals exposed as a percentage present in the LSA per year to sound levels from shipping, vibratory pile driving, or dredging where the sensation level exceeds 100 dB re 1 µPa	10%	10% or less exposed to these sounds represent a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including noise and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including noise. Wolfden High Lake EIS (2006, active NIRB review) discusses the effects of noise on marine mammals but it does not contain a threshold for any effects. While Labrador Island Transmission Link EIS does not have specific threshold values for marine mammals, it uses a threshold level of >25% for high magnitude for a caribou which includes effects of noise. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Mortality: increase above natural mortality per annum in Steensby Inlet (including pups)	1%	An increase in natural mortality of 1% or less represents a low magnitude effect and is not anticipated to impact ringed seal population within Steensby Inlet.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for marine mammals, Long Harbour EIS (2008) uses a threshold level of >25% for marine mammals. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna) While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year . In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Habitat: a) decrease in suitable overwintering habitat as a percentage of area in Hudson Strait and Foxe Basin b) decrease in suitable feeding and haul-out habitat as a percentage of area in Steensby Inlet	10%	A habitat disruption of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different parameters (including disturbances)for various VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was >10% change in carrying capacity of the environment (e.g. fast ice habitat). It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.

Walrus	Disturbance by airborne, underwater noise and/or wave height generated by an ore carrier: change in occupancy of areas identified as important feeding, nursing, breeding or haul-out habitat as a percentage of walrus in the RSA per year	10%	A strong disturbance and avoidance reaction that lead to (seasonal) abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different parameters (including disturbances)for various VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Hearing Impairment: In water, pulsed sound: Walrus exposed as a percentage present in the LSA per year to sound levels from blasting exceeding 180-190 dB re 1 uPa (rms) in water. In water, "continuous" sound: Walrus exposed as a percentage present in the LSA to sound levels from shipping, vibratory pile driving, or dredging where the sensation level exceeds 100 dB re 1 µPa	10%	10% or less exposed to these sound levels represent a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including noise and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including noise. Wolfden High Lake EIS (2006, active NIRB review) discusses the effects of noise on marine mammals but it does not contain a threshold for any effects. While Labrador Island Transmission Link EIS does not have specific threshold values for marine mammals, it uses a threshold level of >25% for high magnitude for a caribou which includes effects of noise. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Mortality: increase above natural mortality per annum in the LSA	Any project-caused mortality	No significant walrus/vessel and walrus/aircraft interaction are anticipated to occur therefore any increase above natural mortality would be a significant effect.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including mortality. Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including mortality. While the Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, when discussing caribou mortality it describes a threshold where it is "Predicted to have a measurable change in Caribou populations relative to baseline conditions that does cause management concern". Lower Churchill EIS uses the number of fatalities as a proportion to the population for all terrestrial VECs for mortality. While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year . In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
Beluga	Habitat: a) decrease in suitable overwintering habitat as a percentage of area in Hudson Strait per year b) decrease in suitable summering habitat as a percentage of area in Milne and Steensby Inlets per year	10%	A habitat disruption of 10% or less represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for marine mammals, Long Harbour EIS (2008) uses a threshold level of >25% for marine mammals, Wolfden High Lake EIS (2006, active NIRB review) uses a >50% increase in avoidance reactions by beluga. Wolfden High Lake EIS also uses a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Disturbance by pulsed or continuous underwater noise: change in occupancy of areas identified as important feeding, nursing, calving, breeding, wintering and summering habitat as a percentage of belugas in the RSA per year	10%	A strong disturbance and avoidance reaction that lead to (seasonal) abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. Wolfden High Lake EIS (2006, active NIRB review) discusses the effects of noise on marine mammals but it does not contain a threshold for any effects however it does use a >50% increase in avoidance reactions by beluga. Wolfden High Lake EIS also uses a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Hearing Impairment: In water, "continuous" sound: Beluga exposed as a percentage of population in the LSA per year to sound levels from shipping, vibratory pile driving, or dredging where the received levels exceeds 175 dB re 1 µPa over a duration of 100s	10%	Less than 10% exposed to continuous sound levels represent a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for marine mammals, Long Harbour EIS (2008) uses a threshold level of >25% for marine mammals, Wolfden High Lake EIS (2006, active NIRB review) uses a >50% increase in avoidance reactions by beluga. Wolfden High Lake EIS also uses a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.

	Mortality: increase above natural mortality per annum in the LSA	Any project-caused mortality	No significant beluga/vessel interaction is anticipated to occur therefore any increase above natural mortality would be a significant effect.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including mortality. Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including mortality. While the Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, when discussing caribou mortality it describes a threshold where it is "Predicted to have a measurable change in Caribou populations relative to baseline conditions that does cause management concern". Lower Churchill EIS uses the number of fatalities as a proportion to the population for all terrestrial VECs for mortality. While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year. In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
Narwhal	Habitat: a) decrease in suitable wintering habitat as a percentage of area in Hudson Strait per year b) decrease in suitable summering habitat as a percentage of area in Milne and Steensby Inlets per year	10%	A habitat disruption of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including decreases in habitat, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including loss of habitat. Wolfden High Lake EIS (2006, active NIRB review) did evaluate disturbance of marine mammals however it did not include narwhal. Wolfden High Lake EIS does use a threshold a >50% increase in avoidance reactions by beluga as well as a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different parameters (including disturbances)for various VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Disturbance caused by pulsed or continuous underwater noise: change in occupancy of areas identified as important feeding, nursing, calving, breeding, wintering and summering habitat as a percentage of narwhals in the RSA per year	10%	A strong disturbance and avoidance reaction that lead to (seasonal) abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. Wolfden High Lake EIS (2006, active NIRB review) did evaluate noise effects on marine mammals however it did not include narwhal. Wolfden High Lake EIS does use a threshold a >50% increase in avoidance reactions by beluga as well as a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different parameters (including disturbances)for various VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Hearing Impairment: In water, "continuous" sound: Narwhals exposed as a percentage of the population in the LSA per year to sound levels from shipping, vibratory pile driving, or dredging where the sensation level exceeds 175 dB re 1 µPa over a duration of 100s	10%	10% or less exposed to continuous sound levels represent a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including noise and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including noise. Wolfden High Lake EIS (2006, active NIRB review) did evaluate noise effects on marine mammals however it did not include narwhal. Wolfden High Lake EIS does use a threshold a >50% increase in avoidance reactions by beluga. While Labrador Island Transmission Link EIS does not have specific threshold values for marine mammals, it uses a threshold level of >25% for high magnitude for a caribou which includes effects of noise. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Mortality: increase above natural mortality per annum in the LSA	Any project-caused mortality	No significant narwhal/vessel interaction is anticipated to occur therefore any increase above natural mortality would be a significant effect.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including mortality. Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including mortality. While the Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, when discussing caribou mortality it describes a threshold where it is "Predicted to have a measurable change in Caribou populations relative to baseline conditions that does cause management concern". Lower Churchill EIS uses the number of fatalities as a proportion to the population for all terrestrial VECs for mortality. While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year. In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.

Bowhead	Habitat: a) decrease in suitable overwintering habitat as a percentage of area in Hudson Strait per year b) decrease in suitable summering habitat as a percentage of area in Milne and Steensby Inlets per year	10%	A habitat disruption of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including decreases in habitat, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including loss of habitat. Wolfden High Lake EIS (2006, active NIRB review) did evaluate disturbance of marine mammals however it did not include bowhead. Wolfden High Lake EIS does use a threshold a >50% increase in avoidance reactions by beluga as well as a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Disturbance: change in occupancy of areas identified as important feeding, nursing, calving, breeding, wintering and summering habitat as a percentage of bowhead whales in the RSA per year	10%	A strong disturbance and avoidance reaction that lead to (seasonal) abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. Wolfden High Lake EIS (2006, active NIRB review) did evaluate noise effects on marine mammals however it did not include bowhead. Wolfden High Lake EIS does use a threshold a >50% increase in avoidance reactions by beluga as well as a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Hearing Impairment: In water, pulsed sound: Bowhead exposed as a percentage of the population in the LSA per year to sound levels from blasting exceeding 180 dB re 1 uPa (rms) in any single event per year In water, "continuous" sound: Bowhead exposed as a percentage of the population in the LSA per year to sound levels from shipping, vibratory pile driving, or dredging where the sensation level exceeds 175 dB re 1 µPa over a duration of 100s	10%	Pulse sound: any single event where a bowhead whale enters the safety zone during blasting. Continuous sound: Less than 10% exposed to continuous sound levels represent a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including noise and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including noise. Wolfden High Lake EIS (2006, active NIRB review) did evaluate noise effects on marine mammals however it did not include bowhead. Wolfden High Lake EIS does use a threshold a >50% increase in avoidance reactions by beluga . While Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, it uses a threshold level of >25% for high magnitude for a caribou which includes effects of noise. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Mortality: increase above natural mortality per annum in the LSA	Any project-caused mortality	No significant bowhead/vessel interaction is anticipated to occur therefore any increase above natural mortality would be a significant effect.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including mortality. Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including mortality. While the Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, when discussing caribou mortality it describes a threshold where it is "Predicted to have a measurable change in Caribou populations relative to baseline conditions that does cause management concern". Lower Churchill EIS uses the number of fatalities as a proportion to the population for all terrestrial VECs for mortality. While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year. In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Habitat: decrease in suitable foraging habitat as a percentage of area in Steensby Inlet and pack ice habitat in Foxe Basin and Hudson Strait per year	10%	A habitat disruption of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including decreases in habitat, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including loss of habitat. Wolfden High Lake EIS (2006, active NIRB review) uses a threshold of 10% for change in distribution or change in abundance for caribou, 20% for grizzly bears and 15% for habitat lost for all VECs. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.

Polar Bear	Disturbance caused by noise: change in occupancy of areas identified as important feeding or denning habitat as a percentage of polar bears in the RSA per year	10%	A strong disturbance and avoidance reaction that lead to (seasonal) abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for marine mammals, Long Harbour EIS (2008) uses a threshold level of >25% for marine mammals. Wolfden High Lake EIS (2006, active NIRB review) uses a threshold of 10% for change in distribution or change in abundance for caribou. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Mortality: increase above natural mortality per annum in the LSA	Any project-caused mortality	Any project-caused mortality will be deducted from the harvest quota. This ensures that polar bear mortality per year does not exceed allowable quotas for sustainable populations.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including mortality. Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including mortality. While the Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, when discussing caribou mortality it describes a threshold where it is "Predicted to have a measurable change in Caribou populations relative to baseline conditions that does cause management concern". Lower Churchill EIS uses the number of fatalities as a proportion to the population for all terrestrial VECs for mortality. While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year. In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was >10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
Bearded Seal	Habitat: a) decrease in suitable pupping habitat in as percentage of pack ice and edge of landfast ice in the LSA per year b) decrease in suitable foraging habitat as percentage of area in Steensby Inlet per year	10%	A habitat disruption of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including decreases in habitat, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including loss of habitat. Wolfden High Lake EIS (2006, active NIRB review) uses a >30% decrease in air holes used by ringed seals near the dock site. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of parameters (including loss of habitat) for various VECs (fish and fish habitat, furbearers, terrestrial mammals). In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was ≥10% change in carrying capacity of the environment. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Disturbance caused by airborne and/or underwater noise: change in occupancy of areas identified as important feeding, nursing, breeding and hauling out as a percentage of bearded seals in the RSA per year	10%	A strong disturbance and avoidance reaction that lead to (seasonal) abandonment of important habitat of less than 10% represents a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including disturbances, and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including disturbances. Wolfden High Lake EIS (2006, active NIRB review) uses a >30% decrease in air holes used by ringed seals near the dock site. While Lower Churchill EIS (2009) and Labrador Island Transmission Link EIS do not have specific threshold values for marine mammals, they use a threshold level of >25% for high magnitude for a variety of different parameters (including disturbances) for various VECs (fish and fish habitat, furbearers, terrestrial mammals, avifauna). The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.
	Hearing Impairment: In water, pulsed sound: Bearded Seals exposed as a percentage present in the LSA per year to sound levels from blasting exceeding 180-190 dB re 1 uPa (rms) in water In water, "continuous" sound: Bearded Seals exposed as a percentage present in the LSA per year to sound levels from shipping, vibratory pile driving, or dredging where the sensation level exceeds 100 dB re 1 µPa	10%	10% or less exposed to these sounds represent a low magnitude effect	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including noise and the Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including noise. Wolfden High Lake EIS (2006, active NIRB review) discusses the effects of noise on marine mammals but it does not contain a threshold for any effects. While Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, it uses a threshold level of >25% for high magnitude for a caribou which includes effects of noise. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.

