APPENDIX 5B

GREENHOUSE GAS EMISSIONS

Tel: 519.823.1311
Fax: 519.823.1316

RWDI AIR Inc.
650 Woodlawn Road West
Guelph, Ontario, Canada
N1K 1B8
Email: solutions@rwdi.com

CONSULTING ENGINEERS
& SCIENTISTS

Baffinland Iron Mines Corporation

Baffin Island, Nunavut

Final Report

Greenhouse Gas Emissions

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SUBMITTED TO

Richard Cook

Knight Piésold Ltd.
1650 Main Street West,
North Bay, Ontario P1B 8G5

SUBMITTED BY

Alain Carrière, B.A., Dipl. Ecotox
Senior Project Manager
alain.carriere@rwdi.com

Christian Reuten, Ph.D.
Senior Scientist
christian.reuten@rwdi.com

Mike Lepage, M.S. CCM
Project Director
mike.lepage@rwdi.com

CONSULTING ENGINEERS & SCIENTISTS

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1. INTRODUCTION

The Mary River project's mine site and the associated ports in Milne Inlet and Steensby are isolated from any energy supplies. Total greenhouse gas (GHG) emissions associated with the project can be broken down into four categories, which will be treated in separate sections below:

- onsite GHG emissions from diesel fuel combustion for construction and operation activities;
- GHG emissions from disturbances of the underlying permafrost;
- emissions from shipping of iron ore to market; and,
- aircraft emissions.

According to The Mining Association of Canada (2009), the first two emission categories are categorized as Scope 1 emissions (*i.e.,* direct GHG emissions occurring from sources owned or controlled by the company), while the latter two categories are defined as Scope 3, "other indirect," emissions.[1]

All energy needs for the Mary River Project will be met with diesel fuel shipped to and stored at the two ports. This allows a straightforward estimation of the GHG emissions from total fuel consumption by all mine-related construction and operation activities, including temporary and permanent work camps. Total fuel consumption figures are very reliable upper estimates, because storage capacities will have to be designed according to estimated maximum fuel needs. Fuel consumption and associated GHG emissions are broken down by year and construction and operation activities.

Construction and operation activities will cause disturbances of the underlying permafrost. A rough estimate of the emissions associated with this land use change is provided in the second section.

The emissions from shipping of iron ore to market will be treated in the third section, separately from diesel combustion, because these emissions are Scope 3 emissions from upstream and downstream activities. Furthermore, a different fuel type is used (bunker fuel), and it is not stored at the ports.

Finally, aircraft emissions are treated in the last section and are separated into two categories: commercial long-distance flights and local flights. No fuel will be stored on site for commercial long-distance flights from Ottawa to Milne and Steensby for bringing workers to and from the project sites. Local flights are serviced by helicopters and small fixed wing aircraft, for which fuel will be stored on site.

All emissions are shown in units of Mt CO_2eq, where Mt equal 1 million tonnes or 109 kg, and 'CO_2eq' denotes 'CO_2 equivalent', where all GHG are converted to an equivalent amount of CO_2 with respect to their global warming potential (GWP) for a 100-year reference period. By definition, the GWP of CO_2 is 1. The GWP of CH_4 and N_2O are not exactly known, but we use the values used by the IPCC (2007) of 25 for CH_4 and 298 for N_2O. In the context of the Mary River project, other GHG can be neglected.

2. ON-SITE EMISSIONS FROM DIESEL FUEL COMBUSTION

Greenhouse gas emissions from diesel fuel combustion are calculated by multiplying the estimated annual fuel needs shown in Table A1 in the appendix by the associated combined emission factor for diesel fuel in Table A2. The results are shown in Table 1.

[1] Scope 2 emission sources are generated through the consumption of purchased electricity, which is not available for this project.

Table 1: Total GHG emission in Mt CO_2eq from diesel fuel combustion at the three project sites.

