Recent studies in northern climates have shown that invasive plants are becoming more prevalent; however, it is unclear whether this is due in part or in combination to a true increase in plant species, the conduct of more surveys specifically targeting invasive species, or increased development in remote areas (Shrader and Hennon 2005; Carlson ad Shephard 2007).

Invasive plants have the ability to aggressively establish and quickly spread in new environments. These adaptations coupled with their ability to out compete native species can affect plant species richness, diversity, and the composition and function of affected natural ecosystems (Haber 1997). The successful introduction and colonization of an area by invasive plant species relies, in part, on the presence of suitable habitat, access to a source of invasive plant material, and a means of dispersal.

The disturbances associated with development projects can unintentionally create growing conditions that facilitate the successful establishment of invasive plants. Exposed soil resulting from the removal of plant cover is particularly susceptible to colonization. Dirty equipment transported to site from other areas with invasive plants can act as a dispersal mechanism for invasive plant propagules that may have become lodged in tires and mud.

The most effective management of invasive plants is preventing their establishment into an area (Carlson and Shephard 2007; Schrader and Hennon 2005; USDA 2006; Polster 2005; Clark 2003). Removal once established is more costly and can be particularly challenging logistically in more remote northern areas.

Currently there are no known highly invasive alien plant species in the NWT (GNWT 2010j), including those identified in the TLP area. Invasive plant species are primarily restricted to populated and high-use areas, such as roadsides and communities. Development and operation of the proposed TLP could result in an increase in invasive plant species presence, primarily in disturbed, un-vegetated areas.

6.8.5 Project Design Features and Mitigation Measures

Mitigation strategies to reduce potential effects to ecosystems and plant species are outlined in Table 6.8-6 and generally involve limiting the overall size of the footprint, incorporating previously disturbed areas into development plans, and avoiding sensitive ecosystems and ecosystems with a high potential to support rare plant habitat, where possible. Reclamation trials will be developed throughout the life of the Project to identify the most effective treatment options for various conditions that are likely to occur. Treatments will be applied progressively wherever possible, as well as after Project closure.

Mitigation strategies are presented for both the Nechalacho Mine site and Hydrometallurgical Plant site, as they will be largely identical.

Removal/Burial of Ecosystem and Plant Species

The removal or burial of plants and portions of ecosystem types within the footprint will be unavoidable during the development of the TLP. Mitigation strategies for this effect largely involve limiting the size of the footprint, maximizing the incorporation of previously disturbed areas into the footprint (such as existing roads), and avoiding particularly sensitive

ecosystem types, to the extent possible. Additionally, on-site activities, such as ATV use, will be restricted to disturbed areas which will further reduce ecosystem disturbance. Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

Changes to Soils and Permafrost

Efforts have been made to avoid, where possible, and otherwise restrict the level of Project development in permafrost areas. In the event that avoidance is not possible, surficial materials containing permafrost will be stripped to bedrock and stockpiled for use during reclamation activities. If stripping to bedrock is not feasible, engineered structures such as Arctic foundations will be incorporated into the design if determined to be necessary.

Mitigation strategies that help reduce the potential effects to permafrost and soils include restricting the overall size of the development, siting infrastructure on bedrock wherever possible, avoiding areas that could potentially support permafrost, and minimizing the pooling and ponding of water on surfaces.

The potential effects of the TLP on permafrost can be fully addressed by applying appropriate engineering design and mitigation strategies, as described above. As such, no residual effects are anticipated.

Dust Deposition

The GNWT (1998) has developed guidelines for dust suppression, which will be referenced and implemented as required during all phases of the TLP. Dust management will generally involve watering dust-prone areas as and when required, as well as adhering to speed limits on roads, which helps limit the re-suspension of particulate material.

Invasive Plant Species

Mitigation strategies to help control the establishment and spread of invasive plant species include limiting the size of the overall footprint and the extent of soil exposed during the life of the Project. Importing clean equipment for use on-site will also help restrict the potential introduction of invasive plant species to the area.

TABLE 6.8-6: SUMMARY OF MITIGATION MEASURES FOR THE THOR LAKE PROJECT

Potential Effect	Potential Consequence	Mitigation Measures
Potential changes to permafrost	Increased thaw, subsidence, soil erosion, active layer depth, water infiltration, changes to plant communities due to altered substrate	Minimize footprint size; Incorporate previously disturbed areas into development plans; To the extent possible,construct infrastructure on bedrock, avoiding permafrost areas; Minimize ponding and pooling of water on surfaces; Use of appropriate engineering design for permafrost conditions where construction in permafrost cannot be avoided

TABLE 6.8-6: SUMMARY OF MITIGATION MEASURES FOR THE THOR LAKE PROJECT		
Potential Effect	**Potential Consequence**	**Mitigation Measures**
Removal and/or burial of ecosystems and plant species (including ecosystems that are particularly sensitive to disturbance and potentially provide rare plant habitat)	Long-term removal/disturbance of ecosystems and plant species	Minimize footprint size; Incorporate previously disturbed areas into development plans; To the extent possible, avoid ecosystem types that are sensitive or provide high rare plant habitat potential; Restrict site activities (e.g., ATV use) to footprint area; Conduct reclamation trials throughout the life of the Project to identify effective treatment options; Reclaim areas to viable and self-sustaining ecosystem types.
Increased dust deposition	Potential reduction in plant health and productivity; alteration of plant species composition in affected ecosystems	Use of water as a dust suppressant as required; General adherence to the GNWT *Guideline for Dust Suppression* (GNWT 1998); Enforce speed limits to help reduce dust production
Potential Introduction and Spread of Invasive Plants	Alteration of plant species composition in affected ecosystems; displacement of native plant species	Minimize footprint size; Limit amount of exposed soil; Ensure machinery and equipment is clean prior to use on site; Conduct periodic monitoring of disturbance areas, particularly roadsides, for invasive species presence

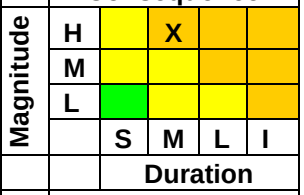
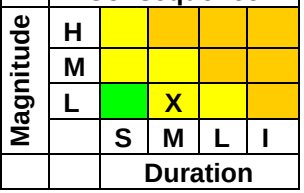
6.8.6 Residual Effects

Within the TLP area, the removal or burial of ecosystem types and plant species will occur during construction and effects will remain until the closure and decommissioning phase (Table 6.8-7). The effects are considered high magnitude and of moderate consequence. The effects are considered to be not significant overall mainly because of the relatively small size of the footprints, the incorporation of previously disturbed areas into the footprint layout (particularly at the Hydrometallurgical Plant site), and the largely reversible nature of the disturbances expected. Additionally, the ecosystem types that will be disturbed by Project activities are represented within the larger LSA, as well as regionally.

The potential effects of dust deposition and the potential introduction of invasive plant species on ecosystem types and plant species has been assessed as a low magnitude, local effect that will persist over the medium-term (Table 6.8-7). Effects will occur periodically throughout the life of the Project and are reversible in the long-term. These effects have been rated as being of low consequence and are not significant, due largely to their localized and generally transient nature.

Residual effects to ecosystem types and plant species are anticipated to be negligible and not significant within the RSA, and as such have not been assessed further.

TABLE 6.8-7: RESIDUAL EFFECTS ASSESSMENT FOR ECOSYSTEM TYPES AND PLANT SPECIES IN THE LSA

Description of Residual Effect (after Mitigation)	Evaluation of Residual Effect						
	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Likelihood	
Removal/Burial of Ecosystem Types and Plant Species	High	Local	Medium-term	Isolated	Reversible Long-term	High	
Dust Deposition and Potential Introduction of Invasive Plant Species on Ecosystem Types and Plant Species	Low	Local	Medium-term	Periodic	Reversible Long-term	Moderate – High	

6.9 WILDLIFE AND WILDLIFE HABITAT

The MVEIRB Terms of Reference (2011) requested Avalon to describe the effects that the development at both sites may have on wildlife and wildlife habitat. For each species, and/or species group Avalon was to consider the following:

- potential effects to habitat, including degradation and fragmentation, with a focus on important wildlife habitat. Include a discussion on effects occurring during vulnerable periods including but not limited to nesting or rearing;
- potential for increased attraction to both Project sites, risk of bear-human encounters, risk to people and associated carnivore mortality;
- potential for increased sensory disturbance from all sources (e.g., noise, odours, activity, vibrations from blasting, overflights, dust, transports trucks, locomotives, barge traffic). Predict effective habitat loss resulting from changed behaviour;
- potential for disruption of movement and migration patterns;
- potential for increased contamination of food and water, including bio-accumulation, from all sources. Discuss effects of tailings ponds on waterfowl, other aquatic birds and furbearers; and,
- potential for increased sources of direct or indirect mortality including from vehicle collisions on the Pine Point-Hay River road, the Thor Lake airstrip, as well as the increased rail traffic through Woodland caribou habitat and changes to hunting access.

The MVEIRB Terms of Reference (2011) also requested Avalon to describe potential adverse effects from both Project sites on any species-at-risk or other species of concern known or suspected to reside in the environmental assessment study area or potential adverse effects on their habitat including residences and to specifically include a discussion of both Woodland and Barren-ground caribou.

A number of wildlife species occur or potentially occur within the TLP area as year round or seasonal residents, spring and fall migrants, or transients. Potential wildlife effects from the proposed TLP may include direct and indirect habitat loss and alteration, habitat fragmentation, physical or behavioural disturbances including habitat avoidance, displacement, habituation, and possibly contamination and/or mortality.

The following sections of the environmental assessment discuss the key wildlife species that live in or utilize the Nechalacho Mine and Flotation Plant and Hydrometallurgical Plant study areas, how they may be affected by development-related activities, and the available mitigation measures for preventing or minimizing any potential effects on wildlife.

The air quality effects assessment (Section 6.2) has determined that air emissions associated with all phases of the TLP will be localized, short-term, periodic, low magnitude and rapidly reversible, for all criteria air contaminants (CACs) and are predicted to be lower than the corresponding NWT AQ Standards. As a result, the limited air emissions are not

anticipated to have a measurable effect on wildlife VCs, and as such will not be assessed further.

In addition, as previously discussed in Section 4.9.6, a screening-level radioactivity pathways assessment of the Thor Lake Project was completed to determine if there were any potential environmental pathways for radiological exposures, in particular, to vegetation, wildlife or fish and fish habitat. The assessment considered all potential pathways associated with the Project and concluded there were no potential environmental effects including effects on wildlife (Appendix G).

The assessment of potential effects of the TLP transportation-related components on wildlife is provided in the following sections:

- Great Slave Seasonal Docks and Barging Operation – Section 6.11;
- Highway 5 Trucking Operation – Section 6.12; and
- CN Railway Operation – Section 6.13.

6.9.1 Nechalacho Mine Study Area

6.9.1.1 Barren-ground Caribou

Caribou from the Bathurst herd can be expected to occasionally over-winter in the Nechalacho Mine Area and the islands in the east arm of Great Slave Lake from November to May. Barren-ground Caribou are ranked by GNWT ENR as "Sensitive" under the general status program (GNWT ENR 2010a), but are not assessed by COSEWIC (COSEWIC 2010). The most recent survey in 2009 estimated size of the herd at 31,900 ± 11,000 (GNWT ENR 2010b). The number of animals in a caribou herd naturally fluctuates over a 40 to 60 year cycle.

The Bathurst caribou herd has an annual home range of approximately 354,000 km^2 (Gunn and Dragon 2000). Their over-wintering areas are variable and include an expansive area consisting south of the tree line, from the Coppermine River to Great Slave Lake (including the Thor Lake study area) and extending in some years as far south as the Saskatchewan border (Gunn and Dragon 2000; Kelsall 1968). However, the herds' over-wintering distribution and density within vary, with the herd rarely using the same area for more than two or three years out of ten (Case et al. 1996). While on their wintering range, barren-ground caribou are sensitive to disturbances.

During the winter, lichens favoured by caribou are associated with late-successional seral stage forests, as found in the Bedrock-Lichen broad habitat type present in the Nechalacho Mine site LSA and RSA. Bedrock-lichen broad habitats cover 16% of the RSA (Stantec 2010f). In some years, deep snow and freeze-thaw cycles reduce the amount of terrestrial lichens available, and arboreal lichens found in the Shrub Wet broad habitat type, which cover approximately 10% of the RSA, become an important food source. During times with low snowfall, caribou will also feed in richer valleys and low lying lakeshores and wetlands. The Bathurst herds' over-wintering habitat is not limiting across their range.

Frozen lakes and ponds provide important security habitat and travel passageways during the winter. All frozen lakes and ponds within the Nechalacho Mine study area may be utilized by over-wintering caribou.

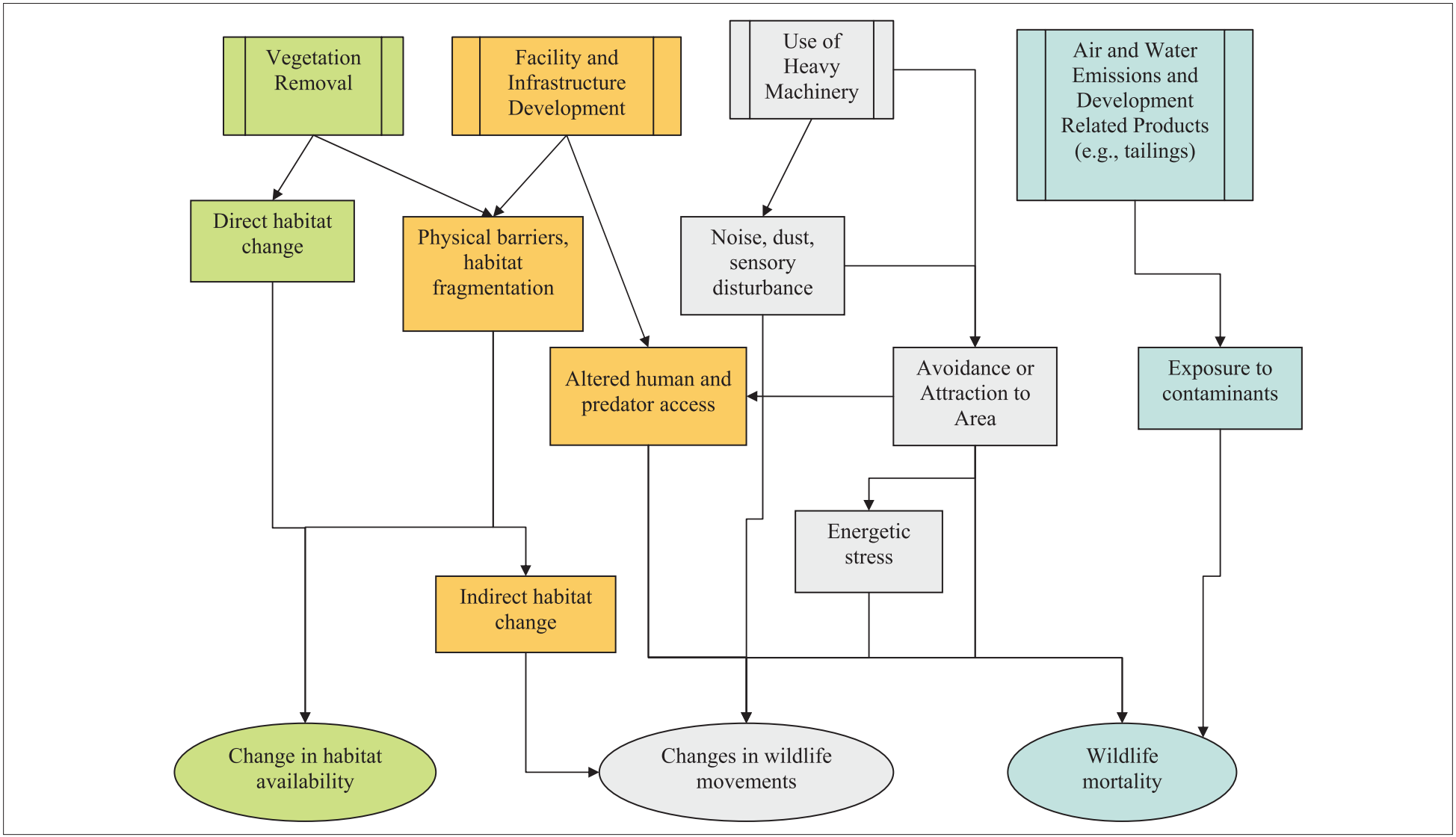
Caribou spring migration generally begins in late April along undefined travel routes within their forested winter ranges, and becomes more directed into broad corridors as movements coalesce towards the calving area. The intensity of use of known routes during spring migration depends largely on the late winter distribution of the herd in any given year. Habitat frequently used for traveling during spring migration includes the drainages of major rivers and large lakes. The location of the Nechalacho Mine is near the limits of the Bathurst herds' annual range. There are no known important migration corridors within the Nechalacho Mine area and the Project is not anticipated to block migratory routes or confuse migrating caribou. Confidence in this assessment is high as known barren-ground caribou migration corridors are well outside the zone of influence from the TLP.

The main ways that the Nechalacho Mine and Flotation Plant (and associated infrastructure and activities) may affect barren-ground caribou is through direct change in over-wintering habitat availability, movements (including avoidance and displacement), and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Avalon's footprint design of the underground mine, clustering of the surface facilities, use of existing roads, and placement of the tailings delivery pipeline along the existing road will minimize the amount of direct habitat loss. Nevertheless, a small amount of winter feeding, resting/security, and traveling habitat will be lost as a result of the Nechalacho Mine and its associated infrastructure. The Flotation Plant and its associated infrastructure may directly affect a negligible amount of poor quality feeding habitat, and the tailings management facility may directly affect a low amount of feeding, resting/security and traveling habitat. Due to the Bathurst caribou herd's large winter range and infrequent occurrence in the area, the amount of quality forage, resting/security, and traveling habitat lost due to the Nechalacho Mine is predicted to be low in magnitude. Direct loss of habitat will be local in extent and reversible in the long term since lichen recovery following habitat disturbance may take decades. However, this reversible loss of such a small amount of habitat that may be infrequently used by caribou is considered to be insignificant at both the local and regional scale. Confidence in this assessment is considered high as the small amount of quality habitat at the Nechalacho Mine study area that may be infrequently used by caribou is considered to be insignificant at both the local and regional scales.

Barren-ground caribou are known to avoid land use developments; however, their response appears to vary with season, group size and composition, sex, herds' previous experiences, and other factors. In addition, avoidance responses vary with the level of human disturbances and activities, where avoidance is greatest towards major developments and activities (Johnson et al. 2005). While some studies indicate that caribou may become habituated to human activities and infrastructure and remain within a few kilometres from disturbance sources, they are not representative of the majority of the herd (Vistnes and Nellemann 2008). Caribou responses to human developments at a regional scale tend to be long-term with little evidence of habituation (Vistnes and Nellemann 2008). Regional

studies generally find caribou reduce their use (50 – 95% avoidance levels) within 5 km of human developments (Vistnes and Nellemann 2008).



LEGEND

- Activity
- Stressor
- Effect

NOTES

1.

ISSUED FOR USE

CLIENT

AVALON RARE METALS INC.

EBA Engineering Consultants Ltd.

THOR LAKE PROJECT

Wildlife Pathways of Effects

PROJECT NO.	DWN	CKD	REV
V15101007.006	SL	TP	0

OFFICE	DATE
EBA-VANC	April 6, 2011

Figure 6.9-1

Q:\Vancouver\Graphics\ENGINEERING\V15\1\V15101007_ThorLake\006_DAR\V15101007_DAR_CDR118.cdr

With Avalon's decision to mine and conduct primary crushing operations underground, dust and noise generation will be minimized at the Nechalacho Mine and Flotation Plant site. A low amount of noise and dust will be generated during the construction, operation, and closure phases. Throughout the life of the Project, the primary source of noise and dust will be from vehicle operations. Vehicle traffic, including haul trucks, will be most frequent at the Flotation Plant site, airstrip, and the haul road to Great Slave Lake. Dust and noise impacts will be low in magnitude, local in extent, reversible in the short-term, , and a low consequence. Confidence in this assessment is high as the Nechalacho Mine is located at the edge of the Bathurst herds known range and barren-ground caribou avoidance to developments is relatively known.

The few over-wintering barren-ground caribou that may occur in the Nechalacho Mine area in some winters may also be displaced by visual disturbances from the infrastructure, vehicle traffic, people, and aircraft. This temporal disturbance may influence daily movements if encountered, but is unlikely to disrupt seasonal movements. Displacement may occur most frequently near the haul road to Great Slave Lake, airstrip, and at the Flotation Plant during the construction, operations, and closure phases, as well as at the tailings management facility during the construction and closure. Visual disturbances to the few over-wintering barren-ground caribou are low in magnitude and local in extent. The duration of such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance by the few barren-ground caribou occurring in the local area would be expected to be low and periodic. Confidence in this assessment is considered moderate since the response of barren-ground caribou to various development-related visual disturbances is dependent upon multiple factors.

The Nechalacho Mine and Flotation Plant may result in localized avoidance by the few over-wintering caribou that may infrequently occupy the local area; however, the mine is not predicted to have any effect at the herd level.

Mineral developments do not directly result in significant caribou mortality (Lines 2009). The risk of mortality from equipment and vehicle collisions at the Nechalacho Mine study area is considered negligible with a low likelihood of occurrence.

To minimize any potential for direct and indirect Project-related barren-ground caribou effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Develop standard aircraft procedures for flying into and departing from the Nechalacho Mine airstrip to accommodate caribou if present
- Maintain a minimum flight altitude of 600 m during all times, except during take off and landings.
- Implement speed limits on all site roads.

- All Project-related transportation activities to give the right-of-way to any wildlife including barren-ground caribou that such activity may encounter.
- Alert system to warn personnel of barren-ground caribou in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program of wildlife related policies and mitigation to all Project employees and contractors.
- Regularly monitor and adjust, where appropriate, mitigations to minimize disturbance to caribou.
- Incinerate all waste foods and human garbage consistent with current industry good management practices to minimize predator attraction to the local area.
- Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on barren-ground caribou will be low with no residual impacts expected to occur. With the implementation of the mitigation, development-related activities are not expected to affect the population of the Bathurst caribou herd within the RSA.

6.9.1.2 Moose

Moose occur throughout the boreal forest of the NWT and are listed as secure in the Northwest Territories. Aerial moose surveys were conducted across the Taiga Shield ecoregion in 2004 and 2007 (Cluff 2005; 2008). Based on these results, moose populations are believed to be increasing. The most current densities in the Taiga Shield ecoregion is estimated at 5.4 moose per 100 km² (Cluff 2008). Similar densities are expected at the Nechalacho Mine study area.

Moose populations are sensitive to harvesting and predation. Harvests of moose near the Nechalacho Mine area are expected to be low and likely opportunistic due to the remoteness of the site. Wolves and black bears are the main predators of moose and moose calves. Predator densities specific to the Nechalacho Mine study area is unknown.