	Mortality: increase above natural mortality per annum in Hudson Strait and Foxe Basin (including pups)	1%	An increase in natural mortality of 1% or less represents a low magnitude effect and is not anticipated to impact bearded seal population within the in Foxe Basin and Hudson Strait.	Doris North Gold Mine EIS (2004, NIRB approved) uses a threshold level of >10% for high magnitude for all marine mammals parameters including mortality. Long Harbour EIS (2008) uses a threshold level of >25% for all marine mammals parameters including mortality. While the Labrador Island Transmission Link EIS (2012) does not have specific threshold values for marine mammals, when discussing caribou mortality it describes a threshold where it is "Predicted to have a measurable change in Caribou populations relative to baseline conditions that does cause management concern". Lower Churchill EIS uses the number of fatalities as a proportion to the population for all terrestrial VECs for mortality. While Wolfden High Lake Project EIS (2006, active NIRB review) does not have a mortality threshold for marine mammals it does have a mortality threshold of 1 caribou per year, 0.25 grizzly bear per year, and 0.5 wolverine per year. In the environmental evaluation of the Polar 8 Icebreaker (CCG, 1990) a high magnitude of effect was $\geq$10% change in size of a population. It should be noted that this study area comprised the entire Canadian arctic so that lower thresholds for magnitude of effect were more appropriate on this scale, compared to other studies. The threshold levels selected by Baffinland are in line with those stated above and are accepted as legitimate threshold levels in EAs.

CCME-ISQG = CCME INTERIM SEDIMENT QUALITY GUIDELINE

CCME-PEL = CCME PROBABLE EFFECTS LEVEL.

Appendix 6:

Methods for Measurements of Velocities at the Milne Inlet Tote Road

Methods for Measurements of Velocities at the Milne Inlet Tote Road

Water velocities at culverts and sea cans along the Milne Inlet Tote Road were measured in 2008 and 2009 with a Swoffer 2100 velocity metre. Passage velocities were collected at the upstream and downstream ends of the culverts at the cross-sectional mid-point (i.e. the deepest point). All other velocities (i.e., riffle-crest, pool, run, etc.) were collected wherever those habitats existed in the streams. Velocities were measured at 0.6 m depths. When possible, measurements were recorded in early spring (during typical high water periods) and in late summer (during typical low water periods).

Safety permitting (i.e., water depth and velocities did not present a safety hazard), velocities were measured at the inlet and outlet of culverts and sea cans at crossings in all fish-bearing streams along the road. At some crossings it was feasible to measure water velocity in the culverts while positioned on the road above to avoid dangerous in-stream conditions. Measurements in 2008 focussed primarily on large or extra-large crossings where important Arctic Char habitat was located. In 2009, velocities were recorded at all fish-bearing crossings. When multiple culverts or sea cans were present at a crossing, a subsample was often measured, focussing on structures with the slowest flows to represent the minimum available passage velocity. Concurrent with culvert velocities, several point velocities in natural upstream and downstream habitat types (riffles, pools, runs, rapids) were collected for comparison.

Mean (i.e., average) flow velocities were derived for each crossing using all data collected in 2008 and 2009. Raw water velocity data collected in 2008 and 2009 are provided in the attached Table 1.

Table 1. Velocities measured at Milne Inlet Tote Road stream crossings in Arctic Char habitat.

Culvert I.D. (KP)	Chainage (m)	UTM Coordinates			Habitat Rating	Culvert/Sea Can End [1]	Date	Velocity [2] (m/s)
		Zone	Easting	Northing				
CV-129	15+310	17W	512381	7966783	Important	O	24-Jun-08	1.93
						O	23-Jul-08	2.51
						O	2-Jul-09	1.41
						O	26-Aug-09	1.57
						I	2-Jul-09	0.75
						I	26-Aug-09	0.45
CV-128	17+117	17W	513545	7965895	Important	O	2-Jul-09	<0.50 - >1.50
						O	27-Aug-09	0.21
						O	27-Aug-09	0.59
						O	27-Aug-09	0.40
						O	27-Aug-09	1.01
						O	27-Aug-09	1.25
						O	27-Aug-09	0.98
						O	27-Aug-09	1.21
CV-115	27 + 686	17W	519222	7958135	Marginal	O	3-Jul-09	0.28
						O	27-Aug-09	0.39
						I	3-Jul-09	0.01
						I	27-Aug-09	0.20
CV-114	29+151	17W	520278	7956528	Marginal	O	3-Jul-09	0.74
						O	27-Aug-09	1.10
						I	3-Jul-09	0.54
						I	27-Aug-09	1.06
CV-112	30+947	17W	521033	7954935	Important	O	3-Jul-09	0.44
						O	27-Aug-09	1.26
						I	3-Jul-09	0.62
						I	27-Aug-09	0.54
CV-111	31+489	17W	521355	7954524	Important	O	3-Jul-09	1.33
						O	27-Aug-09	1.34
						I	3-Jul-09	0.62
						I	27-Aug-09	0.16
CV-106	32+681	17W	521663	7953392	Marginal	O	3-Jul-09	0.43
						I	3-Jul-09	0.38
CV-104	33+301	17W	521732	7952788	Marginal	O	3-Jul-09	0.10
						O	27-Aug-09	0.21
						I	3-Jul-09	0.38
						I	27-Aug-09	0.44
CV-102	35+540	17W	521934	7950591	Important	O	3-Jul-09	0.35
						O	27-Aug-09	0.52
						I	3-Jul-09	0.33
						I	27-Aug-09	0.57
CV-099	37+351	17W	521811	7948820	Important	O	24-Jun-08	1.56

Culvert I.D. (KP)	Chainage (m)	UTM Coordinates			Habitat Rating	Culvert/Sea Can End [1]	Date	Velocity [2] (m/s)
		Zone	Easting	Northing				
						O	22-Jul-08	1.89
						I	22-Jul-08	0.21
						O	3-Jul-09	0.58
						O	27-Aug-09	0.38
						O	27-Aug-09	1.74
						I	3-Jul-09	0.87
						I	27-Aug-09	0.77
						I	27-Aug-09	0.85
CV-079	50+109	17W	525562	7937276	Important	O	3-Jul-09	1.32
						O	27-Aug-09	1.05
						I	3-Jul-09	0.91
						I	27-Aug-09	0.96
CV-078	50+680	17W	525852	7936787	Important	O	1-Sep-08	0.87
						I	1-Sep-08	0.91
						O	3-Jul-09	1.19
						O	27-Aug-09	0.76
						I	3-Jul-09	0.78
						I	27-Aug-09	0.90
CV-207	50+762	17W	525652	7937138	Important	O	8-Sep-08	0.20
						I	8-Sep-08	0.55
CV-076	52+536	17W	526617	7935335	Marginal	O	3-Jul-09	0.09
						O	27-Aug-09	0.07
						I	3-Jul-09	0.13
						I	27-Aug-09	0.16
CV-072	53+830	17W	526897	7934576	Important	O	3-Jul-09	0.03
						O	27-Aug-09	Dry
						O	27-Aug-09	0.20
						I	3-Jul-09	0.38
						I	27-Aug-09	Dry
						I	27-Aug-09	0.70
CV-060	58+114	17W	527622	7930342	Important	O	3-Jul-09	0.54
						O	27-Aug-09	0.48
						I	3-Jul-09	0.46
						I	27-Aug-09	0.56
CV-059	59+217	17W	528102	7929356	Marginal	O	3-Jul-09	0.57
						O	27-Aug-09	0.38
						I	3-Jul-09	0.02
						I	27-Aug-09	0.04
CV-058	59+779	17W	528322	7928839	Marginal	O	4-Jul-09	0.19
						O	27-Aug-09	0.10
						I	4-Jul-09	0.40
						I	27-Aug-09	0.33
CV-057	59+970	17W	528379	7928657	Marginal	O	4-Jul-09	0.00
						O	27-Aug-09	0.00

Culvert I.D. (KP)	Chainage (m)	UTM Coordinates			Habitat Rating	Culvert/Sea Can End [1]	Date	Velocity [2] (m/s)
		Zone	Easting	Northing				
						I	4-Jul-09	0.69
						I	27-Aug-09	0.00
BG-50	62+054	17W	529334	7926846	Important	O	24-Jun-08	2.79
						O	23-Jul-08	1.40
						I	23-Jul-08	0.06
						O	4-Jul-09	1.82
						O	28-Aug-09	0.35
						O	28-Aug-09	0.75
						O	28-Aug-09	1.01
						O	28-Aug-09	1.83
						O	28-Aug-09	2.14
						I	4-Jul-09	0.71
						I	28-Aug-09	0.25
						I	28-Aug-09	1.38
						I	28-Aug-09	1.26
						I	28-Aug-09	0.63
						I	28-Aug-09	0.95
CV-049	62+550	17W	529677	7926542	Important	O	4-Jul-09	0.60
						O	28-Aug-09	0.39
						O	28-Aug-09	0.27
						I	4-Jul-09	1.00
						I	28-Aug-09	1.04
						I	28-Aug-09	0.47
CV-030	77+495	17W	540123	7921310	Marginal	O	4-Jul-09	1.14
						I	4-Jul-09	0.69
BG32	78+123	17W	540706	7921622	Important	O	4-Jul-09	0.02
						O	28-Aug-09	0.09
						I	4-Jul-09	0.05
						I	28-Aug-09	0.06
CV-217	79+854	17W	542219	7922158	Important	O	4-Jul-09	0.25
						O	28-Aug-09	1.11
						O	28-Aug-09	0.96
						O	28-Aug-09	1.09
						O	28-Aug-09	0.04
						O	28-Aug-09	0.14
						O	28-Aug-09	0.21
CV-216	80+951	17W	542774	7921700	Marginal	O	4-Jul-09	0.33
						O	28-Aug-09	1.06
						I	4-Jul-09	0.59
						I	28-Aug-09	0.78
BG-29	84+706	17W	546229	7919877	Marginal	O	4-Jul-09	0.68
						O	28-Aug-09	0.62
						I	4-Jul-09	0.70
						I	28-Aug-09	0.78

