Caribou

Population estimates for caribou on Melville Peninsula have varied. Calef and Helmer (1981) provided an estimate of 52,000 animals in 1976 for the southern portion of Melville Peninsula (below 68°N). Heard *et al.* (1986) estimated 2500 animals and Ferguson and Vincent (1992) estimated a similar population of 2900 for northern Melville Peninsula (above 68°N). Others have indicated that about 4000 to 4500 adult females have been observed on the calving grounds and a total population for Melville Peninsula is about 10,000 animals (Borealis Exploration Limited 1981).

Caribou adapt their migrations according to snow conditions and forage availability. They can deplete the food supply in an area, and change their migration routes to utilize new browsing areas. They are particularly sensitive to disturbances during calving and post-calving periods. Little information on caribou movements on Melville Peninsula is available. Evidence from researchers and locals suggest that there is an east-west movement of caribou in late winter (Ferguson and Vincent 1992). Caribou surveys for the Melville Peninsula have shown that animals are principally distributed along the western coast.

Surveys (Calef and Helmer 1981; Rippen and Bowden 1972) have shown that calving grounds on Melville Peninsula are located in the area central region of the peninsula between Parry Bay and Lyon Inlet. Calving occurs from late May to mid June. Calves have been observed south of Sarcpa Lake (Ferguson and Vincent 1992). After the calving period bulls and non-breeding females have been found to the south of the calving grounds (Calef and Helmer 1981). Caribou tend to move to higher country inland during the summer and move to coastal areas in the fall.

Hunters from Igloolik and Hall Beach usually harvest caribou from northern Melville Peninsula and northern Baffin Island (Ferguson and Vincent 1992). During the winter, hunters have harvested caribou in the area east and south of Hall Lake. Some have also been harvested along the eastern coast, south of Parry Bay during the summer. Significant numbers of annual harvest have been taken on the Rae Isthmus, to the extreme south of the Melville Peninsula. Hunters have indicated that caribou move eastward through the isthmus in April and May and westward during September and October (Rippen and Bowden 1972).

Wolves

Little information exists on the status of wolves in Nunavut but they are expected to occur in low densities (COSEWIC 2003). Wolves are considered a sensitive species in Nunavut that is considered rare on Melville Peninsula (Department of Sustainable Development 2001) and usually hunted whenever they are seen (Borealis Exploration Limited 1981). They are usually found in association with caribou herds and have been reported by residents of Igloolik and Hall Beach (Ferguson and Vincent 1992). One of the biggest threats to the long-term persistence of wolves are humans and their associated activities that cause habitat alteration and exploitation (Cluff *et al.*, 2002).

Wolverines

The wolverine (*Gulo gulo*) is listed as a species of Special Concern by COSEWIC and is considered sensitive in Nunavut (COSEWIC 2003; Department of Sustainable Development 2001). There are limited data available on the distribution, abundance, and ecology of wolverines in Nunavut (Mulders, 2000). On the Melville Peninsula, wolverine populations are expected to be at low densities compared to other regions in Nunavut. Like wolves, they are usually found in association with caribou herds however, odours and waste from human developments have acted as an attraction for

these animals. Residents of Igloolik and Hall Beach have reported wolverines whenever caribou are around (Ferguson and Vincent 1992).

Fox

The Red Fox and the Arctic Fox occur on Melville Peninsula, both of which are considered secure in Nunavut (Department of Sustainable Development 2001). Red foxes have adapted well to arctic tundra habitats and compete with arctic foxes. In the arctic, foxes primarily prey upon lemmings and nests of waterfowl species. The cyclic nature of lemming populations influences the populations and behaviour of foxes. They are typically trapped in winter when they are common (Borealis Exploration Limited 1981). Arctic foxes will also trail behind polar bears to scavenge food.

Arctic foxes prefer vegetated soft ground for denning so the potential for dens exists in the CAM-F DEW Line Site region. Arctic foxes are territorial and rarely den less than a mile apart. Density of dens in the Keewatin was one per twenty-seven square miles. If foxes are present in the CAM-F DEW Line Site region they would likely only be one or two dens (Borealis Exploration Limited 1981).

Arctic Hare

The arctic hare occurs on the Melville Peninsula, however population numbers and density are unknown. They are considered secure in Nunavut (Department of Sustainable Development 2001). They have small home ranges that allow them to build up a series of runways and escape routes from predators (Anand-Wheeler 2002). They are a main prey species for carnivores and are important for maintaining predator-prey relationships in this harsh environment. The presence of arctic hare in a region can act as an indicator to the presence of prey species, such as foxes, in the region.

