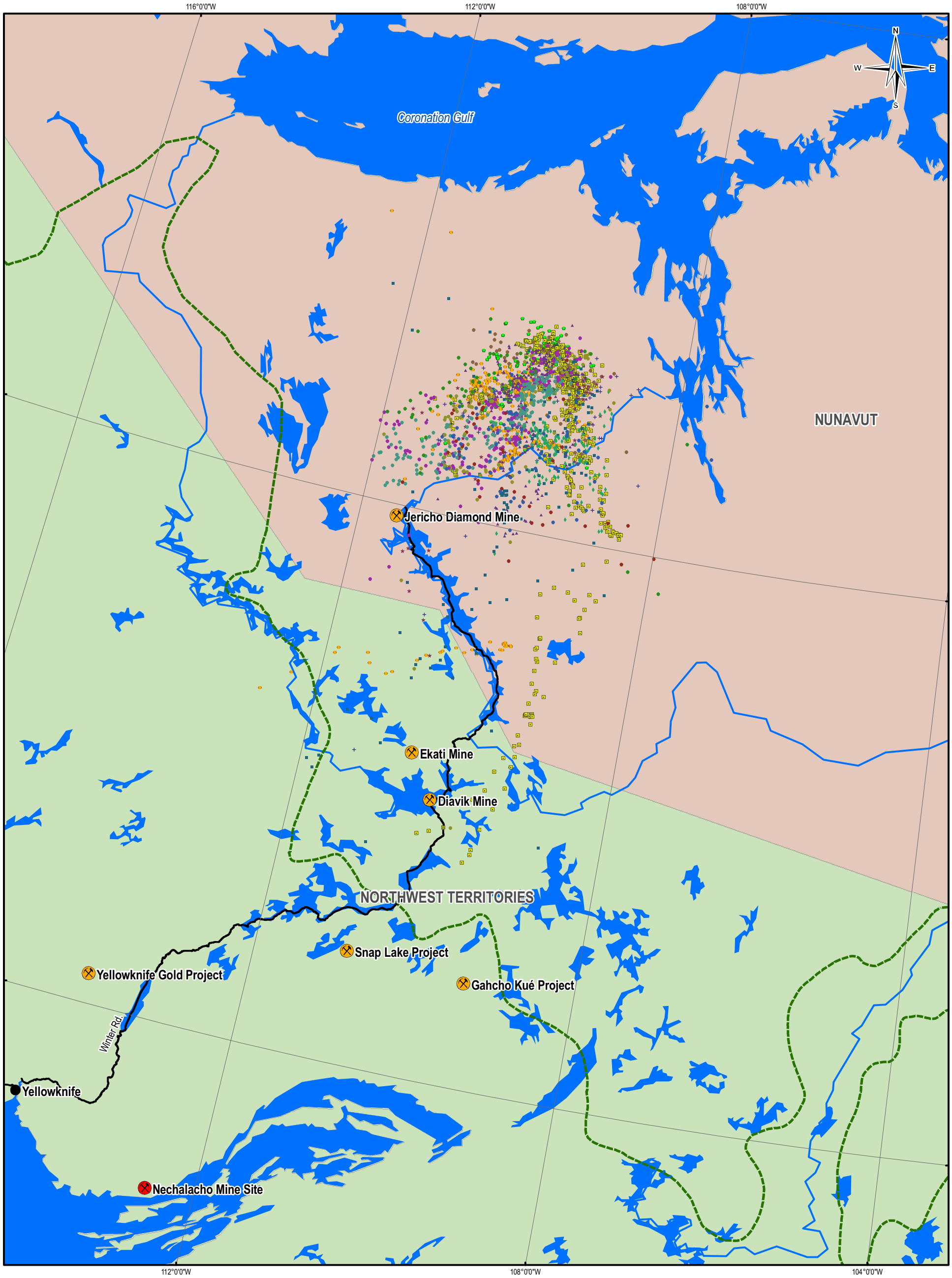
Q:\Vancouver\GIS\ENGINEERING\V151\V15101007_ThorLake\Maps\006_DAR\V15101007_DAR_Map009_CarCalving.mxd



LEGEND

- Yellowknife
- Existing Mine/Project
- Thor Lake Project
- Road
- Treeline
- Watercourse
- Waterbody

Bathurst Caribou Calving Period by Year

1996	2002	2008
1997	2003	2009
1998	2004	2010
1999	2005	
2000	2006	
2001	2007	

NOTES
1. Some locations seen on the map may represent Caribou from other herds.
2. Base data sources: GNWT ENR (February, 2011), ESRI.

ISSUED FOR USE

THOR LAKE PROJECT

Distribution of Satellite- and GPS-Collared Bathurst Caribou: Calving Period (June 1 to June 25)

PROJECTION	DATUM
Canada Albers	NAD83

Scale: 1:2,250,000
40 20 0 40
Kilometres

FILE NO.
V15101007_DAR_Map009_CarCalving.mxd

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

OFFICE	DATE
EBA-VANC	March 7, 2011

AVALON RARE METALS INC

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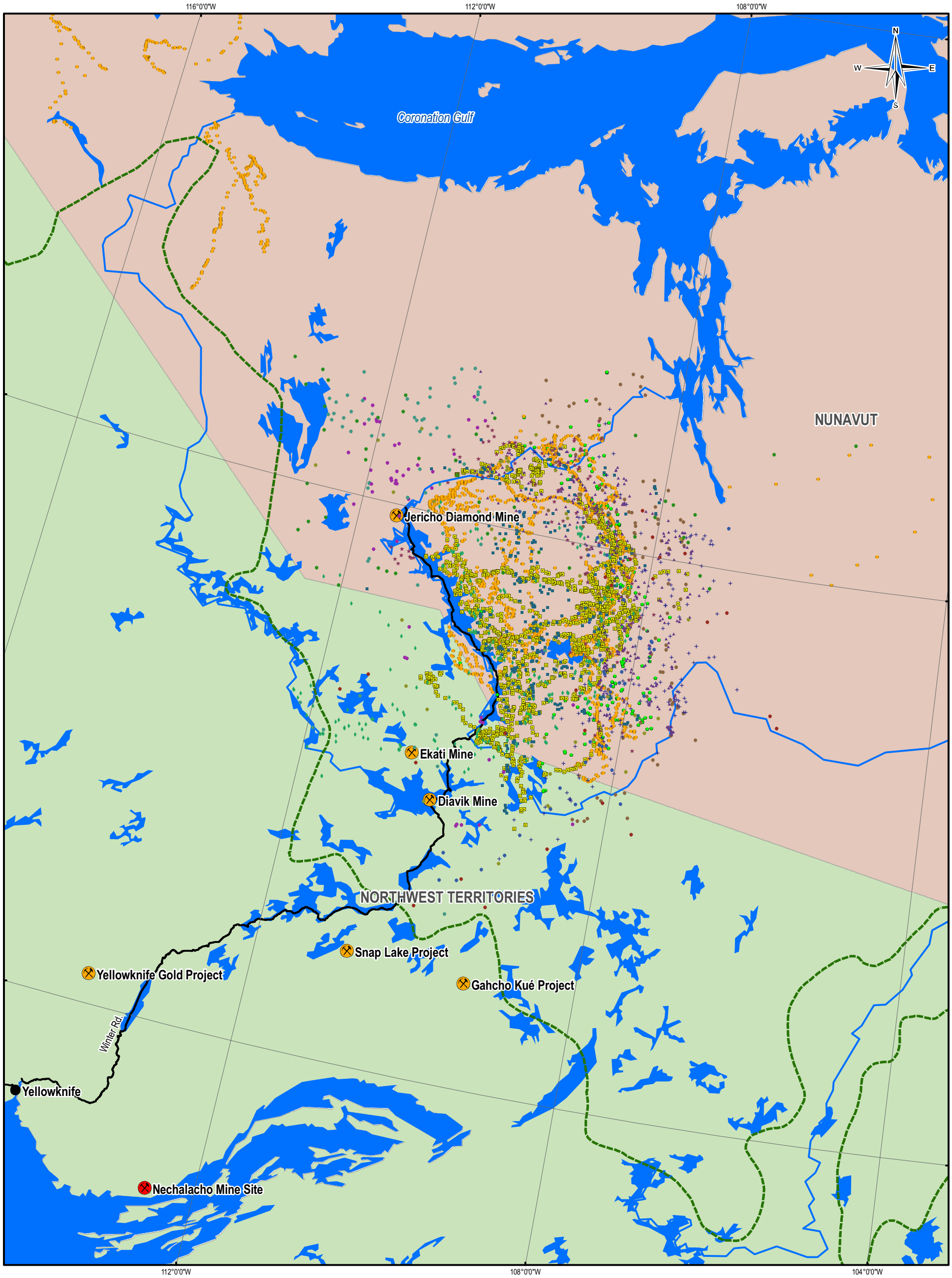
Figure 2.11-4

Q:\Vancouver\GIS\ENGINEERING\V151\V15101007_ThorLake\Maps\006_DAR\V15101007_DAR_Map010_CarPostCalving.mxd



LEGEND

- Yellowknife
- Existing Mine/Project
- Thor Lake Project
- Road
- Treeline
- Watercourse
- Waterbody

Bathurst Caribou Post Calving Movement by Year

1996	2002	2008
1997	2003	2009
1998	2004	2010
1999	2005	
2000	2006	
2001	2007	

NOTES

1. Some locations seen on the map may represent Caribou from other herds.
2. Base data sources: GNWT ENR (February, 2011), ESRI.