	2011	2012	2013	2014	2015	2016-2035	2036-2038	Totals	Annual Averages
Construction									
Milne Port	0.017	0.017						0.034	0.001
Mine Site 3 Mt/a road	0.046	0.031						0.077	0.003
Mine Site 18 Mt/a railway		0.028	0.028	0.028	0.028			0.111	0.004
Railway (north)		0.028	0.028	0.028	0.028			0.113	0.004
Steensby Port	0.334	0.334	0.334	0.334				1.337	0.048
Operation									
Milne Port			0.077	0.077	0.077	1.532		1.762	0.063
Mine Site					0.040	0.808		0.849	0.030
Steensby Port					0.334	6.685		7.020	0.251
Closure									
Closures and decommissioning							0.084	0.084	0.003
Totals									
	0.397	0.438	0.467	0.467	0.507	9.026	0.084	**11.386**	**0.407**

In Table 1 we segregated the data into years that involve some construction activities (2011-2015), years that involve operations only (2016-2035), and the final three years for closures and decommissioning (2036-2038). Total GHG emissions for the entire project period from 2011-2038 from on-site diesel fuel combustion are estimated to be 11.386 Mt CO_2eq with average annual emissions of 0.407 Mt CO_2eq.

3. ON-SITE EMISSIONS FROM PERMAFROST DISTURBANCES

3.1 Background

In this subsection, background information collected to estimate GHG releases from permafrost disturbances by the Mary River project is presented.

Past observations and future modeling results suggest a regional amplification of global warming in the Arctic, predominantly through decreased albedo (reflectivity of the Earth's surface) due to less sea ice and a longer ice-free season over the Arctic Ocean, which increases the absorption of radiation (IPCC, 2007). In this context, the question has been researched if GHG stored in permafrost, most notably methane (CH_4), would be released when more permafrost thaws under regional warming. Based on the insight that potentially very large amounts of methane could be released in some areas in the Arctic (e.g. Zimov et al., 2006), we investigated if any substantial methane releases could be expected from the proposed construction and operation of the iron ore mine.

Significant presence and release of GHG emissions from permafrost is limited to carbon dioxide (CO_2) and methane (Rasmussen et al., 1993). Both require the presence of organic matter. In some study areas, for example in Eastern Siberia, carbon dioxide and methane concentrations seem inversely related (Brouchkov and Fukuda, 2002) within the observed concentrations ranges. That is expected since the presence of sufficient oxygen allows the aerobic decomposition of organic matter into carbon dioxide, while, more commonly in permafrost regions, anaerobic decomposition produces methane. Mechanisms to oxidize methane may also exist (Brouchkov and Fukuda, 2002). However, there seems general agreement that carbon dioxide emissions from permafrost are insignificant. The focus is therefore on methane.

3.2 Previous Work on GHG Emissions from Permafrost

Substantial amounts of organic matter are found in three different kinds of permafrost: 'yedoma' (north plains of Siberia and Alaska, where organic matter was buried underneath a roughly 25 m deep dust layer during the glacial age, e.g. Rasmussen et al., 1993, and Moraes and Khalil, 1993), peatbogs (Toptygin et al., 2005: western Siberia), and other non-yedoma permafrost (see for example studies on methane release from discontinuous permafrost wetlands in the Mackenzie River Basin by Liblik et al., 1997, and in permafrost wetlands and dry sites in northeastern Siberia by Nakano et al., 2000).

The scientific literature provides methane contents in permafrost ranging over many orders of magnitude depending on organic matter and water content, temperatures, thawing and freezing cycles in the active layer, and vertical transport processes (Brouchkov and Fukuda, 2002). The latter in particular are not well understood, but play a major role in the accumulation of methane in mineral soils under the presence of organic soil layers. One such process might be the percolation of spring melt water into freeze cracks in underlying permafrost mineral soils. Anaerobic decomposition tends to be strongest in spring and summer (Moraes and Khalil, 1993; Nakano et al., 2000), so that the melt water carries air bubbles with high methane concentrations into underlying mineral soil layers (Tarnocai, 1999). Such vertical transport processes and the resulting accumulation of methane in lower mineral soil layers are likely to play an important role at the project sites.

3.3 Particular Challenges to Estimating GHG Emissions from Project Related Permafrost Disturbances

Understandably, research has focused on areas which are potentially large methane sources to gauge the potential of positive climate feedback, for example in the vast plains of Siberia, in northern Alaska, and in Canada's Mackenzie River Basin. Another potential concern are permafrost areas thatare currently net carbon sinks, in particular in the discontinuous permafrost zone, but might turn into carbon sources under future climate change.

In contrast, Baffin Island has received little attention in the research community. Tarnocai (1999) measured soil temperatures in Pangnirtung Fjord on Baffin Island 800 km southeast and at Lake Hazen on Ellesmere Island 1200 km northeast of the project sites. Further borehole information is available on Baffin Island (Smith and Burgess, 2000 and 2002) and vegetation information for southern Baffin Island (Jacobs et al., 1997).