6.7.1.2 Birds

In the Arctic, the presence of birds is for the most part a seasonal phenomenon. Nunavut contains the northern limits of breeding ranges for numerous species of migratory birds, colonial seabirds, shorebirds and waterfowl. Besides being important for subsistence harvesting, birds are also valuable components of the landscape.

Approximately 40 species of birds are typically present in the CAM-F DEW Line Site region, of which approximately 22 are breeding in the area. The breeding bird community is more similar to those of Arctic Island sites than to other mainland sites (Montgomerie *et al.* 1982). Table 6-9 provides a summary of the birds for the CAM-F DEW Line Site region and provides and indication of their status and abundance as described by Montgomerie *et al.* (1982)

Table 6-9: Birds of the CAM-F DEW Line Site region

Common Name	Scientific Name	Status / Abundance (CAM-F DEW Line Site)	Status (Nunavut)
Red-throated Loon	*Gavia stellata*	Uncommon Breeder	Secure
Arctic Loon	*Gavia arctica*	Rare Breeder	Secure
Yellow-billed Loon	*Gavia adamsii*	Rare Visitor	Secure
Snow Goose	*Chen caerulescens*	Abundant Transient	Secure
Canada Goose	*Branta canadensis*	Uncommon Transient	Secure
King Eider	*Somateria spectabilis*	Abundant Transient	Sensitive
Oldsquaw	*Clangula hyemalis*	Common Breeder	Secure

Table 6-9: Birds of the CAM-F DEW Line Site region			
Common Name	Scientific Name	Status / Abundance (CAM-F DEW Line Site)	Status (Nunavut)
Red-breasted Merganser	*Mergus serrator*	Uncommon Visitor	Secure
Rough-legged Hawk	*Buteo lagopus*	Rare Breeder	Secure
Peregrine Falcon	*Falco peregrinus*	Rare Transient	May be at Risk
Gyrfalcon	*Falco rusticolus*	Rare Transient	Secure
Rock Ptarmigan	*Lagopus mutus*	Abundant Breeder	Sensitive
Black-bellied Plover	*Pluvialis squatarola*	Uncommon Transient	Secure
Lesser Golden Plover	*Pluvialis dominica*	Abundant Breeder	Secure
Semipalmated Plover	*Charadrius semipalmatus*	Uncommon Breeder	Undetermined
Ruddy Turnstone	*Arenaria interpres*	Rare Transient	Secure
Red Knot	*Calidris canutus*	Rare Transient	Undetermined
Sanderling	*Calidris alba*	Rare Transient	Secure
Semipalmated Sandpiper	*Calidris pusilla*	Uncommon Breeder	Sensitive
White-rumped Sandpiper	*Calidris fuscicollis*	Common Breeder	Secure
Baird's Sandpiper	*Calidris bairdii*	Abundant Breeder	Secure
Pectoral Sandpiper	*Calidris melanotos*	Uncommon Breeder	Secure
Purple Sandpiper	*Calidris maritima*	Rare Visitor	Sensitive
Dunlin	*Calidris alpina*	Rare Breeder	Secure
Red Phalarope	*Phalaropus fulicaria*	Uncommon Breeder	Sensitive
Pomarine Jaeger	*Stercorarius pomarinus*	Rare Visitor	Secure
Parasitic Jaeger	*Stercorarius parasiticus*	Rare Transient	Secure
Long-tailed Jaeger	*Stercorarius longicaudus*	Uncommon Breeder	Secure
Herring Gull	*Larus argentatus*	Rare Breeder	Secure
Thayer's Gull	*Larus thayeri*	Uncommon Visitor	Not Assessed
Glaucous Gull	*Larus hyperboreaus*	Uncommon Breeder	Secure
Sabine's Gull	*Xema sabini*	Rare Visitor	Secure
Arctic Tern	*Sterna paradisaea*	Uncommon Breeder	Secure
Snowy Owl	*Nyctea scandiaca*	Rare Visitor	Secure
Horned Lark	*Eremophila alpestris*	Abundant Breeder	Sensitive
Common Raven	*Corvus corax*	Uncommon Visitor	Secure
Water Pipet	*Anthus spinoletta*	Uncommon Breeder	Sensitive
White-crowned Sparrow	*Zonotrichia leucophrys*	Rare Visitor	Sensitive
Lapland Longspur	*Calcarius lapponicus*	Abundant Breeder	Secure
Snow Bunting	*Plectrophenax nivalis*	Abundant Breeder	Sensitive

Waterfowl and Water Birds

Waterfowl observed in the CAM-F DEW Line Site region include Snow Geese, Canada Geese, King Eider, Oldsquaw, and Red-breasted Merganser. There is a colony of snow geese nesting in the Roche Bay area (Borealis Exploration Limited 1981; Montgomerie *et al.* 1982) and most birds seen in the CAM-F DEW Line Site area are associated with this colony. Roche Bay is also a spring staging area for other geese and eiders. The area is not used for staging in the fall (Borealis Exploration Limited 1981).