ISSUED FOR USE

THOR LAKE PROJECT

Distribution of Satellite- and GPS-Collared Bathurst Caribou: Post-Calving Movement (June 26 to July 15)

PROJECTION	DATUM
Canada Albers	NAD83

Scale: 1:2,250,000

40 20 0 40

Kilometres

FILE NO.
V15101007_DAR_Map010_CarPostCalving.mxd

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

OFFICE	DATE
EBA-VANC	March 7, 2011

AVALON RARE METALS INC

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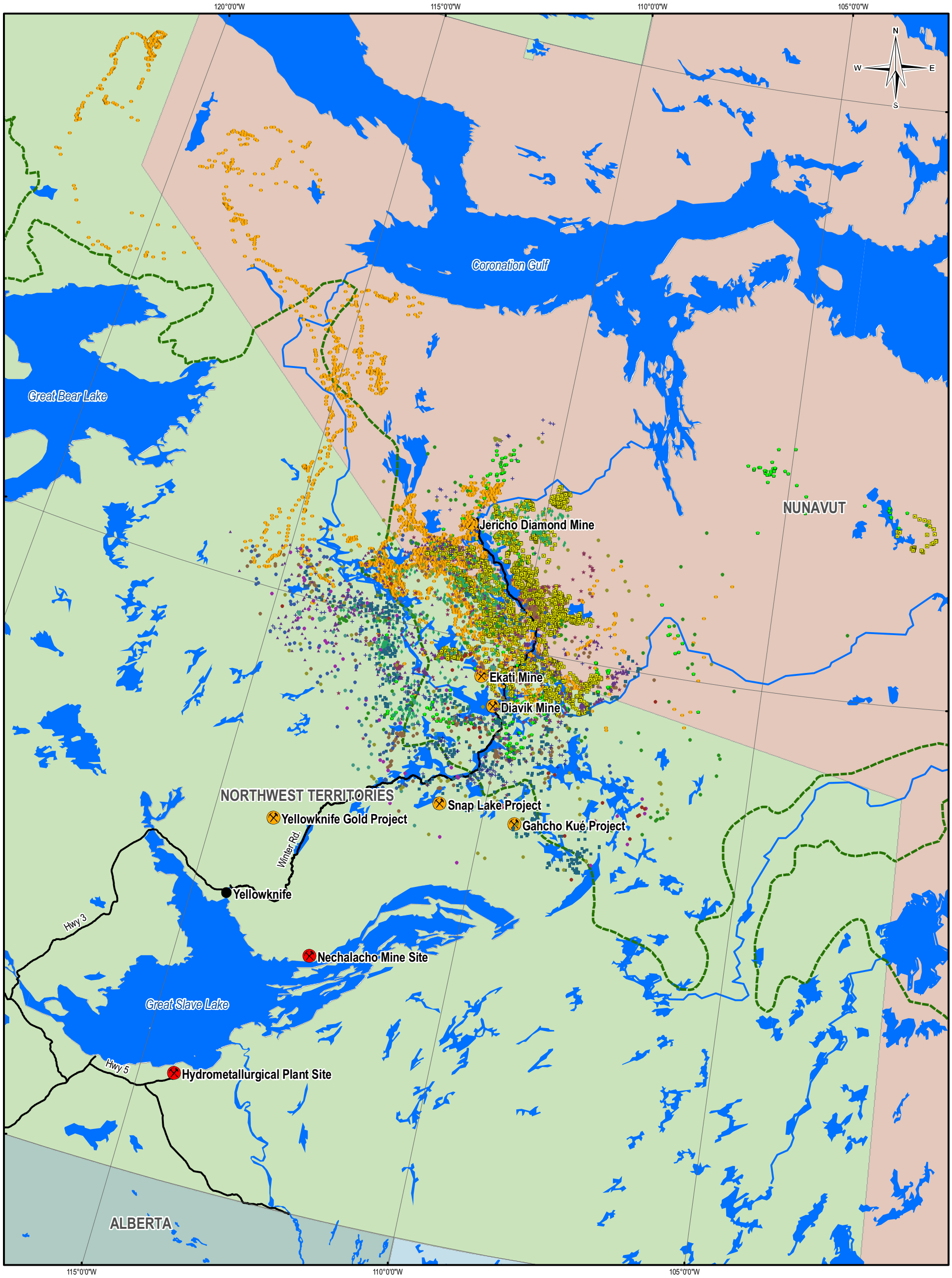
Figure 2.11-5

Q:\Vancouver\GIS\ENGINEERING\V151\V15101007_ThorLake\Maps\006_DAR\V15101007_DAR_Map011_CarSummer.mxd



LEGEND

- Yellowknife
- Existing Mine/Project
- Thor Lake Project
- Road
- Treeline
- Watercourse
- Waterbody

Bathurst Caribou Summer Range by Year

1996	2002	2008
1997	2003	2009
1998	2004	2010
1999	2005	
2000	2006	
2001	2007	

NOTES
1. Some locations seen on the map may represent Caribou from other herds.
2. Base data sources: GNWT ENR (February, 2011), ESRI.

ISSUED FOR USE

THOR LAKE PROJECT

Distribution of Satellite- and GPS-Collared Bathurst Caribou: Summer Range (July 16 to September 10)

PROJECTION	DATUM
Canada Albers	NAD83

Scale: 1:3,500,000
40 20 0 40 80
Kilometres

FILE NO.
V15101007_DAR_Map011_CarSummer.mxd

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

OFFICE	DATE
EBA-VANC	March 7, 2011

AVALON RARE METALS INC

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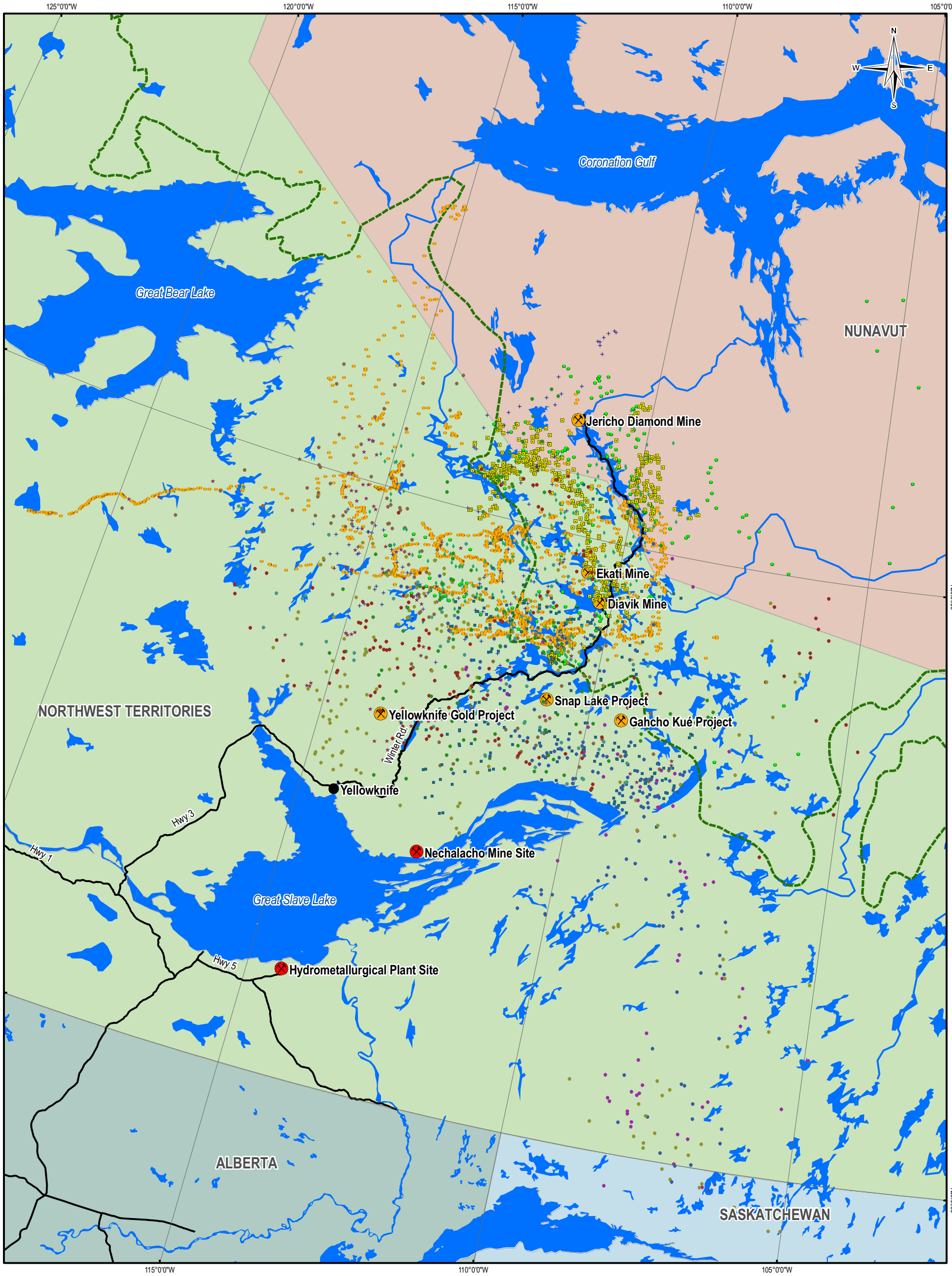
Figure 2.11-6

Q:\Vancouver\GIS\ENGINEERING\V151\V15101007_ThorLake\Maps\006_DAR\V15101007_DAR_Map012_CarFall.mxd



LEGEND

- Yellowknife
- Existing Mine/Project
- Thor Lake Project
- Road
- Treeline
- Watercourse
- Waterbody

Bathurst Caribou Fall Migration by Year

1996	2002	2008
1997	2003	2009
1998	2004	2010
1999	2005	
2000	2006	
2001	2007	

NOTES
1. Some locations seen on the map may represent Caribou from other herds.
2. Base data sources: GNWT ENR (February, 2011), ESRI.