Moose favour semi-open forests that include an abundance of willow and other deciduous browse material located close to lakes, river valleys, stream banks or sand bars. In the summer they can be found close to shallow lakes and ponds where they feed on aquatic vegetation. Open wind exposed ridgelines and aquatic habitats are also used to avoid insects in the summer. In the winter, they may use thick conifer forests for winter cover. Moose habitat is not considered limiting in the local and regional study areas.

Areas with a high concentration of deciduous shrubs and trees, such as habitats in early successional stages support good moose foraging habitat. Based on the wildlife habitat assessment, broad habitat types present in the Nechalacho Mine study area that have moderate to high values for moose are: Broadleaf Upland, Shrub Fen, Sedge Fen, and Open Water (EBA 2010a). In late May or early June, calves are born in secluded areas in densely vegetated habitats including shorelines and islands. Calving may occur throughout the Nechalacho Mine local and regional study areas.

The main ways the Nechalacho Mine and associated infrastructure and activities can affect moose is through habitat loss, change in daily movements, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

The Nechalacho Mine and its associated infrastructure may remove and create moose habitat. The Nechalacho Mine and Flotation Plant will result in direct habitat loss during construction; however, the majority of the site infrastructure will be located in habitat types with a low overall habitat ranking for moose (EBA 2010a). Summer feeding and insect relief habitat will be directly lost as a result of the construction and operation of the tailings management facility.

Salmo Consulting Inc. et al. (2004) report moose populations appear to be more sensitive to overharvesting and other sources of mortality than compared to habitat loss and fragmentation. Direct habitat loss effects are reversible after site closure when willows and other early seral stage browse plants develop. Based on the ecosystem mapping studies (Stantec 2010f), habitats with moderate to high overall values for moose are common in the LSA and RSA. The direct loss of moose habitat is considered low in magnitude, local in extent, and low consequence of effect. Confidence in this assessment is high since the amount of moose habitat in the local and regional study areas are known based on the ecological mapping studies.

The Nechalacho Mine and associated infrastructure and activities may also directly affect moose daily movements through avoidance during the short-term construction and closure phases and longer-term operations phase. Scientific evidence suggests moose may avoid linear features and other land use developments by 100 to 500 m depending on the season, sex, surrounding habitat, and population (Salmo Consulting Inc. et al. 2004). The effect on moose daily movements as a result of avoidance behaviour to development-related infrastructure is low in magnitude and local in extent. Disturbances are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures would be expected to be limited. Confidence in this assessment is moderate since avoidance effects on moose are variable with disturbance activity, season, surrounding habitat, and other factors.

Moose are considered to be relatively tolerant to human disturbances (Salmo Consulting Inc. et al. 2004). Although, moose may be still be affected by the visual and noise disturbances from the infrastructure, vehicle and foot traffic, and aircraft. These short-term disturbances may occur most frequently near the haul road to Great Slave Lake, at the airstrip, and at the Flotation Plant during the operation phase, as well as at the tailings

management facility during the construction and closure phases. Visual and noise disturbances to the few moose occurring in the LSA is low in magnitude, local in extent, sporadic to periodic in frequency, and reversible upon cessation of the activity or by moving away from the activity. Confidence in this assessment is moderate since behavioural effects on moose are variable with disturbance activity, season, surrounding habitat, and other factors; however, moose are relatively common in the LSA and will likely encounter development-related disturbances.

The risk of mortality from equipment and vehicle collisions at the Nechalacho Mine study area is considered negligible, with a low likelihood of occurrence.

To minimize any potential for direct and indirect Nechalacho Mine development-related moose effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Maintain a minimum flight altitude of 600 m during all times, except during take off and landings.
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including moose that such activity may encounter.
- Alert system to warn personnel of moose in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program of wildlife related policies and mitigation to all Project employees and contractors.
- Regularly monitor and adjust, where appropriate, mitigations to minimize disturbance to caribou.
- Incinerate all waste foods and human garbage consistent with current industry good management practices to minimize predator attraction to the local area.
- Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on moose will be low with low residual impacts expected to occur. A low level of residual impacts may remain at the tailings management facility following mitigation. These residual effects are anticipated to be negligible and not significant in the context of the RSA. With the implementation of the mitigation as described, development-related activities are not expected to affect the overall health or well-being of the moose population frequenting the LSA.

6.9.1.3 Black Bear

Black Bears are common throughout the boreal forests of the NWT, and are relatively common in the area of the Nechalacho Mine and Flotation Plant. The Black Bear population in the NWT is healthy and estimated at 10,000 (GNWT ENR 2010a). Black bear densities at the Nechalacho Mine study area are unknown. During the 2010 field studies, two black bears were observed and 49 observations of tracks, feeding sign, and scat were recorded in various habitat types across the Nechalacho Mine study area.

Black bears are habitat generalists and the quality of their habitat is based primarily on the abundance of seasonally important food items. For instance, in the spring, bears gravitate towards areas with early-emerging vegetation such as roadsides and wetlands dominated by sedges, cottongrass, grasses, and horsetails, and may be found in sites such as meadows with over-wintered berries. In summer, bears typically consume a variety of species of grasses, sedges, horsetails, and forbs. Insect activity peaks during summer, and black bears feed heavily on colonies of ants, bees, and wasps. By fall time, their diet shifts as the nutritional quality of many plants decline and berries become ripe.

By late fall to early spring (late September to April), black bears are hibernating in dens constructed in eskers or drumlins, stream banks, or in natural cavities such as an upturned tree root. Black bears can be expected to den in the vicinity of the LSA wherever appropriate habitat exists.

Black bear home range sizes within the Nechalacho Mine LSA and RSA is generally unknown; however, in the NWT they are estimated to be 75 to 200 km^2 (GNWT ENR 2010b). A male's home territory is significantly larger than females, and a single male's territory may overlap several females (GNWT ENR 2010b). Based on the size of the direct footprint of the Nechalacho Mine and Flotation Plant (and its associated infrastructure), only a few black bears may be directly affected.

The main ways that the Nechalacho Mine and Flotation Plant and associated infrastructure and activities can affect black bears are through habitat loss or alteration, changes in daily movements through avoidance, displacement, and habituation (e.g. attraction) behaviours, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Black bear habitat will be directly lost as a result of the construction activities for the Nechalacho Mine and Flotation Plant and associated infrastructure. Appropriate black bear feeding and denning habitat is common throughout the LSA and RSA. Direct loss of black bear habitat is considered low in magnitude, local in extent, and reversible in the short-term following closure of the mine. Confidence in this assessment is high since the amount of black bear habitat in the local and regional study areas are known based on the ecological mapping studies.

Black bears can be expected to be present in the vicinity of the Nechalacho Mine and associated infrastructure and activities quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Encounters with development-related noise or activities will most commonly occur in the spring, summer, and fall during construction, operation, and closure of the Nechalacho Mine. These

encounters may result in black bears avoiding the disturbance or adjacent quality habitat. A low potential for development-related encounters during winter hibernation may only occur during the construction phase.

Scientific evidence suggests avoidance behaviour of land use developments is dependent on human activities, visual and noise disturbances, and season. Black bears encountering Nechalacho Mine activities may show minor displacement behaviour and avoid the immediate development area. The construction phase, in particular, is expected to generate some degree of disruption, at least temporarily. The duration of exposures during construction are expected to be low, perhaps lasting a few minutes to a few months, and are reversible upon cessation of the activity or by moving away from the activity.

Visual and noise disturbances from the local roads and site infrastructure and associated activities is considered to be low in magnitude, local in extent, and reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures would be expected to be low and periodic. Confidence in this assessment is high since suitable black bear habitat occurs throughout the LSA and RSA.

Black bears are most sensitive to disturbance during winter denning (late September to April). However, scientific evidence regarding the degree of sensitivity is conflicting and may depend on the individual, sex, and denning habitat type. Jalkotzy et al. (1997) reported black bears in northeastern Alberta were relatively tolerant of industrial development during the denning period, and found industrial activity in the area did not deter bears from denning in the local vicinity. That being said, black bears have been known to be displaced from and abandon their dens as a result of human presence near the den (Jalkotzy et al. 1997). Suitable black bear denning habitat may exist within the direct footprint of the Nechalacho Mine and Flotation Plant (and associated infrastructure). Although no black bear dens were observed during the field studies. Construction may occur during the winter denning period and therefore may directly disturb one or two active black bear dens. Potential disturbance to black bears during winter denning, particularly during construction activities is considered high in magnitude, local in extent (within the development footprint), reversible in the short-term, with a low likelihood of occurrence. The potential consequence of disturbing a black bear during the winter denning period is considered moderate. Confidence in this assessment is moderate since suitable denning habitat is known to exist within the development footprint and the sensitivity of black bears is generally unknown.

Potential attraction and habituation of black bears to waste foods and human garbage is of particular concern since this can lead to black bear mortality. Black bears may also be attracted to the low traffic haul roads, particularly in the spring when plant emergence may be earlier than in the forest. Black bear mortality may occur during the construction, operation, and closure phases of the Nechalacho Mine, particularly as a result of attraction and habituation to the Project. The risk of collision with the vehicles and equipment is considered negligible. The consequence of black bear attraction, habituation, and possible mortality from the Nechalacho Mine is moderate.

To minimize any potential for direct and indirect Nechalacho Mine development-related black bear effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Avoid all known or suspected den sites.
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including black bears that such activity may encounter.
- Alert system to warn personnel of black bears in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.
- Incinerate all waste foods and human garbage consistent with current industry good management practices to minimize black bear attraction to the local area.
- Adaptive management will be applied to Avalon's waste management practices. If black bears are attracted to the site (i.e. problem wildlife) additional management practices, if required, will be adapted.
- Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on black bears will be low with no residual impacts expected to occur. With the implementation of the mitigation measures as described, development-related activities are not expected to affect the overall black bear population frequenting the LSA and RSA.

6.9.1.4 Other Fur-bearers

Based on the results of the recently completed Traditional Knowledge Studies (EBA 2010c), wildlife field surveys in the Nechalacho Mine study area, and species range maps, other fur-bearing mammals determined or likely to be present in the LSA from time to time include snowshoe hare, red squirrel, beaver, muskrat, grey wolf, red fox, wolverine, weasel, river otter, mink, marten, and lynx. Known grizzly bear range is located outside the study area; however, grizzly bears may also rarely occur in the Nechalacho Mine study area. Fur-bearers are an important economic resource for many hunters and trappers in the north. However, during the Traditional Knowledge Studies, several participants indicated many people avoid harvesting in the Thor Lake area because of the former mine (EBA 2010c).

Each of these fur-bearing mammals differs in their habitat requirements and general biology. For instance, snowshoe hare prefer deciduous, mixed wood, and lowland treed fen forest communities with an abundance of browse material. Other fur-bearers such as the lynx and red fox prey upon snowshoe hares; but, perhaps, the lynx is most closely tied to the hare and its cyclic oscillations. The snowshoe hare is one of the key prey species within the Boreal Forest. In general, the fur-bearers present in the Nechalacho Mine study area are sensitive to disturbance at their natal dens. In the Nechalacho Mine study area, the period from late February to early June is considered the most sensitive period for fur-bearers.

Of the fur-bearing species commonly occurring in the Nechalacho Mine study area, only the wolverine has special conservation status (assessed by COSEWIC as "Special Concern" and ranked by GNWT ENR as "Sensitive"). Wolverines are particularly sensitive to human-caused effects, including mortality due to attraction to human developments and habitat loss. Wolverines live at low densities even under optimal conditions (Banci 1994); however, they can be expected to occur within the Nechalacho Mine study area on a year round basis, wherever appropriate prey exist. Wolverines may be sensitive to habitat loss, fragmentation, extensive developments, and their associated access roads. However, some wolverines can become habituated to human developments and activities. In Montana, there was no difference in movements, habitat use, or behaviour of wolverines between logged and unlogged areas, (Jalkotzy et al. 1997). To date, wolverine and wolverine sign have not been documented on site during any field surveys.

The grey wolf, another large predator and important fur-bearer for local hunters and trappers, occurs across the Nechalacho Mine study area on a year-round basis, wherever prey (e.g., caribou and moose) exist. Traditional Knowledge suggests there are more wolves now than in the historical past (EBA 2011a). Like most carnivores, wolves can be sensitive to disturbance, especially during their reproductive period (Chapman 1977). The denning period for wolves typically begins in early May. The response of wolves to a given disturbance varies and is difficult to predict (Jalkotzy et al. 1997). The sensitivity of wolves to human activities and developments, particularly near the den site differs with individuals, background landscape disturbance in the area, and age of pups. Den site abandonment was observed in Alaska at various temporal scales and disturbance types, including humans on foot, vehicles, and aircraft. However, in the NWT, tundra wolves were more likely to abandon their den as a result of human disturbances once the pups were at least 6 weeks old, an age when they possessed greater mobility and physical development (Frame et al. 2007). Frame et al. (2007) concluded the amount and type of human disturbances did not influence wolves' reproductive success, and wolves continued to re-use dens the following year even if the dens were previously disturbed by humans. Nevertheless, their high productivity and dispersal capabilities ensure resiliency to sustained levels of moderate human disturbance (Weaver et al. 1996).

Martens are another important harvestable species and are ranked by GNWT ENR as "Secure" under the general status program. Marten are expected to occur throughout the forested areas of the Nechalacho Mine study area, particularly in Spruce Upland, Mixed Upland, and Spruce Wet broad habitat types; however, all habitats may be occupied if abundant prey and cover exist. Marten prefer forests with a high canopy cover, and in

general, do not travel across open areas that are 200 m wide or greater (Salmo Consulting Inc. et al. 2004). Marten are opportunistic hunters, but they prefer small mammals (e.g., voles and mice), birds and bird eggs, insects, berries, red squirrels, and snowshoe hares. Marten populations are generally cyclic in response to their dominant prey populations. Like many fur-bearers, marten are particularly sensitive to disturbance during their denning period. Litters are born in dens in mature forests in rock piles, tree roots, deadfall, or peat banks in March or April. Marten are considered to be relatively tolerant to human disturbances and activities, but are vulnerable to overharvest (Salmo Consulting Inc. et al. 2004).

Beavers are a common harvest species in the NWT. In 2009, the beaver lodge density for the Nechalacho Mine Project Area was 0.23 lodges/km^2 (Stantec 2010f), and was within the range of values observed elsewhere for northern boreal regions. In 1989, the density estimate for both active and inactive lodges in the Thor Lake area was 0.14 lodges/ km^2 (Melville et al. 1989). In contrast, the density of beaver lodges in 1989 was notably higher to the west of the Nechalacho Mine site, which was consistent with Stantec's (2010f) results. The closest known active beaver lodge to the proposed mine site was at Ring Lake (Melville et al. 1989), although there did not appear to be an active lodge there in 2009.

During EBA's field survey in the Nechalacho Mine study area, a number of fur-bearing species and their sign were observed, including red squirrel, snowshoe hare, red fox, wolf, marten, river otter, and beaver. In particular, two beaver lodges were observed in the Nechalacho Mine study area, one in an unnamed lake north of the proposed tailings management facility, and a second in an unnamed lake approximately 2 km west of Thor Lake, outside the direct footprint of the Nechalacho Mine and Flotation Plant development.

The main ways that the Nechalacho Mine and associated infrastructure and activities can affect fur-bearers is through habitat loss, change in daily movements (including avoidance, displacement, and habituation (e.g. attraction)), and mortality. Figure 6.9-1 depicts the pathways of potential effects.

A small amount of fur-bearer habitat will be directly lost as a result of the clearing and construction activities of the Nechalacho Mine and Flotation Plant and associated infrastructure (including the tailings management facility). Habitat suitable for fur-bearer feeding and denning habitat is common throughout the Nechalacho Mine LSA and RSA. Direct loss of habitat for forest dwelling fur-bearers will be lost as a result of the Flotation Plant and associated infrastructure, whereas, aquatic fur-bearers such as beaver, muskrat, and river otter habitat will be irreversibly lost as a result of the tailings management facility. Direct loss of fur-bearer habitat is considered low in magnitude, local in extent, and reversible following closure of the mine, with the exception of aquatic fur-bearers. Habitat loss effects are low to moderate in consequence. Confidence in this assessment is high since the amount of fur-bearer habitat in the local LSA and RSAs are known based on the ecological mapping studies.

Fur-bearers may be expected to be present in the vicinity of the Nechalacho Mine footprint area quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, fur-bearers will be exposed to low levels

of vehicle traffic, site infrastructure, and human presence. The disturbance or avoidance of habitat may result in changes in their daily movements. Construction of the Nechalacho Mine and Flotation Plant, in particular, is expected to generate some degree of disruption, at least temporarily. The duration of exposures during construction, operation, and closure are expected to be low, perhaps lasting a few minutes to a few months, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance of fur-bearers would be expected to be low and infrequent.

Fur-bearers are sensitive to disturbance at their natal sites and or during the winter when food resources may be limiting and energy demands are greatest. However, the degree of sensitivity is species dependent. For instance, red fox are considered more tolerant to human developments and activities, whereas wolverines are less tolerant. Changes to fur-bearer daily movements as a result of development-related noise, dust, and visual disturbances are considered low in magnitude, local in extent, reversible, and low in consequence. Confidence in this assessment is moderate since the sensitivity of fur-bearers to development-related activities differs with species and levels of human activity and presence.

Potential attraction and habituation of fur-bearers to waste foods and human garbage is of particular concern since this can lead to fur-bearer mortality, particularly for wolverine, red fox, and grey wolf. An attraction and habituation effect that leads to mortality as a result of the Nechalacho Mine is considered moderate in magnitude and local in extent, but has a low likelihood of occurrence. The consequence of fur-bearer attraction and habituation resulting in mortality to the Nechalacho Mine is moderate.

Mortality of fur-bearer young may occur during clearing activities during the natal season. Mortality during the natal season is considered moderate in magnitude, local in extent, with a moderate likelihood of effect, and of moderate consequence.

To minimize any potential for direct and indirect Nechalacho Mine development-related fur-bearer effects, Avalon will implement the following policies and mitigation measures:

- No hunting and trapping policy for all Project employees and contractors while working on or off-site for Avalon.
- Avoid all known or suspected den sites.
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including fur-bearers that such activity may encounter.
- Alert system to warn personnel of fur-bearers, particularly wolverine in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors, including prohibition of feeding wildlife.
- Incinerate all waste foods and human garbage consistent with current industry good management practices to minimize attraction to the local area.
- Adaptive management will be applied to Avalon's waste management practices. If fur-bearers are attracted to the site (i.e. problem wildlife) additional management practices, if required, will be adapted.
- Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on fur-bearers will be low with low residual impacts expected to occur. A low level of residual effects on aquatic fur-bearers may remain at the tailings management facility following mitigation. Any residual effects on aquatic fur-bearers is considered low in magnitude, local in extent, long-term in duration, irreversible, and a high likelihood of occurrence. The consequence of any residual effects on local aquatic fur-bearers is moderate. However, these residual effects are anticipated to be negligible and not significant in the context of the RSA. With the implementation of the mitigation measures, development-related activities are not expected to affect the over-all fur-bearer populations frequenting the LSA and RSA.

6.9.1.5 Bald Eagle

Bald Eagles can be expected within the Nechalacho Mine study area from early April to November. Bald Eagles and their nests have been documented within the Nechalacho Mine local and regional study areas during previous field surveys.

Bald Eagle breeding distribution is largely contiguous throughout all forested regions, and they are known to nest within the Nechalacho Mine study area. Often the largest or tallest tree within a suitable area is chosen as a nesting tree; however, on Blanchet Island in the Hearne Channel, Bald Eagles were found nesting on both trees and cliffs 12 to 67 m in height (Allen and Ealey 1979). Nests are often reused year after year; however, more than one nest may be present in their breeding territory (referred to as an alternate nest). Of the nests observed in the Nechalacho Mine Area, all were situated in spruce trees, either at the edge of a small lake, or on an island. Bald Eagle nests are commonly found within 100 m of a lake or river (Allen and Ealey 1979).

Bald Eagles are opportunistic foragers, and will hunt fish, waterfowl and other birds, small mammals and will scavenge on carrion when available. Bald Eagles can be expected to occur within the Nechalacho Mine study area wherever appropriate prey exist.

Like most raptors, Bald Eagles are most sensitive to disturbance during their nesting period. To date, studies on the sensitivity of nesting Bald Eagles to human disturbances is conflicting; however, in most cases humans on foot were considered the most disturbing to nesting Bald Eagles and aircraft was considered the least (Jalkotzy et al. 1997). Jalkotzy

et al. (1997) reported incubating and or brooding Bald Eagles remained on the nest when a fixed-wing aircraft (of unknown size) passed 20 to 200 m from the nest. The nearest known Bald Eagle nest is located at Elbow Lake, 1040 m southeast of the Flotation Plant site and further from the airstrip. All other known Bald Eagle nests are approximately 6 to 15 km away from the Flotation Plant site.

The main ways that the Nechalacho Mine and associated infrastructure and activities can affect Bald Eagles are through feeding habitat loss and changes in daily movements including habitat avoidance, displacement, and habituation (e.g. attraction). Figure 6.9-1 depicts the pathways of potential effects.

Bald Eagle feeding habitat may be directly lost as a result of the tailings management facility. This low amount of habitat loss is considered negligible in magnitude since Bald Eagle feeding habitat is common in the local and regional study areas. Effects of potential feeding habitat loss are local in extent, long-term in duration, and of negligible consequence. The confidence in this assessment is high since Bald Eagle feeding habitat is common throughout the LSA and RSA.

Bald Eagles may avoid or be displaced by development-related visual and noise disturbances and dust throughout the life of the Project. The level of avoidance or displacement is unknown, but is likely determined by the level of human presence and activity. Therefore, avoidance and disturbance impacts may be greatest during construction and operation. Effects from visual and noise disturbances near the local roads, aircraft, and site infrastructure is considered to be low in magnitude, local in extent, periodic, reversible upon cessation of the activity or by moving away from the activity. The consequence of avoidance or displacement by development-related visual and noise disturbances is considered low. The confidence in this assessment is moderate since the sensitivity of Bald Eagles to various development related activities is generally known.

The GNWT recommends permanent structures and long-term habitat disturbances should be at a minimum of 1000 m distance from Bald Eagle nests, and ground and air access should remain at least 1000 m from the nest during a period from March 30 to July 31 (Joint Review Panel 2009). The nearest Bald Eagle nest site is located 1040 m from the Flotation Plant site (nearest construction site), 1370 m from the airstrip, and 1760 m from the haul road. Disturbances at known Bald Eagle nests as a result of the Nechalacho Mine and Flotation Plant construction, operation, and closure activities is considered negligible in magnitude. The confidence in this assessment is high since the Project-related infrastructure and activities are located a sufficient distance to known Bald Eagle nests.

Bald Eagles are also scavengers, and may become attracted to waste foods and human garbage at the Project site. Attraction to the waste foods and human garbage is considered a negligible consequence.