Culvert I.D. (KP)	Chainage (m)	UTM Coordinates			Habitat Rating	Culvert/Sea Can End [1]	Date	Velocity [2] (m/s)
		Zone	Easting	Northing				
BG-27	86+499	17W	547876	7919342	Marginal	O	4-Jul-09	1.04
						O	28-Aug-09	0.83
						I	4-Jul-09	0.75
						I	28-Aug-09	0.72
BG-24	87+588	17W	548766	7918878	Important	O	23-Jun-08	2.20
						O	23-Jul-08	2.12
						I	23-Jun-08	1.40
						O	4-Jul-09	0.67
						O	28-Aug-09	0.49
						I	4-Jul-09	0.54
						I	28-Aug-09	0.55
BG-17	90+016	17W	550703	7917643	Important	O	4-Jul-09	0.39
						O	28-Aug-09	0.70
						I	4-Jul-09	0.81
						I	28-Aug-09	0.43
BG-04	93+992	17W	553250	7915113	Important	O	4-Jul-09	0.89
						O	28-Aug-09	0.33
						O	28-Aug-09	1.26
						I	4-Jul-09	0.96
						I	28-Aug-09	0.24
						I	28-Aug-09	1.09
CV-001	94+606	17W	553782	7914922	Important	O	30-Aug-09	0.36
						I	30-Aug-09	0.00
CV-223	97+007	17W	555818	7914691	Important	O	4-Jul-09	0.24
						O	28-Aug-09	1.35
						O	28-Aug-09	0.66
						O	28-Aug-09	0.71
						O	28-Aug-09	0.57
CV-224	97+756	17W	556238	7915044	Important	O	4-Jul-09	0.31
						O	28-Aug-09	0.89
						I	4-Jul-09	1.07
						I	28-Aug-09	0.89
CV-225	98+845	17W	557407	7915138	Important	O	23-Jun-08	2.23
						O	23-Jul-08	2.85
						O	3-Jul-09	1.79
						O	28-Aug-09	1.61
						I	28-Aug-09	1.27
BG-01	99+483	17W	557991	7914919	Important	O	23-Jun-08	2.93
						O	23-Jul-08	2.67
						O	4-Jul-09	2.24
						O	28-Aug-09	2.08
						I	28-Aug-09	0.74
CV-186	102+587	17W	560705	7913498	Important	O	4-Jul-09	0.13
						O	28-Aug-09	0.55

Culvert I.D. (KP)	Chainage (m)	UTM Coordinates			Habitat Rating	Culvert/Sea Can End [1]	Date	Velocity [2] (m/s)
		Zone	Easting	Northing				
						I	4-Jul-09	0.82
						I	28-Aug-09	1.03
CV-187	102+856	17W	560957	7913414	Important	O	4-Jul-09	0.01
						O	28-Aug-09	0.03
						I	4-Jul-09	0.25
						I	28-Aug-09	0.48

[1] - O = outlet; I = inlet

[2] - multiple velocities recorded on the same day are from multiple culverts/sea cans

Appendix 7:

Arctic Cod and Blunt Gape Effects Summaries

Effects Assessment Summary: Arctic Cod Health at Milne Inlet

Potential Impacts				Residual Effect				
Project Activity	**Environmental Effect**	**Direction and Nature of Interaction**	**Mitigation Measure(s)**	**Magnitude**	**Extent**	**Frequency**	**Duration**	**Reversibility**
CONSTRUCTION PHASE								
Sediment Resuspension	- Short-term exposure to small, temporary increases in concentrations of TSS, nutrients, and metals (through dredging and infilling during construction of port infrastructure) is expected to have minimum potential to negatively affect fish health; - The redistribution of sediments near construction activities is not expected to directly affect fish health or condition	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan).	1	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Combined effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater, oiled water, and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
OPERATION PHASE								
Sediment Resuspension	- Increases in concentrations of TSS, nutrients, and metals in the water column as a result of sediment disturbance from propeller currents are expected infrequently during operation. Short-term exposure of arctic cod to these conditions has minimum potential to affect fish health. - The redistribution of sediments near the docks is not expected to directly affect fish health or condition	Negative	-	1	1	2	1	1
Discharge of ballast water	Slight reductions in nutrient concentrations and short-term, localized increases water temperature in Milne Inlet are expected to have negligible effects on fish health and condition. - Metal concentrations in water and fish tissues are not expected to change	Negligible						
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Combined effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater, oiled water, and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	2	1
DECOMMISSIONING PHASE								
Sediment Resuspension	- There is potential for slight increases in fish metal concentrations and declines in condition as a result of short-term exposure to small, temporary increases to concentrations of TSS, nutrients, and metals that are expected in the water column resulting from dismantling port infrastructure. - The redistribution of sediments near construction activities is not expected to directly affect fish health or condition	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan).	1	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Combined effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater, oiled water, and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
Discharge of ballast water	- Slight reductions in nutrient concentrations and short-term, localized increases water temperature in Milne Inlet are expected to have negligible effects on fish health and condition. - Metal concentrations in water and fish tissues are not expected to change.	Negligible	-	-	-	-	-	-

Key:
Direction and Nature of Interaction: Positive; Negligible; Negative
Magnitude: 1 (Level I) = a change that is less than threshold values; 2 (Level II) = a change that is greater than threshold values; 3 (Level III) = a change that is an order of magnitude greater than threshold values; includes consideration of environmental sensitivity
Extent: 1 (Level I) = confined to the LSA; 2 (Level II) = beyond the LSA and within the RSA; 3 (Level III) = beyond the RSA
Frequency: 1 (Level I) = infrequent (rarely occurring); 2 (Level II) = frequent (intermittently occurring); 3 (Level III) = continuous
Duration: 1 (Level I) = short-term; 2 (Level II) = medium-term; 3 (Level III) = long-term (beyond the life of the project) or permanent
Reversibility: 1 (Level I) = fully reversible after activity is complete; 2 (Level II) = partially reversible after activity is complete; 3 (Level III) = non-reversible after the activity is complete

NOTE(S):
1. CRITERIA RATINGS WERE NOT APPLIED TO ACTIVITIES WHERE NO ENVIRONMENTAL EFFECTS WERE EXPECTED (I.E., A NEUTRAL INTERACTION).

Effects Assessment Summary: Arctic Cod Health at Steensby Inlet

Potential Impacts				Residual Effect				
Project Activity	**Environmental Effect**	**Direction and Nature of Interaction**	**Mitigation Measure(s)**	**Magnitude**	**Extent**	**Frequency**	**Duration**	**Reversibility**
CONSTRUCTION PHASE								
Sediment Resuspension	- Short-term exposure to small, temporary increases in concentrations of TSS, nutrients, and metals (through dredging and infilling during construction of port infrastructure) is expected to have minimum potential to negatively affect fish health; - The redistribution of sediments near construction activities is not expected to directly affect fish health or condition	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan).	1	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
OPERATION PHASE								
Sediment Resuspension	- Increases in concentrations of TSS, nutrients, and metals in the water column as a result of sediment disturbance from propeller currents are expected in the early years of operation. Short-term exposure of arctic cod to these conditions has minimum potential to affect fish health. - The redistribution of sediments near the docks is not expected to directly affect fish health or condition	Negative	-	1	1	2	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	2	1
Discharge of ballast water	- Slight reductions in nutrient concentrations and localized increases in salinity during open water conditions in Steensby Inlet are expected to have negligible effects on fish health and condition. - Metal concentrations in water and fish tissues are not expected to change.	Negligible	-	-	-	-	-	-
Fugitive ore dust deposition	- Increases in metal concentrations in fish tissues and reductions in fish health and condition as a result of increased metals (primarily iron) in the water and sediment.	Negative	-	2	1	3	2	1
DECOMMISSIONING PHASE								
Sediment Resuspension	- There is potential for slight increases in fish metal concentrations and declines in condition as a result of short-term exposure to small, temporary increases to concentrations of TSS, nutrients, and metals that are expected in the water column resulting from dismantling port infrastructure. - The redistribution of sediments near construction activities is not expected to directly affect fish health or condition	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan).	1	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
Discharge of ballast water	- Slight reductions in nutrient concentrations and localized increases in salinity during open water conditions in Steensby Inlet are expected to have negligible effects on fish health and condition. - Metal concentrations in water and fish tissues are not expected to change.	Negligible	-	-	-	-	-	-

Key:
Direction and Nature of Interaction: Positive; Negligible; Negative
Magnitude: 1 (Level I) = a change that is less than threshold values; 2 (Level II) = a change that is greater than threshold values; 3 (Level III) = a change that is an order of magnitude greater than threshold values; includes consideration of environmental sensitivity
Extent: 1 (Level I) = confined to the LSA; 2 (Level II) = beyond the LSA and within the RSA; 3 (Level III) = beyond the RSA
Frequency: 1 (Level I) = infrequent (rarely occurring); 2 (Level II) = frequent (intermittently occurring); 3 (Level III) = continuous
Duration: 1 (Level I) = short-term; 2 (Level II) = medium-term; 3 (Level III) = long-term (beyond the life of the project) or permanent
Reversibility: 1 (Level I) = fully reversible after activity is complete; 2 (Level II) = partially reversible after activity is complete; 3 (Level III) = non-reversible after the activity is complete

NOTES:
1. CRITERIA RATINGS WERE NOT APPLIED TO ACTIVITIES WHERE NO ENVIRONMENTAL EFFECTS WERE EXPECTED (I.E., A NEUTRAL INTERACTION)

Effects Assessment Summary: Blunt Gaper Health at Milne Inlet

Potential Impacts				Residual Effect				
Project Activity	**Environmental Effect**	**Direction and Nature of Interaction**	**Mitigation Measure(s)**	**Magnitude**	**Extent**	**Frequency**	**Duration**	**Reversibility**
CONSTRUCTION PHASE								
Sediment Resuspension	- Short-term exposure to small, temporary increases in concentrations of TSS, nutrients, and metals (through dredging and infilling during construction of port infrastructure) is expected to have minimum potential to negatively affect blunt gaper; - The redistribution of sediments near construction activities is would directly affect blunt gaper	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan). Impacts on blunt gaper habitat within the area confined by silt curtains would be addressed in the Marine HADD document.	2	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in blunt gaper tissues and reductions in blunt gaper health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Combined effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater, oiled water, and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
OPERATION PHASE								
Sediment Resuspension	- Increases in concentrations of TSS, nutrients, and metals in the water column as a result of sediment disturbance from propeller currents are expected infrequently during operation. Short-term exposure of blunt gaper to these conditions has minimum potential to affect blunt gaper health. - The episodic redistribution of sediments near the docks is not expected to directly affect blunt gaper health or condition	Negative		1	1	2	1	1
Discharge of ballast water	Slight reductions in nutrient concentrations and short-term, localized increases water temperature in Milne Inlet are expected to have negligible effects on blunt gaper health and condition. - Metal concentrations in water and blunt gaper tissues are not expected to change	Negligible						
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in blunt gaper tissues and reductions in blunt health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Combined effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater, oiled water, and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	2	1
DECOMMISSIONING PHASE								
Sediment Resuspension	- There is potential for slight increases in blunt gaper metal concentrations and declines in condition as a result of short-term exposure to small, temporary increases to concentrations of TSS, nutrients, and metals that are expected in the water column resulting from dismantling port infrastructure. - The redistribution of sediments near construction activities would directly affect blunt gape	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan). Impacts on blunt gaper habitat within the area confined by silt curtains would be addressed in the Marine HADD document.	2	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in blunt gaper tissues and reductions in blunt gaper health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Combined effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater, oiled water, and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
Discharge of ballast water	- Slight reductions in nutrient concentrations and short-term, localized increases water temperature in Milne Inlet are expected to have negligible effects on blunt gaper health and condition. - Metal concentrations in water and blunt gaper tissues are not expected to change.	Negligible		-	-	-	-	-

Key:
Direction and Nature of Interaction: Positive; Negligible; Negative
Magnitude: 1 (Level I) = a change that is less than threshold values; 2 (Level II) = a change that is greater than threshold values; 3 (Level III) = a change that is an order of magnitude greater than threshold values; includes consideration of environmental sensitivity
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Frequency: 1 (Level I) = infrequent (rarely occurring); 2 (Level II) = frequent (intermittently occurring); 3 (Level III) = continuous
Duration: 1 (Level I) = short-term; 2 (Level II) = medium-term; 3 (Level III) = long-term (beyond the life of the project) or permanent
Reversibility: 1 (Level I) = fully reversible after activity is complete; 2 (Level II) = partially reversible after activity is complete; 3 (Level III) = non-reversible after the activity is complete

NOTE(S): 1. CRITERIA RATINGS WERE NOT APPLIED TO ACTIVITIES WHERE NO ENVIRONMENTAL EFFECTS WERE EXPECTED (I.E., A NEUTRAL INTERACTION).