ISSUED FOR USE

THOR LAKE PROJECT

Distribution of Satellite- and GPS-Collared Bathurst Caribou: Fall Migration (September 11 to November 20)

PROJECTION	DATUM
Canada Albers	NAD83

Scale: 1:3,500,000
40 20 0 40 80
Kilometres

FILE NO.
V15101007_DAR_Map012_CarFall.mxd

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

OFFICE	DATE
EBA-VANC	March 7, 2011

AVALON RARE METALS INC

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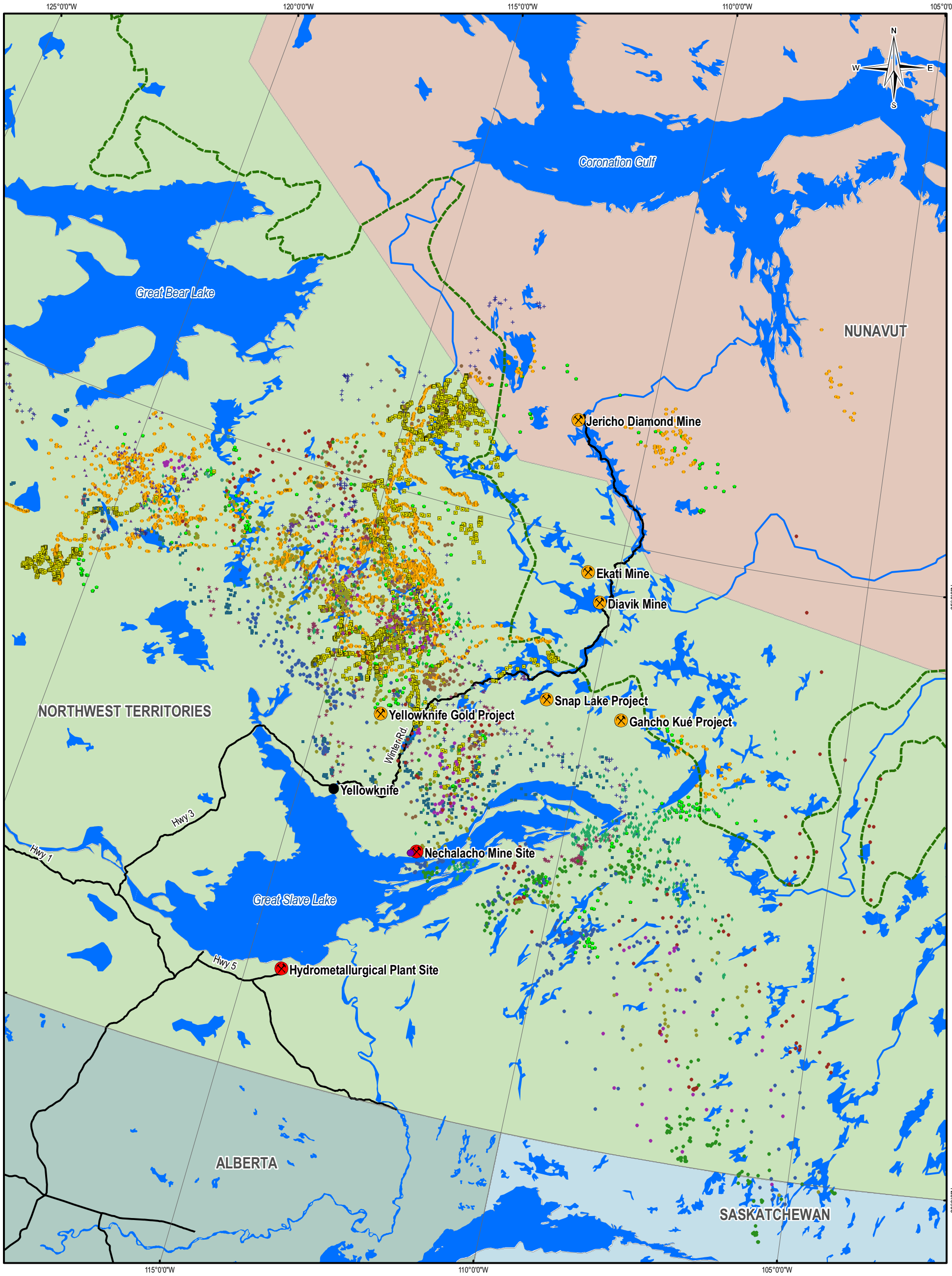
Figure 2.11-7

Q:\Vancouver\GIS\ENGINEERING\V151\V15101007_ThorLake\Maps\006_DAR\V15101007_DAR_Map013_CarWinter.mxd



LEGEND

- Bathurst Caribou Observation[3]
- Yellowknife
- Existing Mine/Project
- Thor Lake Project
- Road
- Treeline
- Watercourse
- Waterbody

Bathurst Caribou Winter Range by Year

1996	2002	2008
1997	2003	2009
1998	2004	2010
1999	2005	
2000	2006	
2001	2007	

NOTES
1. Some locations seen on the map may represent Caribou from other herds.
2. Base data sources: GNWT ENR (February, 2011), ESRI.
3. Observation data from EBA (2010) and Golder (1998).

ISSUED FOR USE

THOR LAKE PROJECT

Distribution of Satellite- and GPS-Collared Bathurst Caribou: Winter Range (November 21 to April 15)

PROJECTION	DATUM
Canada Albers	NAD83

Scale: 1:3,500,000
40 20 0 40 80
Kilometres

FILE NO.
V15101007_DAR_Map013_CarWinter.mxd

PROJECT NO.	DWN	CKD	REV
V15101007.006	SL	GC/KL	0

OFFICE	DATE
EBA-VANC	March 7, 2011

AVALON RARE METALS INC

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Figure 2.11-8

2.11.5.2 Moose

Moose occur throughout the Great Slave Lake area (Figure 2.11-9). The population of moose in the NWT is estimated to range from 20,000 to 40,000 (GNWT ENR 2010a). Densities of moose are relatively low in the NWT, ranging from 3 to 17 moose per 100 km² when compared to other areas in North America and Europe (GNWT ENR 2010a). A low moose density in the region is corroborated by local Traditional Knowledge (EBA 2011a). Moose densities specifically within the Nechalacho Mine and the Hydrometallurgical Plant study areas are unknown.

A survey in the Gordon Lake area (over 50 km east of Yellowknife) in 1989 reported an average density of two moose per 100 km² (Case and Graf 1992). Stratified grid moose surveys were conducted more recently across much of the Taiga Shield ecoregion in 2004 and 2007 (Cluff 2005; Cluff 2008). In 2004, moose densities in the Taiga Shield ecoregion were estimated at 2.75 moose per 100 km² (Cluff 2005).

The ratio of calves to cows was 62 calves per 100 cows, and the ratio of bulls to cows was 56 bulls per 100 cows (Cluff 2005). However, the ratio of bulls to cows is conservative since the aerial survey was conducted in March when bull moose have dropped their antlers and classification errors by observers are likely (Cluff 2008). Estimated moose densities increased during the 2007 survey to 5.4 moose per 100 km² (Cluff 2008). In addition, the ratio of calves to cows increased in 2007 to 77.3 calves per 100 cows, and the number of bulls to cows increased to 77.1 bulls to 100 cows (Cluff 2008).

In 1995, an aerial moose survey in the northern Slave River lowland region (approximately 35 km east of the Hydrometallurgical Plant site area) was conducted. At this time, moose densities were estimated at 0.15 moose/km^2 (or 15 moose/100 km^2) (Bradley et al. 1996).

In the fall of 2009, GNWT ENR completed systematic aerial moose population surveys 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 site area). This data is unpublished; however, preliminary results estimate a moose density of 5 moose/100 km^2 (D. Cluff, personal communication, 2010).

Moose populations are affected by harvesting and predation. Harvests of moose near the Nechalacho Mine area are expected to be low and likely opportunistic. A reported 315 moose were harvested by residents in the North and South Slave regions, and 752 moose were harvested by residents of Yellowknife from 2000 to 2008 (GNWT ENR 2010c); however, these data do not specify the harvested area. An increase in moose harvest is predicted with the decline in the Bathurst caribou herd population (Cluff 2008). In addition, moose harvest within the Hydrometallurgical Plant study area is expected to be greater than at the Nechalacho Mine area due to its proximity to communities and existing public access. Wolves and black bears are the main predators of moose and moose calves. Predator densities specific to the Nechalacho Mine and the Hydrometallurgical Plant study areas are unknown.