To minimize any potential for direct and indirect Nechalacho Mine development-related Bald Eagle effects, Avalon will implement the following policies and mitigation measures:

- Avoid all known or suspected nest sites.

- All Project-related transportation activities to give the right-of-way to any wildlife including raptors that such activity may encounter.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.
- Incinerate all waste foods and human garbage consistent with current industry good management practices to minimize attraction to the local area.
- Adaptive management will be applied to Avalon's waste management practices. If Bald Eagles are attracted to the site (i.e. problem wildlife) additional management practices, if required, will be adapted.
- Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

With adherence to mitigation discussed above, the effects of habitat loss and changes in daily movements on Bald Eagles will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures as described, development-related activities are not expected to affect the overall health or well-being of Bald Eagle populations in the LSA and RSA. Potential impacts outlined for Bald Eagles may also be similar for other forest raptors.

6.9.1.6 Short-eared Owl

Short-eared Owls are listed by SARA as "Special Concern" (Schedule 3), and are ranked by GNWT ENR as "Sensitive". Short-eared Owls likely arrive in the Nechalacho Mine study area by late April or May and depart by late October.

Short-eared Owls occur wherever an abundance of small mammals are present, particularly in bogs, marshes, and other non-forested areas (CWS and GNWT ENR 2008). Nests are normally located in dry open sites dominated by grasses or sedges typically less than 50 cm in height, or of sufficient height to conceal an incubating female. Nests are infrequently constructed in wet areas, such as wetlands (Wiggins et al. 2006). Native grassland and low-structured open shrublands provide the greatest potential for nesting Short-eared Owls. The Nechalacho Mine and Flotation Plant study area is considered poor Short-eared Owl nesting habitat; however, the cleared area along the airstrip may provide appropriate Short-eared Owl habitat. Feeding habitat exists along open and shrubby wetlands, lakeshores, and riparian areas. Short-eared Owls may also hunt in open areas such as along roadsides and the airstrip.

The main way that the Nechalacho Mine and associated infrastructure and activities could potentially affect Short-eared Owls is through the creation of potential nesting habitat, adverse changes in daily movements, particularly displacement from seasonal feeding habitat, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Although the potential for Short-eared Owls nesting within the Nechalacho Mine study area is currently negligible, the cleared airstrip buffer zone may provide suitable nesting habitat. The potential creation of Short-eared Owl nesting habitat is considered negligible in magnitude and a negligible consequence.

Short-eared Owls are sensitive to disturbance during nesting, and may abandon nests as a result (GNWT ENR 2010e). Females are generally reluctant to flush from their nest until the disturbance (e.g., predator or humans on foot) is within a few meters from the nest (Wiggins et al. 2006). Aircraft, human activities, and equipment operation near the nest site may disturb nesting owls. Disturbance effects at the nest site is considered low in magnitude, local in extent, and reversible upon cessation of the activity or by moving away from the activity. Disturbance effects at the nest site have a low likelihood of occurrence. Confidence in this assessment is moderate since the level of sensitivity of Short-eared Owls to aircraft and other development-related activities is relatively unknown; however, the potential for nesting within the Project footprint is considered low.

Short-eared Owls may infrequently occur in the Nechalacho Mine study area to feed during the construction, operation, and closure phases, and may conceivably be disturbed by localized vehicle traffic or aircraft noise and activity. A Short-eared Owl encountering human activities, and vehicular or aircraft traffic may show minor displacement behaviour and avoid the immediate area. Effects to the Short-eared Owl daily movements as a result of the Nechalacho Mine and associated activities is considered low in magnitude, periodic in frequency, and low likelihood of occurrence. Confidence in this assessment is moderate since the level of sensitivity to disturbances is relatively unknown.

The risk of morality from vehicle/equipment collisions, particularly along the haul road and airstrip is considered low. Mortality effects are considered moderate in magnitude, local in extent, sporadic in frequency, and low likelihood of occurrence. Confidence in this assessment is high due to their special conservation status and infrequent occurrence in the LSA.

To minimize any potential for direct and indirect Nechalacho Mine development-related Short-eared Owl effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Avoid all known or suspected nest sites.
- Avoid mowing or other activities in the airstrip buffer zone during nesting and fledging season (late April to late July).
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including raptors that such activity may encounter.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on Short-eared Owls will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of Short-eared Owls populations potentially frequenting the LSA and RSA.

6.9.1.7 Common Nighthawk

The Common Nighthawk is listed by SARA as "Threatened", and ranked by GNWT ENR as "At Risk" under the general status program. Population estimates within the NWT or the study areas are unknown. Within the Nechalacho Mine study area, Common Nighthawks are expected to arrive in mid May or early June and depart by mid August to mid September (CWS and GNWT ENR 2008). Suitable nesting and foraging habitat exists throughout the Nechalacho Mine study areas.

Preferred nesting and foraging habitat includes: open forests, forest clearings, recent burn areas, rock outcrops, wetlands and marshes, lakeshores and gravel areas (including airports, mine tailings, quarries, railroads, and roads) (CWS and GNWT ENR 2008). Although Common Nighthawks are known to nest on human developed sites, they tend to prefer natural sites (Ontario Ministry of Natural Resources 2010). Preferred nesting and feeding habitats are common throughout the Nechalacho Mine local and regional study areas.

Nests are prepared directly on the soil, sand, gravel, and bare rock. Appropriate Common Nighthawk nesting habitat exists within the Bedrock-Lichen broad habitat type, as well as at old mine site, roads, and airstrips. Common Nighthawks will also forage near artificial lights that have attracted insects.

Although the Nechalacho Mine LSA and RSA include suitable nesting and feeding habitat, few Common Nighthawks have been recorded in the area. During the 2010 baseline surveys at Nechalacho Mine study area, a single Common Nighthawk was incidentally heard near camp.

The main way that the Nechalacho Mine and associated infrastructure and activities could potentially affect Common Nighthawks is through direct habitat loss, changes in daily movements including avoidance and displacement from habitat, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

The Flotation Plant and associated infrastructure, including the tailings management facility, tailings delivery pipeline, and airstrip will directly affect potential Common Nighthawk nesting and feeding habitat. Avalon's footprint design of the underground mine and crushing operations, clustering of the surface facilities, use of existing roads, and placement of the tailings delivery pipeline along the existing road minimizes the amount of direct habitat loss. That being said, Common Nighthawks will also occupy cleared areas with limited development-related activities, such as the airstrip, tailings management facility, and the roads for resting and feeding. Favourable Common Nighthawk habitat is common

across the LSA and RSA. Direct loss of Common Nighthawk habitat will be low in magnitude, local in extent, and reversible at Project closure. The consequence of this low amount of habitat loss as a result of the Nechalacho Mine and its associated infrastructure is low. Confidence in this assessment is high since the amount of Common Nighthawk habitat within the LSA and RSA is known.

Common Nighthawks are most sensitive to disturbances during nesting and fledging seasons. However, the level of sensitivity to human disturbances and equipment/vehicles is unknown. Common Nighthawks are known to nest and feed in high density disturbance areas such as cities, therefore, some degree of habituation or tolerance to human activities is assumed. Some level of habitat avoidance during construction, operation, and closure phases may occur. Common Nighthawks may be present in the vicinity of the footprint area, including at the seasonal dock facility on occasion and may potentially be disturbed by local equipment and vehicle traffic noise or activity. A Common Nighthawk encountering disturbance activity or vehicle traffic during construction, operation, and closure phases may show minor displacement behaviour and avoid the immediate area. Avoidance and disturbance effects as a result of the Nechalacho Mine and associated activities are considered low in magnitude and a low consequence. Confidence in this assessment is moderate since the level of sensitivity to Project-related infrastructure and activities is relatively unknown.

Clearing operations pose the greatest risk of mortality to nesting Common Nighthawks. Mortality risks during the other construction, operation, and closure phases including collision with vehicles and equipment may also occur. The Nechalacho Mine and associated activities may attract predators (e.g., gulls, Common Ravens, and red foxes), which may lead to the indirect death of Common Nighthawks. Direct and indirect mortality of Common Nighthawks as a result of the Nechalacho Mine and associated activities in considered moderate in magnitude, with a moderate likelihood of occurrence without mitigation, and a moderate consequence.

To minimize any potential for direct and indirect Nechalacho Mine development-related Common Nighthawk effects, Avalon will implement the following policies and mitigation measures:

- Avoid all known or suspected nest sites.
- Avoid clearing activities from mid-May to late August.
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

- Incinerate all waste foods and human garbage consistent with current industry good management practices to minimize predator attraction to the local area.

With adherence to mitigation discussed above, effects of habitat loss, changes in daily movements, and mortality on Common Nighthawks will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of Common Nighthawk populations potentially frequenting the LSA and RSA.

6.9.1.8 Olive-sided Flycatcher

The Olive-sided Flycatcher is listed by SARA as "Threatened", and is ranked by GNWT ENR as "At Risk" under the general status program (Environment Canada 2010d; GNWT ENR 2010a). The Olive-sided Flycatcher arrives in the Northwest Territories in late May and early June, and departs in late July and early August (GNWT ENR 2010e).

Appropriate Olive-sided Flycatcher habitat exists throughout the Nechalacho Mine study area in the form of open to semi-open forests (e.g., Bedrock-Lichen and Shrub Wet broad habitat types) and natural and man-made edge habitats (near bedrock outcrops, lakeshores, and roads) with large trees and standing snags.

Feeding occurs throughout all semi-open to open spaces, including over forest canopies, wherever flying insects occur. Within the LSA and RSA, open to semi-open forests, disturbed sites, habitat edges, and wetlands provide suitable feeding habitat for Olive-sided Flycatchers. The nest is usually constructed in a tree adjacent, or close, to a forest opening or edge. A total of 22 Olive-sided Flycatchers were heard or seen within the Nechalacho Mine LSA during the June and July 2010 field programs. Olive-sided Flycatchers were reported occupying seven different habitat types (or their edges).

The main way that the Nechalacho Mine and associated infrastructure and activities could potentially affect Olive-sided Flycatchers is through habitat loss and alteration, changes in daily movements, in particular avoidance and displacement from seasonal feeding and nesting habitat, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Olive-sided Flycatchers benefit from habitat edges. Clearing operations for the Nechalacho Mine and Flotation Plant (and associated infrastructure) will result in the adverse loss of feeding and nesting habitat, but will also increase habitat edges and add suitable habitat. The direct loss of Olive-sided Flycatcher habitat as a result of the Nechalacho Mine and associated infrastructure is considered negligible. Confidence in this assessment is high since preferred Olive-sided Flycatcher habitat is known, and suitable habitat commonly occurs throughout the LSA and RSA.

Olive-sided Flycatcher may conceivably be present in the vicinity of the Nechalacho Mine footprint area throughout the construction, operation, and closure phases and may potentially be disturbed by localized activity at the Flotation Plant and associated infrastructure, vehicle and aircraft traffic noise or other general activity. In addition, Olive-sided Flycatchers may avoid suitable habitat due to noise levels, human presence, and dust levels, particularly along the haul road and at the Flotation Plant site.

The sensitivity of Olive-sided Flycatchers to noise, human presence and activities is relatively unknown. However, some songbird species are thought to be negatively affected by noise. Human induced noise may mask communication calls, increase stress hormones, and alter behaviors; consequently, some species may avoid adjacent habitats. Some species remain in these habitats in lower densities, and may have lower nest success or productivity (AMEC 2005). Noise levels, particularly during operation will be low since mining and primary crushing activities will be conducted underground. An Olive-sided Flycatcher encountering construction or vehicular traffic may show minor displacement behaviour and avoid the immediate area of construction, the haul road, airstrip, and the Flotation Plant site. Changes in daily movements as a result of avoidance and displacement from noise and visual disturbances are considered low in magnitude and periodic. Confidence in this assessment is moderate since the sensitivity of Olive-sided Flycatchers to human induced noise and visual disturbances is relatively unknown; however, noise levels will be continuously low through the operation phase and sporadic during construction and closure.

Potential Olive-sided Flycatcher effects from road dust are relatively unknown. In general, habitat avoidance effects attributed to road dust are typically less than 10 – 20 m from the road, but may extend into habitats 200 m downwind depending on the adjacent landscape and habitat types (e.g. open tundra habitats) (Forman and Alexander 1998). Dust effects would be greatest along the haul road during construction, operation, and closure phases. Since Olive-sided Flycatchers favour habitat edges, they may be directly affected by road dust. The magnitude of dust effects on the Olive-sided Flycatchers in the local area is considered moderate. Without mitigation, dust effects is a low consequence to the local population. Confidence in this assessment is moderate since the effect of dust on Olive-sided Flycatchers is unknown; however, appropriate habitat is common throughout the LSA and RSA.

In addition, habitat clearing may result in Olive-sided Flycatcher mortality if active nests are disturbed. A small amount of Olive-sided Flycatcher nesting habitat will be cleared for the Nechalacho Mine and Flotation Plant and their associated infrastructure. The timing of habitat clearing will influence the risk of mortality during construction. Mortality of Olive-sided Flycatchers, their eggs, and young as a result of habitat clearing can be mitigated if habitat clearing occurs outside nesting season. Without mitigation, mortality effects on Olive-sided Flycatchers are moderate in magnitude, a high likelihood of occurrence, and a moderate consequence of effect. Confidence in this assessment is high due to its special conservation status and the potential for nesting to occur within the footprint.

To minimize any potential for direct and indirect Nechalacho Mine development-related Olive-sided Flycatcher effects, Avalon will implement the following policies and mitigation measures:

- Avoid clearing habitat from May 15 to August 15 to prevent accidental mortality of Olive-sided Flycatcher adults, eggs, and pre-fledged young (as well as other upland breeding birds).
- Implement speed limits on all site roads.

- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on Olive-sided Flycatchers will be negligible with no residual impacts expected to occur.

Potential impacts outlined for Olive-sided Flycatchers may also be similar for other forest birds. Mitigation presented here is appropriate for other forest birds potentially occurring in the Nechalacho Mine LSA.

6.9.1.9 Rusty Blackbird

Rusty Blackbirds are listed by SARA as "Special Concern", and are ranked by GNWT ENR as "May Be At Risk" (Environment Canada 2010d; GNWT ENR 2010a). Rusty Blackbirds can be expected to occur in the Nechalacho Mine study area from early May to late September.

Rusty Blackbirds forage along the edge of fens, bogs, beaver ponds, streams, and swampy lake shores in search for aquatic and terrestrial insects and plant materials (e.g., seeds and fruits). Nests are constructed in conifer and deciduous trees and shrubs in suitable feeding habitat. Rusty Blackbirds are most commonly associated with forest edges along natural waterbodies; however, they occasionally occupy treatment ponds and hydroelectric reservoirs that are in forested areas (COSEWIC 2006). Research indicates Rusty Blackbird populations are associated with beaver lodge densities in an area (Avery 1995). Areas with a low beaver lodge density may have a low Rusty Blackbird abundance. Beaver lodge surveys in the Nechalacho Mine LSA and RSA generally indicated low densities in the LSA; however, higher beaver lodge densities were recorded in the region to the west. That being said, Rusty Blackbird habitat exists within the Nechalacho Mine LSA and RSA.

Appropriate Rusty Blackbird habitat within the Nechalacho Mine LSA occurs along many shallow ponds/lakes and fens, including within the proposed tailings management facility.

The main way that the Nechalacho Mine and associated infrastructure and activities could potentially affect Rusty Blackbirds is through direct habitat loss, changes to daily movements including habitat avoidance and displacement, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Direct habitat loss may occur during clearing operations at the tailings management facility. All other proposed development-related infrastructure is positioned away from shorelines and Rusty Blackbird habitat. Similarly, the temporary dock facility and storage yard at Great Slave Lake consists of upland spruce and bedrock, which is considered poor quality Rusty Blackbird habitat. Direct loss of Rusty Blackbird habitat at the tailings management facility is considered high in magnitude, irreversible, and of moderate significance since Rusty Blackbird habitat is considered relatively common in the LSA and RSA. Confidence in this assessment is high since suitable Rusty Blackbird habitat in the LSA and RSA is common.

Rusty Blackbirds may conceivably be present in the vicinity of the tailings management facility on occasion during the operation phase and may potentially be disturbed by infrequent activity. Similarly, Rusty Blackbirds may occasionally fly over or feed in the wetland areas, marshes or bogs, near the haul road. A Rusty Blackbird may encounter development-related activity during construction, operation, and closure phases. Those encountering construction or vehicular traffic (and associated noise) may show minor displacement behaviour and avoid the immediate area of activity; however, the sensitivity of Rusty Blackbirds to human disturbances is unknown. The duration of any such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity.

Clearing operations during construction at the tailings facility pose the greatest risk of mortality to nesting birds, their eggs, and young. Without mitigation, mortality as a result of the clearing operations is considered moderate in magnitude, moderate likelihood of occurrence, and a moderate consequence of effect. Confidence in this assessment is high due to its special conservation status and its potential to nest within the direct footprint of the tailings management facility.

To minimize any potential for direct and indirect Nechalacho Mine development-related Rusty Blackbird effects, Avalon will implement the following policies and mitigation measures:

- Avoid clearing during nesting season from May 15 to August 15.
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

Reclamation following mine closure will help re-establish self-sustaining ecosystem types.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on Rusty Blackbirds will be low with low residual impacts expected to occur. A low level of residual impacts may remain at the tailings management facility following mitigation. These residual effects are anticipated to be negligible and not significant in the context of the RSA. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of Rusty Blackbird populations in the LSA and RSA.

6.9.1.10 Horned Grebe

Horned Grebes have been assessed by COSEWIC as "Special Concern" (as of April 2009), and ranked by GNWT ENR as "Secure" under the general status program. Horned Grebes are not listed by SARA. The Horned Grebe population is stable in the Yellowknife area, and is presumed to be stable throughout its range in the NWT (GNWT ENR 2010a).

Horned Grebes are expected to arrive within the study area at the end of April or early May and depart by mid-August to early September (GNWT ENR 2010e). Within their breeding range, Horned Grebes occupy small ponds, wetlands, shallow lakeshores, and other natural or man-made permanent or semi-permanent waterbodies wherever their main foods (aquatic insects, fish, frogs, and crustaceans) are abundant (Environment Canada 2010d). Favourable breeding ponds include areas of open water with sufficient emergent (e.g. cattails and sedge) and submergent vegetation. Nests are anchored to emergent plants, primarily cattails and willows, which provide cover and support (Fournier and Hines 1999).

In late July and August, adults leave their pre-fledged young at the breeding ponds and reside at larger waterbodies (waterbodies greater than 15 ha in size and depths greater than 1 m) to molt immediately prior to fall migration. During molt, Horned Grebes experience a flightless period and may form large post-breeding aggregations during this time (Fournier and Hines 1999; Stout and Cook 2003).

Horned Grebes are most sensitive to disturbance during the nesting season (including pre-fledging) and moult. Horned Grebes have the potential to occur within the Nechalacho Mine LSA and RSA during the construction, operation, and closure phases.

The main way that the Nechalacho Mine and associated infrastructure and activities could potentially affect Horned Grebes is through habitat loss, changes to daily movements including habitat avoidance and displacement, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Within the Nechalacho Mine footprint area, potential Horned Grebe nesting habitat exists at the tailings management facility. Direct loss of potential Horned Grebe nesting habitat will occur as a result of the tailings management facility; however, there will be a negligible loss of moulting habitat from the Nechalacho Mine and associated infrastructure. The loss of potential nesting habitat is considered high in magnitude and irreversible. The potential consequence of losing Horned Grebe nesting habitat is considered moderate. Confidence in this assessment is high since suitable Horned Grebe nesting habitat is common in the LSA and RSA.

Potential moulting habitat exists in Great Slave Lake near the dock facility and in Thor Lake. A negligible amount of moulting habitat may be lost from the temporary dock facility. As a result of Avalon's decision to construct a temporary docking facility each open water season, moulting habitat potentially lost from the facility will be reversible at closure of the Nechalacho Mine. The direct physical effects of these components of the Nechalacho Mine and its associated infrastructure on preferred Horned Grebe moulting habitat are expected to be negligible in magnitude since Horned Grebe moulting habitat is common throughout the LSA and RSA.

Potential nesting and moulting Horned Grebes may encounter development-related activity at the tailings management facility and docking facility during construction, operation, and closure phases. Those encountering construction or barging traffic (and associated noise) may show minor displacement behaviour and avoid the immediate area of activity. The sensitivity of Horned Grebes to development-related activity is unknown. Any exposure to development activities is expected to be brief, perhaps lasting a few minutes to a few hours,

and are reversible upon cessation of the activity or by moving away from the activity. Habitat avoidance and disturbance in response to the Nechalacho Mine and associated activities is considered low in magnitude and local in extent.

Construction of the tailings management facility poses the greatest risk of mortality to nesting birds, their eggs, and young. The Nechalacho Mine and associated activities may also attract nest predators (e.g., gulls, Common Ravens, and red foxes), which may lead to the indirect death of Horned Grebes. Without mitigation, mortality as a result of the Nechalacho Mine and associated infrastructure is considered moderate in magnitude, a moderate likelihood of occurrence, and a moderate consequence of effect. Confidence in this assessment is high due to its special conservation status and its potential to nest within the direct footprint of the tailings management facility.

To minimize any potential for direct and indirect Nechalacho Mine development-related Horned Grebe effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Maintain existing drainage patterns to avoid potential alterations to existing Horned Grebe habitat.
- Keep worksites clean and manage waste to avoid attracting egg and chick predators such as gulls and Common Ravens.
- Maintain sufficient buffer distances between development activities (e.g., re-fuelling and material storage) and waterbodies, where possible.
- Avoid all known or suspected nest sites.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on Horned Grebes will be moderate with moderate residual impacts expected to occur. A moderate level of residual impacts may remain at the tailings management facility following mitigation. These residual effects are anticipated to be negligible and not significant in the context of the RSA. Development-related effects do not threaten the long-term persistence of Horned Grebe populations in the LSA and RSA.

Potential impacts outlined for Horned Grebes may also be similar for other species of grebes, loons, and waterfowl. Mitigation presented here is appropriate for other waterfowl potentially occurring in the local Nechalacho Mine study area.

6.9.2 Hydrometallurgical Plant Site (Pine Point) Area

6.9.2.1 Woodland Caribou

Boreal woodland caribou are known to occur in the area of the former Pine Point Mine where the proposed Hydrometallurgical Plant will be located, along Highway 5/6, and along

the rail line from Hay River to the NWT/Alberta border. Boreal woodland caribou are ranked by GNWT ENR as "Sensitive" under the general status program (GNWT ENR 2010a) and are listed by SARA as "Threatened".

In the South Slave and Southeast Dehcho region, the boreal woodland caribou population is estimated at approximately 600 individuals, and is likely in decline based on the recruitment and cow survival rates (Environment Canada 2008a). At present, the current range of this population is not considered to be self-sustaining due to the current level of fire and human disturbances in the range (35% and 16% disturbance levels, respectively).