An additional challenge is that the scientific literature focuses on thermal disturbance of permafrost from regional warming; the mechanical disturbance for example from stripping overburden is an entirely different matter.

3.4 Expected Project Related Permafrost Disturbances

Unlike many other permafrost regions mentioned above, the areas affected by the proposed mining activity on northern Baffin Island are characterized by little organic matter. During the last ice age, Baffin Island was covered underneath the Laurentian ice sheet. The retreat of the ice sheet left a partly barren landscape on northern Baffin Island. Most of the areas affected by the project are characterized by rocks and mineral soils with very little overlying organic soil. Vegetation is limited to mosses and very small ground cover with small biomass.

With respect to ground disturbances, the following areas of construction and operation need to be distinguished: infrastructure areas; waste rock stockpile and some smaller waste storage areas; iron ore deposit area; sand and gravel borrow areas along tote roads; and rock quarry areas.

The active layer (seasonally thawing surface layer) per se and its potential deepening due to local or regional warming pose challenges for infrastructure. Therefore, infrastructure will be designed in such a way that underlying permafrost will remain undisturbed. We can reasonably assume that methane will remain trapped. However, to the extent that these areas currently might be net carbon sinks, covering these with infrastructure or waste rock would eliminate their carbon uptake. We assume here that the carbon uptake is negligible because of the small biomass.

Access to the iron ore deposit requires minimal overburden removal, because most aggregate will be derived from rock that outcrops at the surface. The deposit is part of a local ridge with steeply sloping, rocky terrain. There is very little soil, mostly mineral soils. The total deposit area to be mined is 167 ha.

For ease of access, sand and gravel for tote roads will be sourced at locations with little or no organic soil cover, comparable to the overburden in the iron ore deposit area. The total area for potential sand and gravel area is about 44 ha. Mostly likely, only a fraction of this total area will have to be sourced. The largest extent of disturbances will be caused by overburden removal in roughly 50% of all the total rock quarry area, which is 207 ha.

3.5 Estimation of Maximum Possible GHG Emissions

We make the following conservative assumptions. We treat all areas to be stripped of overburden as being organic cryosols (soils with permafrost) with 107 kg/m2 carbon over full depth (Tarnocai, 1999). This is roughly equivalent to a 4 m deep layer of mineral cryosol with 27 kg/m2 based on a depth of 1 m (4 m × 27 kg/m2/m= 108 kg/m2; Tarnocai, 1999). Non-permafrost mineral soils have a carbon content about 15 times smaller (Zimov et al., 2006) but lack the vertical transport mechanisms for the accumulation of carbon; so our estimate should lie somewhere between these two values. Furthermore, our estimate should be considerably lower than 21 kg/m2 for mountainous steppe-tundra soils in Siberia for a 1 m active layer depth (Zimov et al., 2006) because of the much higher biomass of mountainous steppe-tundra soil. In what follows we will consider a carbon content of 107 kg/m2 a conservative and 10 kg/m2 a realistic value.

We assume that the total area will be developed, 418 ha (4.18 × 106 m2). The upper limit of the total carbon content of this area would be about 447,000 t (4.18 × 106 m2 × 107 kg/m2 × 1000 t/kg) and a more realistic value 41,800 t. Assuming that all the carbon is eventually converted to methane, the methane equivalent content is at most 596,000 t CH_4 (using 12 t C = 16 t CH_4), more realistically 55,700 t CH_4. For a 100-year global warming potential of 25 for methane, the corresponding carbon dioxide equivalents are 14.9 Mt CO_2eq (596,000 t CH_4 × 25 × 10-6 Mt/t) and 1.39 Mt CO_2eq, respectively.

Assuming that all carbon is present as or eventually converted into methane, it would take roughly one hundred years to release all the methane when the permafrost thaws (Zimov et al., 2006). That, however, is not the case here. Trapped methane will be released through mechanical disturbance. Currently, the active-layer depth varies depending on ground conditions between 0.2 m and 3 m, with typical values of 1-2 m. The overturning of the current ground layers will expose some permafrost to thaw-freeze cycles while embedding current active layers into permanent permafrost. A conservative estimate would be that as little as ten percent of the total trapped methane would be released initially, which itself is only a fraction of total carbon content. However, no further releases would be expected once the stripped overburden has settled and is no longer disturbed. Vertical temperature profiles will become similar to those before the disturbances occurred, and the slow formation and vertical transport of methane will commence again. The remaining carbon would therefore remain trapped.