The only common waterfowl breeder in the CAM-F DEW Line Site area is the Oldsquaw who nest in the small ponds near the site. Oldsquaw will move their broods to larger lakes, like Sarcpa Lake, and remain there until August or September (Montgomerie *et al.* 1982).

Three species of loons are rare to uncommon in the CAM-F DEW Line Site region. Red-throated Loons and Arctic Loons have been observed on and flying over Sarcpa Lake. Evidence of breeding by

both species has also been observed. One Yellow-billed Loon has been observed on the lake (Montgomerie *et al.* 1982).

Four species of gulls are rare to uncommon for the area. The Herring Gull and Glaucous Gull have bred in the area and Thayer's Gull and Sabine's Gull have been observed in the area. Records from Igloolik have shown that these species are more common along the coastal regions (Montgomerie *et al.* 1982).

Raptors

Peregrine falcons are relatively common on the Melville Peninsula. Surveys on the Melville Peninsula (Calef and Heard 1981) indicate their preferred nesting sites are on cliffs and outcrops near lakes, ponds and streams. Peregrine falcons have been observed nesting on southern Melville Peninsula (Calef and Heard 1981) but have not been observed nesting in the vicinity of Sarcpa Lake (Montgomerie *et al.* 1982).

The gyrfalcon is the largest of all falcons, preying on mammals and birds up to the size of arctic hares and geese. They begin nesting in May and return to the same cliffs for many years, leaving a build-up of white guano that becomes encrusted with orange lichen. While the gyrfalcon has been observed nesting on southern Melville peninsula (Calef and Heard 1981), it is considered a rare transient in the CAM-F DEW Line Site region (Montgomerie *et al.* 1982).

Rough-legged Hawks have been observed nesting in the Sarcpa Lake region (Montgomerie *et al.* 1982; Smith 1987) as well as on the southern portion of Melville Peninsula (Calef and Heard 1981). However, they are considered a rare breeder in area (Montgomerie *et al.*, 1982). The snowy owl is considered a rare visitor to the area (Montgomerie *et al.* 1982).

Shorebirds

Thirteen species of shorebirds have been recorded for the Sarcpa Lake area (see Table 6-9). Of this group five are considered rare to uncommon breeders, one is considered a common breeder and two are considered abundant breeders. The latter two are the lesser golden plover and Baird's sandpiper. Both of these species prefer dry Dryas-lichen areas for nesting. The common breeder (white-rumped sandpiper) prefers wet sedge meadows for nesting as do the majority of the uncommon breeders (Montgomerie *et al.* 1982).

Other Birds

Of the remaining birds in the area, three are considered abundant breeders. These are the horned lark, lapland longspur and the snow bunting. The horned lark and lapland longspur nest mainly on dry Dryas-lichen areas. In the Sarcpa Lake area snow buntings have been found nesting on disturbed habitats, in crevices on rock ridges and boulder fields (Montgomerie *et al.* 1982).

6.7.1.3 Species at Risk

The federal *Species at Risk Act* (*SARA*) was passed by Parliament on December 12, 2002. As of June 5, 2003 most of the Act has come into force. *SARA* applies to all aquatic species and migratory birds wherever they are found and to all species listed as endangered, threatened or extirpated species on federal lands (which includes territorial lands) by COSEWIC. In addition, *SARA* amends the definition of "environmental assessment" in the *Canadian Environmental Assessment Act* to include any

change that the project may cause to a listed species, its critical habitat or the residences of individuals of that species. Subsequently, any project requiring an environmental assessment under federal law that is likely to affect a listed species or its critical habitat needs to identify the adverse effects, and, if the project goes forward, steps must be taken to avoid or lessen those effects and to monitor them.

The polar bear, wolverine and peregrine falcon are three wildlife species that are listed by COSEWIC (2003) as species at risk. The status of these species has been highlighted in the subsections above. Peregrine Falcons are relatively common on Melville Peninsula with the major nesting areas on the southwestern coast (Borealis Exploration Limited 1981), but as mentioned there has been no documented evidence of peregrines nesting near Sarcpa Lake. Both the polar bear and wolverine are only expected to occur near Sarcpa Lake on an occasional basis. Both the horned lark and snow bunting are sensitive species and are expected to be two of the more common species in the Sarcpa Lake area. Given the current level of disturbance in the area effects to these two species are likely to be not significant.