Effects Assessment Summary: Blunt Gaper Health at Steensby Inlet

Potential Impacts				Residual Effect				
Project Activity	**Environmental Effect**	**Direction and Nature of Interaction**	**Mitigation Measure(s)**	**Magnitude**	**Extent**	**Frequency**	**Duration**	**Reversibility**
CONSTRUCTION PHASE								
Sediment Resuspension	- Short-term exposure to small, temporary increases in concentrations of TSS, nutrients, and metals (through dredging and infilling during construction of port infrastructure) is expected to have minimum potential to negatively affect blunt gaper; - The redistribution of sediments near construction activities would directly affect blunt gaper	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan). Impacts on blunt gaper habitat within the area confined by silt curtains would be addressed in the Marine HADD document.	2	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in blunt gaper tissues and reductions in blunt gaper health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
OPERATION PHASE								
Sediment Resuspension	- Increases in concentrations of TSS, nutrients, and metals in the water column as a result of sediment disturbance from propeller currents are expected in the early years of operation. Short-term exposure of blunt gaper to these conditions has minimum potential to affect blunt gaper health. - The redistribution of sediments near the docks is not expected to directly affect blunt gaper health or condition	Negative		1	1	2	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in blunt gaper tissues and reductions in blunt gapr health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	2	1
Discharge of ballast water	- Slight reductions in nutrient concentrations and localized increases in salinity during open water conditions in Steensby Inlet are expected to have negligible effects on blunt gaper health and condition. - Metal concentrations in water and blunt gaper tissues are not expected to change.	Negligible		-	-	-	-	-
Fugitive ore dust deposition	- Increases in metal concentrations in blunt gaper tissues and reductions in blunt gaper health and condition as a result of increased metals (primarily iron) in the water and sediment.	Negative		2	1	3	2	1
DECOMMISSIONING PHASE								
Sediment Resuspension	- There is potential for slight increases in blunt gaper metal concentrations and declines in condition as a result of short-term exposure to small, temporary increases to concentrations of TSS, nutrients, and metals that are expected in the water column resulting from dismantling port infrastructure. - The redistribution of sediments near construction activities would directly affect blunt gaper	Negative	Silt curtains will be placed in as close proximity as feasible around the construction activity to minimize disturbance to the surrounding waters (Environmental Protection Plan). Impacts on blunt gaper habitat within the area confined by silt curtains would be addressed in the Marine HADD document.	2	1	3	1	1
Discharge of wastewater, contact water, and site drainage	- Potential increases in metal and hydrocarbon concentrations in blunt gaper tissues and reductions in blunt gaper health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment. - Effluents will be tested to ensure that they are not acutely toxic	Negative	All discharges of wastewater and contact water will be treated to meet the respective guidelines prior to discharge	1	1	3	1	1
Discharge of ballast water	- Slight reductions in nutrient concentrations and localized increases in salinity during open water conditions in Steensby Inlet are expected to have negligible effects on blunt gaper health and condition. - Metal concentrations in water and blunt gaper tissues are not expected to change.	Negligible	-	-	-	-	-	-

Key:
Direction and Nature of Interaction: Positive; Negligible; Negative
Magnitude: 1 (Level I) = a change that is less than threshold values; 2 (Level II) = a change that is greater than threshold values; 3 (Level III) = a change that is an order of magnitude greater than threshold values; includes consideration of environmental sensitivity
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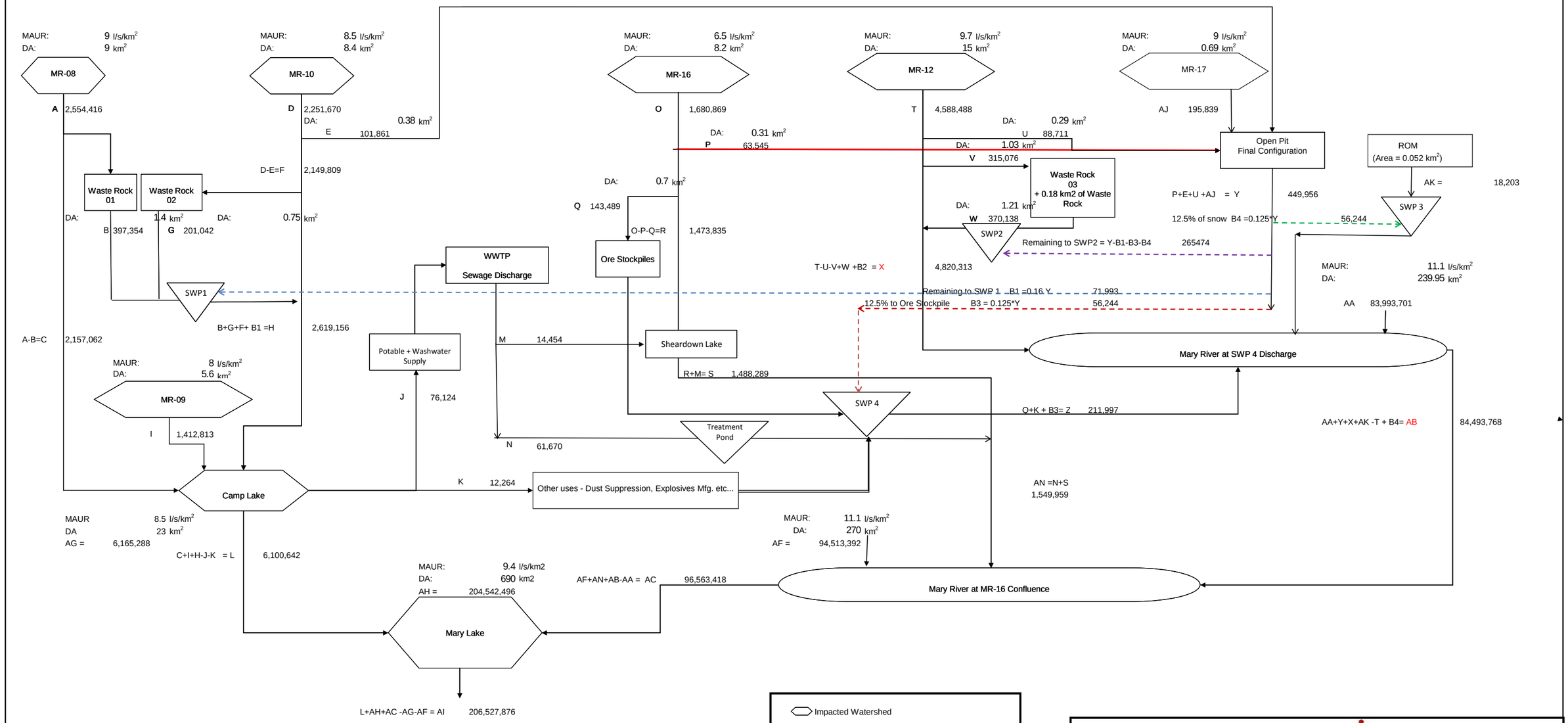
Reversibility: 1 (Level I) = fully reversible after activity is complete; 2 (Level II) = partially reversible after activity is complete; 3 (Level III) = non-reversible after the activity is complete

NOTES:
1. CRITERIA RATINGS WERE NOT APPLIED TO ACTIVITIES WHERE NO ENVIRONMENTAL EFFECTS WERE EXPECTED (I.E., A NEUTRAL INTERACTION)

Appendix 8:

Water Balance Schematics for Mine Site, Steensby Inlet, and Milne Inlet



NOTES:

1. MONTHLY FLOW VOLUMES ARE IN m^3.
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE USED PRESENTED IN THE MARY RIVER EIA.
3. MAUR = MEAN ANNUAL UNIT RUNOFF IN L/s/km2.
4. DA = DRAINAGE AREA IN km2.

Impacted Watershed

Mine Development Areas

Water Usage

Stormwater Pond

A 1,602,785 - Annual Volume (m^3)

HATCH™ Baffinland IRON MINES CORPORATION

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011	MINE SITE WATER BALANCE - FINAL YEAR OPERATION
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011	
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011	
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011		Figure. 2

MAUR: 9 l/s/km^2
DA: 9 km^2
MR-08
A 2,554,416
A-B=C 2,554,416

MAUR: 8.5 l/s/km^2
DA: 8.4 km^2
MR-10
D 2,251,670
2,251,670
2,251,670

MAUR: 6.5 l/s/km^2
DA: 8.2 km^2
MR-16
O 1,680,869
O=R 1,680,869

MAUR: 9.7 l/s/km^2
DA: 15 km^2
MR-12
T 4,588,488
T = X 4,588,488

Sewage From Remote Camps

WWTP
Sewage Discharge

Potable + Washwater Supply

M 14,454

Sheardown Lake

R+M= S 1,695,323

J 135,079

N 120,625

Treatment Pond

MAUR: 8 l/s/km^2
DA: 5.6 km^2
MR-09
I 1,412,813

Camp Lake

K 138,408

Concrete Manufacturing, Exploration Drilling, Dust Suppression, explosives mfg. etc...

MAUR 8.5 l/s/km^2
DA 23 km^2
AG = 6,165,288

C+I+H-J-K = L 5,945,412

MAUR: 9.4 l/s/km2
DA: 690 km2
AH = 204,542,496

Mary Lake

L+AH+AC-AG-AF = AI 206,276,976

MAUR: 11.1 l/s/km^2
DA: 270 km^2
AF = 94,513,392

AF+S+AB -AA = AC 96,467,748

Mary River at MR-16 Confluence

MAUR: 11.1 l/s/km^2
DA: 240.00 km^2
AA 84,011,904

Mary River at SWP 4 Discharge

Q+K= Z 138,408

AA+Z+N -T = AB 84,270,937

Impacted Watershed

Mine Development Areas

Water Usage

Stormwater Pond

A 1,602,785 - Annual Volume (m^3)

NOTES:

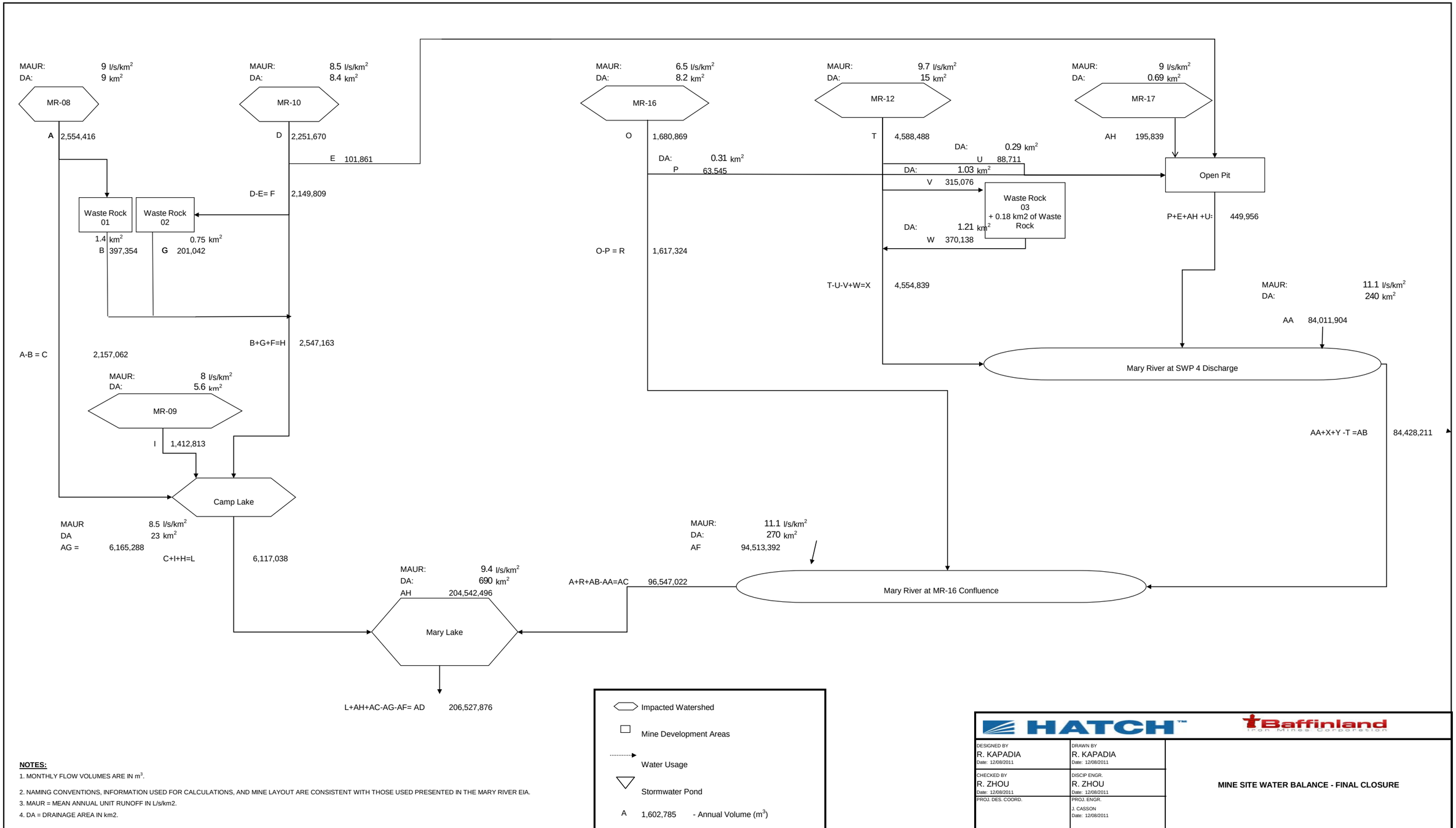
1. MONTHLY FLOW VOLUMES ARE IN m^3.
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE USED PRESENTED IN THE MARY RIVER EIA.
3. MAUR = MEAN ANNUAL UNIT RUNOFF IN L/s/km2.
4. DA = DRAINAGE AREA IN km2.