LEGEND

- Moose Observations[1]
- Moose Range
- Site Location
- Approximate Barging Route
- Wood Buffalo National Park
- Road
- Winter Road
- Railroad
- Watercourse
- Waterbody

NOTES

1. Observation data from EBA (2005; 2010).

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THOR LAKE PROJECT

Moose Range

PROJECTION	DATUM
NWT Lambert	NAD83

Scale: 1:2,000,000

40 20 0 40

Kilometres

FILE NO.
V15101007_DAR_Map033_Moose.mxd

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

OFFICE	DATE
EBA-VANC	March 7, 2011

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EBA Engineering Consultants Ltd.

Figure 2.11-9

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The most favourable areas for moose are characterized by semi-open forest cover, an abundance of willow and aspen stands, and are located close to lakes, river valleys, stream banks or sand bars. They prefer deciduous shrubs for fall and winter food and thick conifers for winter cover. In the summer they can be found close to river valleys and lakes where they feed on aquatic vegetation. Moose tend to favour areas 15-30 years after a forest fire because natural regeneration provides appropriate food resources.

The moose present in the area use a variety of habitats including lakeshores, river valleys and semi-open forests on a year-round basis (Britton 1983). Moose prefer aquatic vegetation, willows and other deciduous shrubs and trees for food, and conifer forests for winter cover (GNWT ENR 2010b). Areas with a high concentration of deciduous shrubs and trees, such as habitats in early successional stages support good moose foraging habitat. In particular, moose favour older (e.g., 15-30 years) burnt areas that are regenerating as shrub-dominated communities (GNWT ENR 2010b).

Based on the wildlife habitat assessment, broad habitat types present in the Nechalacho Mine site area that have moderate to high values for moose include: Broadleaf Upland, Shrub Fen, Sedge Fen, and Open Water (EBA 2010a). Based on the local and regional (15 km radius of the Nechalacho Mine site) ecosystem mapping, suitable moose habitat occurs throughout the local and regional study areas (Stantec 2010f). Within the Hydrometallurgical Plant site area, the Shrub Fen broad habitat type, the existing road right-of-way and its regenerating ditches, 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 (EBA 2010b). In late May or early June, calves are born in secluded areas in densely vegetated habitats including shorelines and islands.

During aerial waterbird surveys conducted by Stantec in 2009 in the Nechalacho Mine area, five incidental moose observations were made, and all observations were associated with recently-thawed wetlands. Based on an analysis of Moose pellet group density in the Nechalacho Mine Area, densities were highest in the Bedrock-Lichen, and then in the Mixed Upland and Shrub Wet broad habitat types (Golder 1998a). Overall browse rates, however, were generally low, with fewer than 10% of all shrubs in each broad habitat types being browsed by Moose and Caribou combined (Golder 1998a,b).

South of Great Slave Lake, EBA recorded 22 moose observations (including sign) during 2005 wildlife surveys (EBA 2005b) in Spruce Upland, Mixed Upland, Spruce Wet, Treed Fen, Shrub Fen, and disturbed broad habitat types (EBA 2005b). 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 and moose sign are also regularly observed during winter Bison Control Area surveillance surveys between the community of Hay River and Buffalo River (Hartop et al. 2009; Bidwell et al. 2009).

In 2010, EBA observed 90 moose pellet groups, tracks, and browse in eight broad habitat types present in the Nechalacho Mine area (EBA 2010a). Of these eight broad habitat types, moose sign was most commonly observed in the Bedrock-Lichen, Mixed Upland,

Spruce Upland, Shrub Wet, and Treed Fen broad habitat types. In the Pine Point area, eight observations of moose tracks, trails, and browse were recorded along the existing road and early successional habitat found in the ditch from Great Slave Lake to the Hydrometallurgical Plant site in 2010 (EBA 2010b).

2.11.5.3 Woodland Caribou

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, but they do not occur in the Nechalacho Mine area (Figure 2.11-10). Boreal woodland caribou are ranked by GNWT ENR as "Sensitive" under the general status program (GNWT ENR 2010a) and listed by SARA as "Threatened". Nationally, this is a species likely to become endangered if limiting factors are not reversed. However, in the NWT, they are not at risk of extinction, but require special attention or protection to prevent them from becoming At Risk.

In the South Slave and Southeast Dehcho region (which includes the former Pine Point Mine and Highway 5/6 areas), the boreal woodland caribou population is estimated at approximately 600 individuals, and is likely in decline based on recruitment and cow survival rates (Environment Canada 2008a). At present, the amount of human disturbances in this caribou range is considered low (16% disturbance); however, fire has disturbed approximately 35% of their range (Environment Canada 2008a). Environment Canada (2008a) suggests the current range of this local population is not self-sustaining due to the amount of current natural and human disturbances (non-overlapping disturbances totaling 47% of range). The number of boreal woodland caribou occupying the Hydrometallurgical Plant site area at any one time is unknown, but is expected to be low.

LEGEND

- Woodland Caribou Observations[1]
- Woodland Caribou Boreal Population Range [2]
- Site Location
- Approximate Barging Route
- Wood Buffalo National Park
- Road
- Winter Road
- Railroad
- Watercourse
- Waterbody

NOTES

1. Observation data from EBA.
2. Wildlife Range data provided by GNWT Geomatics (2010).

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THOR LAKE PROJECT

Woodland Caribou Range

PROJECTION	DATUM
NWT Lambert	NAD83

Scale: 1:2,000,000

40 20 0 40

Kilometres

FILE NO.
V15101007_DAR_Map024_WCaribou.mxd

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

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EBA-VANC	March 7, 2011

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Figure 2.11-10

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Boreal woodland caribou do not migrate and may occur year round in the Hydrometallurgical Plant study area. 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. In the Lower Mackenzie Valley, the typical woodland caribou group size ranged from 8.8 to 9.6 caribou in the fall (September to early November), 11.3 to 11.9 caribou in a group during late winter months (March and April), 3.6 caribou during calving (May), and 1.5 to 2.2 caribou in a group in the summer (June to August) (Nagy et al. 2004). In March, the mean group size in the South Slave region was estimated at 8.2 (Nagy et al. 2004).

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).

Boreal woodland caribou may occur in all forested habitats within the study area; however, they prefer lichen-rich mature or old growth coniferous forests (greater than 100 years old) associated with treed wetlands (bogs and fens), lakes, and rivers (GNWT ENR 2010b). Within the Hydrometallurgical Plant site area, Highway 5/6, and the rail line from Hay River to the Alberta border, boreal woodland caribou can be expected to mainly utilize Treed Fen, Sedge Fen, and the Spruce Wet broad habitat types. Typically, treed fen and bog habitats receive the highest caribou use, and caribou consistently select these peatland habitats over other habitat types available in their home range (Anderson 1999). In contrast, woodland caribou typically use upland habitats the least (Anderson 1999). In winter, woodland caribou tend to favour black spruce and lichen dominated uplands and lowlands (e.g., Treed Fen and Shrub Fen broad habitat types) (Gunn et al. 2004). Their winter diet consists of up to 80% ground and tree lichens. In summer, they prefer areas such as forest edges, marshes and meadows, riparian, and open coniferous forests that provide the fresh green growth of flowering plants, grasses, and lichens (e.g., Treed Fen, Shrub Wet, Shrub Fen, and Sedge Fen broad habitat types).

Woodland caribou commonly move to isolated calving sites, where calves are born by early June. During calving season, cows favour treed islands surrounded by open water in peatlands, lakes, and ponds to minimize predation risks, even if these islands provide sub-optimal forage resources (Environment Canada 2008a). Woodland caribou have been documented to calve on islands off the northwest shore of Great Slave Lake (GNWT ENR 2010b) and in small prairies within the Mackenzie Bison Sanctuary (Gray and Panegyuk 1989). Similar habitats within the Hydrometallurgical Plant site area and along Highway 5/6 may be used for calving.

In an area west of the Hydrometallurgical Plant site area, woodland caribou sign (hair, tracks/trails, and pellets) was observed on four separate occasions during a survey conducted in September 2005 (EBA 2005b). During this time, caribou observations were recorded within poor treed fens and mixed woods habitats. During a June 2006 breeding bird survey (EBA 2006b), fresh woodland caribou tracks were recorded incidentally at a location approximately 40 km west of the Hydrometallurgical Plant site area. Woodland caribou sign was not observed within the Hydrometallurgical Plant site area at the time of the August 2010 field event. Woodland caribou and their sign are also reported during the

winter Bison Control Area surveillance surveys along Highway 5/6 (Hartop et al. 2009; Bidwell et al. 2009).

Threats to woodland caribou populations and the NWT woodland caribou Action and Implementation plans are discussed in Section 2.11.8.1.

2.11.5.4 Wood Bison

Wood bison are ranked by GNWT ENR as "At Risk" under the general status program (GNWT ENR 2010a) and listed by SARA as "Threatened", Schedule 1 (Environment Canada 2010d).