3.6 Conclusions

In the very unlikely worst case scenario of a total release of the conservatively highly estimated carbon content of 107 kg/m^2, 14.9 Mt CO_2eq of GHG would be emitted through the permafrost disturbances associated with the Mary River project. The carbon content is likely overestimated by an order of magnitude, and a more realistic value is 1.39 Mt CO_2eq. Moreover, the actual release of carbon is also likely overestimated by an order of magnitude, as not all trapped methane is likely to be released, and only a fraction of all carbon is present as methane. We would therefore realistically expect a total release of much less than 1 Mt CO_2eq. In the summary below, we will assume a very conservatively high value of 1 Mt CO_2eq over the entire project period from 2011-2038 with an annual average of 0.036 Mt CO_2eq.

4. SHIPPING EMISSIONS

Shipping activities within the context can be broken down into: shipping of the iron ore to market, tugging, tankers, and sealifts. Greenhouse gas emissions from these activities are shown in Table 2. Ore shipping to market is beyond project boundaries. It is included in this section for completeness. We assumed the use of heavy fuel oil with a density of 1 kg/L. This density was used to convert fuel consumptions of each activity in Table A3 in the appendix from units of mass into units of volume. The results were multiplied by the combined GHG emission factor for heavy fuel oil in Table A2.

Table 2: Total GHG emission in Mt CO_2eq from shipping activities associated with the project.

	Total Emissions for 25 Seasons	2011-2038 Average Annual Emissions
Ore Shipping	3.302	0.118
Tugging	0.079	0.003
Tankers	0.157	0.006
Sealifts	0.063	0.002
Total	**3.600**	**0.129**

Shipping of ore to market is scheduled from 2013 until 2035, a total of 23 seasons. We made a conservative assumption of 25 shipping seasons in the calculation of totals. Total GHG emissions for 25 shipping seasons are estimated to be 3.600 Mt CO_2eq, which gives annual emissions averaged over the entire 28-year project period from 2011-2038 of 0.129 Mt CO_2eq. The actual shipping of the iron ore to market constitutes the main activity and accounts for about 90% of all emissions; tugging, tankers, and sealifts make up the remaining 10%.

5. AIRCRAFT EMISSIONS

Table 3 shows the expected emissions from all aircraft activities associated with the project. Like ore shipping to market, these are emissions occurring outside of the project boundaries and are included here to provide a complete picture of all emissions, directly and indirectly, associated with the Mary River project. Emissions were broken down into the first four years of major construction activities (2011-2014) and the remaining years of construction, operation, and decommissioning (2015-2038). The first section lists emissions from worker flights to and from the project sites. The second section covers local flights with helicopters and small fixed wing aircrafts.

Table 3: Total GHG emission in Mt CO_2eq from aircraft activities associated with the project.

	2011	2012	2013	2014	2015-2038	Total	Average per Year
Worker Flights							
Milne Port	0.0043	0.0043	0.0006	0.0006	0.0148	0.364	0.013
Mine Site	0.0179	0.0179	0.0179	0.0179	0.1832	4.468	0.160
Steensby Port	0.0173	0.0173	0.0173	0.0173	0.0045	0.178	0.006
Helicopter and Small Fixed Wing							
All locations	0.0004	0.0004	0.0004	0.0004	0.0003	0.008	0.0003
Totals							
	0.040	0.040	0.036	0.036	0.203	**5.019**	**0.179**

No fuel is stored on site for the worker flights. Emissions were calculated according to the following formula with the units shown underneath:

Emissions = Distance per flight × Number of flights × Fuel consumption × Emission factor × 10^{-9}
Mt CO_2eq = km × 1 × L / km × kg CO_2eq / L × 10^{-9} Mt/kg

Distance per flight and number of flights are estimated in Table A4 in the appendix. Fuel consumption for the flights is very difficult to estimate, because it is strongly dependent on payload, environmental conditions, flight distance and altitude, specific model, and age of the aircraft. In the absence of this information, we conservatively assumed the largest aircraft model that has been on the market for several years and calculated the fuel consumption from average flight range with full payload and maximum fuel capacity (Table A5). The combined emission factor for jet-A fuel is given in Table A2.

Emissions from local flights with helicopters and small fixed wing aircraft were estimated conservatively on the basis of total jet-A fuel needs given in Table A4. From these estimates, GHG emissions were calculated by multiplying fuel volumes by the combined emission factor for jet-A fuel in Table A2.