Boreal woodland caribou do not migrate and may occur year round within the region. Boreal woodland caribou live in small groups even under optimal conditions, and females further disperse from the group in the spring and summer to minimize predation of their calf by increasing predator search time.

The home range of individual caribou is dependent on the distribution and relative availability of high quality of habitat. In the Fort Smith area, the annual range of female woodland caribou was estimated at 574 km^2 (Nagy et al. 2004). The number of boreal woodland caribou occupying the Hydrometallurgical Plant study area at any one time is unknown; however, expected to be low.

Boreal woodland caribou prefer lichen-rich mature or old growth coniferous forests (greater than 100 years old) associated with bogs, lakes, and rivers (GNWT ENR 2010b). In winter, woodland caribou tend to favour uplands, bogs and south facing slopes where the snow is not too deep. Their winter diet consists of up to 80 % ground and tree lichens. In summer, they prefer areas such as forest edges, marshes and meadows that provide the fresh green growth of flowering plants and grasses.

Boreal woodland caribou occur in low numbers throughout the former Pine Point mine, Highway 5/6, and the rail line to the Alberta border on a year round basis. Woodland caribou sign was not observed at the Hydrometallurgical Plant study area at the time of the August 2010 field event (EBA 2010b); however, EBA previously documented caribou sign in poor treed fens and Labrador Tea–Subhygric habitats on adjacent properties along Highway 5/6 in 2005 (EBA 2005b).

Boreal woodland caribou are known to avoid land use developments; however, their response appears to vary with season, habitat type, sex, and population (Salmo Consulting 2004). Woodland caribou populations are most sensitive to habitat loss and habitat fragmentation. As previously noted the Hydrometallurgical Plant and associated infrastructure will be entirely located on a barren portion of the previously disturbed and reclaimed former Pine Point Mine site. All access and haul roads required to service the Hydrometallurgical Plant and associated infrastructure will utilize existing former Pine Point Mine roads, some of which will require upgrading. In particular, the 8 km haul road extending from the seasonal dock facility located at Great Slave Lake south to the Hydrometallurgical Plant site will be upgraded to accommodate the haul trucks. Upgrading of this portion of the haul road will involve the direct loss of a negligible amount of potential woodland caribou habitat. Therefore, direct loss and fragmentation of woodland caribou habitat as a result of the proposed Project is considered negligible.

As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, the direct physical effects (including direct habitat loss and fragmentation) on preferred woodland caribou habitat in the area of the Hydrometallurgical Plant are expected to be negligible. Similarly, existing haul roads, Highways, and rail lines will be utilized. Fragmentation of woodland caribou habitat will remain at baseline conditions. Direct habitat loss and fragmentation of woodland caribou habitat as a result of the Hydrometallurgical Plant and associated infrastructure is considered negligible.

The main ways that the Hydrometallurgical Plant and associated infrastructure and activities may affect woodland caribou are through changes in daily movements including habitat avoidance and disturbance, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Based on the available information, a small number of woodland caribou may be expected to be present in the vicinity of the Hydrometallurgical Plant and associated infrastructure on occasion and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, woodland caribou would be expected to encounter and cross Project-related road and rail line infrastructure where they would be exposed to vehicle and rail traffic. Caribou encountering such activities may show minor displacement behaviour and or avoid the immediate Hydrometallurgical Plant development area, Highway 5/6, and or the rail line. Scientific evidence suggests woodland caribou may avoid suitable habitat that is located at least 250 m from roads and industrial developments for most of the season (Sorensen et al. 2007), and by as much as 1,000 m during calving (Salmo Consulting Inc. et al. 2004). The Hydrometallurgical Plant and its associated infrastructure will be constructed in large brownfields sites, areas that naturally woodland caribou would naturally tend to avoid. Avoidance of roads is dependent on traffic volumes and local harvesting activities.

In un-hunted areas, avoidance to roads is either nonexistent or very temporal in nature (Jalkotzy et al. 1997). As discussed in Section 6.12, traffic volumes and therefore possible avoidance effects along Highway 5/6 may increase from existing conditions. During operation, an additional 50 vehicles per day (approximate annual average daily traffic), concentrated during shift change periods (every 12 hours) is anticipated as a result of the Thor Lake Project. The increase in traffic volumes along Highway 5/6 as a result of the Thor Lake Project is considered low in magnitude since traffic is concentrated during shift change and woodland caribou may already avoid the Highway due to hunting pressures. Similar avoidance behaviour is anticipated in relation to the rail line from Hay River to the Alberta border. However, the Hydrometallurgical Plant will not increase the frequency of train traffic, and therefore, the Thor Lake Project will not affect caribou avoidance of the train and rail line.

The effects of noise on woodland caribou are poorly understood, and are dependent on a number of factors. That being said, woodland caribou are known to negatively react to loud noises. Frequent, unpredictable disturbance types in areas with little previous background noise have the greatest potential for negative effects on woodland caribou (Webster 1997). Loud, frequent, unpredictable disturbances may be common during the

construction and closure periods; however, during operation, low level noise disturbances are expected to be frequent and predictable. Such exposures are expected to be localized and reversible upon cessation of the activity of by moving away from the activity. Since only a few woodland caribou may occur within a few kilometres of the Hydrometallurgical Plant and its associated activities at any given time during construction, operation, and closure, the exposures to noise disturbances are expected to be limited and sporadic.

In summary, avoidance and disturbance effects as a result of the Hydrometallurgical Plant and its associated infrastructure and activities (including Highway 5/6 and the rail line from Hay River to the Alberta border) is expected to be low in magnitude, local in geographic extent, low likelihood of occurrence, and low significance. Confidence in this assessment is high since the Hydrometallurgical Plant and associated activities will remain similar to baseline conditions.

Activities relating to the construction, operation, and closure of the Hydrometallurgical Plant, such as vehicle and rail traffic pose the greatest risk to woodland caribou mortality. Without mitigation, the risk of mortality as a result of the Hydrometallurgical Plant and its associated activities is considered moderate in magnitude. The frequency and likelihood of effects is periodic and low. Confidence in this assessment is high since vehicle and rail traffic will remain low and similar to baseline conditions.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related woodland caribou effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including woodland caribou that such activity may encounter.
- Alert system to warn personnel of woodland caribou in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g. water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Address GNWT ENR's woodland caribou Best Management Practices for Industrial and Commercial Activities (to be developed by 2012) to manage or mitigate habitat impacts and sensory disturbances on woodland caribou (GNWT ENR 2010g). These Best Management Practices will be adopted within the corporate wildlife monitoring program, wherever feasible.

- Develop and implement an education program of wildlife related policies and mitigation to all Project employees and contractors.
- Preserve natural drainage patterns along the haul road to maintain the natural function and processes of peatland habitats adjacent to the haul road.

With adherence to mitigation discussed above, the effects of habitat loss and fragmentation, changes in daily movements, and mortality on woodland caribou will be negligible with no residual impacts expected to occur. With the implementation of the mitigation, development-related activities are not expected to affect the overall health or well-being of the woodland caribou populations in the LSA, the area near Highway 5/6, or the rail line to the NWT/Alberta border.

6.9.2.2 Moose

Moose are listed as secure across the Northwest Territories, and they occur throughout the boreal forest, wherever appropriate habitat exists.

A population density of moose specifically within the Hydrometallurgical Plant study area and along Highway 5/6 and the railhead is unknown. In 1995, moose densities in the northern Slave River lowland region (approximately 35 km east of the Hydrometallurgical Plant study area) was estimated at 0.15 moose/km^2 (or 15 moose/100 km^2) (Bradley et al. 1996). More recently, unpublished moose densities in the Buffalo Lake and River area, including the area between Great Slave Lake and Highway 5/6 (approximately 25 km west of the Hydrometallurgical Plant study area) was estimated at 5 moose/100 km^2 (D. Cluff 2010). Evidence of moose occupying many of the available habitat types within the study area were documented at the time of the August 2010 field event (EBA 2010b).

Moose sign was also considered common along the existing haul road corridor. In the general Pine Point area, approximately 22 moose observations (including sign) were recorded during 2005 wildlife surveys (EBA 2005b) in Spruce Upland, Mixed Upland, Spruce Wet, Treed Fen, Shrub Fen, and disturbed broad habitat types. These observations are consistent with local knowledge (T. Unka, personal communication) and existing scientific understanding, which indicates that the entire area south of Great Slave Lake, including the Hydrometallurgical Plant area is frequented by and used by moose throughout the year.

Moose are an important subsistence species in the study area and are commonly included as an indicator species in many northern projects. During the Traditional Knowledge Studies, 95% of the participants reported harvesting wildlife, including moose in the former Pine Point Mine site area and/or greater general area (EBA 2011a,b,c).

Moose are primarily browsers and they require abundant food supplies juxtaposed with security cover. Favourable moose feeding habitat includes semi-open early successional habitats with an abundance of browse (e.g. willow, aspen, balsam poplar, Saskatoon, Canada buffaloberry, rose, and red-osier dogwood). Floodplains, wetlands, regenerating burns, and previously disturbed areas commonly support an abundance of browse in the form of willows, young deciduous trees, and other early pioneer species. These habitats with a high

cover of willow and other browse material support moose throughout the year, but particularly in the winter. Conifer-dominated landscapes are considered sub-optimal moose habitat

Within the Hydrometallurgical Plant study area, the shrubby fen, the existing haul road right-of-way, and the shoreline of Great Slave Lake have the highest cover of willow within the study area and would support moose feeding habitat year round. In the spring and summer when forbs, grasses, and aquatic plants are available the use of browse material declines. Wet and aquatic habitats are common feeding areas during all non-winter months, but tend to peak during late June to early August when plant nutrition and digestibility are highest (Peek 1998). The beaver pond and the shallow shoreline of Great Slave Lake within the Hydrometallurgical Plant study area may be used by moose during the summer season. Other shallow lakes and ponds along Highway 5/6 and the rail line may also be utilized during the summer months.

Moose also seek distinct habitats to minimize detection from predators and avoid insect harassment. Dense forests and tall shrub stands are used for security cover from wolves and black bears, and open wind exposed ridgelines and aquatic habitats are used to avoid insects. Moose likely use the treed habitats within the study area (except for the Bearberry-Jack Pine forests) for security cover.

Similar to caribou, the main ways that the Hydrometallurgical Plant and associated infrastructure and activities may directly affect moose are through habitat loss, changes in daily movements through avoidance and displacement, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Salmo Consulting Inc. et al. (2004) report moose populations appear to be more sensitive to overharvesting and other sources of mortality than compared to habitat loss and fragmentation. As noted in Section 7.9.1, Avalon is proposing to locate the Hydrometallurgical Plant and associated infrastructure on existing brownfields sites of the former Pine Point Mine. A negligible amount of early to mid-successional shrub dominated communities that are currently regenerating along the roadside ditches at the northern portion of the haul road will be cleared during the road upgrades. Similarly, willows dominate a narrow zone along the shoreline of Great Slave Lake near the graded marshalling yard that is needed to support the seasonal barging operation. This narrow willow community located immediately adjacent to an existing commercial fishing operation will be cleared for the marshalling yard.

As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, the direct loss of preferred moose habitat as a result of the Hydrometallurgical Plant are expected to be low in magnitude and reversible at mine closure. Confidence in this assessment is high due to the limited scale of habitat loss as a result of the Hydrometallurgical Plant and associated infrastructure.

The Hydrometallurgical Plant and associated infrastructure and activities may also directly affect moose daily movements through avoidance and disturbance during the short-term construction and closure phases and longer-term operations phase. Moose are considered

to be relatively tolerant to human disturbances (Salmo Consulting Inc. et al. 2004). Although, moose may be still be affected by visual and noise disturbances from the infrastructure, vehicle and foot traffic, and rail line. Scientific evidence suggests moose may avoid linear features and other land use developments by 100 to 500 m depending on the season, sex, surrounding habitat, and population (Salmo Consulting Inc. et al. 2004). Moose encountering activities from the Hydrometallurgical Plant and associated infrastructure may show minor displacement behaviour and avoid the immediate development area and/or the Highway and rail line.

Based on EBA's regular observations of moose sign in the study area, moose may be expected to be present in the vicinity of the Hydrometallurgical Plant and associated infrastructure quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, moose would be expected to encounter and cross Project-related road infrastructure and are known to occur in the vicinity of Highway 5/6 where they would be exposed to vehicle traffic and potentially associated activities such as hunting. These short-term disturbances may occur most frequently near the haul road, at the Hydrometallurgical Plant, and along Highway 5/6 and the rail line.

The effect on moose daily movements as a result of avoidance behaviour to development-related infrastructure and noise is low in magnitude, sporadic to continuous for the life of the Project, and reversible upon cessation of the activity or by moving away from the activity. Confidence in this assessment is moderate since avoidance effects on moose are variable with disturbance activity, season, surrounding habitat, and other factors.

Activities relating to the construction, operation, and closure of the Hydrometallurgical Plant, such as vehicle and rail traffic pose the greatest risk to moose mortality. Without mitigation, the risk of mortality as a result of the Hydrometallurgical Plant and its associated activities is considered moderate in magnitude but with a low likelihood of occurrence. Confidence in this assessment is high since vehicle and rail traffic will remain low and similar to baseline conditions.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related moose effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including moose that such activity may encounter.

- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program of wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on moose will be negligible with no residual impacts expected to occur. With the implementation of the mitigation, development-related activities are not expected to affect the overall health or well-being of the moose population in the LSA, the area near Highway 5/6 and the rail line to the NWT/Alberta border.

6.9.2.3 Wood Bison

Wood bison are known to occasionally occur in the area of the former Pine Point Mine where the proposed Hydrometallurgical Plant will be located. Wood bison are ranked by GNWT ENR as "At Risk" under the general status program (GNWT ENR 2010e) and listed by SARA as "Threatened", Schedule 1 (Environment Canada 2010d).

The proposed Hydrometallurgical Plant site lies outside known wood bison herds' ranges; however, bison from the neighbouring Slave River Lowlands and Wood Buffalo National Park may occasionally occur in the area. Bison have the potential to occur at low densities within the Hydrometallurgical Plant site, wherever appropriate habitat exists. Bison from these two herds contain diseased individuals. As a result, the majority of the proposed Highway 5 transport route lies inside a Bison Control Area (BCA) where all bison are removed to ensure diseased animals do not migrate and infect other disease-free herds. Any person seeing bison in the Bison Control Area (including the majority of the Highway 5 route) is encouraged to report the sighting to the nearest GNWT ENR office. Any resident hunter seeing a bison in the control area may harvest it and keep the meat, as long as the kill is reported.

Wood bison use different habitats depending on the season. Wood bison are grazers, and rely heavily on grasses and sedges that grow in meadow openings, particularly in the winter. In summer, bison can be found in small willow pastures, wetlands, and uplands where they feed on sedges, forbs, and willow leaves and twigs. In the fall, they can be found in forests and in winter, bison move to graminoid fens and lakeshores where they feed on sedges.

No wood bison sign was observed during EBA's 2010 Hydrometallurgical Plant study area field survey (EBA 2010b), but wood bison scat, tracks, and feeding areas were recorded at two locations further to the west in September 2005: along Twin Creek at the edge of a fen, and along a dirt road near a waste rock pile (approximately 12.5 km west of the former Pine Point town site). Wood bison habitat exists throughout the Hydrometallurgical Plant study area, particularly along the existing road and the shrubby fen. Wood Bison have the potential to occupy the Hydrometallurgical Plant LSA throughout the year.

The main ways that the Hydrometallurgical Plant and associated infrastructure and activities may directly affect wood bison are through habitat loss, changes in daily movements through avoidance and displacement, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

To date, wood bison critical habitat has not been identified within the NWT. However, as a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, the direct loss of wood bison habitat in the area of the Hydrometallurgical Plant are expected to be low in magnitude, local in geographic extent, and reversible at mine closure. Project-related habitat loss is a low consequence. Confidence in this assessment is high due to the limited scale of habitat loss as a result of the Hydrometallurgical Plant and associated infrastructure, and the infrequent occurrence of bison in the local area.

Wood bison herds may be sensitive to disturbance, particularly during calving and post calving season (approximately April to August), and may be wary of human activities particularly the harvested herds. Nevertheless, wood bison are known to become habituated to traffic and human activities. Since traffic volumes and some Hydrometallurgical plant activities can be a constant disturbance, predictable, and have no negative stimulus associated with it (i.e., no hunting), wood bison may become indifferent to the traffic along the haul road and human activities at the Hydrometallurgical Plant. Therefore, avoidance of existing habitat as a result of the Hydrometallurgical Plant and its associated activities is considered low in magnitude, reversible upon cessation of the activity or by moving away from the activity, and a low likelihood of occurrence. The consequence of avoidance effects as a result of the Hydrometallurgical Plant and its associated activities is considered low. Confidence in this assessment is high since bison are expected to infrequently occur in the LSA and the Pine Point region.

Wood bison, particularly males, utilize access roads and other linear features as travel corridors (GNWT ENR 2010-2020), and bison often use development sites, including communities and possibly camps. This habituation and use of human development sites may lead to an increase in bison/human conflict, property damage, and increased vehicle mortalities. Few bison are expected to infrequently occur within the Hydrometallurgical Plant study area and along Highway 5/6. However, all wood bison occurring in the bison control area will be removed by GNWT ENR. Without mitigation, mortality within the Hydrometallurgical Plant LSA is considered low in magnitude, low likelihood of occurrence, and a low consequence of effect.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related wood bison effects, Avalon will implement the following policies and mitigation measures:

- Cooperate with and report any wood bison sightings seen in the Bison Control Area to the nearest GNWT ENR office as and when such sightings occur.
- Implement a no hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Employ bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions.
- Require all Project-related transportation activities to give the right-of-way to any wildlife including wood bison that such activities may encounter.

- Alert system to warn personnel of wood bison in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Employ dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and initiate an education program for Project employees and contractors of the company's wildlife related policies and mitigation.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on wood bison will be negligible with no residual impacts expected to occur. With the implementation of the mitigation, development-related activities are not expected to affect the overall health or well-being of the few wood bison infrequently occupying the LSA.

6.9.2.4 Black Bear

Black bears are common throughout the boreal forests of the NWT, and are relatively common in the area of the Hydrometallurgical Plant. The black bear population in the NWT is healthy and estimated at 10,000 (GNWT ENR 2010a). In the NWT, black bear densities are estimated at 10 bears/100 km^2 (GNWT ENR 2010a).

Black bears are expected to be harvested on occasion in the area of the Hydrometallurgical Plant study area.

Black bears occupy a variety of habitat types based on the abundance of seasonally important food items. In the spring, bears gravitate towards areas with early-emerging vegetation such as roadsides and wetlands, and may be found in sites such as meadows with over-wintered berries. In summer, bears occupy habitats with a variety of grasses, sedges, horsetails, and forbs, as well as an abundance of colonies of ants, bees, and wasps. By fall time, their diet shifts as the nutritional quality of many plants decline and occupy habitats with ripe berries. Disturbed habitats, including fire influenced habitats are also known to provide good black bear habitat.

Black bears typically dig dens in till material available on eskers or drumlins, stream banks, or in natural cavities such as an upturned tree root. Black bears can be expected to den in the vicinity of the Hydrometallurgical Plant study area and along Highway 5/6.

During a previous EBA wildlife study conducted in the fall of 2005 to the west of the Hydrometallurgical Plant area, a total of 37 observations of black bear sign were recorded, with about 46% of the observations being recorded in the upland Labrador tea habitat type, 16% in the Canada buffaloberry-green alder habitat type, and 19% in disturbed sites. During the 2010 reconnaissance survey at the Hydrometallurgical Plant study area, black bear sign was most commonly observed along the proposed haul road from Great Slave Lake to the proposed Hydrometallurgical Plant site.

Scientific evidence suggests avoidance behaviour of land use developments is dependent on human activities, visual and noise disturbances, and season of use. The main ways that the

Hydrometallurgical Plant and associated infrastructure and activities can affect black bears are through habitat loss, changes to daily movements (including avoidance, displacement, and attraction), and mortality. Figure 6.9-1 depicts the pathways of potential effects.

A negligible amount of black bear feeding and traveling habitat will be directly lost as a result of the clearing for the haul road upgrade and the marshalling yard. Appropriate black bear feeding, traveling, and denning habitat is common throughout the LSA and the Pine Point region. Direct loss of black bear habitat is considered negligible in magnitude, local in extent, and reversible in the short-term following closure of the mine. The consequence of the Nechalacho Mine and associated infrastructure on black bear habitat is considered negligible. Confidence in this assessment is high since the amount of black bear habitat in the local and regional study areas are known based on the ecological mapping studies, and the limited scale of habitat loss as a result of the Hydrometallurgical Plant and associated infrastructure.

Based on EBA's previous observations of black bear sign in the general Pine Point area, bears may be expected to be present in the vicinity of the Hydrometallurgical Plant and associated infrastructure and activities area quite regularly and may potentially directly encounter or be disturbed by localized development-related noise or activities. Similarly, black bears are known to occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activity such as hunting. Black bears are known to cross roads with low traffic volumes more frequently than compared to those with higher volumes (Jalkotzy et al. 1997). Development-related traffic volumes are anticipated to be low and concentrated at shift change (every 12 hours). Little effect on existing black bear avoidance and disturbance behaviours towards the Highway is expected as a result of the Hydrometallurgical Plant.

Black bears encountering such activities may show minor displacement behaviour and avoid the immediate development area and/or the Highway. Construction of the Hydrometallurgical Plant, in particular, is expected to generate some degree of disruption, at least temporarily. The duration of exposures during construction and operation are expected to be low, perhaps lasting a few minutes to a few months, and are reversible upon cessation of the activity or by moving away from the activity. The number and frequency of such exposures to disturbance for black bears would be expected to be limited and sporadic.

Black bears are most sensitive to disturbance during winter denning (late September to April). However, scientific evidence regarding the degree of sensitivity is conflicting and may depend on the individual, sex, and denning habitat type. Jalkotzy et al. (1997) reported black bears in northeastern Alberta were relatively tolerant of industrial development during the denning period, and found industrial activity in the area did not deter bears from denning in the local vicinity. Nevertheless, black bears have been known to be displaced from and abandon their dens as a result of human presence near the den (Jalkotzy et al. 1997). Construction will occur during winter months; however, the Hydrometallurgical Plant will be constructed within an existing brownfields site (approximately 0.25 km^2 in size) therefore no denning black bears will be directly affected during construction.