6.7.2 Terrestrial Animals and Habitat Impact Assessment

6.7.2.1 Study Area Boundaries

Given the wide ranging characteristics of most wildlife species, the spatial boundary for the assessment of the effects of project activities on the terrestrial animals should include the footprint of the CAM-F DEW Line Site facilities plus the surrounding area which may extend to the limit of the Melville Peninsula depending on the type of wildlife species. The temporal boundary is the remediation field-work period as well as the additional monitoring period following completion of the project.

The administrative boundaries for the assessment refer to the jurisdictions within which and for which the assessment is being prepared. In this case, the assessment is being prepared under CEAA and NIRB for review by other federal and territorial departments following the CEAA process with additions to meet the NIRB requirements. Technical boundaries of the terrestrial animals and habitat assessment are the limited time frame associated with the environmental screening.

6.7.2.2 Identification of Issues, Interactions and Potential Effects

Most wildlife species are likely to exhibit some degree of sensitivity to human disturbance and from heavy equipment during the remediation. This sensitivity varies based on aspects of their behaviour, including the degree to which they adapt and habituate to human disturbance. This disturbance could result in temporary displacement of certain species from preferred habitat, abandonment of nests, dens or breeding areas and stress-related reduction in reproductive success.

Potential interactions between wildlife, such as polar bear, wolves, wolverine and foxes, and the Project exist if proper waste and odour management strategies for the facilities are not developed. These strategies must identify and describe details of design features, operational measures, employee/contractor staff awareness and training, for handling of food, food waste and other wastes

throughout the clean up site and specifically for the incinerator, landfill site, kitchens, camps and personnel quarters.

Major threats to polar bears are occurring at the global scale. Bio-accumulation of pollutants and climate change are effecting the overall survival of this species. For the Foxe Basin population global climate change, as it is effecting sea ice patterns is the major threat (IUCN 2004). Hunting regulations and sustainable harvesting practices are being implemented to protect the bears.

The CAM-F DEW Line Site project is not within a major core area for polar bears. Consequently, interaction between the remediation activities and polar bears are expected to be minimal. A strategy for dealing with polar bear interactions will be implemented to ensure that no bears are unnecessarily destroyed as a result of the project.

Local inhabitants have identified the CAM-F project area as a good place to hunt caribou (C. Doupe pers. comm. 2004). However, the major movements of caribou are nearer the coast, away from Sarcpa Lake. The nearest caribou activity to Sarcpa Lake would be the wintering areas that extend up the east coast from Hall Lake south along Parry Bay, generally from the coast to 15 km inland (Borealis Exploration Limited 1981). The northern boundary of the calving area on Melville Peninsula is about 100 km south of Sarcpa Lake (Borealis Exploration Limited 1981), thus avoiding any disturbance during the calving and post calving period.

Loss of habitat may occur as a result of the development of new landfills in previously undisturbed areas, and the removal of existing facilities that may be used by wildlife as habitat, has the potential to impact the availability of habitat. Additionally, the extraction of granular material will require the disturbance of the ground and has the potential to impact terrestrial habitat. These effects will likely only influence the abundant land-bird species and smaller mammals. These species have localized habitat requirements but are typically widespread so that localized effects will not be significant at the regional scale.

Accidents, malfunctions and unplanned events such as collisions between wildlife and Project-related vehicles or hazardous materials spill may interact with wildlife in a manner that results in the alteration of habitat, changes in wildlife movement patterns and/or the loss of individual animals.

It should be noted that the removal of hazardous materials and contaminated soil from the environment reduces the risk of exposure to terrestrial animals. Table 6-10 is an environmental assessment matrix for the terrestrial animals VEC.

Table 6-10: Environmental Effects Assessment Matrix: Terrestrial Animals and Habitat								
Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects					
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context	
General Clean Up Activities	The use of heavy equipment during the clean up has the potential to disturb wildlife (A).	• Known wildlife colonies or bird nesting areas will be avoided, if possible • Minimum distance / height restrictions for transportation activities will be applied.	1	2	4/1	R	1	
Contaminated Soil Disposal / Hazardous Materials Removal	The removal of hazardous materials and contaminated soil from the environment reduces the risk of exposure to terrestrial animals (P).	• N/A						
Landfill Developments	Loss of habitat may occur as a result of the development of the new landfills in previously undisturbed areas (A).	• New landfills will be located within the existing facility footprint or adjacent to it wherever possible • New landfill areas will be graded and reshaped to match existing terrain to facilitate the recovery of ecosystem components.	1	2	3/1	R	1	
Facility Demolition	The existing facilities may be used by wildlife as habitat (i.e., nests in structures). The demolition of these facilities has the potential to impact availability of habitat (A).	• Facilities will be inspected for use by wildlife prior to demolition. • Facilities will not be demolished in the immediate vicinity of nests while birds are nesting. • Appropriate wildlife officer will be contacted for additional guidance to ensure disturbance of wildlife is minimized.	1	2	3/1	R	1	
Borrow Source Development	The extraction of granular material will require the disturbance of the ground and has the potential to impact terrestrial habitat (A).	• Disturbed areas will be graded and reshaped to match existing terrain to facilitate the recovery of ecosystem components.	1	2	3/1	R	1	