Total GHG emissions for all anticipated flights associated with the project from 2011-2038 are estimated to be 5.019 Mt CO_2eq with average annual emissions of 0.0.179 Mt CO_2eq.

6. SUMMARY OF GHG EMISSIONS

Table 4 summaries all GHG emissions from the Mary River project in the four areas discussed above. Total emissions over the project period from 2011-2038 are expected to be 21 Mt CO_2eq. This corresponds to an average of 0.75 Mt CO_2eq per year. Below we will evaluate the significance of these emissions by comparing them with other mining projects and different jurisdictions and by estimating their climate impact.

Table 4: Summary of project related GHG emissions in Mt CO_2eq.

	Total Emissions 2011-2038 (Mt CO_2eq)	Annual Average Emissions 2011-2038 (Mt CO_2eq)
Scope 1 Emission Sources		
On-Site Emissions from Diesel Fuel Consumption	11.386	0.407
On-Site Emissions from Permafrost Disturbances	1.000	0.036
Subtotal	***12.386***	***0.443***
Scope 3 Emission Sources		
Shipping Emissions	3.600	0.129
Aircraft Emissions	5.019	0.179
Subtotal	***8.619***	***0.308***
Grand Total	**21.005**	**0.750**

7. EVALUATION OF SIGNIFICANCE

A detailed analysis of all aspects of the significance of the proposed project's GHG emissions was not conducted; instead we provide a comparison with other mining projects and with jurisdictional and industry totals.

7.1 Comparison with other Mining Projects

Table 5 shows available GHG emissions data from some other mining facilities in Canada. The emissions are roughly comparable to the project's estimated average annual Scope 1 emissions of 0.443Mt CO_2eq. The two diamond mines are included based on their remoteness, although construction of, and access to, the facilities is likely easier than for the Mary River Project.

Table 5: Examples of total GHG emissions of other mining facilities in Canada for 2008[1]

Facility	City	Province/Territory	2008 GHG Emissions (Mt CO_2eq)
Diavik Diamond Mine	Lac de Gras	Northwest Territories	0.235
EKATI Diamond Mine	Yellowknife	Northwest Territories	0.188
Carol Iron Mine	Labrador City	Newfoundland and Labrador	1.244

[1]Source: http://www.ec.gc.ca/pdb/ghg/onlinedata/datasearch_e.cfm.

For the Carol iron mine and the proposed Mary River iron mine, emission intensities can be compared. At the Carol mine, 40 Mt raw ore are extracted annually, almost twice the projected production of Mary River (21 Mt). The Carol Project's emission intensity from Scope 1 emission sources (Baffinland, personal communication) is approximately 0.0311 Mt CO_2eq / Mt ore, which is similar to the estimated emission intensity of the Mary River project (0.0211Mt CO_2eq / Mt ore).The higher emission intensity at the Carol project can be attributed to the additional concentrator/pellet plant. Overall, the estimated average annual GHG emissions from the Mary River project appear reasonable by comparison with the other three mining projects in Table 5 above.

7.2 Comparison with Jurisdictional and Industry Totals

Table 6 shows a comparison of the Mary River Project's estimated average annual GHG emissions (0.443 Mt CO_2eq) with jurisdictional totals and emissions from all mining activities in Canada. All data were compiled for 2008.

Table 6: Mary River Project Annual Average Scope 1 GHG Emissions in Context

	GHG Emissions Mt CO_2eq / year	Mary River Project Emissions Comparison (%)
Nunavut [1,2]	0.36	123.000
Mining in Canada [1,3]	24.63	1.800
Canada [1]	734.42	0.060
Global [4]	40,253.00	0.001

[1]Source: Environment Canada (2010b).

[2]Nunavut's total GHG emissions for 2008, provided in Environment Canada (2010b), seems very low. Nunavut (2003) lists total GHG emissions for Nunavut in 1996 as 0.696 Mt CO_2. This corresponds to per capita emissions of 27.4 t CO_2, which is comparable to the Northwest and Yukon Territories. The values provided in Environment Canada (2010b) would suggest per capita emissions below the Canadian average, which seems unrealistic given the high heating and transportation needs in Nunavut.

[3]Includes stationary combustion from mining and oil and gas extraction and fugitive emissions from coal mining.

[4]Aggregated from information in The World Bank (2010).