Potential attraction and habituation of black bears to waste foods and human garbage is of particular concern since this can lead to black bear mortality. Black bears may also be attracted to the low traffic haul roads, including Highway 5/6, particularly in the spring when plant emergence may be earlier than in the forest. Black bear mortality may occur during the construction, operation, and closure phases of the Hydrometallurgical Plant, particularly as a result of attraction and habituation to the Project. The risk of collision with the vehicles and equipment is considered negligible. Black bear mortality as a result of the Hydrometallurgical Plant is considered moderate in magnitude, and a high likelihood of occurrence without mitigation. The consequence of black bear attraction, habituation, and possible mortality from the Nechalacho Mine is moderate. The confidence in this assessment is high.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related black bear effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Avoid all known or suspected dens sites.
- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including black bears that such activity may encounter.
- Alert system to warn personnel of black bears in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program of wildlife related policies and mitigation to all Project employees and contractors.
- Store all waste foods and human garbage in bear-proof containers prior to offsite disposal.
- Adaptive management will be applied to Avalon's waste management practices. If black bears are attracted to the site (i.e., problem wildlife) additional management practices, if required, will be adapted.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on black bears will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures as described, development-

related activities are not expected to affect the overall black bear population frequenting the LSA and the Pine Point region.

6.9.2.5 Other Fur-bearing Mammals

Other fur-bearing mammals determined or likely to be present in the Hydrometallurgical Plant LSA from time to time include snowshoe hare, red squirrel, beaver, muskrat, porcupine, coyote, wolf, red fox, wolverine, weasel, mink, marten, fisher, and lynx. Based on Traditional Knowledge Studies, 95% of the participants reported harvesting fur-bearers in the former Pine Point Mine site area and/or the greater general area (EBA 2011b).

Each of these fur-bearing mammals differs in their habitat requirements and general biology. For instance, snowshoe hare prefer deciduous, mixed wood, and lowland treed fen forest communities with an abundance of browse material. Other fur-bearers such as the lynx, red fox, fisher, and coyote prey upon this species; but, perhaps, the lynx is most closely tied to the hare and its cyclic oscillations. The snowshoe hare is one of the key prey species within the Boreal Forest.

Marten populations also follow the cyclic oscillations of their main prey populations, mice and voles. Marten associate closely with late-successional stands of moist coniferous forests, especially those with complex understory and 30 – 50% crown closure, but they may also be found in sparse open forests, riparian areas, forest edges, and burned areas provided sufficient deadfall and other cover is available. In general, scientific evidence suggests marten do not travel across open areas that are 200 m wide or greater (Salmo Consulting Inc. et al. 2004). Marten are considered to be relatively tolerant to human disturbances and activities, but are vulnerable to overharvest (Salmo Consulting Inc. et al. 2004).

During EBA's 2010 field survey of the study area (EBA 2010b), snowshoe hare pellets and evidence of browsing were most commonly documented, as well as a few signs of red squirrel (dens and vocalization), marten (scat), and beaver. In particular, a beaver pond with a lodge was noted between the former T-37N Pit (to be used for supplying water to the Hydrometallurgical Plant) and the proposed haul road to Great Slave Lake. As well, two beaver lodges were recorded within the former T-37N pit. Multiple red fox and wolf scats were also observed along the existing haul road during the 2010 field studies. Two of the wolf scats observed contained beaver fur.

The main ways that the Hydrometallurgical Plant and associated infrastructure and activities can affect fur-bearers are through habitat loss and alteration, changes in daily movements including avoidance, displacement, and habituation (e.g., attraction), and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Habitat loss for all fur-bearing species, except for the aquatic fur-bearers such as beaver and muskrat is considered negligible since the Hydrometallurgical Plant and its associated infrastructure will be located on existing Pine Point mine brownfield sites. In addition, a negligible amount of habitat may be directly lost due to upgrading the existing haul road. Potential adverse effects on aquatic fur-bearers could result from degradation of the former T-37N pit habitat. Water from the T-37N pit will be utilized for potable and process water,

which may alter aquatic fur-bearer habitat. However, aquatic fur-bearer habitat is common in the LSA and the Pine Point region. Development-related habitat loss or alteration is negligible in magnitude, local in geographic extent, reversible at site closure, and a high likelihood of occurrence. The consequence of this habitat loss and alteration is considered negligible.

Based on EBA's observation of a variety of fur-bearer sign within the general study area and Traditional Knowledge, various species of fur-bearers may be expected to be present in the vicinity of the Hydrometallurgical Plant and associated footprint area from time-to-time and may potentially directly encounter or be disturbed by localized development-related noise or activities during construction and operation. Similarly, most of these fur-bearer species are known to occur in the vicinity of Highway 5 where they would be exposed to vehicle traffic and potentially associated activity such as hunting and trapping. Fur-bearers encountering such activities may show minor displacement behaviour and avoid the immediate development area and/or the Highway. Construction of the Hydrometallurgical Plant, in particular, is expected to generate some degree of disruption, at least temporarily.

Fur-bearers are sensitive to disturbance at their natal sites and or during the winter when food resources may be limiting and energy demands are greatest. However, the degree of sensitivity is species dependent. For instance, coyote and red fox are considered more tolerant to human developments and activities, whereas, fisher and wolverine are less tolerant. Construction will occur year round; however, the Hydrometallurgical Plant will be constructed within an existing brownfields site which is unsuitable for natal denning and provides negligible winter food resources. Avoidance and disturbance effects from the construction, operation, and closure phases of the Hydrometallurgical Plant and associated activities is considered brief, perhaps lasting a few minutes to a few hours, negligible in magnitude, and reversible upon cessation of the activity or by moving away from the activity. The consequence of the avoidance and disturbance effects is negligible.

Fur-bearers, particularly wolves, coyotes, red foxes, wolverines may become attracted to the Hydrometallurgical Plant and associated footprint area, which may result in mortality. In addition, there is a negligible risk of mortality from development-related equipment and vehicles. An attraction and habituation effect that leads to mortality as a result of the Hydrometallurgical Plant is considered moderate in magnitude. The consequence of fur-bearer attraction and habituation resulting in mortality to the Nechalacho Mine is moderate. The confidence in this assessment is high.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related fur-bearer effects, Avalon will implement the following policies and mitigation measures:

- No hunting and trapping policy for all Project employees and contractors while working on or off-site for Avalon.
- Avoid all known or suspected dens sites.

- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including fur-bearers that such activity may encounter.
- Alert system to warn personnel of fur-bearers, particularly wolverine in the local area by relaying sighting information to vehicles and equipment operators and on-site personnel to avoid the area, if possible.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program of wildlife related policies and mitigation to all Project employees and contractors.
- Store all waste foods and human garbage in wildlife-proof containers prior to offsite disposal.
- Adaptive management will be applied to Avalon's waste management practices. If wolverine, wolf, and red fox are attracted to the site (i.e., problem wildlife) additional management practices, if required, will be adapted.

With adherence to mitigation discussed above, habitat loss, changes in daily movements, and mortality effects on fur-bearers will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures as described, development-related activities are not expected to affect the overall fur-bearer population frequenting the LSA and the Pine Point region.

6.9.2.6 Waterfowl

Studies have shown that waterfowl spring migration in the region peaks between mid to late May. Flocks of waterfowl are seen flying over the Pine Point study area during this time; however, there is poor quality staging habitat available in the Hydrometallurgical Plant study area. Open waters along the south shoreline of Great Slave Lake at the Hydrometallurgical Plant study area is considered limiting during spring migration due to the prevailing wind patterns and ice presence. In contrast, large areas of open water are available at the Slave and Taltson rivers, in the Simpsons Islands, and Resolution Bay (approximately 10 km east of the Hydrometallurgical Plant study area) by late May, but do not open at the Hydrometallurgical Plant study area until mid-June, after peak spring migration (Sirois et al. 1995).

Waterfowl breed throughout the study areas with select habitats such as wetlands and lakeshores attracting higher breeding densities. Breeding habitats of the waterfowl within the study area differ between species. Available ponds and open water wetlands within the Hydrometallurgical Plant study area are limiting, but are common in the region. Waterfowl

can be expected to breed wherever their habitat requirements are met. Ponds and shallow bays in lakes that contain emergent and submergent vegetation are the most important feeding and nesting areas for waterfowl. Aquatic vegetation, particularly pondweed accounts for approximately three-quarters of waterfowl diets, with aquatic invertebrates and minnows providing the balance. Nests are commonly located within 100 m of the waterbody.

Waterfowl nesting habitat exists within the Hydrometallurgical Plant study area at the beaver pond near pit T-37N and along the shoreline of Great Slave Lake near the marshalling station. Favoured nesting and brood rearing habitat for variety of waterfowl species includes a high ratio of open water and emergent vegetation. The beaver pond near pit T-37N is favourable nesting and rearing habitat. The T-37N pit itself currently supports willow and forest cover along the south and western shorelines, waste rock along the north and eastern shorelines, and small patches of aquatic vegetation in the south and west shoreline areas. Two ducks (a female Bufflehead and an unknown species) were observed occupying the former T-37N pit at the time of the August 2010 field event. The former T-37N pit provides low quality waterfowl habitat and will be used as a potable and process water source for the Hydrometallurgical Plant. Most waterfowl will return to the same area where they hatched, and in many cases, adults return to the same nest site (Terres 1982). Waterfowl are sensitive to disturbance during nesting, fledging, and moulting seasons (mid-May to late August).

During post-breeding moult, adult waterfowl are flightless (flightlessness lasting approximately a month) and seek permanent lakes, ponds, and wetlands that provide both an abundance of food resources and security cover. Waterfowl are particularly sensitive to disturbances during this time. For dabbling ducks, security cover includes emergent vegetation, whereas, diving ducks seek deep, open water for security.

In addition, the shoreline of Great Slave Lake within the Hydrometallurgical Plant study area is not considered an important waterfowl area for spring or fall migrations. Few waterfowl may stage within the study area during migration; however, the Slave River Delta and the Sass and Nyarling Rivers Key Migratory Bird Terrestrial sites (approximately 45 km and 16 km, respectively away from the Hydrometallurgical Plant study area) would be preferentially used by waterfowl during migration.

Since the Hydrometallurgical Plant and its associated infrastructure will be constructed on existing disturbed areas, direct waterfowl habitat loss is considered negligible. The temporary docking facility and the graded marshalling yard will be located on the south shoreline of Great Slave Lake, in an area previously disturbed by a commercial fishing operation. A negligible amount of local habitat may be directly due to the seasonal construction of the dock. Use of water from the former T-37N pit for potable and process water may also result in a negligible alteration of waterfowl habitat. In summary, direct loss of waterfowl habitat is considered negligible in magnitude, local in extent, medium-term in duration, isolated, reversible in the short-term, high likelihood of occurrence, and of low consequence.

The main ways the Hydrometallurgical Plant and its associated infrastructure may adversely affect waterfowl is through changes in daily movements through disturbance and avoidance behaviours, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

The barge operation, the temporary dock facility and associated activity, use of water from the former T-37N pit, and the operation of the haul road and Highway 5/6 have the potential to disturb waterfowl. Barging will occur during the open water season from approximately the end of June to the end of October. The timing of barging operation coincides with waterfowl brood rearing, moulting, and fall migration. A detailed description of the barge operations and dock facilities effects on waterfowl occurring on and around the islands of Great Slave Lake are further discussed in Section 6.11.

At the Hydrometallurgical Plant study area, operation of the barge, a slow moving vessel, the installation and removal of the temporary dock facility each year (a few days each mid-June and late October), and the associated loading and unloading activities may result in low level habitat avoidance at the local scale. Operation of the dock facility will also result in temporary displacement when a barge is present (approximately three times a week) and off and on-loading activities occur (lasting approximately one day). The proposed dock facility and the shoreline in the local area have limited emergent vegetation cover and are not considered high quality waterfowl nesting and rearing habitat, although some nesting and rearing are expected. Barging and its associated activities may have a low, reversible, and periodic avoidance or disturbance effect on a few nesting waterfowl. Potential avoidance or disturbance effects from barging and its associated activities have a moderate likelihood of occurrence, but a low consequence. In addition, the docking facility and local shoreline is considered to provide relatively poor security cover and moulting habitat for waterfowl. Barging and its associated activities effects on moulting waterfowl will be negligible.

Few waterfowl may stage within the study area during migration; however, the shoreline of Great Slave Lake within the Hydrometallurgical Plant study area is not considered an important waterfowl area for spring or fall migrations. Potential effects on migrating waterfowl due to the Hydrometallurgical Plant and its associated infrastructure and activities are considered negligible.

The risk of development-related (including Highway 5/6) waterfowl mortality is considered negligible at the Hydrometallurgical Plant study area, and low along Highway 5/6. The risk of waterfowl mortality increases along the Highway as traffic volumes increase. Mortality as a result of the Hydrometallurgical Plant and associated activities is considered moderate in magnitude and a moderate likelihood of occurrence without mitigation. The number and frequency of exposures would be low and sporadic. To minimize any potential for direct and indirect Hydrometallurgical Plant development-related waterfowl effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Maintain existing drainage patterns to avoid potential alterations to existing waterfowl habitat.

- Avoid all known or suspected nest sites.
- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including waterfowl that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Keep worksites clean and manage waste to avoid attracting egg and chick predators such as gulls and Common Ravens.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on waterfowl will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of waterfowl frequenting the LSA and the Pine Point region.

6.9.2.7 Whooping Crane

Whooping Cranes are listed by SARA as "Endangered", and are ranked by GNWT ENR as "At Risk". Whooping Cranes are sensitive to disturbance during breeding season. In general, cranes are relatively tolerant of carefully operated boats (including barges) and land vehicles; however, people on foot and low flying aircraft are more disturbing (Environment Canada 2007).

A breeding population of Whooping Cranes is located in Wood Buffalo National Park. Non-breeding individuals are known to inhabit marshes, bogs, and shallow lakes between Wood Buffalo National Park and the Mackenzie Bison Sanctuary. The nearest known Whooping Crane nest is located approximately 20 km east and south of the proposed Hydrometallurgical Plant site. Whooping Cranes are not expected to occur in the Nechalacho Mine study area.

During the winter of 2004/05, the Wood Buffalo National Park population of Whooping Cranes was 217 counted on their wintering grounds in the USA. The rising population trend continued in 2010, with a record 74 nests and 46 chicks fledging and a total Canadian population of at least 269 (Kindopp 2010).

In Canada, critical habitat for Whooping Cranes includes the marshes located in the northeastern corner of Wood Buffalo National Park (Environment Canada 2007). The Mackenzie Bison Sanctuary is also considered important habitat for the non-breeding

segment of the Whooping Crane population. In addition, the large wetland complex approximately 3 km west of the Hydrometallurgical Plant study area has been identified as potential nesting habitat currently not occupied for nesting (Olson and Olson 2003). Although this wetland complex is currently not occupied for nesting, it is considered critical habitat for the recovery of this species and will likely be legally protected in the future.

Regarding preferred habitats for nesting, as previously indicated, the LSA does not contain suitable Whooping Crane nesting habitat. However, non-breeding cranes could potentially frequent any of the marshes or bogs in the general area for seasonal feeding purposes.

The Hydrometallurgical Plant and its associated infrastructure will not affect Whooping Crane habitat. The Hydrometallurgical Plant and the former Pine Point mine pits (including L-37 and T-37N) are located in brownfield sites that do not provide Whooping Crane feeding or nesting habitat. In addition, no Whooping Crane nesting or feeding habitat will be directly lost by the haul road upgrades or the graded marshalling yard.

The main way that the Hydrometallurgical Plant and its associated infrastructure and activities could potentially affect Whooping Cranes is through changes in daily movements of non-breeders. Figure 6.9-1 depicts the pathways of potential effect. Based on EBA's observation of a single non-breeding Whooping Crane in the general Pine Point area in 2005, Whooping Cranes may conceivably be present in the vicinity of the beaver pond near T-37N pit on occasion and may potentially be disturbed by localized development-related noise or traffic. Similarly, non-breeding Whooping Cranes may occasionally fly over or feed in marshes, bogs, or shallow lakes adjacent to Highway 5, and throughout the Pine Point region.

A Whooping Crane encountering such activities may show minor displacement behaviour and avoid the immediate Hydrometallurgical Plant development area and/or the Highway. The duration of any such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. Development-related effects on Whooping Crane daily movements are considered low in magnitude and a low likelihood of occurrence. The number and frequency of exposures is considered low and isolated.

The highest risk of development-related Whooping Crane mortality is along Highway 5/6 during construction, operation, and closure. The risk of mortality increases along the Highway as traffic volumes increase. Without mitigation, mortality as a result of the Hydrometallurgical Plant and associated activities is considered high in magnitude and low likelihood of occurrence. The consequence of Whooping Crane mortality is considered high due to its special conservation status.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Whooping Crane effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.

- Maintain existing drainage patterns to avoid potential alterations to potential habitat downstream.
- Avoid all known or suspected nest sites.
- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including Whooping Cranes that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of changes in daily movements and mortality on Whooping Cranes will be negligible with no residual impacts expected to occur.

6.9.2.8 Peregrine Falcon (*anatum* subspecies)

In 2007, COSEWIC combined the subspecies *Falco peregrinus anatum* and *F.p. tundrius* into a single sub-population complex and ultimately upgraded the recommendation of the *F.p.anatum* from "Threatened" to "Special Concern" (Environment Canada 2010d; CWS and GNWT ENR 2008). SARA has yet to list the status of this single *anatum/tundrius* unit. In the NWT, Peregrine Falcons are ranked by GNWT ENR as "Sensitive" under the general status program (GNWT ENR 2010a).

The *Falco peregrinus anatum* subspecies is distributed generally throughout portions of the NWT below the tree line, with a large population located along the Mackenzie River Valley. A small population can be found nesting in the east arm of Great Slave Lake and in Wood Buffalo National Park. However, during the MVEIRB scoping sessions held for the proposed Project in Fort Resolution in August 2010, Mr. Tom Unka informed the Developer that he had observed Peregrines nesting on the steep sides of one or more of the historical mined-out pits in the area of the former Pine Point mine site. However, further information regarding which pits were being used by nesting Peregrines was not reported. No Peregrine Falcons were observed in the Hydrometallurgical Plant study area during the August field event, nor were nesting Peregrines documented during EBA's previous studies in the area. Peregrines are most sensitive to disturbances at their nest sites.

Peregrines mainly hunt other birds in flight, and consequently open areas such as the beaver pond near T-37N and the shoreline of Great Slave Lake within the Hydrometallurgical Plant study area may be important foraging habitats.

The Hydrometallurgical Plant study area lies outside the known breeding range (CWS and GNWT ENR 2008); however, two individuals have been observed in the Pine Point region during September 2005 field surveys. It is expected that the Peregrines observed were generally migrants or non-breeders from known populations in the northeast corner of Wood Buffalo National Park or the east arm of Great Slave Lake. The general Pine Point area does not meet the necessary habitat requirements for nesting Peregrine Falcons (i.e., cliff ledges close to water). The Hydrometallurgical Plant and its associated infrastructure will not directly affect Peregrine Falcon nesting or feeding habitat.

The main way that the Hydrometallurgical Plant and its associated infrastructure and activities could potentially affect Peregrine Falcons is change in daily movements of non-breeding floaters or migrants and mortality. Figure 6.9-1 depicts the pathways of potential effects. Although the Hydrometallurgical Plant study area is outside known breeding ranges, non-breeding floaters or migrants may utilize feeding habitats in the Hydrometallurgical Plant study area and along Highway 5/6 including open shorelines of lakes, ponds, wetlands, and beaver ponds.

The sensitivity of Peregrine Falcons to human disturbances and equipment/vehicles is relatively unknown; however, they are known to nest and feed in high density disturbance areas such as cities. Some degree of habituation or tolerance to human activities is assumed. Non-breeding Peregrine Falcons may infrequently be present in the vicinity of the Hydrometallurgical footprint area, including at the seasonal dock facility and the beaver pond, as well as along Highway 5/6 and may potentially be disturbed by local equipment and vehicle traffic noise or activity. A Peregrine Falcon encountering disturbance activity or vehicle traffic during construction, operation, and closure phases may show minor displacement behaviour and avoid the immediate area. Avoidance and disturbance effects as a result of the Hydrometallurgical Plant and associated activities are considered low in magnitude, low likelihood of occurrence, and a low consequence. The duration of any such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity.

In addition, the mortality as a result of the development-related traffic along Highway 5/6 during construction, operation, and closure of the Hydrometallurgical Plant and its associated infrastructure is considered low. Migrants or non-breeding floaters may utilize Highway 5/6 and open areas surrounding the Hydrometallurgical Plant and its associated infrastructure, including the Highway for hunting. Without mitigation, mortality as a result of the Hydrometallurgical Plant and its associated activities is considered moderate in magnitude but a low likelihood of occurrence.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Peregrine Falcon effects, Avalon will implement the following policies and mitigation measures:

- No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Conduct a field survey to document possible nesting Peregrine Falcons at pits L-37 and N-42 prior to construction and operation. If evidence of Peregrine Falcon nesting

in these pits is observed, avoidance and/or mitigation to minimize adverse impacts from construction and operation will be developed.

- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including Peregrine Falcons that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

With adherence to mitigation discussed above, the effects of changes in daily movements and mortality on Peregrine Falcons will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the population of Peregrine Falcons potentially occurring in the LSA and the Pine Point region.

6.9.2.9 Yellow Rail

The Yellow Rail is listed by SARA as "Special Concern", and ranked by GNWT ENR as "May Be At Risk" under the general status program. Based on their known distribution in the NWT (GNWT ENR 2010e) and their preferred habitat requirements, they occur in the Pine Point region, wherever appropriate habitat exists. Yellow Rails are sensitive to disturbances during nesting season, particularly human presence and activities and changes in water levels.

Yellow Rails arrive in the NWT in early May to breed. Preferred nesting habitats are characterized by sedges and shallow water depths (ranging from moist substrate to 15 cm water). They feed on freshwater snails, aquatic and terrestrial insects, and seeds of sedges found in wet sedge meadows. Potential habitat for Yellow Rails is limited to a small graminoid fen within the Hydrometallurgical Plant study area. At the time of the August 2010 field event, this small graminoid fen was dry and not considered quality Yellow Rail habitat. However, appropriate Yellow Rail habitat likely exists along Highway 5/6

As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, no direct physical effects on Yellow Rail habitat in the area of the Hydrometallurgical Plant LSA are expected. In addition, the Hydrometallurgical Plant and its associated activities do not change the risk of Yellow Rail mortality within the LSA.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Yellow Rails is through changes in daily movements, such as displacement from seasonal feeding and nesting habitat along Highway 5/6. Figure 6.9-1 depicts the pathways of potential effect. A Yellow Rail may encounter vehicular traffic

along Highway 5/6 during the Hydrometallurgical Plant construction, operation, and closure activities and may show minor displacement behaviour and avoid the immediate area of the Highway. However, the Hydrometallurgical Plant is not considered to substantially increase traffic volumes along the Highway. The duration of any such exposures are expected to be periodic, are reversible in the short-term, and low in magnitude.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Yellow Rail effects, Avalon will implement the following policies and mitigation measures:

- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Maintain existing drainage patterns to avoid potential alterations to potential habitat downstream.

With adherence to mitigation discussed above, the effects of changing Yellow Rail daily movements will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the population of Yellow Rails potentially occurring in the LSA and the Pine Point region.