Wood bison herds in the Wood Buffalo National Park and Slave River Lowlands contain diseased individuals, while the other two herds in the NWT (Nahanni and Mackenzie Bison) are believed to be disease free (GNWT ENR 2010b).

The Hydrometallurgical Plant site area lies outside known Wood Bison herds' range; however, bison from the neighbouring Slave River Lowlands (Hook Lake and Little Buffalo River herds) 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 area, wherever appropriate habitat exists. The Hydrometallurgical Plant site area lies outside a Bison Control Area (BCA) (approximately 35 km west of the BCA boundary); however, the majority of the proposed Highway 5/6 transport route lies inside the BCA (Figure 2.11-11), where all bison are removed to ensure diseased animals from Wood Buffalo National Park and the Slave River Lowlands do not migrate and infect other disease-free herds, such as at the Mackenzie Bison Sanctuary. Wood bison do not occur in the Nechalacho Mine site area.

The population trend for wood bison in the NWT is increasing as they are slowly recovering from near extinction. The population of Wood Bison estimated in the Slave River Lowlands (includes two herds) is approximately 1,000 animals; whereas, approximately 5,641 animals occur in Wood Buffalo National Park (containing four herds) (GNWT ENR 2010a; 2010-2020). The populations of both herds are increasing.

Surveys of the Bison Control Area are carried out on a regular basis during the winter months because of the increased visibility of bison at this time. Aerial surveys are conducted from December through to April, and any person seeing bison in the BCA 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. To date, 14 bison have been removed from the entire BCA since its establishment (GNWT ENR 2010-2020).

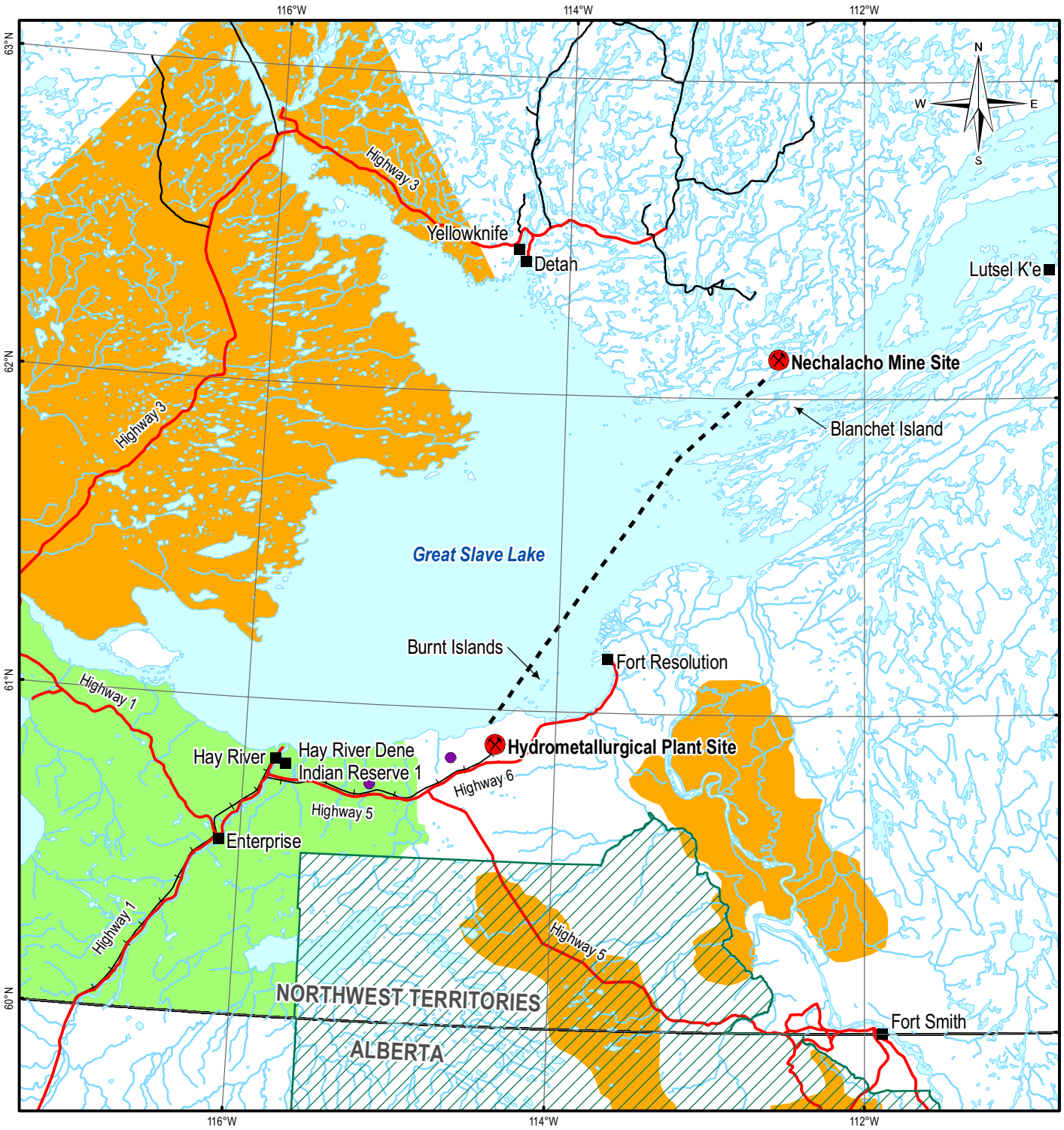
Wood bison use different habitats depending on the season. Wood bison are grazers, and rely heavily on grasses and sedges that grow in meadow openings, wetlands, and along lakes and rivers, particularly in the winter. In summer, bison can be found in small willow pastures and uplands where they feed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

Calf productivity is poor in diseased herds such as the Slave River Lowlands and Wood Buffalo National Park (GNWT ENR 2010b). Wood bison calve from April to July, with peak calving occurring in May (GNWT ENR 2010b). Calves less than a year old often fall as prey to wolves, their main predator.

Wood bison scat, tracks, and feeding areas were recorded along Twin Creek at the edge of a fen (approximately 48 km west of the Hydrometallurgical Plant study area), and along a dirt road near a waste rock pile (approximately 16 km west of the Hydrometallurgical Plant study area). During the 2010 field reconnaissance survey, no evidence of wood bison within the Hydrometallurgical Plant study area was observed. As noted, this species does not occur in the Nechalacho Mine area.

Threats to wood bison populations and the NWT Wood Bison Management Strategy are discussed in Section 2.11.8.1.



LEGEND

- Wood Bison Observations[1]
- Wood Bison Range[2]
- Bison Control Area[2]
- Site Location
- Approximate Barging Route
- Wood Buffalo National Park
- Road
- Winter Road
- Railroad
- Watercourse
- Waterbody

NOTES

1. Observation data from EBA.
2. Wildlife Range data provided by GNWT Geomatics (2010).

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THOR LAKE PROJECT

Wood Bison Range

PROJECTION	DATUM
NWT Lambert	NAD83

Scale: 1:2,000,000

40 20 0 40

Kilometres

FILE NO.
V15101007_DAR_Map023_WBison.mxd

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

OFFICE	DATE
EBA-VANC	March 7, 2011

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Figure 2.11-11

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2.11.5.5 Black Bear

Black Bears are common throughout the boreal forests of the NWT, and are relatively common in the area of the Nechalacho Mine site, Hydrometallurgical Plant site, and Highway 5/6 to Hay River. However, the Yellowknives Dene First Nation Traditional Knowledge Study reported fewer black bears in the geographic North Slave region now than in the historical past (EBA 2011b).

The Black Bear population in the NWT is stable and conservatively estimated at 10,000 (GNWT ENR 2010a). Black Bears are found at low densities in the northern part of their range, which includes the Nechalacho Mine and Pine Point study areas (FSC et al. 1999). In the NWT, Black Bear densities are estimated at 10 bears/100 km^2 (GNWT ENR 2010a).

Black bear populations in the NWT are monitored using harvest statistics as an indicator of population health (INAC 2007a). The NWT Resident Hunter Harvest data from the South and North Slave regions (except Yellowknife) indicate approximately 12 black bears were harvested by residents from 2000 to 2008 (GNWT ENR 2010c). During this same time, Yellowknife residents harvested approximately 78 black bears (GNWT ENR 2010c). This data may not include defence or property damage kills.

Black bear habitat quality is based primarily on the abundance of seasonally important food items. Black bears occupy a variety of habitat types in search of food. 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.

Disturbed habitats, including fire influenced habitats are known to provide good black bear habitat. Black bears benefit most from sites that have been burned at least 20 years prior (Laviviere 2001). These regenerating sites commonly provide summer and fall forage resources such as berries and ants in downed and burned trees. In addition, black bears benefit from higher moose densities and increased moose calf productivity from these regenerating sites (Nelson et al. 2008). Black bears are omnivores. In most areas, their diet is dominated by vegetation. However, meat, especially winter-killed ungulates during spring, moose and woodland caribou calves, insects during summer, and possibly fish, can be locally important.

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 both the Nechalacho Mine and Hydrometallurgical Plant study areas. In the NWT, bears begin seeking out dens in September and enter the den to hibernate by October (GNWT ENR 2010b). Bears emerge from their dens in April. Bears are most sensitive to disturbance during hibernation.