Because of Nunavut's small population and manufacturing base, total GHG emissions in Nunavut are currently very low. Because the proposed project would be the first major mining operation in Nunavut, annual GHG emissions of the proposed mine would be more than double of total territorial emissions in 2008. The annual emission estimate for the project constitutes 1.8% of GHG emissions from all Canadian mining operations in 2008, 0.06% of total GHG emissions in Canada in 2008, and 0.001% of global emissions. On a national level, the emissions from the project are very small, and compared with global emissions they are insignificant.

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Appendix A

Table A1: Estimated diesel fuel needs (in millions of litres) at the three project sites. Data based on AMEC's Technical Decision Record 165926-7500-TDR-001 Rev. A (12 Oct 2010) and Technical Decision Memorandum TDM-159952-8500-131-042 Rev 1 (22 Jun 2010).

	2011	2012	2013	2014	2015	2016-2035	2036-2038	Totals	Annual Averages
Construction									
Milne Port	6.1	6.1						12.2	0.4
Mine Site 3 Mt/a road	16.6	11.1						27.7	1.0
Mine Site 18 Mt/a railway		10.0	10.0	10.0	10.0			40.0	1.4
Railway (north)		10.1	10.1	10.1	10.1			40.4	1.4
Steensby Port	120.0	120.0	120.0	120.0				480.0	17.1
Operation									
Milne Port			27.5	27.5	27.5	550.0		632.5	22.6
Mine Site					14.5	290.2		304.7	10.9
Steensby Port					120.0	2400.0		2520.0	90.0
Closure									
Closures and decommissioning							30.0	30.0	1.1
Totals									
	142.7	157.3	167.6	167.6	182.1	3240.2	30.0	**4087.5**	**146.0**

Table A2: Emission factors for combustion of different fuel types (data from Table A8-4 in Environment Canada, 2010a). Combined emission factors were calculated by adding all three masses weighted by the global warming potentials of each GHG; for a 100-year reference period these are 1 for CO_2, 25 for CH_4, and 298 for N_2O (IPCC, 2007).

	Emission Factor (g/L)			**100-Year GWP**			**Combined Emission Factor (kg CO_2eq/L)**
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	
Diesel	2,663	0.133	0.4	1	25	298	2.786
Heavy Fuel Oil	3,124	0.057	0.064	1	25	298	3.144
Jet-A	2,534	0.08	0.23	1	25	298	2.605

Table A3: Estimated shipping fuel needs. To convert mass to volume in the calculation of emissions, we assumed a density of 1 kg/L. A total of 25 seasons were assumed for calculation of totals. This is an over estimate since shipping of ore to market is scheduled from 2013 until 2035 (23 seasons).

	Fuel Consumption (t/day)	**Days per Round Trip**	**Round Trips per Season**	**Fuel Consumption (Mt) per Season**	**Total Fuel Consumption (Mt)**
Ore Shipping	35	30	40	0.042	1.050
Tugging				0.001	0.025
Tankers	20	20	5	0.002	0.050
Sealifts	20	20	2	0.001	0.020
Total				**0.046**	**1.145**

Table A4: Estimated number of worker flights (upper section) and estimated fuel consumption in million litres (ML) for local and regional helicopter and small fixed wind flights (lower section).

			2011	2012	2013	2014	2015-2038	Total	Average per Year
Number of Worker Flights									
	Aircraft Type	Round Trip Distance (km)							
Milne Port	Dash-8 / ATR	1500	365	365	52	52	52	2082	74.36
Mine Site	Boing 737	6200	365	365	365	365	156	5204	185.86
Steensby Port	Boing 737	6000	365	365	365	365	4 [1]	1556	55.57
Helicopter and Small Fixed Wing Fuel Consumption (ML)									
			0.150	0.150	0.150	0.150	0.100	3.000	0.107

[1]These are emergency/alternate flights and are only a rough estimate.

Table A5: Average fuel consumption of aircraft deployed locally at the project sites and for bringing workers to and from sites.

	Range (km)	Maximum Fuel Capacity (L)	Fuel Consumption (L/km)
Dash-8 400 [1]	2,522	6,526	2.59
ATR 72-500 [2]	1,650	5,000	3.03
Boeing 737 [3]	4,300	20,100	4.67

[1]Data from Wikipedia. Assumed the biggest Dash-8, seating 70 people. Since the number flights with Dash-8 versus ATR was not known we did actually not use this entry but rather the higher value for ATR.
[2]Data from manufacturer online brochure. Assumed the biggest ATR, seating up 74 people.
[3]Data from Wikipedia. Assumed a Boeing 737 Classic 300, 400, or 500, seating 108-189 people.