6.9.2.10 Short-eared Owl

Short-eared Owls are listed by SARA as "Special Concern" (Schedule 3), and are ranked by GNWT ENR as "Sensitive" under the general status program (Environment Canada 2010d; GNWT ENR 2010a). Under SARA Schedule 3, the Short-eared Owl requires assessment or re-assessment by COSEWIC and is not yet protected under SARA. Therefore, species listed under Schedule 3, including the Short-eared Owls may be protected under SARA in the future, following re-assessment. Although Short-eared Owls are not protected under SARA, all raptors and their nests (including Short-eared Owls) are protected under the NWT Wildlife Act.

The Short-eared Owl arrives in the NWT to breed by late April or May and depart by late October (CWS and GNWT ENR 2008; Bromley and Trauger ND). The NWT population status of these owls is difficult to assess because individuals are nomadic and prone to annual fluctuations in numbers. Short-eared Owls occur wherever an abundance of small mammals are present, particularly in bogs, marshes, and other non-forested areas (CWS and GNWT ENR 2008). Preferred nesting habitat includes expansive areas of open grasslands or low-structured open shrublands that are dominated by grasses or sedges typically less than 50 cm in height. Short-eared owls are associated with large open habitats. Favourable nesting habitat within the Hydrometallurgical Plant study area is negligible; however, Short-eared Owls may hunt in open areas such as along roadside ditches, beaver ponds, and graminoid fens.

The brownfields sites of the former Pine Point mine (including the Hydrometallurgical Plant site) are considered to possess poor quality feeding habitat for Short-eared Owls due to the limited amount of revegetation that has occurred to date, which limits prey species abundance. Although Short-eared Owls likely do not nest within the Hydrometallurgical Plant study area, they may nest wherever appropriate habitat exists along Highway 5/6. As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, the direct physical effects of these components of the TLP on Short-eared Owl nesting and feeding habitat is negligible.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Short-eared Owls is through changes in daily movements, such as displacement from seasonal feeding and nesting habitat, and mortality. Figure 6.9-1 depicts the pathways of potential effects. Short-eared Owls may infrequently occur in the Hydrometallurgical Plant LSA to feed during the construction, operation, and closure phases, particularly along the haul road. Both feeding and nesting Short-eared Owls may also occur along the Highway. Short-eared Owls are sensitive to disturbance during nesting, and may abandon nests as a result (GNWT ENR 2010b). Short-eared Owls may conceivably be present in the vicinity of the Hydrometallurgical Plant and associated infrastructure on occasion to feed and may potentially be disturbed by localized vehicle traffic noise or activity. Similarly, Short-eared Owls may nest or feed in appropriate habitat adjacent to the Highway. A Short-eared Owl encountering human activities or vehicular traffic may show minor displacement behaviour and avoid the immediate area, the haul road, and/or the Highway. The duration of any such exposures are expected to be periodic, reversible in the short-term, local in geographic extent, low in magnitude, and a low consequence.

In addition, the mortality as a result of the development-related traffic along Highway 5/6 during construction, operation, and closure of the Hydrometallurgical Plant and its associated infrastructure is considered low. Short-eared Owls are at most risk of mortality while hunting along Highway 5/6 during the construction, operation, and closure phases. Without mitigation, mortality as a result of the Hydrometallurgical Plant and its associated activities is considered moderate in magnitude but low likelihood of occurrence.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Short-eared Owl effects, Avalon will implement the following policies and mitigation measures:

- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- All Project-related transportation activities to give the right-of-way to any wildlife including Short-eared Owls that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

With adherence to mitigation discussed above, the effects of changing Short-eared Owl daily movements and mortality will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the population of Short-eared Owls potentially occurring in the LSA and the Pine Point region.

6.9.2.11 Common Nighthawk

The Common Nighthawk is listed by SARA as "Threatened", and ranked by GNWT ENR as "At Risk" under the general status program. Common Nighthawks migrate into the NWT to breed in mid May to early June, and depart by mid August to mid September (CWS and GNWT ENR 2008).

While in the NWT, Common Nighthawks are most sensitive to disturbances during the nesting and fledging season. However, the level of sensitivity to human disturbances is unknown. Common Nighthawk feeding and breeding habitat exists throughout the Hydrometallurgical Plant site study area and along Highway 5/6 in Bedrock-Lichen broad habitat types, as well as at old mine or mineral exploration sites, roads, and airstrips. Preferred nesting habitat includes: open forests, forest clearings, recent burn areas, rock outcrops, lakeshores, and gravel areas (including airports, quarries and roads) (CWS and GNWT ENR 2008). Their preferred feeding habitat includes areas with an abundance of insects, such as open forests (e.g., Bedrock-Lichen and Shrub Wet broad habitat types), forest clearings, recent burn and logged areas, rock outcrops, wetlands and marshes (e.g., Treed, Shrub, and Sedge fen broad habitat types) open water habitat types (including lakes and rivers), and gravel areas (including the former Pine Point mine brownfields sites, airstrips, and roads). Common Nighthawks will also forage near artificial lights that have attracted insects.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Common Nighthawks is through nesting and feeding habitat loss, changes to daily movements including habitat avoidance and displacement, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

The Hydrometallurgical Plant, dock facility, and graded marshalling yard will be located on potential Common Nighthawk nesting and feeding habitat. Common Nighthawks likely do not nest on the existing haul road from Great Slave Lake to the Hydrometallurgical Plant site due to existing traffic relating to the commercial fishery and other local traffic; however, feeding may occur throughout the road length.

Common Nighthawks are known to nest and feed in high density disturbance areas such as cities, therefore, some degree of habituation or tolerance to human activities is assumed. As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure in a limited area of the large existing brownfields/disturbed terrain of the former Pine Point Mine area, the direct physical effects of these components of the TLP on preferred Common Nighthawk habitat in the area of the Hydrometallurgical Plant are expected to be negligible. Common Nighthawk feeding and nesting habitat is common throughout the LSA and the Pine Point region.

Some level of habitat avoidance and disturbance during construction, operation, and closure phases may occur. Common Nighthawks may be present in the vicinity of the Hydrometallurgical footprint area on occasion and may potentially be disturbed by local equipment and vehicle traffic noise or activity. Similarly, Common Nighthawks may fly over, nest, or feed in other previously disturbed areas present in the historic Pine Point Mine area, adjacent to Highway 5, along the haul road from the Hydrometallurgical Plant to Great Slave Lake and throughout the Pine Point region. A Common Nighthawk encountering disturbance activity or vehicle traffic during construction, operation, and closure phases may show minor displacement behaviour and avoid the immediate area, the haul road and/or the Highway. Avoidance and disturbance effects as a result of the Hydrometallurgical Plant and associated activities is considered low in magnitude and local in extent. The duration of any such exposures are expected to be brief, perhaps lasting a few minutes to a few hours, and are reversible upon cessation of the activity or by moving away from the activity. Confidence in this assessment is moderate since the level of sensitivity to Project-related infrastructure and activities is relatively unknown.

Traffic along the haul road and Highway pose the greatest risk of mortality to Common Nighthawks. In addition, the Hydrometallurgical Plant and associated activities may attract predators (e.g., gulls, Common Ravens, and red foxes), which may lead to the indirect death of Common Nighthawks. Without mitigation, direct and indirect mortality of Common Nighthawks as a result of the Hydrometallurgical Plant and associated activities in considered moderate in magnitude, local in extent, but a low likelihood of occurrence.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Common Nighthawk effects, Avalon will implement the following policies and mitigation measures:

- Avoid all known or suspected nest sites.
- Bus transportation for employees from Hay River and Fort Resolution to the Hydrometallurgical Plant site to minimize the risk of vehicle-wildlife collisions and disturbances from the road.
- Implement speed limits on the haul road from Great Slave Lake to the Hydrometallurgical Plant.
- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Keep worksites clean and manage waste to avoid attracting egg and chick predators such as gulls, Common Ravens, and red foxes.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on Common Nighthawks will be negligible with no residual

impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of Common Nighthawks frequenting the LSA and the Pine Point region.

6.9.2.12 Olive-sided Flycatcher

The Olive-sided Flycatcher is listed by SARA as "Threatened", and is ranked by GNWT ENR as "At Risk" under the general status program (Environment Canada 2010d; GNWT ENR 2010a). Olive-sided Flycatcher habitat exists throughout the Pine Point region including the Hydrometallurgical Plant site study area.

The Olive-sided Flycatcher arrives in the Northwest Territories in late May and early June to breed, and departs in late July and early August (GNWT ENR 2010e). Breeding pairs generally establish territories at forest edges adjacent to clearings, especially where scattered tall trees or snags are available for perching on, or foraging from. Typical Olive-sided Flycatcher habitat includes forest edges with large trees and standing snags, and open to semi-open forest stands located in regenerating forests, edge habitats near man-made openings, bedrock outcrops, and lakeshores, and treed bogs (Altman and Sallabanks 2000). During breeding bird surveys in the Pine Point region, EBA (2006b) documented eight Olive-sided Flycatcher observations in Spruce Upland, Bedrock-Lichen, Treed Fen, and the edge of a Graminoid Fen broad habitat types.

Within the Hydrometallurgical Plant LSA and the Pine Point region, feeding Olive-sided Flycatchers are closely associated with waterbodies that have a high density of insects (e.g. beaver ponds, lake edges, streams), but also feed in open and semi-open habitats such as brownfields sites, natural and man-made habitat edges, and Bedrock-Lichen, Spruce and Mixed Upland, Shrub Fen, and Graminoid Fen broad habitat types.

Nests are typically built in coniferous trees usually near a habitat edge (Altmann and Sallabanks 2000). Within the Hydrometallurgical Plant site study area, Bedrock-Lichen, Spruce Upland, Mixed Upland, Spruce Wet, and Treed Fen broad habitat types near a habitat edge (such as a road/Highway, and brownfields site) provide moderate to high habitat potential for nesting Olive-sided Flycatchers.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Olive-sided Flycatchers is through habitat loss, changes in daily movements through avoidance and displacement from seasonal feeding and nesting habitat, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, the direct loss of preferred Olive-sided Flycatcher habitat will be limited to the small amount of habitat cleared for the haul road upgrades and the marshalling yard. Olive-sided Flycatcher habitat loss is considered low in magnitude and reversible at mine closure.

The Hydrometallurgical Plant and associated infrastructure and activities may also directly affect Olive-sided Flycatcher daily movements through avoidance and disturbance during the short-term construction and closure phases and longer-term operations phase. Olive-

sided Flycatcher may conceivably be present in the vicinity of the Hydrometallurgical footprint area on occasion and may potentially be disturbed by localized vehicle traffic noise or activity. Similarly, Olive-sided Flycatchers may occasionally fly over or feed in open areas including previously burnt areas and wetlands adjacent to Highway 5/6, along the haul road from the Hydrometallurgical Plant to Great Slave Lake, and throughout the Pine Point region. In addition, Olive-sided Flycatchers may avoid suitable habitat due to noise levels, human presence, and dust levels, particularly along the haul road.

The sensitivity of Olive-sided Flycatchers to noise, human presence and activities is relatively unknown. However, some songbird species are thought to be negatively affected by noise. Human induced noise may mask communication calls; consequently, some species may avoid adjacent habitats. Some species remain in these habitats in lower densities, and may have lower nest success or productivity (AMEC 2005). An Olive-sided Flycatcher encountering construction or vehicular traffic may show minor displacement behaviour and avoid the immediate area of construction, the haul road and/or the Highway.

Potential impacts to birds from road dust are relatively unknown. However, effects attributed to road dust are typically less than 10 – 20 m from the road, but may extend into habitats 200 m downwind depending on the adjacent landscape and habitat types (e.g. open tundra habitats) (Forman and Alexander 1998).

In summary, visual disturbances from traffic, human presence, noise, dust, and other activities of the Hydrometallurgical Plant may result in changes to Olive-sided Flycatcher daily movements. Avoidance and disturbance effects are considered low in magnitude, local in geographic extent, and reversible upon cessation of the activity or by moving away from the activity. The number and frequency of exposures is low, but continuous for the life of the Project.

In addition, habitat clearing along the haul road and marshalling yard may result in Olive-sided Flycatcher mortality if active nests are directly affected. The timing of habitat clearing will influence the risk of mortality during clearing activities. Mortality of Olive-sided Flycatchers, their eggs, and young as a result of habitat clearing can be avoided if habitat clearing occurs outside nesting season. Without mitigation, mortality is considered moderate in magnitude, local in extent, and moderate likelihood of occurrence. The consequence of Olive-sided Flycatcher mortality as a result of the Hydrometallurgical Plant and associated activities is considered moderate.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Olive-sided Flycatcher effects, Avalon will implement the following policies and mitigation measures:

- Avoid clearing habitat from May 15 to August 15 to prevent accidental mortality of Olive-sided Flycatcher adults, eggs, and pre-fledged young (as well as other upland breeding birds).
- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.

- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

With adherence to mitigation discussed above, the effects of habitat loss, changes in daily movements, and mortality on Olive-sided Flycatchers will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of Olive-sided Flycatcher frequenting the LSA and the Pine Point region.

6.9.2.13 Rusty Blackbird

Rusty Blackbirds are listed by SARA as "Special Concern", and are ranked by GNWT ENR as "May Be At Risk" (Environment Canada 2010d; GNWT ENR 2010a). Rusty Blackbirds can be expected to occur in the LSA and the Pine Point region from early May to late September.

Rusty Blackbirds forage along the edge of fens, bogs, beaver ponds, streams, and swampy lake shores in search for aquatic and terrestrial insects and plant materials (e.g., seeds and fruits). Nests are constructed in conifer and deciduous trees and shrubs in suitable feeding habitat. Rusty Blackbirds are most commonly associated with forest edges along natural waterbodies; however, they occasionally occupy treatment ponds and hydroelectric reservoirs that are in forested areas (COSEWIC 2006). Research indicates Rusty Blackbird populations are associated with beaver lodge densities in an area (Avery 1995). Areas with a low beaver lodge density may have a low Rusty Blackbird abundance. Beaver lodges within the Hydrometallurgical Plant site study area are located at and near the T-37N pit; however, beaver lodges and Rusty Blackbird habitat occurs along Highway 5/6 and throughout the Pine Point region.

Appropriate Rusty Blackbird habitat within the Hydrometallurgical Plant site study area occurs at the beaver pond near T-37N pit. This beaver pond is located at the edge of a former Pine Point mine brownfields site and two adjoining roads. Rusty Blackbirds were not observed within the Hydrometallurgical Plant site study area during the August 2010 field event. Additional Rusty Blackbird habitat exists throughout the Pine Point region.

As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all associated infrastructure on existing brownfields/disturbed terrain, no direct physical effects on preferred Rusty Blackbird habitat is expected.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Rusty Blackbirds is through changes in daily movements, in particular avoidance and displacement from seasonal feeding and nesting habitat at the beaver pond located adjacent to the T-37N pit and in treed wetlands along the Highway, and mortality. Figure 6.9-1 depicts the pathways of potential effects.

Rusty Blackbirds may conceivably be present in the vicinity of the Hydrometallurgical footprint area on occasion and may potentially be disturbed by localized vehicle traffic noise or activity. Similarly, Rusty Blackbirds may occasionally fly over or feed in the wetland areas, marshes or bogs, adjacent to Highway 5/6 and throughout the Pine Point region.

A Rusty Blackbird may encounter Hydrometallurgical Plant development-related activity during construction, operation, and closure phases. Those encountering construction or vehicular traffic (and associated noise) may show minor displacement behaviour and avoid the immediate area of activity, the haul road and/or the Highway. Disturbance and habitat avoidance in response to the Hydrometallurgical Plant and its associated activities is considered low in magnitude, low likelihood of occurrence, and a low consequence.

Traffic at the beaver pond near T-37N pit and along the Highway poses the greatest threat to Rusty Blackbird mortality. Without mitigation, mortality as a result of the Hydrometallurgical Plant and associated activities is considered moderate in magnitude, with a low likelihood of occurrence, but a moderate consequence of effect.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Rusty Blackbird effects, Avalon will implement the following policies and mitigation measures:

- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.

With adherence to mitigation discussed above, the effects of changes in daily movements and mortality on Rusty Blackbirds will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related activities are not expected to affect the overall health or well-being of Rusty Blackbird populations in the LSA and the Pine Point region.

6.9.2.14 Horned Grebe

Horned Grebes have been assessed by COSEWIC as "Special Concern" (as of April 2009), and ranked by GNWT ENR as "Secure" under the general status program. Horned Grebes are not listed by SARA. The Horned Grebe population is stable in the Yellowknife area, and is presumed to be stable throughout its range in the NWT (GNWT ENR 2010a).

Horned Grebes are expected to arrive within the study area at the end of April or early May to breed and depart by mid-August to early September (GNWT ENR 2010e). Within their breeding range, Horned Grebes occupy small ponds, wetlands, shallow lakeshores, and other natural or man-made permanent or semi-permanent waterbodies wherever their main foods (aquatic insects, fish, frogs, and crustaceans) are abundant (Environment Canada 2010d). Favourable breeding ponds include areas of open water with sufficient emergent (e.g. cattails and sedge) and submergent vegetation. Nests are anchored to emergent plants, primarily cattails and willows, which provide cover and support (Fournier and Hines 1999).

In late July and August, adults leave their pre-fledged young at the breeding ponds and reside at larger waterbodies (waterbodies greater than 15 ha in size and depths greater than 1 m) to molt immediately prior to fall migration. During molt, Horned Grebes experience a

flightless period and may form large post-breeding aggregations during this time (Fournier and Hines 1999; Stout and Cook 2003).

Horned Grebes are most sensitive to disturbance during the nesting (including pre-fledging) and moulting periods. Horned Grebes have the potential to occur within the Hydrometallurgical Plant LSA and along Highway 5/6 during construction, operation, and closure phases.

Within the Hydrometallurgical Plant site study area, potential Horned Grebe nesting habitat exists at the beaver pond near T-37N pit, and potential moulting habitat exists in Great Slave Lake near the dock facility. Additional nesting and moulting habitat exists along Highway 5/6. No direct loss of potential Horned Grebe nesting habitat will occur as a result of the Hydrometallurgical Plant and its associated infrastructure. The temporary docking facility may result in the seasonal loss of a negligible amount of Horned Grebe moulting habitat. As a result of Avalon's decision to construct a temporary docking facility each open water season, moulting habitat potentially lost from the facility will be reversible at closure of the Hydrometallurgical Plant. The direct physical effects of these components of the Hydrometallurgical Plant and its associated infrastructure on preferred Horned Grebe habitat is negligible in magnitude, local in extent, medium-term in duration, isolated, reversible, low occurrence of effect, and a low consequence.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Horned Grebes is through changes in daily movements at the beaver pond located adjacent to the T-37N pit, at the dock facility, and the Highway. Figure 6.9-1 depicts the pathways of potential effect. Potential nesting and moulting Horned Grebes may encounter Hydrometallurgical Plant development-related activity (including barging and associated activities) periodically during construction, operation, and closure phases. Those encountering construction or vehicular/barging traffic (and associated noise) may show minor displacement behaviour and avoid the immediate area of activity, the haul road and/or the Highway. The sensitivity of Horned Grebes to development-related activity is unknown. However, habitat avoidance and disturbance in response to the Hydrometallurgical Plant and associated activities is considered low in magnitude, reversible in the short-term, and a low likelihood of effect.

Traffic along the Highway poses the greatest risk of mortality to Horned Grebes. The Hydrometallurgical Plant and associated activities may also attract nest predators (e.g., gulls, Common Ravens, and red foxes), which may lead to the indirect death of Horned Grebes. Without mitigation, mortality as a result of the Hydrometallurgical Plant and associated infrastructure is considered low likelihood of occurrence, and moderate in magnitude.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Horned Grebe effects, Avalon will implement the following policies and mitigation measures:

- Maintain existing drainage patterns to avoid potential alterations to existing Horned Grebe habitat.
- Avoid all known or suspected nest sites.

- Implement speed limits on all site roads.
- All Project-related transportation activities to give the right-of-way to any wildlife including birds that such activity may encounter.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines. No hunting policy for all Project employees and contractors while working on or off-site for Avalon.
- Keep worksites clean and manage waste to avoid attracting egg and chick predators such as gulls and Common Ravens,
- Maintain sufficient buffer distances between development activities (e.g., re-fuelling and material storage) and waterbodies, where possible.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of changes in habitat availability, daily movements, and mortality on Horned Grebes will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related effects do not threaten the long-term persistence of Horned Grebe populations in the LSA and the Pine Point region.

6.9.2.15 Northern Leopard Frog

Northern Leopard Frogs are ranked by GNWT ENR as "Sensitive" under the general status program and are listed by SARA as "Special Concern" (Schedule 1). Northern Leopard Frogs have been recorded along the Slave and Taltson Rivers, as far north as Fort Resolution and may occur year round in the Hydrometallurgical Plant LSA and the Pine Point region wherever appropriate habitat exists.

Northern Leopard Frogs use various habitat types throughout their life history stages including lakes, ponds, roadside ditches, and flooded areas during breeding; meadows and grasslands close to water in summer, and unfrozen lake and river bottoms in winter. Northern Leopard Frogs are sensitive to disturbance particularly during winter hibernation and in the egg and tadpole stages. Egg masses are attached to emergent vegetation close to the water surface or at the pond bottom. Both the egg masses and tadpoles are particularly vulnerable to predation and habitat changes such as altered water levels and water chemistry.

Potential Northern Leopard Frog habitat is present within the Hydrometallurgical Plant site study area and along Highway 5/6. Direct habitat loss of potential summer feeding Northern Leopard Frog habitat will occur at the temporary dock facility and the graded marshalling yard (approximately 2 ha in size). The dock facility is situated in shallow water without emergent vegetation and would therefore be considered poor breeding and over-wintering habitat. The graded marshalling yard may be used by Northern Leopard Frogs by adults during the summer period, outside the breeding season. As a result of Avalon's decision to locate the physical footprints of the Hydrometallurgical Plant and all other associated infrastructure on existing brownfields/disturbed terrain, the direct physical

effects of these components of the TLP on preferred Northern Leopard Frog habitat in the area of the Hydrometallurgical Plant are expected to be negligible.

The main way that the Hydrometallurgical Plant and associated infrastructure and activities could potentially affect Northern Leopard Frogs is through habitat alteration and mortality. Figure 6.9-1 depicts the pathways of potential effects.

The Hydrometallurgical Plant and its associated activities may result in alteration of breeding and over-wintering habitat during the operation phase. During the operation phase, water from the T-37N pit will be used to support the Hydrometallurgical Plant with potable and process water, therefore altering water levels. Northern Leopard Frog breeding habitat in the T-37N pit is considered poor quality due to the limited amount of emergent vegetation, and over-wintering habitat is considered moderate quality. Adverse impacts of a moderate alteration in water levels at the T-37N pit during Northern Leopard Frog breeding is considered negligible in magnitude due to the low breeding habitat potential of this pit and the availability of higher quality breeding habitat in the immediate area (beaver pond) and the region.