HATCH™ Baffinland Iron Mines Corporation

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011	

MINE SITE WATER BALANCE - CONSTRUCTION (2012-2016)

Figure. 1



NOTES:

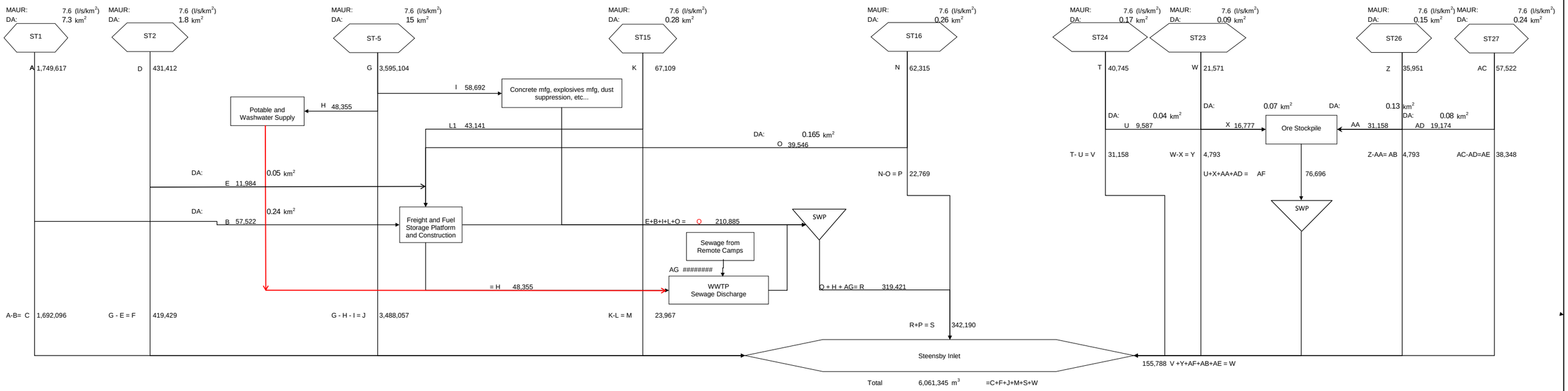
1. MONTHLY FLOW VOLUMES ARE IN m^3.
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE USED PRESENTED IN THE MARY RIVER EIA.
3. MAUR = MEAN ANNUAL UNIT RUNOFF IN L/s/km2.
4. DA = DRAINAGE AREA IN km2.

HATCH™ Baffinland Iron Mines Corporation

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011	

MINE SITE WATER BALANCE - FINAL CLOSURE

Figure. 3



Impacted Watershed

Development Areas

Water Usage

Stormwater Pond

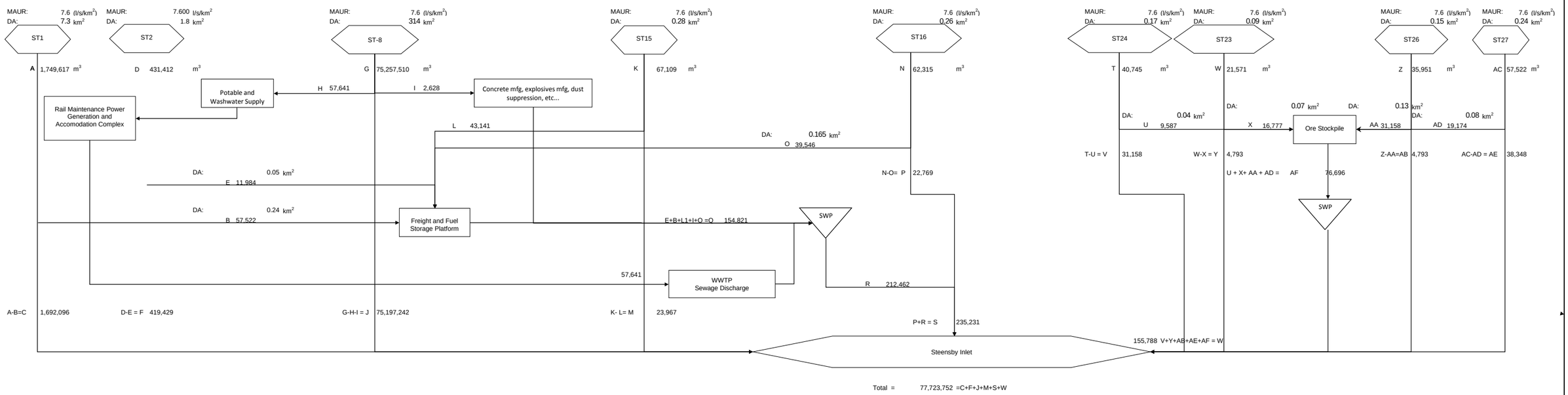
A 1,602,785 - Annual Volume (m^3)

Notes:

1. MONTHLY FLOW VOLUMES ARE IN m^3.
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE USED PRESENTED IN THE MARY RIVER EIA.
3. MAUR = MEAN ANNUAL UNIT RUNOFF IN L/s/km2
4. DA = DRAINAGE AREA IN km2

HATCH™ Baffinland Iron Mines Corporation

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011	STEENSBY SITE - CONSTRUCTION (2012-2016)
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011	
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011	
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011		Figure. 6



Impacted Watershed

Development Areas

Water Usage

Stormwater Pond

A 1,602,785 - Annual Volume (m^3)

Notes:

1.MONTHLY FLOW VOLUMES ARE IN m^3.

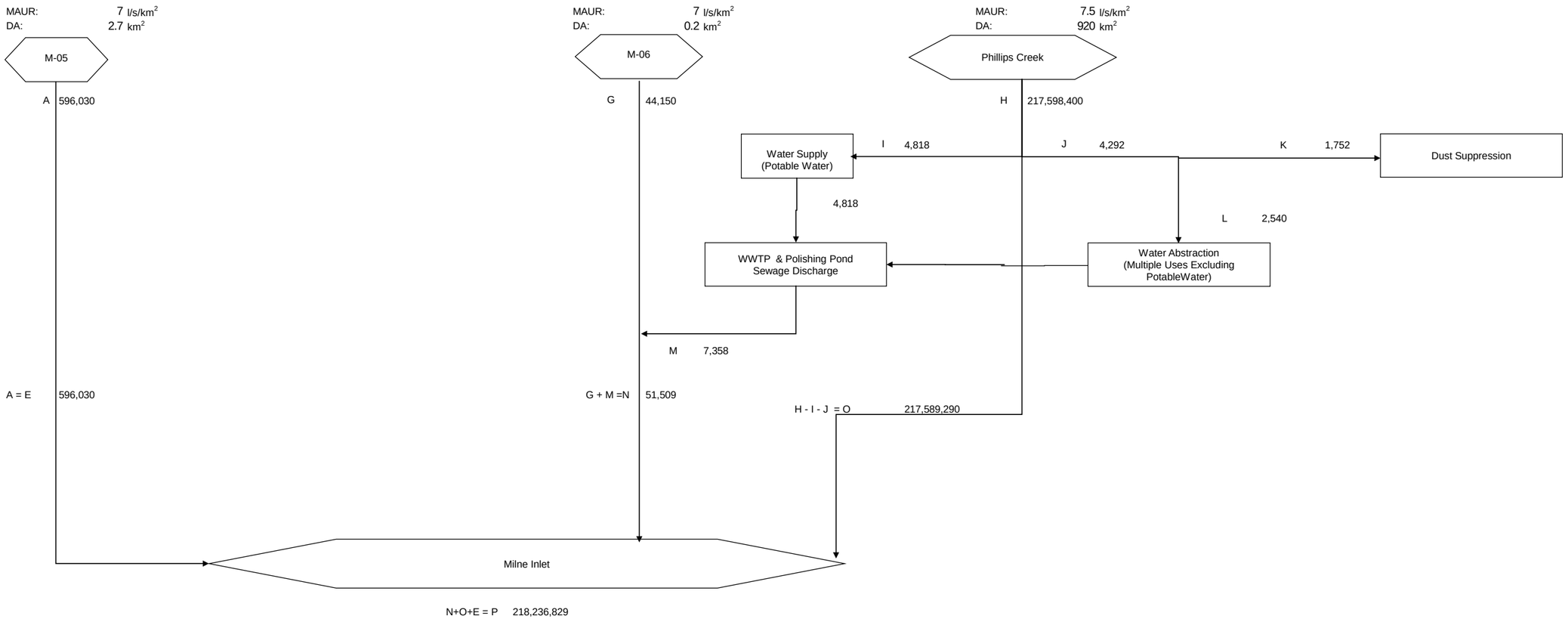
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE USED PRESENTED IN THE MARY RIVER EIA.