They have been observed in the Nechalacho Mine and Hydrometallurgical Plant study areas during previous surveys (Golder 1998a,b; EBA 2005b), and again in 2010. In 2010, black bear sign (total of 49 recorded observations) was observed in many of the available habitat types, including along mine roads and trails. In the Nechalacho Mine study area, black bear sign was most commonly observed in Bedrock-Lichen broad habitat types, closely followed by Spruce Upland, roads/trails, and Mixed Upland. Few black bear observations were also recorded in Treed Fen and Shrub Wet broad habitat types during the 2010 surveys.

During the 2010 reconnaissance survey at the Hydrometallurgical Plant study area, black bear sign, including scat, feeding sign and claw marks was most commonly observed on or immediately adjacent to the proposed haul road from Great Slave Lake to the Hydrometallurgical Plant site.

2.11.5.6 Grizzly Bear

Known grizzly bear range is located outside the Thor Lake Project study areas; however, grizzly bears may rarely occur in the Nechalacho Mine site area. There have been no formal attempts to estimate grizzly bear densities in either of the study areas.

The grizzly bear has been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010) as "Special Concern" because of its low resiliency to human-caused effects, but has no status under SARA. This is largely a function of low population densities, low reproductive capacity and sensitivity to human activity. Grizzly bears are also ranked by GNWT ENR as "Sensitive" under the general status program. Grizzlies use a wide variety of habitats and show seasonal habitat preferences related to food availability and thermal shelter (Gau 1998; McLoughlin 2000).

Grizzly bears typically enter their dens in late October or early November and emerge in late April or early May (McLoughlin et al.1997). In a WKSS study of radio-collared barren ground grizzlies, five of the 56 known dens (approximately 9%), were located in spruce forest found in the transition zone between the boreal forest and tundra (McLoughlin 2000).

2.11.5.7 Grey Wolf

Grey wolf populations in the NWT are considered generally stable (GNWT ENR 2010a). Wolves play a pivotal role in all levels of the food chain in subarctic ecosystems, and are the predominant predators of caribou and moose (Williams 1990). Traditional Knowledge suggests there are more wolves now than in the historical past (EBA 2011a). Wolves are hunted and trapped and are important to the local and regional economies in the north.

In the Nechalacho Mine area, two different groups of grey wolves can be expected to occupy the area, migratory and resident. Migratory wolves (also known as tundra wolves) follow the barren-ground caribou herds and could be in the Nechalacho Mine area in the winter if caribou were present. The boreal resident wolves (also known as timber wolves) remain below the tree line year-round and depend on non-migratory prey such as moose and wood bison. Timber wolves maintain regular territories, which vary in size depending on prey densities. Tundra wolves do not maintain regular territories and travel extensively

while following the caribou herds. Timber wolves also occur in the Hydrometallurgical Plant study area and along Highway 5/6.

An estimated 1,400 to 3,000 wolves are present within the annual range of the Bathurst caribou herd (Bromley and Buckland 1995). In 2006, the wolf population within the winter range of the Bathurst herd was estimated at 211 ± 66 (Mattson et al. 2009). Recent evidence suggests the number and productivity of wolves occupying the Bathurst caribou range has decreased in concert with the Bathurst caribou herd population decline (Adamczewski et al. 2009, Cluff 2006/2007). However, timber wolf numbers and productivity respond positively to an increase in moose and woodland caribou populations. As moose populations increase in burned areas, wolf numbers will likely increase in response.

The size of timber wolf's annual range is negatively correlated with prey density. In areas with low prey densities, timber wolf ranges are large. Annual ranges for radio-collared tundra wolf males in the Slave Geological Province are large, reported to average over 63,000 km² (Walton 2000). Like most carnivores, wolves can be sensitive to disturbance, especially during their reproductive period (Chapman 1977). Nevertheless, their high productivity and dispersal capabilities ensure resiliency to sustained levels of moderate human disturbance (Weaver et al. 1996).

Tundra wolves are tied to specific areas only during the denning period, whereas, timber wolves maintain territories year-round. Wolf dens are traditional and may be used over many years (BHP 1995, 2000). Of 63 wolf dens found in the Bathurst caribou range, 26 were on the tundra, 28 in the tree line transition area and nine in the boreal forest (Heard and Williams 1992). The denning period for wolves typically begins in early May. Timber wolf dens are constructed in esker material, within a rock crevice, or an overturned stump, particularly near water or heights of land.

Timber wolf habitat, including denning habitat, exists throughout the Nechalacho Mine and former Pine Point Mine, and Highway 5/6 study areas. This is supported by Traditional knowledge from the regions (EBA 2011a,b,c). During the 2010 field survey at the former Pine Point Mine, wolf sign was observed at three locations along the existing haul road between Great Slave Lake and the proposed Hydrometallurgical Plant. In addition, eight observations of wolf sign was reported in upland spruce forests and cutlines/trails at the Nechalacho Mine study area during the 2010 field surveys. In addition, wolf scat was documented by EBA (2005b) in the area of the former Pine Point Mine and along Highway 5/6. No dens were documented during the 2010 or past field programs.

2.11.5.8 Wolverine

The wolverine has been assessed by COSEWIC (2010) as "Special Concern" and ranked by GNWT ENR as "Sensitive" under the general status program (GNWT ENR 2010a) due to their low resiliency to human-caused effects, decreasing prey populations (e.g., caribou), and their innate low reproductive rates and delayed sexual maturity. However, wolverines are not protected under SARA.

Wolverines are solitary omnivores that range over large areas throughout most of northern and western Canada. Wolverine population densities are low but stable in the NWT. Populations are sensitive to disturbances because they only breed every two years, have small litters and kits can have high mortality rates (GNWT ENR 2010b). Wolverines live at low densities even under optimal conditions (Banci 1994). An estimated 2,100 to 4,000 wolverines exist in the NWT; however the population estimate specific to the boreal zone is unknown (GNWT ENR 2010a).

Wolverines are scavengers and predators of birds and small and large mammals, and also forage on plant materials and carrion; relying on a diversity of foods to offset the uncertainty of availability in the harsh northern environment. The presence of large prey, such as ungulates, at least at some time during the year, appears to be important for the persistence of wolverine populations (Banci 1994).

Although wolverines occupy a variety of habitats within the boreal forest year-round, little is known about their abundance. Studies have proved to be difficult and logistically expensive, more so than where access is readily available. Home ranges of wolverines vary between sexes and can range up to several hundred square kilometres. The longest recorded straight-line movement involved two wolverines travelling from Daring Lake to the Lutsel K'e area, a distance of more than 300 km (Mulders 1999). In 1998, movements of some individuals corresponded with the general distribution of Bathurst caribou during winter (R. Mulders, personal communication, 1999).

Although active year round, wolverines will construct snow dens to escape predators, cache food, and raise their young. Kits (young) are born in February or March in a shallow pit dug in the ground within a constructed snow den (Banci 1994). In addition, natal dens have been documented in abandoned beaver lodges and bear dens, in upturned roots and fallen logs, or rocks crevices (Banci 1994).

Wolverines are important furbearers for local communities throughout the NWT. The majority of wolverines in the territories, approximately 70%, are hunted from snowmobiles during winter (Mulders 1999). Harvests are typically centred around the communities and where road access is available. Residents from the North and South Slave regions (except Yellowknife) reported harvesting seven wolverines from 2000 to 2008; whereas, Yellowknife residents reported harvesting 30 wolverines during this same time period (GNWT ENR 2010c). Hunting and trapping, followed by predation and starvation, are the major cause of mortality of radio-collared wolverines across western North America, including the NWT (SENES Consultants Ltd. 2008).

Based on 2005 and 2006 results from wolverine DNA mark-recapture programs on the tundra, Boulanger and Mulders (ND) suggest male wolverine populations are in decline possibly due to of higher harvest rates. Results suggest male wolverines display greater rates of movement and immigration than compared to females, and therefore are at a greater risk of harvest (Boulanger and Mulders ND). A similar declining trend in male wolverines may also occur within the study areas.

Wolverine habitat is present throughout the Nechalacho Mine site, Hydrometallurgical Plant site, and Highway 5/6 study areas wherever abundant food resources exist; however, no wolverines have been recorded during any of the past baseline surveys.

2.11.5.9 American Marten

Marten are managed as an important furbearer and make-up approximately half the fur trade value of NWT harvesters (GNWT 2009c). COSEWIC has not assessed the American marten, but GNWT ENR ranks them as "Secure" under the general status program (GNWT ENR 2010a).

Although population densities are unknown across the NWT, martens occur at approximately 0.5 animals /km^2 in the southern NWT with smaller densities further north (GNWT ENR 2010a). During Traditional Knowledge Studies, participants from the Deninu Ku'e First Nation and the Fort Resolution Metis Council reported marten trapping is cyclical, and martens that once occupied the Pine Point region have "moved north" (EBA 2011a).

Marten home range sizes vary depending on available food resources. Average marten home range size in the Mackenzie Valley and Yukon is 5.8 km^2 for males, and 3.9 to 4.8 km^2 for females (Latour et al. 1992, Archibald and Jessup 1984). Similar home range sizes are expected within the Project study areas. Salmo Consulting Inc et al. (2004) indicate martens occupy at least 2 km^2 of available habitat on a daily basis.