Table 6-10: Environmental Effects Assessment Matrix: Terrestrial Animals and Habitat

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context

KEY:

Magnitude:

1 = Low: *e.g.*, a few individuals. Species and or habitats affected occasionally.

2 = Medium: *e.g.*, a moderate percentage/number of individuals, species and or habitats affected within the LSA for a period of more than one month.

3 = High: *e.g.*, a large percentage/ number of individuals, species and or habitats within LSA affected for a period of more than one month.

4 = Very High *e.g.*, long-term regional effects on wildlife abundance distribution and biodiversity (*e.g.*, impact to an endangered species).

Geographic Extent:

1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101-1000 km²
5 = 1001-10,000 km²
6 = >10,000 km²

Duration:

1 = <1 month
2 = 1-7 months
3 = 8-36 months
4 = 37-72 months
5 = >72 months

Frequency:

1 = <11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:

R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:

1 = Relatively pristine area or area not adversely affected by human activity.

2 = Evidence of adverse effects.

N/A = Not Applicable

6.7.2.3 Mitigation

Prior to commencement of remediation field work, workers will receive wildlife awareness training and will be instructed to avoid wildlife encounters.

During the remediation activities, efforts will be made to avoid known wildlife colonies or bird nesting areas. Where applicable, minimum distance and height restrictions will be employed for transportation activities. All disturbed areas will be re-graded and reshaped to match the existing terrain to facilitate the recovery of the ecosystem components. Prior to demolishing facilities, they will be inspected for use by wildlife. Should any active nests be discovered, demolition activities will be postponed until the nesting is complete. Also, the appropriate wildlife officer will be contacted for guidance to ensure that the disturbance of wildlife is minimized.

Caribou protection measures are likely to be attached to land use permits. These measures will likely state that project activities shall be prohibited within all caribou calving areas during calving season or block or cause substantial diversion to caribou migration. Since the CAM-F DEW Line Site is outside of these areas these measures should not affect the project schedule.

There is the potential for accidental events to adversely affect wildlife and wildlife habitat. A contingency plan has been prepared to address spills of hazardous materials and this is included as Appendix B.

6.7.2.4 Residual Environmental Effects

Definition of Significance

A significant environmental effect of the project activities on terrestrial animals occurs when the population of a species is sufficiently affected by the Project to cause a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction and immigration from unaffected areas) would not return the population to its former level within several generations.

Residual Environmental Effects Summary

Table 6-11 summarizes the residual environmental effects of the project activities on terrestrial animals and habitat. Effects of the remediation activities on terrestrial animals and habitat are assessed as not significant. The removal and disposal of hazardous materials will have a positive effect on terrestrial animals.

Table 6-11: Residual Environmental Effects Summary Matrix: Terrestrial Animals and Habitat

Phase	Residual Adverse Environmental Effect Rating	Likelihood (of significant adverse environmental effects)	
		Probability of Occurrence	Scientific Uncertainty
General Clean Up Activities	NS		
Contaminated Soil Disposal / Hazardous Materials Removal	P		
Landfill Development	NS		
Facility Demolition	NS		
Borrow Source Development	NS		

KEY

Residual Environmental Effects Rating:

S = Significant Adverse Environmental Effect
NS = Not Significant Adverse Environmental Effect
P = Positive Environmental Effect

Probability of Occurrence: based on professional judgement:

1 = Low
2 = Medium
3 = High
n/a = effect not predicted to be significant

Scientific Uncertainty: based on scientific information, and statistical analysis or professional judgement:

1 = low level of confidence
2 = medium level of confidence
3 = high level of confidence
n/a = effect not predicted to be significant

6.7.2.5 Summary of Environmental Effects on Terrestrial Animals and Habitat

During the project activities, efforts will be made to avoid known wildlife colonies or bird nesting areas. Where applicable, minimum distance and height restrictions will be employed for transportation activities. All disturbed areas will be re-graded and reshaped to match the existing terrain to facilitate the recovery of the ecosystem components. Prior to demolition, facilities will be inspected for use by wildlife (*i.e.*, nests in structures). Should any active nests be discovered, waste consolidation will be postponed until the nesting is complete. Also, the appropriate wildlife officer will be contacted for guidance to ensure that the disturbance of wildlife is minimized.