3. MAUR = MEAN ANNUAL UNIT RUNOFF IN L/s/km2

4. DA = DRAINAGE AREA IN km2

HATCH™ Baffinland

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011	**STEENSBY SITE - OPERATION (2017-2037)**
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011	
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011	
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011	**Figure. 7**	



Notes:

1. MONTHLY FLOW VOLUMES ARE IN m^3.
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE USED PRESENTED IN THE MARY RIVER EIA.
3. MAUR IN WATERSHEDS M5 AND M6 LIKELY RANGE BETWEEN 5 AND 7 l/s/km2. 5 l/s/km2 WAS SELECTED TO BE CONSISTENT WITH THE MARY RIVER EIA.
4. MAUR = MEAN ANNUAL UNIT RUNOFF in L/s/km2
5. DA = DRAINAGE AREA IN km2

Impacted Watershed

Development Areas

Water Usage

Stormwater Pond

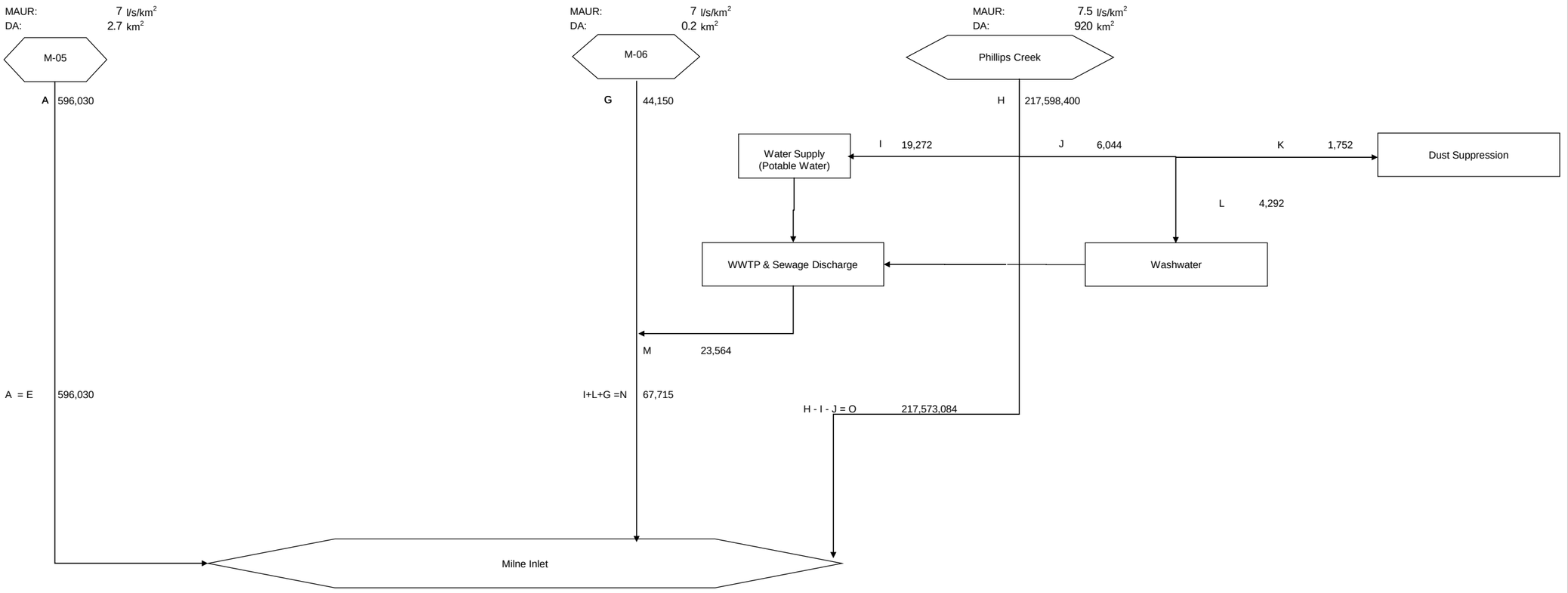
A 1,602,785 - Annual Volume (m^3)

HATCH™ Baffinland IRON MINES CORPORATION

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011	

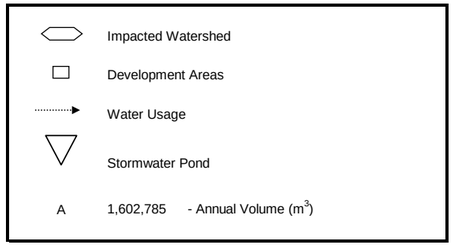
MILNE SITE WATER BALANCE - OPERATION (2017-2037)

Figure. 5



Notes:

1. MONTHLY FLOW VOLUMES ARE IN m^3.
2. NAMING CONVENTIONS, INFORMATION USED FOR CALCULATIONS, AND MINE LAYOUT ARE CONSISTENT WITH THOSE US
3. MAUR IN WATERSHEDS M5 AND M6 LIKELY RANGE BETWEEN 5 AND 7 l/s/km2. 5 l/s/km2 WAS SELECTED TO BE CONSISTENT WITH THE MARY RIVER EIA.
4. POTABLE WATER REQUIREMENTS INCLUDE THOSE OF THE MILNE INLET TOTE ROAD CONSTRUCTION CAMP.
5. MAUR = MEAN ANNUAL UNIT RUNOFF IN L/s/km2
6. DA = DRAINAGE AREA IN km2



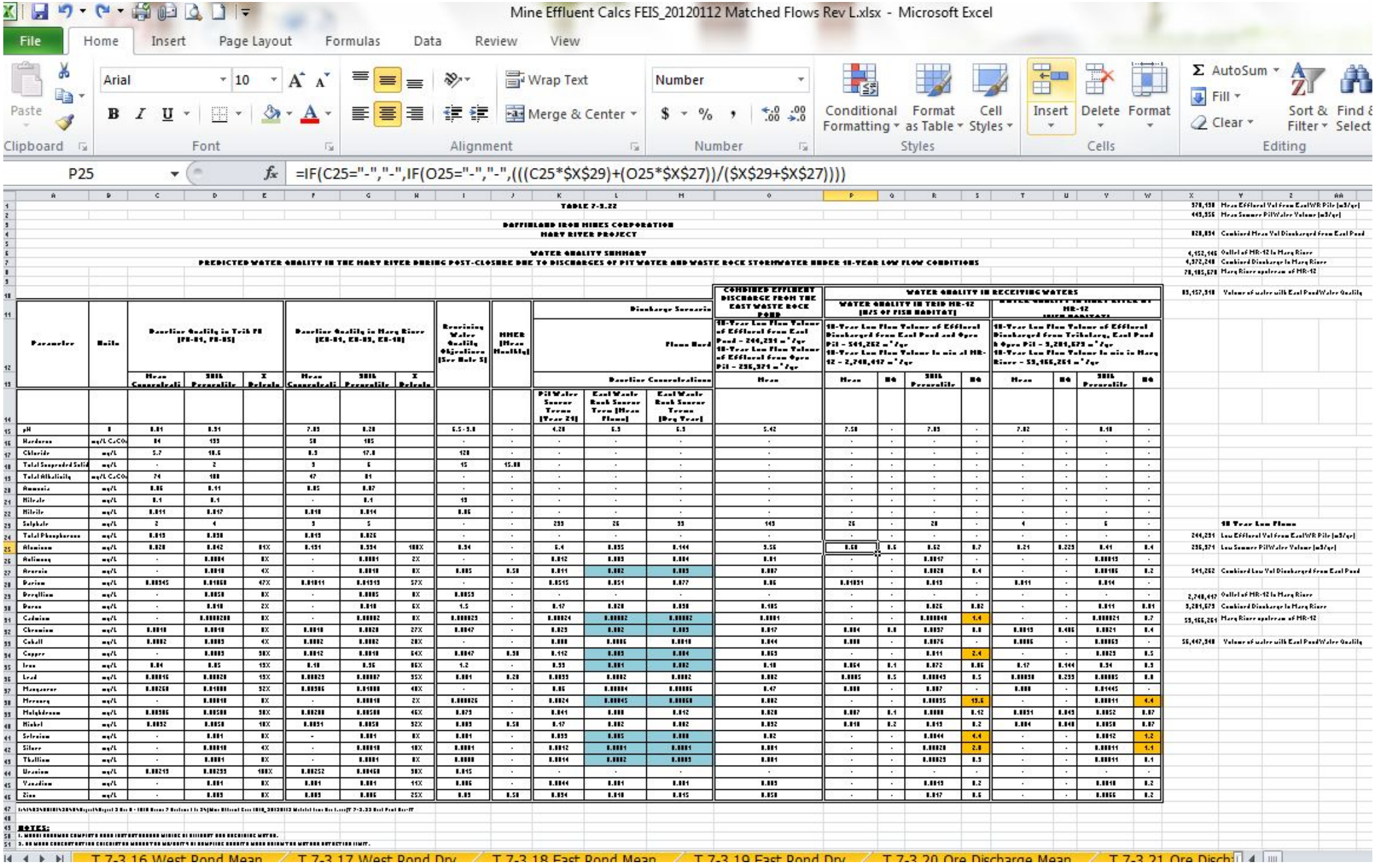
HATCH™ Baffinland Iron Mines Corporation

DESIGNED BY R. KAPADIA Date: 12/08/2011	DRAWN BY R. KAPADIA Date: 12/08/2011	**MILNE SITE WATER BALANCE - CONSTRUCTION (2012-2016)**
CHECKED BY R. ZHOU Date: 12/08/2011	DISCIP ENGR. R. ZHOU Date: 12/08/2011	
PROJ. DES. COORD.	PROJ. ENGR. J. CASSON Date: 12/08/2011	
PROJECT MANAGER H. CHARALAMBU Date: 12/08/2011		**Figure. 4**

Appendix 9:

Mine Effluent Calculations

Mine Effluent Calculation



Mine Effluent Calculation

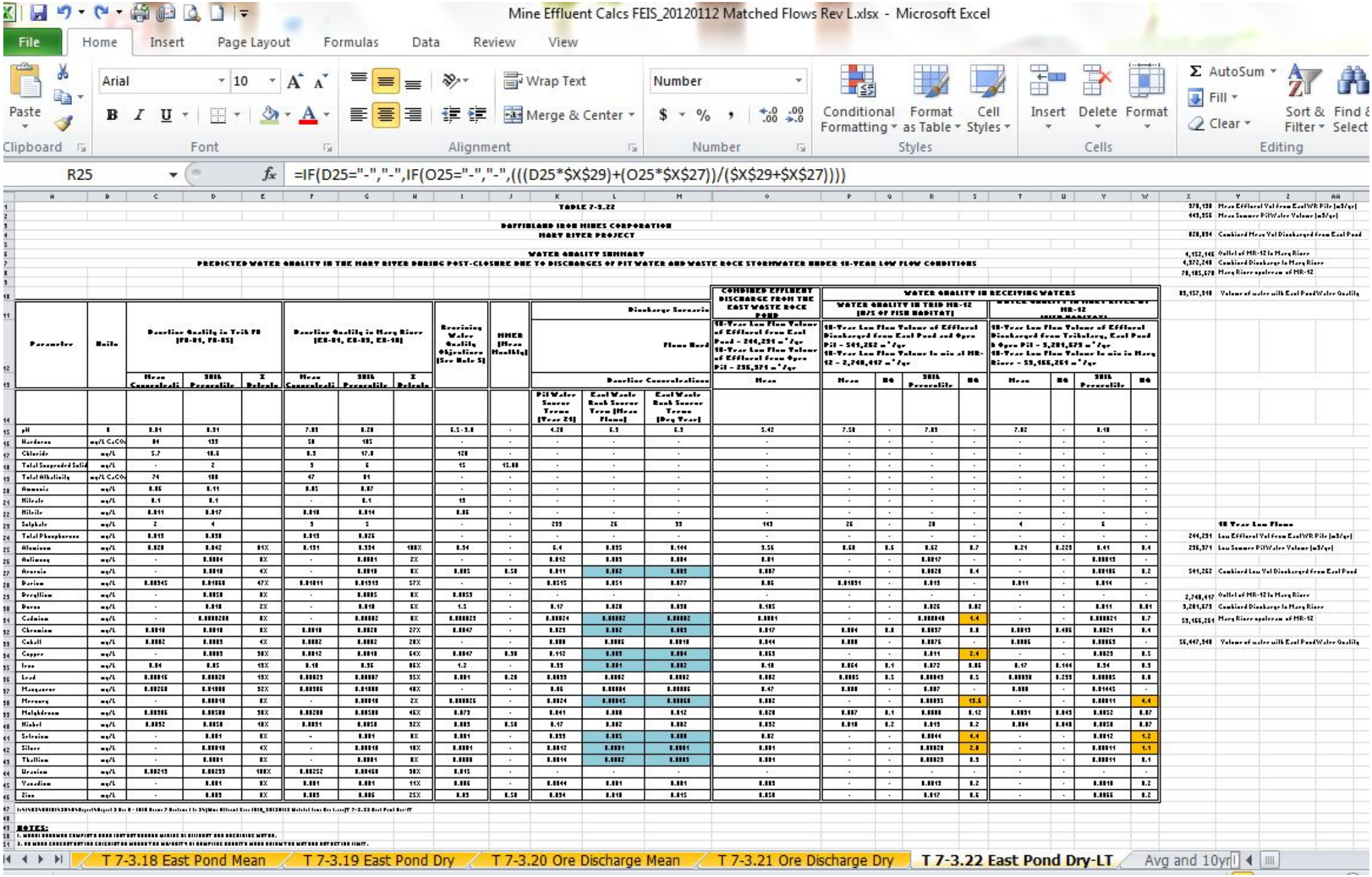


TABLE 7-3.22

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

WATER QUALITY SUMMARY
PREDICTED WATER QUALITY IN THE MARY RIVER DURING POST-CLOSURE DUE TO DISCHARGES OF PIT WATER AND WASTE ROCK STORMWATER UNDER 10-YEAR LOW FLOW CONDITIONS