Marten prefer mature spruce forests, particularly those with a complex understory structure and 30 – 50% crown closure (Clark et al. 1987), but will also use other forest types including sparse open forests, riparian areas, and forest edges if sufficient prey and cover exist (Clark et al. 1987; GNWT ENR 2010b). Large burned areas typically provide little habitat for martens for approximately 15 years, unless a complex of unburned patches and significant deadfall remain as cover (Clark et al. 1987; GNWT ENR 2010b). Up to 30% of habitat selection by marten at the landscape level may include forest cover openings (Chapin et al. 1998, Hargis et al. 1999, Potvin et al. 2000).

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. Much of their preferred prey populations are cyclic; mice and voles on a 3 to 5 year cycle, and snowshoe hare on an 8 to 10 year cycle. Studies have confirmed that the rate of marten population growth is positively correlated with population densities of their main prey species as well as other environmental factors (GNWT ENR 2010b; Fryxell et al. 1999). Based on small mammal trapping studies conducted across the NWT, including Yellowknife and Fort Resolution (the two closest locations to the study areas), mice and vole populations were low in 2008 and have since been recovering (GNWT ENR 2010d). It can be assumed that marten populations may show a similar trend within the study areas.

In March or April, litters are born in dens located in rock piles, tree roots, deadfall, peat banks, usually in mature forests (GNWT ENR 2010b). These dens, as well as red squirrel middens may also be used in the winter during inclement weather (Clark et al. 1987). In the winter, martens rest primarily in downed logs stumps under the snow, whereas in the

summer, marten tend to rest in the crown of coniferous trees (Salmo Consulting Inc. et al. 2004).

Marten are expected to occur throughout the forested areas of the study areas (including the Nechalacho Mine site, Hydrometallurgical Plant site, and Highway 5/6 study areas), particularly in Spruce Upland, Mixed Upland, and Spruce Wet broad habitat types; however, all habitats may be occupied if abundant prey and cover exist. A single marten scat was observed during the 2010 field studies in a Wet Spruce broad habitat type. The large disturbance areas at the Hydrometallurgical Plant site would not be used by marten at any time of the year.

Marten are known to be harvested along traplines along the lower Buffalo River and Twin Creeks (Green Consulting 2008), and may also be harvested throughout the Project areas.

2.11.5.10 Beaver

Beaver were traditionally harvested for their pelt, hide and meat (Green Consulting 2008). Beavers are common throughout the region and have been recorded in both the Nechalacho Mine site and Hydrometallurgical Plant site study areas. Traditional Knowledge Studies indicated beaver dams are relatively common throughout the Nechalacho Mine site and Hydrometallurgical Plant site areas, and there are more beavers than in the historical past (EBA 2011a). In particular, pit lakes that remain from the former Pine Point Mine, roadside ditches, and along the access road within the Hydrometallurgical Plant site area were identified as having beaver dams (EBA 2011a,b,c).

A Beaver lodge survey in 2009, combined with historical information, was used to identify the spatial distribution of beaver activity in relation to the Nechalacho Mine site area. In 2009, beaver lodge density for the Nechalacho Mine site area was 0.23 lodges/km^2 (Stantec 2010f), and was within the range of values observed elsewhere for northern boreal regions (e.g., 0.17 lodges/km^2 [Dennington and Johnson 1974], 0.10–0.38 lodges/ km^2 [Fuller and Keith 1980], 0.26 lodges/ km^2 [Poole and Croft 1990]). In 1989, the density estimate for both active and inactive lodges combined in the vicinityof the Nechalacho Mine site area was 0.14 lodges/ km^2 (Melville et al. 1989). Additionally, beaver lodge density in 1989 was notably higher to the west of the Nechalacho Mine site, and was consistent with results from Stantec (2010f). 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 the 2010 field surveys, two beaver lodges were documented: one at an unnamed lake immediately north of Buck Lake, and another at an unnamed lake west of Thor Lake.

In the Hydrometallurgical Plant site area, beaver have also been recorded in wetlands, ponds and streams (EBA 2005b, 2011b, Green Consulting 2008). Although no formal beaver survey has been conducted in this area, Traditional Knowledge indicates the area north of Mellor Rapids (along the lower Buffalo River, approximately 30 km west of the Hydrometallurgical Plant site area and 7 km from Highway 5/6) is a critical area for beaver (Green Consulting 2008). Beaver are also harvested along Birch Creek, near Highway 5/6

(Green Consulting 2008). No other known beaver harvest sites near the study areas are known.

Within the Hydrometallurgical Plant site area, an active beaver lodge was observed in a single pond near the former Pine Point mine pit T-37N, and two beaver lodges were observed inside the former T-37N pit. Any open water surrounded by appropriate forest habitat within the Hydrometallurgical Plant site area has the potential to support beaver, although suitable beaver habitat also exists along Highway 5/6.

2.11.6 Birds

Numerous bird species occupy a variety of habitat types across the study areas year round. The study areas lie within or immediately adjacent to traditional flyways for subarctic and Arctic birds during spring and fall migrations (Lincoln et al 1998), and migrants can be expected to occur in the study areas regularly on a seasonal basis. Upon reaching their traditional breeding grounds, birds disband to appropriate breeding habitat. These resident birds are regularly present in the study areas during the late spring, summer, and early fall to raise their young. In the winter, some resident bird species remain and some species move south from their Arctic breeding grounds to overwinter within the study areas, provided appropriate food resources exist. Individual transient birds (including non-breeders or juveniles) may also occur irregularly within the study areas throughout the year.

Within the study areas, the phenology of bird arrival and departure is influenced by weather and food availability. Birds advance northward as the weather warms and food becomes available and return south when the weather cools and food resources become unavailable. In general, raptors are the earliest to arrive in the spring, followed by waterfowl and waterbirds, then upland nesting birds such as warblers. In the study areas, spring migrants can be expected to arrive between mid-April to mid-June (Bromley and Trauger ND). In the fall, migrant birds generally depart the study areas from early August to October.

During the Deninu Ku'e First Nation and the Fort Resolution Métis Council Traditional Knowledge Studies (EBA 2011a), one participant indicated the 2010 bird migration was smaller than usual.

A number of upland game birds and waterfowl are currently or have historically been harvested from the Nechalacho Mine and Pine Point areas (EBA 2011a,b,c). Upland game birds (e.g., ptarmigan and grouse) are harvested year-round, whereas, waterfowl are harvested from spring until late fall.

2.11.6.1 Upland Nesting Birds

Upland nesting birds includes, passerines (or songbirds, a specific group of birds belonging to the largest avian Order Passeriformes), grouse/ptarmigan, woodpeckers, kingfishers, and nighthawks. Upland nesting birds are widely distributed throughout the boreal forest, and occupy all terrestrial habitat types within the study areas. A total of 62 upland nesting bird species potentially reside in the Nechalacho Mine site area, whereas 85 upland nesting bird species potentially reside in the Pine Point area (including the Hydrometallurgical Plant site and Highway 5/6 study areas) (Table 2.11-4).

Few upland nesting birds are year-round residents, while the majority are migratory and are present only during their reproductive phase. Most species in this group have relatively small home ranges or territories, and are generally good indicators of local and regional habitat change (i.e., conversion or fragmentation). All of the species listed in Table 2.11-4 reside within the study areas during the summer breeding and/or overwintering seasons. Eighteen species may be present during the winter at the Nechalacho Mine site and/or the Hydrometallurgical Plant site areas (noted in Table 2.11-4).

TABLE 2.11-4: UPLAND NESTING BIRD SPECIES OCCURRING OR POTENTIALLY OCCURRING IN THE PROJECT AREAS1

Common Name	Scientific Name	Nechalacho Mine Site	Hydrometallurgical Plant Site
Ruffed Grouse[W•]	*Bonasa umbellus*	X	X
Spruce Grouse[W*•]	*Falcipennis canadensis*	X	X
Willow Ptarmigan[W]	*Lagopus lagopus*	X	X
Rock Ptarmigan[W]	*Lagopus muta*	X	X
Sharp-tailed Grouse[W]	*Tympanuchus phasianellus*	X	X
Common Nighthawk*•	*Chordeiles minor*	X	X
Belted Kingfisher	*Ceryle alcyon*	X	X•
Yellow-bellied Sapsucker*•	*Sphyrapicus varius*	X	X
Downy Woodpecker[W]	*Picoides pubescens*	X	X
Hairy Woodpecker[W*]	*Picoides villosus*	X	X
American Three-toed Woodpecker[W*]	*Picoides dorsalis*	X	X
Black-backed Woodpecker[W•]	*Picoides arcticus*	X	X
Northern Flicker*•	*Colaptes auratus*	X	X
Pileated Woodpecker•	*Dryocopus pileatus*		X
Olive-sided Flycatcher*•	*Contopus cooperi*	X	X
Western Wood-Pewee•	*Contopus sordidulus*		X
Yellow-bellied Flycatcher	*Empidonax flaviventris*		X
Alder Flycatcher*•	*Empidonax alnorum*	X	X
Least Flycatcher*•	*Empidonax minimus*	X	X
Eastern Phoebe*	*Sayornis phoebe*	X	X
Eastern Kingbird	*Tyrannus tyrannus*	X	X
Northern Shrike	*Lanius excubitor*	X	X
Blue-headed Vireo•	*Vireo solitarius*		X
Warbling Vireo	*Vireo gilvus*	X	X
Red-eyed Vireo•	*Vireo olivaceus*	X	X
Gray Jay[W*•]	*Perisoreus canadensis*	X	X
Black-billed Magpie[W]	*Pica hudsonia*		X
American Crow	Corvus brachyrhynchos		X
Common Raven[W*•]	*Corvus corax*	X	X