In addition, airborne dust from the haul road has the potential to alter Northern Leopard frog habitat. Introduced fine sediment into the roadside ditches and the beaver pond, has the potential to increase the water turbidity and possibly degrade the habitat by inhibiting aquatic plant growth and macro-invertebrates, and water pH (Forman and Alexander 1998). Habitat alteration effects are considered moderate in magnitude and local in extent.

Northern Leopard Frogs are particularly susceptible to mortality from high traffic roads due to their innate behaviour. Research suggests that Northern Leopard Frogs do not strongly avoid roads or traffic, consequently increasing their risk to road mortality (Bouchard et al. 2009). Bouchard et al. (2009) reported a 6% mortality rate while crossing roads with very low traffic volumes (10.86 mean vehicles per hour) and a 28% mortality rate at higher traffic volumes (58.29 mean vehicles per hour). In relation to Northern Leopard Frog mortality risks, traffic volumes along the haul road are anticipated to have very low traffic volumes, and the Thor Lake Project will have a negligible mortality risks along Highway 5/6.

Similarly, a large removal of water from the T-37N pit during Northern Leopard Frog over-wintering period may result in mortality. The water in the T-37N pit originates from the groundwater, and pit recharge will be sufficient to support the Hydrometallurgical Plant and its associated activities year round. In addition, egg masses that are secured to emergent vegetation near the water surface may desiccate if a moderate reduction in water levels occurs during the breeding season. Mortality as a result of the Hydrometallurgical Plant traffic and water removal from the T-37N pit is considered moderate in magnitude, local in geographic extent, and low likelihood of occurrence. Any mortality effect will be irreversible, isolated in frequency, and a moderate consequence.

To minimize any potential for direct and indirect Hydrometallurgical Plant development-related Northern Leopard Frog effects, Avalon will implement the following policies and mitigation measures:

- Maintain existing drainage patterns to avoid potential alterations to existing Northern Leopard Frog habitat.

- Maintain sufficient water levels in the T-37N pit to sustain oxygenation of the water and avoid freezing conditions near the bottom substrate.
- Dust suppression strategies (e.g., water or approved dust suppressant products) in accordance with the GNWT dust suppression guidelines.
- Maintain sufficient buffer distances between development activities (e.g., re-fuelling and material storage) and waterbodies, where possible.
- Develop and implement an education program for wildlife related policies and mitigation to all Project employees and contractors.

With adherence to mitigation discussed above, the effects of changes in habitat availability, daily movements, and mortality on Northern Leopard Frogs will be negligible with no residual impacts expected to occur. With the implementation of the mitigation measures, development-related effects do not threaten the long-term persistence of Northern Leopard Frog populations in the LSA and the Pine Point region.

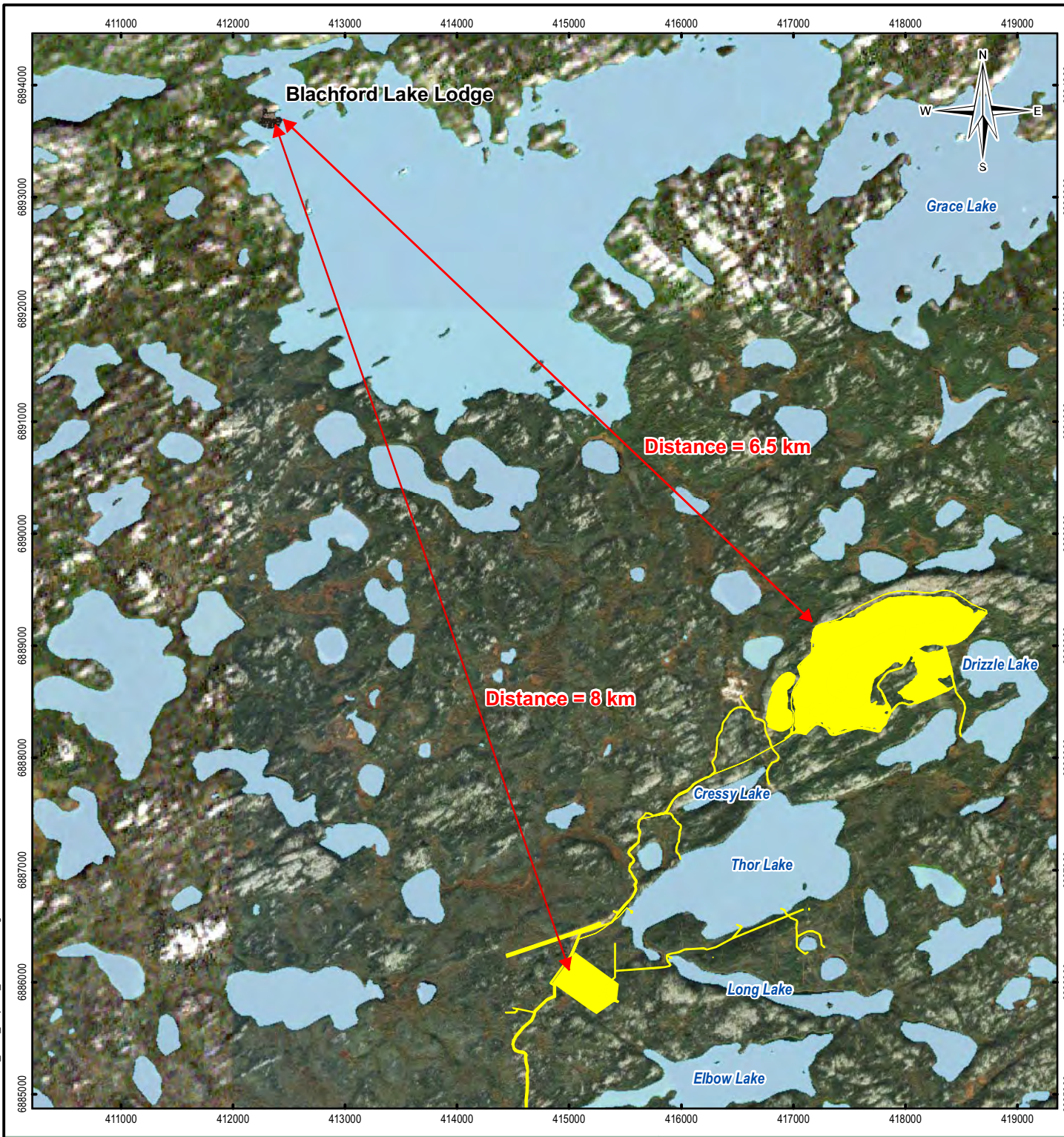
6.10 BLACHFORD LAKE LODGE

The MVEIRB Terms of Reference (MVEIRB 2011) requested Avalon to describe existing noise, light, and viewshed conditions at Thor Lake with particular reference to the ongoing operation of Blachford Lake Lodge (the Lodge) and the Lodge's aurora viewing services.

6.10.1 Viewshed Conditions

Blachford Lake Lodge is located on the northwest end of Blachford Lake, approximately 8 km to the northwest of the current Avalon mining exploration camp (Figure 6.10-1). However, due to the undulating shield terrain and forest cover that exists between these two locations as shown in Figure 6.10-1, the tallest component of existing infrastructure located at the Nechalacho mine site, namely the 50 m tall windtower, with installed lighting, cannot be viewed from Blachford Lake Lodge.

In the future, as construction of the Nechalacho Mine proceeds, the tallest construction equipment, likely one or more cranes, would be considerably shorter than the current wind tower, which will likely be maintained for some time to come. Likewise, any new infrastructure that will be installed, including the processing and flotation plant, and other structures such as the fuel tank farm, are all expected to be less than about 20 m high. As a result, none of the proposed Nechalacho Mine infrastructure will be able to be viewed from Blachford Lake Lodge.



LEGEND

- Blachford Lake Lodge
- Nechalacho Mine Site Footprint
- Waterbody

NOTES

Base data sources:
- NTS 1:50,000 (Sheet 85I02)

Imagery:
- thor_lake_wv2_2010oct01_east and west from Avalon
- Canimage 1:50,000

ISSUED FOR USE

THOR LAKE PROJECT

Location of Blachford Lake Lodge

PROJECTION	DATUM
UTM Zone 12	NAD83

Scale: 1:50,000

1 0.5 0 1

Kilometers

FILE NO.: V15101007_DAR_Map038_BlachfordLodge.mxd

PROJECT NO.	DWN	CKD	REV
V15101007.006	SL	RH	0

OFFICE	DATE
EBA-VANC	April 19, 2011

AVALON RARE METALS INC

EBA Engineering Consultants Ltd.

Figure 6.10-1

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6.10.2 Noise Conditions

Regarding airborne noise, as previously indicated in Section 2.4.2, the Nechalacho Mine site is located in a remote area where natural background ambient noise levels are expected to be low, generally in the range of 35 dBA. The acoustic environment is dominated by the sounds of nature, e.g. wind rustling through the foliage, birds singing, waves lapping on the shores of Thor Lake, etc.

Man-made sounds that can currently be heard in the Nechalacho Mine Area from time to time are those associated with the limited and intermittent ongoing exploration drilling program, the existing mining camp at Thor Lake, the camp power generator, local exploration-related vehicle traffic, and the limited fixed-wing aircraft flights that use the airstrip.

During the short (2 year) construction phase, noise levels would be expected to be considerably greater and extend for longer periods of time. Sources of noise at that time would be related primarily to site preparation and infrastructure construction activities, including blasting, excavation, earth-moving, and building construction.

Upon completion of construction, noise levels would be expected to be much lower because the mining activities will be underground and the process plant, camp and power generation plant will be contained inside solid, insulated structures. Other sources of noise generated during the long-term operations phase would be associated with mine-related vehicle traffic, including the hauling of concentrate containers to the seasonal dock at Great Slave Lake, the barging operation, and air traffic into and out of the airstrip.

The presence of natural sound buffers such as forest and hills would help to attenuate noise from the Project reaching as far as Blachford Lake Lodge. Winds, as well as masking noise, can also help to carry noise from a source to a receptor, in this case Blachford Lodge. As previously indicated in Section 2.3.1, the prevailing winds at Thor Lake come predominantly from the east (ENE, E, ESE - 43% frequency of occurrence). Winds are least common from the west (1.8%) and winds moving in the direction of the Lodge (from the ESE, SE and SSE) are estimated to occur approximately 17.7% of the time. It is during this time that sounds emanating from the Nechalacho Project site could be heard from time to time at the Lodge.

Based on the more detailed assessment of noise emissions related to the Nechalacho Mine site as discussed in Section 6.2.3, noise levels emanating from the Nechalacho Mine site and associated infrastructure during all phases of this component of the Project are predicted to be typically less than 40 dBA at a distance of 1.5 km from the site.

Mitigation measures that will be employed to minimize noise generated by the Project have been discussed in Section 6.2.3. Avalon is committed to ensuring that all reasonable measures will be taken to minimize noise levels associated with its operations and will be working closely with Blachford Lake Lodge to ensure the wilderness experience enjoyed by their guests will be maintained.

6.10.3 Light Conditions

Regarding possible effects of light associated with infrastructure and activities related to the future constuction and long term operation of the Nechalacho Mine, it should be noted that the current exploration program generates considerable light from the surface-based exploration drilling rigs. Likewise diffuse light currently emanates from the tent camp during the long winter nights (Photo 6.10-1). Ambient light levels are likely to be somewhat higher than current levels for the relatively short (2 year) construction phase, and will likely return to current exploration phase levels as all mining activities will be underground and the process plant and camp will be contained inside solid structures.

Photo 6.10-1
Northern Lights over Nechalacho Mine Site Camp

Avalon recognizes and appreciates that Blachford Lake Lodge and its guests wish to have their remote, wilderness experience preserved. Avalon also understands that the Lodge and its guests wish to continue to enjoy the northern aurora that is a highlight of any visitors to the Lodge during the winter months. As shown in Photo 6.10-1, on clear winter nights, the aurora is also a highlight for workers at the Nechalacho Project site, and Avalon is committed to managing light emissions from its future operations to ensure that the opportunity to enjoy the wilderness experience and night-time viewing of the Aurora Borealis is maintained.

6.11 GREAT SLAVE LAKE DOCKS AND BARGING OPERATION

6.11.1 Nechalacho Seasonal Dock Site

6.11.1.1 Facility Description

The MVEIRB Terms of Reference (MVEIRB 2011) specifically requested Avalon to predict the effects to fish and fish habitat from mooring barges at a seasonal dock facility on the north shore of Great Slave Lake. The facility will consist of a single low keel floating barge moored to dolphins and connected to the shore by a 20-30 m long removable ramp capable of handling the cargo loading and unloading equipment (Figure 4.7-11).

The seasonal dock will be utilized only during the open water period. The Great Slave Lake barging season typically lasts 120 days each year. During the life of operations, barge loading activities will occur over a 60 day period during the summer allowing for an additional 60 days within the overall 120-day barging season for any delays due to weather or mechanical issues.

The adjacent upland area will be developed into a marshalling yard to handle load/offload materials and transfer containers between the Nechalacho Mine and Flotation Plant site and the dock as shown in Figure 6.11-1. This yard is located approximately 65-70 metres from the shore of Great Slave Lake, and is therefore outside of the lake riparian zone. Similarly, the access road to the dock site is located a minimum of 50 metres from the shoreline except for the area of direct access to the barge dock.

6.11.1.2 Potential Effects and Mitigation Measures

Mooring dolphins will involve the installation of piles that will be driven into the gravel substrate in water that is greater than five metres in depth. Pile driving can result in noise and vibration that might temporarily disrupt fish movements within proximity of the work site. For this reason, pile driving will be restricted to the fish work window period of July 16-September 14, identified by DFO as the preferred time period for in-water work within the Project area. The displacement of relatively very small areas of lake bottom due to the pile footprints is not expected to impact adversely on available spawning or rearing habitat for fish populations in this area, which are mainly comprised of lake whitefish and lake cisco. Both species generally select shallow areas (<5 m depth) over mixed-substrate lake bottoms for spawning.

The barge ramp, which will connect the barge to the beach area, will necessarily be located above the high water mark, to prevent the operation of equipment within the wetted area. The beach at this location consists of coarse material, thereby minimizing or precluding erosion and subsequent sedimentation.

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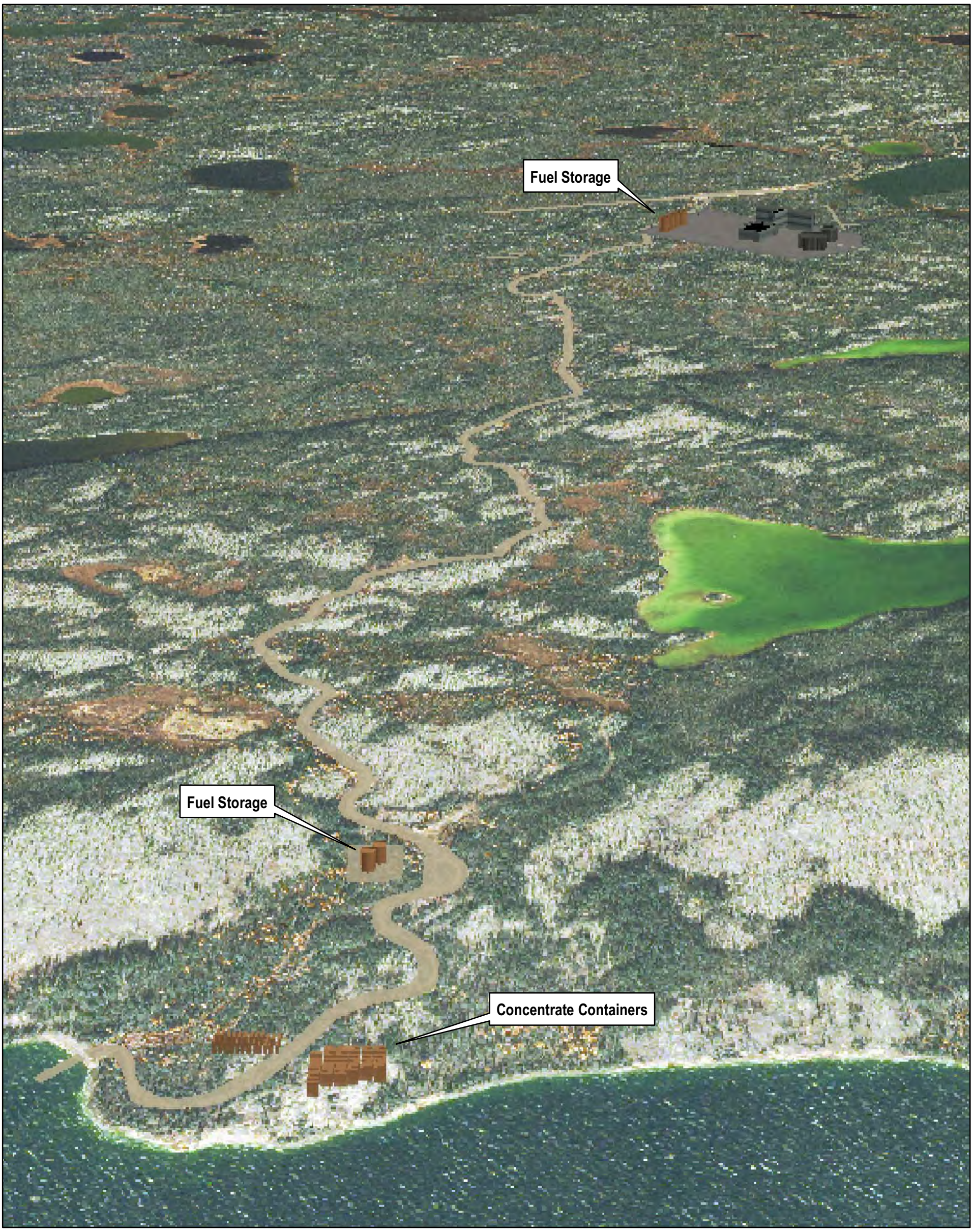

Representation of Docking Area

N
W E
S

NOTES
Base data source: Imagery provided by Avalon (October 2010).

ISSUED FOR USE

THOR LAKE PROJECT

Schematic Representation of the Nechalacho Mine Site Docking Area

PROJECTION	DATUM
UTM Zone 12	NAD83

EBA Engineering Consultants Ltd. eba

AVALON RARE METALS INC.

FILE NO.
V15101007_DAR_Map050_NechDockView.mxd

PROJECT NO.	DWN	CKD	REV
V15101007.006	KMW	RH	0

OFFICE	DATE
EBA-VANC	April 5, 2011

Figure 6.11-1

Barge operations are anticipated to take place during the summer months, ending prior to spawning for fall-spawning species such as lake whitefish and lake cisco, which predominate in this area. This operational schedule limits the possibility of adverse effects on fish production since it will occur after hatching and prior to spawning. As such, spawning migrations, if they occur in the bay, will not be affected by barge movements or docking procedures. It is also the case that aquatic vegetation is virtually absent in this bay, indicating that no spawning or rearing for northern pike is likely. Additional assessment related to potential effects on fish due to noise generated by tug boats is provided in Section 6.11.3.2 of this DAR, and concludes that fish may move to avoid moving tugs, but that their movements and behaviour would return to normal once the tugs had passed.

Pile driving activities will adhere to the BC Marine and Pile Driving Contractors Association and Fisheries and Oceans BMP (2003) for pile driving, to avoid potential adverse effects on fish and fish habitat. The area of lake bottom and potential habitat collectively occupied by the dolphins will be very small. It is also possible that the dolphins may provide cover for young fish and a substrate for benthic invertebrates and periphyton. Although it will be necessary to carry out monitoring to determine whether such positive effects occur, it is anticipated that no net loss of productive capacity of habitat will occur due to installation of the dolphins.

As a result of the application of environmentally sound practices, in combination with scheduling to avoid interactions with spawning fish or egg hatching, it is anticipated that no residual adverse effects will occur to fish, or the productive capacity of fish habitat, due to seasonal installation and operation of the barge dock at the Nechalacho Mine site.

6.11.2 Hydrometallurgical Plant Seasonal Dock Site

A seasonal floating barge dock will be installed on the south shore of Great Slave Lake, approximately 8.6 km from the Hydrometallurgical Plant. This barge dock will serve as the terminal for shipping containers loaded with concentrate produced at the Nechalacho Mine and Flotation Plant site. The MVEIRB Terms of Reference (MVEIRB 2011) specifically requested Avalon to predict the effects to fish and fish habitat from mooring barges.

The dock facility will be similar in design and operation to the seasonal barge dock facility developed for the Nechalacho Plant site (Section 6.11.1 of this DAR). However, due to the relatively shallow conditions on the south side of the lake adjacent to the barge location, the Hydrometallurgical Plant dock facility will consist of two moored barges that will reach the necessary three metre minimum water depth required for the seasonal barging operation. The nearshore moored barge will be connected to the shore by a 20-30 m long removable ramp. The seasonal dock will be utilized only during the open water period.

Directed fish and fish habitat surveys have not been carried out within the immediate area proposed for the barge dock facility. It is anticipated, however, that fish habitat within the nearshore area at this location would be poor to moderate due to shallow depths (< 3 m). These nearshore areas would not provide suitable spawning habitats for fall spawning fish (e.g., lake whitefish, lake cisco, lake trout) due to ice depths of about 1-1.5 m. Fish are likely

to migrate through this area, which may also be suitable for summer feeding by juvenile fish, which prefer shallow, protected inshore areas.

The moored barges will be tethered to dolphins, consisting of piles driven into the substrate. As described in Section 6.11.1, pile driving will adhere to the BC Marine and Pile Driving Contractors Association and Fisheries and Oceans BMP (2003), which provides guidance on measures to avoid or reduce adverse effects on the aquatic environment. Pile driving will occur over a relatively short period during the fish work window period of July 16-September 14, thereby further limiting potential interactions with fish or fish habitat.

The area of lake bottom and potential habitat collectively occupied by the dolphins will be very small. It is also possible that the dolphins may provide cover for young fish and a substrate for benthic invertebrates and periphyton. Although it will be necessary to carry out monitoring to determine whether such positive effects occur, it is anticipated that no net loss of productive capacity of habitat will occur due to installation of the dolphins.

Tug boat operations may result in temporary avoidance behaviour by fish, largely due to noise and vibrations generated by these boats. Their very slow approach will likely not result in startle behaviour. Once boats pass an area, it is very likely that fish will return to their preferred habitats.

During grading of the marshalling yard adjacent to the barge dock, sediment and erosion control measures will be implemented to avoid erosion and subsequent sediment releases to Great Slave Lake. Where applicable, a five metre buffer of existing riparian vegetation will be maintained to separate the work area from the lake shore.

Based on the foregoing, no adverse residual effects to fish or to the productive capacity of fish habitat are expected due to the installation and operation of the hydrometallurgical plant seasonal dock site.

6.11.3 Barging Operation

6.11.3.1 General

The MVEIRB Terms of Reference (MVEIRB (2011) requested Avalon to discuss the potential effects of the proposed barging operation on the environment of Great Slave Lake, on public safety and on traditional lifestyles, pursuits and activities on or near Great Slave Lake.