Wildlife protection measures that include provisions to reduce attractants through proper waste disposal, education and awareness of potential wildlife interactions and hazardous materials and spill contingency procedures will be adhered to.

The effects of the remediation program on the terrestrial animals and habitat are assessed as not significant.

6.8 Aquatic Animals and Habitat

6.8.1 Existing Environment

The most important fish species to the people of the Melville peninsula is the Arctic char *(Salvelinus alpinus)*. Char are fished during their spring run out of the rivers and during the fall run back into the rivers. Char are usually caught in estuaries as the fish wait there to acclimatise to a change in water salinity. Populations of arctic char occur in Hall Lake and Hall River. These populations are the largest in the region and are important to the residents of Hall Beach and Igloolik (Borealis Exploration Limited. 1981).

Lake trout have been sampled from Sarcpa Lake (Wilson and Hebert, 1998), however their population numbers are unknown. Little information exists for other fish species in the Sarcpa Lake region.

6.8.2 Aquatic Animals and Habitat Impact Assessment

6.8.2.1 Study Area Boundaries

The spatial boundary for the assessment of the effects of project activities on the aquatic animals is Sarcpa Lake and its outlets, primarily Kingora River that leads into Hall Lake. The temporal boundary is the remediation field-work period as well as the additional monitoring period following completion of the project.

The administrative boundaries for the assessment refer to the jurisdictions within which and for which the assessment is being prepared. In this case, the assessment is being prepared under CEAA and NIRB for review by other federal and territorial departments following the CEAA process with additions to meet the NIRB requirements. Technical boundaries of the aquatic animals and habitat assessment are the lack of site-specific information and limited time frame associated with the environmental screening.

6.8.2.2 Identification of Issues, Interactions and Potential Effects

Sarcpa Lake drains into Hall Lake and Hall River via Kingora River, then into Roche Bay (Parry Bay) so it will be critical that deleterious substances (pollution and sedimentation) are kept out of Sarcpa Lake.

The potential exists for an accidental release of hazardous materials, contaminated soil and/or fuels, which could affect aquatic habitat. The proximity of the beach landfills to the marine environment has the potential to affect aquatic habitat, thereby affecting aquatic animals, due to sediment or hazardous materials entering the water. However, the potential for this impact will be reduced once the landfills

are remediated. The extraction of granular material and grading adjacent to water bodies has the potential to affect aquatic habitat, and thereby affect aquatic animals through sediment entering the water. The removal of contaminated soil and other hazardous materials from areas close to water bodies, reduces the risk of exposure to aquatic animals. The potential exists for an accidental release of hazardous materials, contaminated soil and/or fuels, which could affect aquatic habitat. Table 6-12 is an environmental assessment matrix for the aquatic animals and habitat VEC.

Table 6-12: Environmental Effects Assessment Matrix: Aquatic Animals and Habitat

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Landfill Closure	The proximity of the beach landfills to the marine environment has the potential to affect aquatic habitat, thereby affecting aquatic animals through sediment or hazardous materials entering the water (A).	• Mitigative measures such as berms, silt fences and/or silt booms will be implemented to prevent deleterious substances from entering the aquatic environment.	2	2	3/1	R	1
	The remediation of the beach landfills will reduce the potential for impact (P).	• N/A					
Site Regrading / Borrow Source Development	The extraction of granular material and grading adjacent to waterbodies (fresh and marine) has the potential to affect aquatic habitat thereby affecting aquatic animals though sediment entering the water (A).	• Mitigative measures such as berms, silt fences and/or silt booms will be implemented to prevent deleterious substances from entering the aquatic environment.	2	2	3/1	R	1
Contaminated Soil Disposal / Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from areas close to waterbodies, reduces the risk of exposure to aquatic animals (P).	• N/A					

Table 6-12: Environmental Effects Assessment Matrix: Aquatic Animals and Habitat

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
Removal and Transport of Hazardous Material, Fuel and Contaminated Soil	Accidental releases of hazardous materials, contaminated soil and/or fuels may enter the aquatic environment (A).	• A spill prevention and contingency plan will be in effect during activities. • Mitigative measures such as berms, silt fences and/or silt booms will be implemented to prevent deleterious substances from entering the aquatic environment.	2	2	2/1	R	1

KEY:

Magnitude:

1 = Low: <1% loss of critical fish habitat or <1% change in fish population abundance.

2 = Medium: 1-20% loss of critical fish habitat or 1-20% change in fish population abundance.

3 = High: >20% loss of critical fish habitat or >20% change in fish population abundance.