Parameter	Units	Baseline Quality in Trib PB (PB-01, PB-05)			Baseline Quality in Mary River (ER-01, ER-09, ER-10)			Receiving Water Quality Objectives (See Note 5)	MMER (Mean Monthly)	Discharge Scenario			COMBINED EFFLUENT DISCHARGE FROM THE EAST WASTE ROCK POND	WATER QUALITY IN RECEIVING WATERS							
														WATER QUALITY IN TRIB MR-12 (R/S OF FISH HABITAT)				WATER QUALITY IN MARY RIVER AT MR-12 (WITHIN HABITAT)			
										Flows Used			10-Year Low Flow Volume of Effluent from East Pond = 244,231 m³/yr 10-Year Low Flow Volume of Effluent from Open Pit = 296,371 m³/yr	10-Year Low Flow Volume of Effluent Discharged from East Pond and Open Pit = 541,252 m³/yr 10-Year Low Flow Volume in min at MR-12 = 2,748,417 m³/yr			10-Year Low Flow Volume of Effluent Discharged from Tehcheng, East Pond & Open Pit = 3,289,673 m³/yr 10-Year Low Flow Volume in min in Mary River = 55,166,264 m³/yr			
		Mean Concentration	95th Percentile	% Exceed	Mean Concentration	95th Percentile	% Exceed			Baseline Concentrations			Mean	Mean	NO	95th Percentile	NO	Mean	NO	95th Percentile	NO
										Pit Water Source Terms (Year 24)	East Waste Rock Source Term (Mean Flows)	East Waste Rock Source Terms (Dry Year)									
pH	-	8.01	8.31		7.85	8.28		6.5 - 9.0	-	4.28	6.5	6.5	5.42	7.58	-	7.85	-	7.82	-	8.18	-
Hardness	mg/L CaCO3	84	133		58	105		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	5.7	10.5		8.5	17.8		120	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	-	2		3	5		15	15.00	-	-	-	-	-	-	-	-	-	-	-	-
Total Alkalinity	mg/L CaCO3	74	108		47	81		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia	mg/L	0.05	0.11		0.05	0.07		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate	mg/L	0.1	0.1		-	0.1		13	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite	mg/L	0.011	0.017		0.010	0.014		0.06	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/L	2	4		3	5		-	-	255	26	55	143	25	-	28	-	4	-	5	-
Total Phosphorous	mg/L	0.015	0.038		0.015	0.025		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum	mg/L	0.020	0.042	0%	0.151	0.334	100%	0.34	-	0.4	0.035	0.144	0.56	0.58	0.5	0.62	0.7	0.21	0.223	0.41	0.4
Antimony	mg/L	-	0.0004	0%	-	0.0001	0%	-	-	0.002	0.003	0.004	0.01	-	-	0.0017	-	-	-	0.0019	-
Arsenic	mg/L	-	0.0010	0%	-	0.0010	0%	0.005	0.50	0.011	0.002	0.005	0.007	-	-	0.0028	0.4	-	-	0.0105	0.2
Barium	mg/L	0.00545	0.01050	0%	0.01011	0.01545	0%	-	-	0.0545	0.051	0.077	0.05	0.01051	-	0.015	-	0.011	-	0.014	-
Beryllium	mg/L	-	0.0050	0%	-	0.0005	0%	0.0053	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	0.010	0%	-	0.010	0%	1.5	-	0.17	0.020	0.050	0.105	-	-	0.026	0.82	-	-	0.011	0.01
Cadmium	mg/L	-	0.0000200	0%	-	0.00002	0%	0.000025	-	0.00024	0.00002	0.00002	0.0001	-	-	0.000040	1.4	-	-	0.000021	0.7
Chromium	mg/L	0.0010	0.0010	0%	0.0010	0.0020	0%	0.0042	-	0.025	0.002	0.005	0.017	0.004	0.0	0.0057	0.0	0.0015	0.005	0.0021	0.4
Cobalt	mg/L	0.0002	0.0005	0%	0.0002	0.0002	0%	-	-	0.000	0.0005	0.0010	0.004	0.000	-	0.0015	-	0.0005	-	0.00053	-
Copper	mg/L	-	0.0005	0%	0.0002	0.0010	0%	0.0047	0.30	0.112	0.005	0.004	0.015	-	-	0.011	2.4	-	-	0.0025	0.5
Iron	mg/L	0.04	0.05	0%	0.10	0.35	0%	1.2	-	0.35	0.001	0.002	0.10	0.054	0.1	0.072	0.05	0.07	0.144	0.14	0.3
Lead	mg/L	0.00015	0.00020	0%	0.00025	0.00007	0%	0.001	0.20	0.0059	0.0002	0.0002	0.002	0.0005	0.5	0.00045	0.5	0.00050	0.255	0.00005	0.0
Manganese	mg/L	0.00250	0.01000	0%	0.00505	0.01000	0%	-	-	0.05	0.00004	0.00005	0.07	0.000	-	0.007	-	0.000	-	0.01405	-
Mercury	mg/L	-	0.00010	0%	-	0.00010	0%	0.000026	-	0.0024	0.00045	0.00050	0.002	-	-	0.00055	19.6	-	-	0.00011	4.4
Molybdenum	mg/L	0.00505	0.00500	0%	0.00200	0.00500	0%	0.073	-	0.041	0.000	0.012	0.020	0.007	0.1	0.0000	0.12	0.0051	0.043	0.0052	0.07
Nickel	mg/L	0.0052	0.0050	0%	0.0051	0.0050	0%	0.005	0.50	0.17	0.002	0.002	0.052	0.010	0.2	0.015	0.2	0.004	0.010	0.0050	0.07
Selenium	mg/L	-	0.001	0%	-	0.001	0%	0.001	-	0.055	0.005	0.000	0.02	-	-	0.0044	0.4	-	-	0.0012	0.2
Silver	mg/L	-	0.00010	0%	-	0.00010	0%	0.0001	-	0.0012	0.0001	0.0001	0.001	-	-	0.00020	0.0	-	-	0.00011	0.1
Thallium	mg/L	-	0.0001	0%	-	0.0001	0%	0.0008	-	0.0014	0.0002	0.0005	0.001	-	-	0.00025	0.5	-	-	0.00011	0.1
Uranium	mg/L	0.00249	0.00253	100%	0.00252	0.00468	50%	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	-	0.001	0%	0.001	0.001	0%	0.006	-	0.0044	0.001	0.001	0.005	-	-	0.0015	0.2	-	-	0.0010	0.2
Zinc	mg/L	-	0.005	0%	0.005	0.005	0%	0.03	0.50	0.054	0.010	0.015	0.050	-	-	0.007	0.5	-	-	0.0055	0.2

NOTES:
1. MDMER BENCHMARK COMPLIANCE BASED ON EFFLUENT DISCHARGE MONITORING AT DISCHARGE LOCATION.
2. AN MDMER CONCENTRATION EXCEEDANCE MONITORED MONTHLY IS DEEMED TO EXCEED A MDMER BENCHMARK WHEN MORE THAN THE ANTICIPATED NUMBER OF TIMES.

378,158	Mean Effluent Vol from East WR Pile [m³/yr]
449,356	Mean Summer Pit Water Volume [m³/yr]
828,834	Combined Mean Vol Discharged from East Pond
4,152,142	Outlet of MR-12 to Mary River
4,372,248	Combined Discharge to Mary River
78,185,678	Mary River upstream of MR-12
83,157,348	Volume of water with East Pond Water Quality

10 Year Low Flows

244,231	Low Effluent Vol from East WR Pile [m³/yr]
296,371	Low Summer Pit Water Volume [m³/yr]
541,252	Combined Low Vol Discharged from East Pond
2,748,417	Outlet of MR-12 to Mary River
3,289,673	Combined Discharge to Mary River
55,166,264	Mary River upstream of MR-12
58,447,348	Volume of water with East Pond Water Quality

Appendix 10:

Risk Assessment Table of Contents

Overwintering of Fuel Vessel at Steensby Inlet – 2013-2014 Winter

Table of Content for Risk Analysis

Appendix 11:

Letter and Updated ZOI Table

June 30, 2011

Ryan Barry
Director, Technical Services
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU X0B 0C0

Re: Submission of the Addendum related for the Removal of the Road Haulage Option and Supplemental Information on Pre-Development Works

Dear Mr. Barry,

As described in my June 24, 2011 letter from Baffinland to the Nunavut Impact Review Board (NIRB), please find attached the addendum that provides additional information related to the removal of the Road Haulage option from the Draft Environmental Impact Statement (Draft EIS) as requested by NIRB on May 30, 2011. As noted in my previous letter we have carefully considered and discussed the desired content of this Addendum with key agencies (INAC, QIA, and GN) and we are confident that we have addressed their concerns.

The addendum is comprised of the following:

- This Transmitttal Letter
- The Addendum Preface
- The Addendum text for various volumes of the DEIS

The Addendum Preface contains a brief summary of the changes to the project due to the removal of the Road Haulage Option and a complete explanation of the structure of the addendum submission to help reviewers navigate the document effectively. All reviewers should refer to the Addendum Preface prior to reviewing any other parts of the addendum submission. It also includes a fully revised Project Description (Volume Three) including revised figures. Volumes four through ten of the original Draft EIS have been systematically reviewed and a description of the changes and the effect of these changes to the impact assessments are provided.

The sections of the Addendum directly reference the original Draft EIS and should be used as a companion document. The removal of the Road Haulage Option has also led to numerous editorial changes throughout the original Draft EIS document. Although we did provide revised text in all instances, we have also provided reviewers with a list of common changes that should be made in the original Draft EIS if inappropriate original text remains. In addition, we have addressed some simple typographical errors within the original Draft EIS.

This Addendum submission also includes additional details of proposed pre-development works, found in Appendix 3G to Volume 3. We have provided this additional information to allow time for measured discussion and consideration of these proposals during the technical review period. Commencing with pre-development works is a key factor in advancing the Mary River project. We will be requesting meetings in the very near future with both INAC and QIA, as landowners, to discuss pre-development work.

Through the development of this Addendum, and in addressing the IRs, we have worked diligently with many of the responsible agencies. We are pleased to continue this process and would encourage all agencies to contact Baffinland with any questions they may have on this Addendum submission. We also look forward to the continued open exchange of information throughout the Technical Review period.

A full digital copy of this submission will leave Yellowknife today destined for NIRB offices in Cambridge Bay early next week. A copy has also been placed on the following ftp for quicker access for reviewing parties. All may follow the below instructions to access the information:

1. Open your web browser
2. Type ftp://mail.sikumiut.ca in the address bar
3. You will be prompted for a username and password
4. For username enter Baffinland - this is case sensitive
5. For password enter rain88 - also case sensitive
6. Click "Log On"
7. This will open the root directory of the ftp site.
8. On the upper right hand corner of the window, you'll see "Page", with a downward pointing arrow next to it; click it.
9. On the drop down menu click "Open ftp site in Windows Explorer"
10. You may be prompted to re-enter the username and password - if so, enter them.
11. The ftp site will open and be accessible as would any other folder on your computer and files can be downloaded.