To proceed with the requested assessment, a brief description of the nature and scale of the proposed barging operation is warranted. The barging operation represents a key component of the overall infrastructure required to support the Thor Lake Project. The barging operation will serve to address two primary requirements:

- The transportation of shipping containers loaded with concentrate produced at the Nechalacho Mine and Flotation Plant site to the Hydrometallurgical Plant site located in the Pine Point area.
- The annual resupply of mine consumables and fuel to the Nechalacho Mine and Flotation Plant site.

As previously shown in Figure 6.1-1, the main barging corridor across Great Slave Lake extends for about 155 km from the Nechalacho Mine and Flotation Plant site on the north side of the lake, to the Hydrometallurgical Plant site on the south side of the lake.

The barging operation will be conducted during the annual open water period which typically extends from about the end of June to about the end of October (>120 days). Avalon anticipates that about 60 days will be needed to complete all shipments within the annual barging season.

The overall barging operation will involve the use of nine (9) barges arranged in three (3) barge trains consisting of three (3) barges each, supported by two (2) tugs.

The annual resupply of mine consumables and fuel will use the same barges as used for the transportation of the concentrate containers (Photo 6.11-1). The NTCL barges have the capacity to haul one million litres per barge in segregated holds located within the hull of each barge. NTCL is equipped to load and transfer fuel at its Hay River base. Fuel will therefore be loaded at Hay River for transport to the Nechalacho Mine and Flotation Plant site. There will be four(4) consumables/fuel runs in a given season.

Photo courtesy of NTCL

Photo 6.11-1
Typical Three Barge Train

The container transportation operation will involve approximately 30 round trips per season for two barge trains assuming a two day cycle to complete each round trip. Loading and unloading of the barges at the seasonal docks is expected to take a total of two (2) days per load. On this basis, it is assumed that there will be about one (1) barge train moving along the barge corridor every other day or about three (3) per week. When underway, the barge train would typically be moving at a speed of 5-6 knots depending on wave conditions.

6.11.3.2 Environmental Effects

Potential environmental effects related to shipping/barging activities are typically related to the generation of underwater noise and disturbance to aquatic life. In the marine environment, concerns related to underwater noise are mainly focussed on issues pertaining to marine mammals that live in the sea such as whales, seals and related species (National Research Council 2005; Richardson et al. 1995). However, such marine mammals do not occur in the freshwater environment of Great Slave Lake.

Fish and birds that spend time on the open waters of Great Slave Lake are the only VECs that could potentially be affected by the proposed barging activities. Underwater noise would be generated by the tug towing the barges.

Published data on underwater sound levels generated by tug boats indicate that the expected sound source level for a typical tug such as would be used for the Thor Lake Project would be in the order of 145 to 166 dB re 1 µPa-m (sound source level at 1 m distance from the propeller). Received sound levels at a range of 50 m would be about 34 dB lower (Richardson et al. 1995).

Fish in the water column, such as lake trout, whitefish, pike, etc., in the vicinity of a moving tug and barge train would be expected to detect the sounds generated by the passing tug, some may exhibit short-term 'startle reactions" (Nedwell et al. 2003), but the fish would be expected to resume their normal behaviour after the tug passed them.

Birds, such as geese, swans, ducks, loons, etc., that could be sitting on the water in front of the path of a moving tug would be expected to react to an approaching tug by swimming out of the path of the slow-moving tug, or by taking flight and landing some distance away. Such avoidance reactions would be of a short-term nature and the birds would be expected to return to their normal behaviour after they have moved out of the path of the oncoming tug.

The anticipated wake of a slow moving barge train would be expected to be in the order of one (1) to two (2) feet (Photo 6.11-1). Such a wake would dissipate quickly and would have negligible effects on any nearby shoreline, particularly when compared to the natural forces of wind and wave experienced by shoreline areas during storm events that typically occur on a seasonal basis in Great Slave Lake.

6.11.3.3 Public Safety/Traditional Lifestyles

As previously indicated, the proposed barging operation would involve approximately 30 round trips per season for two barge trains assuming a two day cycle to complete each round trip. This would result in about one (1) barge train moving along the barge corridor every other day or about three (3) per week.

Great Slave Lake is also used by pleasure craft, fishermen, and several commercial transportation operations. The Transport Canada Vessel Registry (Transport Canada 2011) lists all vessels (commercial and pleasure craft) of greater than 15 tons, which are required to be licensed. According to their records, 13 vessels are currently registered in Yellowknife, and 8 vessels are registered in Hay River.

The Canadian Coast Guard in Hay River (F. Lamy (CCG), personal communication, 2011) advised that approximately 12 of the registered vessels operating on Great Slave Lake are fish boats, of which 8-10 could be operating in a given year. In addition, an undetermined number of smaller vessels, including sailboats, pleasure craft and open boats (16-20 ft with outboard motors) are known to operate in Great Slave Lake each summer. Most of the public vessel traffic on the lake seems to take place from late June to the end of September (P. Latour (CWS), personal communication, 2011) and most is concentrated in the more populated North Arm area of the Lake and in nearshore areas of the lake.

Based on direct communications with residents of Lutsel K'e during the MVEIRB scoping sessions and in conjunction with the TK study completed in the community, Avalon is also aware that some families from Lutsel K'e travel by small craft from their community to Yellowknife and back during the summer months. Given that a barge train is expected to be moving along the proposed barge corridor about three times a week at a slow speed (~5 knots), it is likely that the boating residents will occasionally see a moving barge train and may need to adjust their course in the vicinity of the barge train to safely proceed to their planned destination.

From the perspective of public safety, the existence of the current exploration camp at the Nechalacho Project site, and the future development of the Thor Lake Project will represent a safe haven for boaters who may be caught in bad weather in the general vicinity of the Project area. The existence of this safe haven is also expected to be of potential benefit to traditional users of the water and the land for the life of the Project.

6.12 HIGHWAY 5 TRUCKING OPERATION

Existing Territorial Highway 5 will be used for the transportation of the refined rare metals concentrate to the CNR rail siding located adjacent to the Town of Hay River and the transportation of Hydrometallurgical Plant construction and operations materials, consumables and reagents.

As previously discussed in Section 4.0 of the DAR, two refined products will be produced at the Hydrometallurgical Plant, a concentrate (Acid-baked Residue) and a combined light rare earths product (Bulk Precipitate).

The concentrate (330 tpd), which is inert, will be transported in 20 tonne trucks (8 per day) towing a similar-sized pup. The concentrate will be temporarily stored inside a purpose-built building at the CN railhead at Hay River prior to loading into railcar gondolas. The combined light rare earths product (88 tpd) will be shipped in 22 tonne intermodal containers (4 per day) by truck to the CN railhead, where they will be loaded onto flatbed railcars. Both products will be shipped by rail from Hay River to a caustic crack and separation plant to be located in the USA.

In addition, approximately 6 truck trips will be required per day to haul reagents (limestone, lime, sulphur, etc.) from Hay River to the Hydrometallurgical Plant.

Territorial Highway 5 is classified as an all-weather highway by the GNWT Department of Transportation (DOT). The highway is rated for year-round use by commercial vehicles with no load restrictions for haul truck traffic. Throughout the operational life of the

historic Pine Point Mine (1964 to 1988), this highway was used for all of the commercial trucking and hauling activities associated with this large-scale mine development. Thus the historic traffic volumes and weights experienced on this highway were considerably higher than those occurring at this time or in the future as a result of development of Avalon's Thor Lake Project.

The most recent available GNWT Department of Transportation traffic monitoring data along Highway 5 east of Hay River and Highway 6 to Fort Resolution were recorded in 2008. The traffic counts were used to estimate Average Annual Daily Traffic (AADT) volumes. These estimates are presented in Table 6.12-1.

Trucking schedules are flexible and can be made to accommodate either dayshift or graveyard shift hours. The trucking operation will be conducted for the life of the Project, which is currently set at 20 years.

In addition, it is anticipated that two vans and two buses will be operating/contracted to transport personnel from Fort Resolution and Hay River on a daily basis. Each of these vehicles will make two (2) return trips per day from these communities. Avalon also anticipates that approximately 25 personal vehicles will be driven to/from these communities to the Hydrometallurgical Plant site per day.

Additional traffic associated with trucks, buses and personal vehicles will be concentrated during the shift change periods. On the basis of these statistics, the total daily anticipated increase in traffic along Highway 5 attributable to the Thor Lake Project is estimated to be in the order of 50 return trips per day. This represents an 8.9% increase in the amount of traffic passing past Traffic counter 5-1 located 1 kilometre east of the Highway 2 and 5 intersection. On an hourly basis (assuming a 12 hour day), this equates to an average of about 47 vehicles per hour, based on the 2008 data, compared to about 51 vehicles per hour with the Thor Lake Project traffic included.

Given that there are no load restrictions on Highway 5 for commercial hauling traffic and discussions with DOT (DOT, personal communication, 2010), the anticipated level of increased traffic is not expected to have a measurable effect on the integrity or safety of Highway 5 or the terrain occupied by the existing road. The Department of Transportation will continue to be responsible for the operation and maintenance of Highway 5.

TABLE 6.12-1 ESTIMATED TRAFFIC ON HIGHWAYS 5 AND 6: 2008

Counter ID	Description	Annual Average Daily Traffic		
		2008	2007	2006
5-1	1 km east of Highway 2 and 5 intersection	560	560	560
5-19	19 km east of Highway 2 and 5 intersection	260	210	150
5-65	5 km south of Highway 5 and 6 intersection	110	90	170
6-30	8.5 km east of Pine Point access	80	80	80
6-74	16 km west of Fort Resolution	110	110	100

Source: GNWT DOT 2009

6.13 CN RAILWAY OPERATION

As discussed in the previous Section, the two products produced at the Hydrometallurgical Plant (12,200 tonnes/month) will be transported to the CN railhead at Hay River and will be temporarily stored inside a purpose-built building at the CN railhead. In addition, approximately 2,500 tonnes/month of various reagents (sulphur, lime, flocculants, etc.) will be transported to Hay River by rail prior to shipment by truck to the Hydrometallurgical Plant or by barge to the Nechalacho Mine site.

In conformance with the MVEIRB's Terms of Reference (MVEIRB 2011), the following information is provided on the nature of the proposed rail transportation component of the Thor Lake Project, and potential environmental considerations associated with the railway operation.

Historically, the railway from Grimshaw, Alberta to Hay River was constructed in the early 1960's by the federal government. The railway was built as part of then Prime Minister Lester B. Pearson's vision for the North and helped to facilitate the shipment of lead-zinc ore from the former Pine Point (Wonders 2003). The total length of the railway track from Hay River to the Alberta border is approximately 144 km.

During the life of the railway line, ownership has changed a number of times, but in January, 2006, CN once again became the owners of this railway. CN is fully committed to business practices that protect the natural environment and ensure employee and public safety and health (CN 2011).

At CN facilities, environmental protection has and continues to be an integral part of their management activities. CN's Environmental Policy, programs and processes are intended to minimize the impacts of their activities on the environment (CN 2011). Some examples of CN's more recent commitments to the environment include:

- Since CN's privatization in 1995, they have acquired 631 new locomotives under their regular fleet renewal program. Specifically for the period 2009-2010, the Company purchased 135 additional electro-motive diesel (EMD) locomotives. These new locomotives produce 40% less nitrogen oxides and are at least 15 to 20% more fuel-efficient than the locomotives they replaced.
- For the second consecutive year in 2010, CN was listed on the Canadian Climate Leadership Index of the Carbon Disclosure Project
- In 2010, CN was again selected as a member on the Dow Jones Sustainability Index: North America. Their environmental score under the sustainability assessment was 82%.
- CN won the 2009 Environmental Award in the freight category by the Railway Association of Canada for their development of the modal shift protocol that helps customers calculate carbon credits related to shifting freight transportation from truck to rail.

According to CN, the number of trains per week into Hay River varies throughout the year (Mark Kimakowich, Asst. Supt. Alberta North, personal communication, February 2010).

Based on past experience, CN typically operates two (2) trains per week from the beginning of April until mid-May unless business increases (2 trains per week north of High Level north, and 2 south).

CN has estimated that the cargo demands placed on the rail system during this time period by Avalon would result in a carload increase of about 10-15 cars per train based on the projected Avalon volumes in and out.

For the remainder of the year CN typically operates three (3) trains per week with considerable excess capacity (Mark Kimakowich, Asst. Supt. Alberta North, personal communication, February 2010). According to CN, currently, based on the transportation demands of Avalon, there is sufficient capacity on the three trains per week to accommodate this level of business. If the Tamerlane lead zinc pilot project were to proceed (Tamerlane's zinc production and any materials, consumables needed , CN indicated that they may need to add one additional train to their schedule to service the combined needs .

The MVEIRB Terms of Reference (MVEIRB 2011) specifically requested that possible effects of the railway traffic on Woodland caribou be addressed. As indicated in Section 2.11.5.3, Boreal woodland caribou are known to occur southwest of Great Slave Lake, including the area of the former Pine Point Mine where the proposed Hydrometallurgical Plant will be located, as well as along Highway 5/6 to Hay River and the railway to Alberta

Recent research suggests that the Woodland caribou population in the Northwest Territories is stable (GNWT ENR 2010b). The Woodland caribou population living in the southern Northwest Territories in the vicinity of the railway, as well as Highway 1 leading to the Alberta border have been exposed to the regular but minimal traffic associated with both the railway and the highway for many generations stretching back to the early 1960's when the railway was constructed and brought into service.

Although no information or documentation has been found to indicate whether there have been any previous interactions (e.g., collisions) between trains moving along the railway to Hay River and return, it is reasonable to assume that there have not been very many if any incidents between moving trains and Woodland caribou frequenting the area of the railway corridor. Since the demand placed on the existing rail service by the Thor Lake Project is expected to be so limited, no significant effects on Woodland caribou frequenting the railway corridor are expected to occur in the foreseeable future and no mitigation measures are anticipated to be required.

6.14 BIOPHYSICAL ENVIRONMENTAL MONITORING

As the Thor Lake Project progresses monitoring programs will be implemented in order to manage the potential effects of the Project on both the biophysical and human environment. Ongoing monitoring is especially anticipated for aquatics effects, air quality, and wildlife. Management plans have also been established for human resources and spill contingencies at both the Nechalacho Mine and Hydrometallurgical Plant sites. The following is a brief description of potential monitoring and management plans.

6.14.1 Aquatic Effects Monitoring

6.14.1.1 Surface and Groundwater Quality Monitoring

Water Quality has been identified by the Mackenzie Valley Review Board (2011) as a key line of inquiry assessment because of concerns over the potential adverse effects of the Nechalacho Mine site on water quality in lakes and streams within the mine footprint area. Testing revealed that waters within the broad footprint of the proposed Nechalacho Mine and Flotation Plant site area have relatively high alkalinity, hardness, and calcium indicating high acid buffering capacity. No CCME exceedances were noted for Thor Lake, into which discharges from the tailings area would ultimately drain.

Water quality in Thor Lake and further downstream is not anticipated to be adversely affected by mining activities and discharges of decant water from the TMF. No adverse residual effects are therefore predicted. Water quality and biological monitoring will be carried out according to requirements of the Water License and the MMER. Monitoring results will be used to confirm that water quality downstream of the TMF discharge remains within allowable limits.

6.14.1.2 Fish and Aquatic Resources Monitoring

The Metal Mining Effluent Regulations (MMER)

Development at the Nechalacho Mine site will be subject to the requirements of the Metal Mining Effluent Regulations (MMER), in addition to other monitoring requirements stipulated in relevant permits and approvals. The MMER directs metal mines to carry out periodic aquatic Environmental Effects Monitoring (EEM) with the objective of evaluating the effects of mine effluent on fish, fish habitat and the use of fisheries resources. It is recognized that the establishment of effluent limits alone may not be sufficient to ensure adequate site specific protection of aquatic resources.

As such, EEM studies are conducted to evaluate the effects of mine effluent on the aquatic environment and permit adjustments to mitigate adverse effects, where they are identified. The MMER is administered by Environment Canada, which is responsible for reviewing and approving EEM study designs and the interpretative reports that provide data and assessments based on relatively prescriptive procedures. These procedures are contained within Guidance Documents for Aquatic Environmental Effects Monitoring (Environment Canada 2002).

The MMER prescribes limits for the discharge of deleterious substances, including arsenic, copper, total cyanide, lead, nickel, radium-226, zinc, pH of effluent, and total suspended solids (TSS), and a requirement for effluent to be non-acutely lethal to rainbow trout.

The MMER sets out requirements for periodic studies of the aquatic environment to monitor and measure: fish, benthic invertebrates, effluent characteristics and water quality, sediment quality, and sublethal toxicity in order to determine and quantify effects on fish and fish habitat. (The *Fisheries Act* definition of fish habitat is: spawning grounds and nursery, rearing, food supply, migration and any other areas on which fish depend directly or indirectly in order to carry out their life processes).

It is important to note that the MMER defines an effect as follows (Environment Canada 2002):

- an "effect on the fish population" means a statistical difference between fish population measurements taken in an exposure area and a reference area.
- an "effect on fish tissue" means measurements of total mercury that exceed 0.45 µg/g wet weight in fish tissue taken in the exposure area and that are statistically different from the measurements of total mercury taken in the reference area.
- an "effect on the benthic invertebrate community" means a statistical difference between benthic invertebrate community measurements taken in an exposure area and a reference area (e.g., control/impact design) or a statistical difference between measurements taken at sampling areas in the exposure area that indicate gradually decreasing effluent concentrations (e.g., a gradient design).

Aquatic Effects Monitoring Studies

In adherence to MMER requirements, monitoring studies for the Thor Lake Project will consist of:

- Effluent and water quality monitoring studies;
- Sublethal toxicity testing; and,
- Biological monitoring studies.

Effluent and Water Quality Monitoring

Effluent and water quality sampling and analysis will need to be carried out within six months of mine startup (as defined in the MMER), and thereafter, at least four times per year, spaced at least one month apart. Effluent will be sampled at the final discharge point and will include analyses for: hardness, alkalinity, aluminum, cadmium, iron, mercury, molybdenum, ammonium, and nitrate. (The final discharge point, in respect of an effluent, means an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent. Mercury analysis may be discontinued if the concentration is less than 0.10 µg/L in 12 consecutive samples).

Water quality samples will be collected from an exposure area (i.e. water containing fish habitat and/or fish that are exposed to effluent) surrounding the point of entry of effluent into water from each final discharge point and from the related reference areas, as well as in areas included in the biological monitoring studies. Water quality samples will be analyzed for the same constituents measured in effluents, as well as temperature, dissolved oxygen, and pH.

Sublethal Toxicity Testing

Sublethal toxicity testing on a fish species, an invertebrate species, a plant species and an algal species will be carried out as specified in the MMER two times each calendar year for three years and once each year after the third year. The first testing will occur on an

effluent sample collected not later than six months after the mine becomes operational (as defined in the MMER).

Biological Monitoring

Generally, the first study design for biological monitoring studies must be submitted for approval to Environment Canada not later than 12 months after the mine begins operations, although exceptions can apply, particularly if biological monitoring studies were completed prior to formal notification of mine start-up. Monitoring studies will then take place not sooner than six months from submission of the study design. The study design will incorporate specific details to justify sampling locations (exposure and reference sites), timing, and field, analytical, and statistical assessment methods according to specifications outlined in the MMER and in Environment Canada (2002).

Following data collection and analysis, an Interpretative Report will be submitted to Environment Canada not later than 30 months after the date the mine becomes operational. The contents of the Interpretative Report are prescribed in the MMER and in Environment Canada (2002), as is the scheduling for the second and all subsequent biological monitoring studies. The sampling frequency following review of the second Interpretative Report is dependent on results of previous studies and can be increased if no effects are demonstrated in two successive studies.

6.14.2 Air Quality Monitoring

It is anticipated that the Thor Lake Project will have minimal effects on local air quality and that all Project related emissions will be below the NWT Air Quality Standards. Because the Project has not yet been constructed, there have been no direct measurements of Project-related emissions. Manufacturers' specifications and dispersion modeling were used to make estimations.

Air quality data collected from local meteorological stations (Yellowknife, Hay River) will likely be adequate for monitoring air quality and potential effects resulting from the Thor Lake Project. Because emissions from the Project are estimated to be lower than NWT Air Quality Standards large-scale air quality monitoring stations will not be necessary on-site.

6.14.3 Wildlife Monitoring

Upon Project approval, Avalon Rare Metals Inc. will prepare a Conceptual Wildlife Monitoring and Management Plan addressing furbearers, migratory birds, waterfowl, large ruminants, and large carnivores. Adaptive management will be included in the Wildlife Monitoring and Management Plan and will be tailored specifically for the TLP to avoid, minimize and mitigate any potential effects to wildlife if problems or issues are detected during construction, operation, and decommissioning/closure.

In order to reduce the potential for wildlife mortality directly related to development at both Project sites, a no hunting policy will be implemented for all Project employees and contractors while they are working on or off-site for Avalon. Additionally, Avalon will require that all Project-related transportation activities give the right-of-way to any wildlife

they might encounter. It will also be required that moose sightings within or around the Project sites will be announced over the radio to alert other employees of their presence.

The potential attraction/habituation of specific wildlife species including black bears, wolves, coyotes, red foxes, wolverines and porcupines, will be minimized by ensuring all waste foods and human garbage is stored in wildlife-proof containers prior to being disposed of offsite in pre-approved manners. Landfilling of wastes will not be conducted on site.

6.14.4 Human Resources Management Plan

The Human Resources Management Plan for the Thor Lake Project is currently being finalized. Before completing the Human Resources Management Plan, Avalon established a list of commitments specific to socio-economic aspects of the Project which Avalon intends to fulfill and for which ongoing monitoring will be carried out.

6.14.5 Spill Contingency Plan

Avalon's Hazardous Materials Spill Contingency Plan is designed to efficiently and effectively respond to any medical or environmental emergency and/or accidental spill that may be associated with the construction, operation or decommissioning of the Thor Lake Project.

The overriding preventative and mitigation measures to be employed include:

- Implementation of best management and industry practices as appropriate to prevent or minimize the occurrence of accidents or malfunctions.
- Compliance with Land Use Permit and Water License requirements and conditions.
- Conformance with existing applicable federal, GNWT and WSCC standards.
- Compliance of all Thor Lake Project-related traffic with existing NWT traffic laws.
- Effective application of Avalon's Hazardous Materials Spill Contingency Plan.

The scope of the Hazardous Materials Spill Contingency Plan encompasses the overall range of types of accidents or malfunctions that may require the initiation of an emergency, medical or environmental response. The Plan also considers the possibility that more than one type of response may be required for any one incident. Response preparedness will be maintained for incidents involving medical, fire or other emergency response, and appropriate related monitoring, fuel or concentrate spills or other environment related incidents (e.g. wildlife collisions).