Geographic Extent:

1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101-1000 km²
5 = 1001-10,000 km²
6 = >10,000 km²

Duration:

1 = <1 month
2 = 1-7 months
3 = 8-36 months
4 = 37-72 months
5 = >72 months

Frequency:

1 = <11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:

R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:

1 = Relatively pristine area or area not adversely affected by human activity.

2 = Evidence of adverse effects.

N/A = Not Applicable

6.8.2.3 Mitigation

Effects of the Project on aquatic animals and habitat during the remediation will be mitigated by spill prevention and contingency plans including the use of berms, silt fences and/or silt booms.

6.8.2.4 Residual Environmental Effects

Definition of Significance

A significant environmental effect of the project activities on aquatic animals occurs if a population or portion thereof is affected in such a way as to cause a decline or change in abundance or distribution of the population over one or more generations; natural recruitment may not re-establish the population to its original level. A significant effect on aquatic habitat may alter the valued habitat, physically, chemically or biologically, in quality or extent, to such a degree that there is a decline in the diversity of the habitat. This effect would be reflected by a decline in abundance and/or change in distribution of

the benthic community within the bridge area, beyond which natural recruitment would not return that population to its former level within several generations.

Residual Environmental Effects Summary

Table 6-13 summarizes the residual environmental effects of the project activities on aquatic animals and habitat. The implementation of the mitigative measures proposed to protect the aquatic animals and habitat will result in the residual effects being not significant or, in the case of the removal of existing hazardous materials, positive.

Table 6-13: Residual Environmental Effects Summary Matrix: Aquatic Animals and Habitat

Phase	Residual Adverse Environmental Effect Rating	Likelihood (of significant adverse environmental effects)	
		Probability of Occurrence	Scientific Uncertainty
Landfill Closure	NS/P		
Site Regrading / Borrow Source Development	NS		
Contaminated Soil Disposal / Hazardous Materials Removal	P		
Removal and Transport of Hazardous Material, Fuel and Contaminated Soil	NS		
Contractor Support	NS		

KEY

Residual Environmental Effects Rating:

S =Significant Adverse Environmental Effect
NS =Not Significant Adverse Environmental Effect
P =Positive Environmental Effect

Probability of Occurrence: based on professional judgement:

1 = Low
2 = Medium
3 = High
n/a = effect not predicted to be significant

Scientific Uncertainty: based on scientific information, and statistical analysis or professional judgement:

1 = low level of confidence
2 = medium level of confidence
3 = high level of confidence
n/a = effect not predicted to be significant

6.8.2.5 Summary of Environmental Effects on Aquatic Animals and Habitat

Effects of the Project on aquatic animals and habitat are associated with the potential deposition of eroded material from borrow excavations and water quality effects from landfill leachates and fuel and chemical spills. The implementation of mitigation measures such as berms, silt fences and/or silt booms will prevent deleterious substances from entering the aquatic environment. Spill prevention and contingency plans will mitigate the effects of accidental spills. The ultimate remediation of the beach landfills, as well as contaminated soil and other hazardous materials from areas close to waterbodies will reduce the potential for further impact. The effect of the remediation of CAM-F on aquatic animals and habitat is assessed as not significant or as positive.

6.9 Health and Safety

6.9.1 Existing Environment

Jacques Whitford performed a human health and ecological risk assessment (HHERA) of the FOX-C site in 2004 (Jacques Whitford 2005). The primary objective of this study was to evaluate whether

known concentrations of chemicals in surface soil and water at the site would present a significant risk to human or ecological health based on future use of the property in its current condition and after remediation. The results of the HHERA were:

- Maximum concentrations of lead, TPH F2 and F4 Fractions resulted in a hazard quotient (HQ) greater than 0.2 and the maximum total PCB concentration resulted in an Incremental Excess Lifetime Cancer Risk (IELCR) greater than $1x10^{-5}$, indicating that exposure to the site could result in potential to produce adverse effects in human receptors under the exposure scenarios included in the risk assessment.

- Surface soil exposure point concentrations (EPCs) of the identified chemicals are not anticipated to produce adverse effects in ecological receptors under the exposure scenarios included in the risk assessment.

6.9.2 Health and Safety Impact Assessment

6.9.2.1 Study Area Boundaries

The spatial boundary for the assessment of the effects of project activities on health and safety is the CAM-F DEW Line Site vicinity (immediate area) and the homes of the workers performing the site investigations and remediation. The temporal boundary is the remediation period, as well as the additional monitoring period following the completion of the project.