Should you have any further questions, please feel free to contact me at 416-814-3963.

Kind regards,

Matthew Pickard
Director, Environment, Health, Safety and Sustainability
Baffinland Iron Mines Corporation

Cc: Dionne Filiatrault, NWB (dionne@nunavutwaterboard.org)
Li Wan, NIRB (lwan@nirb.ca)
Erik Madsen, BIM (erik.madsen@baffinland.com)

Table 6-5.1 Summary of the Factor used to Reduce RSPF Values and Calving Site Effectiveness with Distances from the Project

Project Area	Zone of Influence (ZOI)	Habitat Selection Multiplier	Subspecies or Herd	Source of Information	Calving Site Multiplier
All	PDA	0.00	na	na	0.00
Steensby Port, Milne Port, Railway, Milne Inlet Tote Road	>PDA–2.0 km	0.25	Central arctic herd (Alaska), woodland (Alberta)	Cameron et al. 1992, Dyer et al. 2001	0.125
	>2.0–4.0 km	0.75	Woodland (Newfoundland), central arctic herd, reindeer (Norway)	Weir et al. 2007, Cameron et al. 2005, Vistnes and Nellemann 2001	0.375
	>4.0–14.0 km	0.90	Woodland (Ontario)	Vors et al. 2007, mayor et al. 2007, 2009	0.45
Mine Site	>PDA–3.5 km	0.30	Bathurst herd	Boulanger et al. in Press	0.15
	>3.5–7.0 km	0.40	Bathurst herd	Boulanger et al. in press	0.2
	>7.0–10.5 km	0.60	Bathurst herd	Boulanger et al. in press	0.3
	>10.5–14 km	0.80	Bathurst herd	Boulanger et al. in press	0.4
All	>14.0 km	1.00	na	Vors et al. 2007, Mayor et al. 2007, 2009, Boulanger et al. in press	1.00

Appendix 12:

Estimating Project Effects on Caribou

Estimating Project Effects on Caribou

For estimating effects of the project on caribou, RSPF probability values of each raster cell were summed before and after the predicted impact due to the project footprint and the ZOI (Volume 6, 5.2.1 Assessment Methods). The summed RSPF values are not intended to reflect the probability of caribou occurring within the RSA or North Baffin Herd range, but to provide an index of change in habitat use.

There are 53,469,620 cells that make up the habitat selection raster layers for the North Baffin caribou herd. The cell values range from 0 to 0.48. Consequently, the summed values during baseline conditions across the North Baffin caribou range are approximately 2.3 million, 6.4 million, and 4.7 million for the calving, growing, and winter seasons, respectively. A simplified example is provided below to further explain our method.

Example: A small area is defined by 4 cells where the probability of an occurrence is 1 in each cell. We expect a reduction of 50% in the probability of occurrence after an impact in one cell and a 25% reduction in another cell. The other cells remain unchanged. To provide the estimated reduction of occurrence we sum the raster values as an index and compare the summed values before and after the expected reduction. In this example the sum of values is 4 for the baseline conditions, and 3.25 for the post-impact conditions. The overall reduction because of the impact is therefore -18.75%.

Baseline

1	1
1	1

Impact

1	1
0.5	0.75

Appendix 13:

Caribou Collaring Data

Caribou Collaring Data

a) The proportion of caribou that crossed the existing road, the planned road and railway route during the collar study.

Ten of 31 collared caribou (32%) crossed the proposed Project footprint during 2008–2011 (Table 1).

b) The proportion of segments between successive locations overlapped the road, the planned road and railway route.

During the timeframe that collar data is available 395 line segments overlapped with the proposed Project footprint; this represents 2% of all line segments (Table 2).

c) The proportion of home ranges overlapping the mine site and ZOI.

We used a minimum convex polygon (MCP) to represent caribou home ranges, and calculated the proportion of the each home range that overlaps with the proposed Project footprint (0%), and the predicted ZOI (20%; Table 3).

Table 1. Collared caribou that interact with the project footprint at least once from 2008–2011.

Collared Caribou ID	Cross project footprint
36835	yes
36836	yes
36836 (2008)	no
36837	yes
36838	no
36840	no
36841	no
36842	yes
36843	no
36844	no
36846	no
36847	no
36848	no
36849	no
36851	no
36852	no
37025	no
37030	yes
37033	no
37035	yes
37048	no
37050	no
37052	no
37054	no
37055	yes
37123	no
37407	yes
37408	no
37490	yes
37492	yes
37493	no
Proportion of collared caribou that crossed project footprint at least once	**0.32**

Table 2. The proportion of collared caribou movements that intersected the project footprint

Collared Caribou ID	Overlapping segments	Total segments	Proportion
36835	4	709	0.01
36836	2	582	0.00
36836 (2008)	0	56	0.00
36837	6	1,067	0.01
36838	0	1,082	0.00
36840	0	1,201	0.00
36841	0	1,157	0.00
36842	38	986	0.04
36843	0	1,186	0.00
36844	0	235	0.00
36846	0	1,238	0.00
36847	0	335	0.00
36848	0	70	0.00
36849	0	58	0.00
36851	0	1,150	0.00
36852	0	734	0.00
37025	0	1,223	0.00
37030	6	586	0.01
37033	0	1,177	0.00
37035	22	613	0.04
37048	0	1,167	0.00
37050	0	241	0.00
37052	0	1,226	0.00
37054	0	588	0.00
37055	11	1,186	0.01
37123	0	659	0.00
37407	3	179	0.02
37408	0	817	0.00
37490	297	1,162	0.26
37492	6	1,174	0.01
37493	0	348	0.00
	395	**24,192**	**0.02**

Table 3. The proportion of collared caribou home ranges overlapping with the project footprint and Zone of Influence.

Collared Caribou ID	Home Range area (km²)	Overlap with Footprint (km²)	Proportion	Overlap with 14 km ZOI (km²)	Proportion
36835	3,020	2.0	0.00	672	0.22
36836	844	6.8	0.01	712	0.84
36836 (2008)	1,087	0.0	0.00	0	0.00
36837	4,420	27.5	0.01	1,830	0.41
36838	1,548	0.0	0.00	0	0.00
36840	306	0.0	0.00	54	0.18
36841	2,415	0.0	0.00	20	0.01
36842	980	2.7	0.00	291	0.30
36843	1,621	0.0	0.00	246	0.15
36844	124	0.0	0.00	18	0.14
36846	621	0.0	0.00	0	0.00
36847	564	0.0	0.00	185	0.33
36848	70	0.0	0.00	8	0.12
36849	55	0.0	0.00	0	0.00
36851	969	0.0	0.00	44	0.05
36852	932	0.0	0.00	0	0.00
37025	1,738	0.0	0.00	0.5	0.00
37030	6,692	2.2	0.00	747	0.11
37033	631	0.0	0.00	0	0.00
37035	1,668	13.6	0.01	1,166	0.70
37048	462	0.0	0.00	0	0.00
37050	337	0.0	0.00	209	0.62
37052	847	0.0	0.00	13	0.02
37054	645	0.0	0.00	0	0.00
37055	1,206	3.9	0.00	611	0.51
37123	2,293	0.0	0.00	0	0.00
37407	1,350	5.6	0.00	429	0.32
37408	1,004	0.0	0.00	286	0.29
37490	1,616	17.8	0.01	645	0.40
37492	5,087	2.5	0.00	850	0.17
37493	1,214	0.0	0.00	0	0.00
Totals	**46,366**	**84.6**	**0.00**	**9,036**	**0.20**

Appendix 14:

Table Regarding Glacio-Fluvial Terrain

Table Regarding Glacio-Fluvial Terrain

a) The RSA includes approximately 1,100 km² of glacio-fluvial terrain.

b) Glacio-fluvial habitats were not identified as ecologically sensitive in the FEIS. Approximately 22.6 km² of glacio-fluvial habitat overlaps with the proposed project footprint (PDA), resulting in a potential loss of 2% of the glacio-fluvial wolf denning habitat in the RSA.

Potential Wolf Den Habitat	**Area (km²)**
Glacio-fluvial material within PDA	22.6
Glacio-fluvial material within RSA	1,104.4
RSA total area	**21,053.8**

Appendix 15:

Hosmer-Lemeshaw Goodness-of-fit Statistic

Hosmer-Lemeshaw Goodness-of-fit Statistic

Our primary objective was to develop the simplest useful predictive model of seasonal caribou habitat selection. In other words, we were seeking the most parsimonious model that still predicts the data. The rationale for minimizing the number of variables in the model is that the resultant model is more likely to be numerically stable and more easily generalized. Several model selection techniques and evaluation criteria are available, each with its own advantages and limitations; more common in wildlife biology are comparing a-priori candidate models using Akaike Information Criterion (AIC) and forward stepwise inclusion based on statistics.

Creating a-priori candidate models is most appropriate in well-known systems or when testing specific hypotheses. In the case of Baffin caribou where little information about the system was available, stepwise methods offer an unbiased approach to variable inclusion. However, one of the issues with a univariate selection approach is that it ignores the possibility that a collection of variables, each of which is weakly associated with the outcome, can become an important predictor of outcome when taken together (Hosmer and Lemeshow, 2000). Therefore, we chose to use a hybrid approach whereby candidate models were generated based primarily on univariate predictability and secondly on various associations of covariates with clear but weaker associations to selection. When biologically appropriate, we also tested the second order transformations. Covariates of candidate models are listed in order of predictive strength from left to right based on Kolmogorov-Smirnov (K-S) goodness of fit statistics in tables 15, 18, and 21. Covariates with no clear relationship to caribou selection were not included in these tables.

Our model selection was based on a combination of AIC, Area Under the Curve (AUC) of a Receiver Operating Characteristic (ROC) curve, Hosmer-Lemeshow goodness-of-fit statistic (H-L). We used the AIC as our primary method of identifying potential best models. AIC provides a measure of the *relative* goodness of fit of a model given a set of candidate models. The preferred model is the one with the lowest AIC score whereby fit is rewarded but includes a penalty that is an increasing function of the number of estimated parameters. However, as the sample size grows the weight of penalization relative to the likelihood declines. This means that the AIC can easily overfit and select a model with a larger number of parameters than necessary. In addition, AIC can tell nothing about how well a model fits the data in an absolute sense (i.e. if all candidate models fit poorly, AIC will not give any indication of this).

We also used AUC to measure the discrimination of the model. Specifically, a ROC curve plots true positives (sensitivity) vs. false positives (1-specificity) for a binary classifier system as its discrimination threshold is varied. Therefore, a model with no discriminating power would have an AUC value of 0.5. Generally, AUC values between 0.7 and 0.8 are considered to have acceptable discrimination and values above 0.8 are excellent (Hosmer and Lemeshow 2000). All final Baffin caribou habitat selection models had AUC values above 0.7.

Given the relatively large sample sizes of caribou location data, we chose to evaluate the top AIC-based models using H-L statistics to select the final model. The final model in each season was selected from

the top 3 candidate models (low AIC and high AUC values) based on the H-L statistic. The H-L statistic assesses how close values predicted by the model are to the observed values by partitioning observations into deciles based on the predicted probabilities and comparing them to a X^2 distribution. Therefore, a non-significant H-L test indicates that overall model fit is good. The H-L test is influenced by sample size whereby the test is more likely to find a difference between actual and estimated values as the sample size increases. Therefore, a significant H-L test does not necessarily mean that a model is not useful. Conversely, a non-significant H-L test on large sample sizes is a strong indication that the model is a good fit to the data. Therefore, all final seasonal models for Baffin caribou were one of the top 3 models based on AIC scores and non-significant H-L test values indicating that they were a good fit to the data.

References

Hosmer, D. W. and S. Lemeshow (2000). Applied Logistic Regression. 2nd ed. John Wiley & Sons, Inc.