TABLE 2.11-4: UPLAND NESTING BIRD SPECIES OCCURRING OR POTENTIALLY OCCURRING IN THE PROJECT AREAS1

Common Name	Scientific Name	Nechalacho Mine Site	Hydrometallurgical Plant Site
Horned Lark•	*Eremophila alpestris*	X	X
Tree Swallow*	*Tachycineta bicolor*	X	X
Bank Swallow•	*Riparia riparia*	X	X
Cliff Swallow	*Petrochelidon (Hirundo) phyrrhonota*	X	X
Barn Swallow	*Hirundo rustica*		X
Black-capped Chickadee[W]	*Poecile atripapilla*		X
Boreal Chickadee[W]*•	*Poecile hudsonica*	X	X
Red-breasted Nuthatch	*Sitta canadensis*		X
Marsh Wren*	*Cistothorus palustris*		X
Ruby-crowned Kinglet*•	*Regulus calendula*	X	X
Gray-cheeked Thrush	*Catharus minimus*	X	X
Swainson's Thrush*•	*Catharus ustulatus*	X	X
Hermit Thrush•	*Catharus guttatus*	X	X
American Robin*•	*Turdus migratorius*	X	X
Bohemian Waxwing*•	*Bombycilla garrulus*	X	X
Tennessee Warbler•	*Vermivora peregrina*	X	X
Orange-crowned Warbler*•	*Vermivora celata*	X	X
Yellow Warbler*•	*Dendroica petechia*	X	X
Magnolia Warbler•	*Dendroica magnolia*		X
Cape May Warbler*	*Dendroica tigrina*	X	X
Yellow-rumped Warbler*•	*Dendroica coronata*	X	X
Palm Warbler*•	*Dendroica palmarum*	X	X
Bay-breasted Warbler	*Dendroica castanea*		X
Blackpoll Warbler*•	*Dendroica striata*	X	X
Black-and-white Warbler	*Mniotilta varia*	X	X
American Redstart	*Setophaga ruticilla*		X
Ovenbird	*Seiurus aurocapillus*		X
Northern Waterthrush*•	*Seiurus noveboracensis*	X	X
Common Yellowthroat*•	*Geothlypis trichas*	X	X
Wilson's Warbler	*Wilsonia pusilla*	X	X
Western Tanager	*Piranga ludoviciana*		X
American Tree Sparrow	*Spizella arborea*	X	X
Chipping Sparrow*•	*Spizella passerina*	X	X
Clay-colored Sparrow•	*Spizella pallida*	X	X
Savannah Sparrow	*Passerculus sandwichensis*	X	X
Le Conte's Sparrow•	*Ammodramus leconteii*		X
Nelson's Sharp-tailed Sparrow•	*Ammodramus nelsoni*		X
Fox Sparrow	*Passerella ilia*	X	X
Song Sparrow	*Melospiza melodia*		X

TABLE 2.11-4: UPLAND NESTING BIRD SPECIES OCCURRING OR POTENTIALLY OCCURRING IN THE PROJECT AREAS1			
Common Name	**Scientific Name**	**Nechalacho Mine Site**	**Hydrometallurgical Plant Site**
Lincoln's Sparrow*•	*Melospiza lincolnii*	X	X
Swamp Sparrow*•	*Melospiza georgiana*	X	X
White-throated Sparrow*•	*Zonotrichia albicollis*	X	X
White-crowned Sparrow*	*Zonotrichia leucophrys*	X	X
Dark-eyed Junco*•	*Junco hyemalis*	X	X
Rose-breasted Grosbeak•	*Pheucticus ludovicianus*		X
Red-winged Blackbird	*Agelaius phoeniceus*	X	X
Rusty Blackbird*•	*Euphagus carolinus*	X	X
Common Grackle•	*Quiscalus quiscula*		X
Brown-headed Cowbird	*Molothrus ater*		X
Pine Grosbeak*	*Pinicola enucleator*	X	X
Purple Finch	*Carpodacus purpureus*		X
Red Crossbill[W]	*Loxia curvirostra*		X
White-winged Crossbill[W]•	*Loxia leucoptera*	X	X
Common Redpoll[W]*	*Carduelis flammea*	X	X
Hoary Redpoll[W]	*Carduelis hornemanni*	X	X
Pine Siskin*•	*Carduelis pinus*	X	X

Cornell Lab of Ornithology and the American Ornithologists' Union 2010; Sibley 2003
Species organized based on phylogenetic order of family groups.
1. Bird species list does not include those that may flyover or briefly stop within the study area during spring and fall migrations.
[w] Winter residents in the region (Bromley and Trauger ND)
* indicates species documented within the Nechalacho Mine site study area during the 2010 field events (June 8-13 and July 19-23, 2010).
•indicates species documented within the Hydrometallugical Plant site area including along Highway 5/6 during the 2005 -2007 and 2010 field events (EBA 2005b, 2006b, 2010b).

Among the migratory species, most occur in the Project areas from May through September. For species of conservation concern, including the Common Nighthawk, Olives-sided Flycatcher and Rusty Blackbird, baseline conditions are provided separately (refer to Section 2.11.6).

EBA conducted breeding bird surveys from June 8 – 13, 2010 in the Nechalacho Mine site area. During this time, 39 breeding bird stations were surveyed in eight different habitat types. A total of 199 breeding birds, including 23 bird species were recorded during the breeding bird surveys. Of the species recorded during the breeding bird survey, the Yellow-rumped Warbler was by far the most common breeding bird detected, followed by Swainson's Thrush, Chipping Sparrow, and American Robin. Of particular interest, eight Olive-sided Flycatchers were recorded during the breeding bird surveys, and seven were recorded as incidentals.

An additional 262 breeding birds were documented as incidentals (either outside the breeding bird survey station, outside the breeding bird survey time, and/or during other wildlife surveys). An additional seven species (plus unknown grouse species, ptarmigan species, and woodpecker species) were detected as incidentals including Eastern Phoebe, Rusty Blackbird, American Three-toed Woodpecker, Boreal Chickadee, Common Nighthawk, Least Flycatcher, and Pine Siskin.

Of the available habitats surveyed during the breeding bird survey, excluding habitats with only a single survey station (e.g., Water Sedge-Buckbean-Arrow Grass-Fen [WB]), the Black Spruce-Feathermoss-Crowberry Upland Forest (BF) and White Spruce-Green Alder-Prickly Rose Forest (WA) habitats had the highest average number of birds detected per station. While the Lichen-Bearberry Woodland (LW) and Bedrock-Lichen-Juniper-Saxifrage (RL) habitats had the lowest average number of breeding bird detections. Using the Shannon-Wiener Index, habitat types with the highest breeding bird species diversity included the Black Spruce-Tamarack-Water Sedge Fen (BT) and the Black Spruce-Cloudberry-Sphagnum Moss Bog Forest (BG). Bedrock-Lichen-Juniper-Saxifrage (RL) and Lichen-Bearberry Woodland (LW) habitats exhibited the lowest species diversity.

In 2006, nineteen breeding bird stations were surveyed in six different habitat types from June 3– 5 in a 16,551 ha area west of the Hydrometallurgical Plant site area, including along Highway 5/6. A total of 186 breeding birds were recorded at the point count stations, including 34 different species. During this time, White-winged Crossbill, Ruby-crowned Kinglet, Hermit Thrush, White-throated Sparrow, Yellow-rumped Warbler, Palm Warbler, and Chipping Sparrow were the most common species recorded. Bearberry – Jack pine habitat had the highest average number of birds, followed by shrubby fens, upland/lowland complex, and graminoid fen. The Labrador-tea – subhygric habitat had the lowest average number of bird observations.

Using the Shannon-Wiener Index, habitat types with the highest breeding bird species diversity included the Labrador-tea – mesic ecosystem type, followed by Shrubby Fen, Treed Fen, and Graminoid Fen. The Bearberry – Jack pine and Labrador-tea – subhygric ecosystem types exhibited the lowest species diversity.

2.11.6.2 Raptors

Raptors, also known as "Birds of Prey," make up a small but important group of birds frequenting the Nechalacho Mine site and Hydrometallurgical Plant site areas (including along Highway 5/6 and the islands of Great Slave Lake) (Table 2.11-5). Although this group covers a small number of species, it is diverse and includes hawks and osprey (*Accipitridae*), falcons (*Falconidae*) and owls (*Strigidae*).

Seventeen raptor species (Table 2.11-5) may potentially occur within the Nechalacho Mine site and Hydrometallurgical Plant site areas at some point in the year. Some raptors are breeding residents in the study areas, whereas, others may be present as a migrant (e.g., Rough-legged Hawk), winter resident (e.g., Goshawk), or non-breeding transient. Raptors can be expected to breed within the study areas wherever their habitat requirements are met. Suitable nest sites and food resources are the main factors naturally limit breeding