The administrative boundaries for the assessment refer to the jurisdictions within which and for which the assessment is being prepared. In this case, the assessment is being prepared under CEAA and NIRB for review by other federal and territorial departments following the CEAA process with additions to meet the NIRB requirements. Technical boundaries of the health and safety assessment are the lack of site-specific information and limited time frame associated with the environmental screening.

6.9.2.2 Identification of Issues, Interactions and Potential Effects

The exposure of potentially hazardous materials from the landfills, the collection and disposal of potentially hazardous debris, the removal of hazardous materials from facilities and the general handling of hazardous materials has the potential to impact health and the safety of workers. Ultimately, the removal of contaminated soil and other hazardous materials from the environment reduces the risk of exposure to people. Table 6-14 is an environmental assessment matrix for the Health and Safety VEC.

Table 6-14: Environmental Effects Assessment Matrix: Health and Safety

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/Frequency	Reversibility	Ecological/Socio-Cultural and Economic Context
General Clean Up Activities	The excavation of potentially hazardous materials from the landfills, the collection and disposal of potentially hazardous debris, the removal of hazardous materials from facilities and the general handling of hazardous materials has the potential to impact health and the safety of workers (A).	• Transportation of any hazardous materials will be in accordance with Transportation of Dangerous Goods Regulations. • A comprehensive health and safety plan will be developed and implemented. • Workers will be required to wear and use appropriate personal protective equipment. • Workers will be trained in the use of personal protective equipment and proper handling procedures for hazardous materials.	1	N/A	1/1	R	N/A
Contaminated Soil Disposal/Hazardous Materials Removal	The removal of contaminated soil and other hazardous materials from the environment reduces the risk of exposure to people. (P)	• N/A					

KEY:

Magnitude:

1 = Low: No more than a few individuals are affected with minor, short-term health problems.

2 = Medium: A small portion of the local community are affected with minor, short-term health problems.

3 = High: An individual is affected with a chronic health problem or a large portion of the local community is affected with minor, short-term health problems.

Geographic Extent

N/A

Duration:

1 = <1 month
2 = 1-7 months
3 = 8-36 months
4 = 37-72 months
5 = >72 months

Frequency:

1 = <11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:

R = Reversible
I = Irreversible

Ecological/Socio-cultural and Economic Context:

1 = Relatively pristine area or area not adversely affected by human activity.

2 = Evidence of adverse effects.

N/A = Not Applicable

6.9.2.3 Mitigation

The transportation of any hazardous materials will be in accordance with the Transportation of Dangerous Goods Regulations. A comprehensive health and safety plan will be developed and implemented with requirements for workers to wear and use appropriate personal protective equipment. Workers will also be trained in the use of personal protective equipment and proper handling procedures for hazardous materials.

6.9.2.4 Residual Environmental Effects

Definition of Significance

A significant environmental effect of the project activities on health and safety occurs if an individual develops a chronic health problem as a result of working on the Project.

Residual Environmental Effects Summary

Table 6-15 summarizes the residual environmental effects of the project activities on health and safety.

Table 6-15: Residual Environmental Effects Summary Matrix: Health and Safety

Phase	Residual Adverse Environmental Effect Rating	Likelihood (of significant adverse environmental effects)	
		Probability of Occurrence	Scientific Uncertainty
General Clean Up Activities	NS		
Contaminated Soil Disposal/Hazardous Materials Removal	P		

KEY

Residual Environmental Effects Rating:

S = Significant Adverse Environmental Effect
NS = Not Significant Adverse Environmental Effect
P = Positive Environmental Effect

Probability of Occurrence: based on professional judgement:

1 = Low
2 = Medium
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n/a = effect not predicted to be significant

Scientific Uncertainty: based on scientific information, and statistical analysis or professional judgement:

1 = low level of confidence
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3 = high level of confidence
n/a = effect not predicted to be significant

6.9.2.5 Summary of Environmental Effects on Health and Safety

The excavation of potentially hazardous materials from the landfills, the collection and disposal of potentially hazardous debris, the removal of hazardous materials from facilities and the general handling of hazardous materials has the potential to affect the health and the safety of workers. To help mitigate this risk, the transportation of any hazardous materials will be in accordance with Transportation of Dangerous Goods Regulations. Additionally, a comprehensive health and safety plant will be developed and implemented, which will require workers to wear and use appropriate personal protective equipment. Workers will also be trained in the use of personal protective equipment and proper handling procedures for hazardous materials. The effects of the remediation are assessed as not significant. Ultimately, the removal of contaminated soil and other hazardous materials from the environment reduces the risk of exposure to humans

6.10 Archaeological and Heritage Resources

6.10.1 Existing Environment

The Department of Culture, Language, Elders and Youth of the Government of Nunavut was contacted for information on the archaeological and heritage resources of the CAM-F DEW Line site. They