Plate 3.1-7. Typical Dwarf Shrub-Heath (SH) ecosystem unit.

Plate 3.1-8. Frost boils in the Dwarf Shrub-Heath (SH) ecosystem unit.

3.1.3 Lowland Ecosystems

3.1.3.1 Betula-Moss (BM)

The Betula-Moss (BM) ecosystem unit occurs on level to slightly sloped (0-5%) sandy or silty clay, lacustrine and fluvial sediments, and occasionally on fine tills. BM comprises just under 4% (2,017 ha) of the LSA, generally in valley bottom positions adjacent to flowing or standing water. Relative soil moisture regime is mesic (4) to hygric (6), and rarely submesic (3) or subhydric (7). Soil moisture is variable based on specific soil pit locations as BM is often complexed with wet depressions containing EM or WM. Relative soil nutrient regime is generally medium (C), but occasional poor (B) or very poor (A). Coarse fragments are generally absent or less than 20%. Permafrost is common and typically occurs 25 to 60 cm from the surface.

Vegetation in the BM is relatively simplistic. It is dominated by a high cover of dwarf birch (*Betula nana*), and occasionally *Salix* species (particularly *S. pulchra* and *Vaccinium* species; Plate 3.1-9). Herbaceous and lichen cover is largely absent, while mosses (typically *Sphagnum, Aulacomnium* and *Dicranium* spp.) often form thick mats under the shrub layer.

Plate 3.1-9. Typical Betula-Moss (BM) ecosystem unit with wet depressions containing EM.

The BM has distinct boundaries to adjacent ecosystem units. It typically contains EM or WM in wet depressions between palsa mounds. Adjacent communities are varied, with TM, WM, and RW often occurring.

3.1.3.2 Dry Willow (DW)

The Dry Willow (DW) unit has been modified from the Rescan 1997 description. It was previously limited to fluvial and marine slopes on upper river banks and lakeshores. This description has been expanded to include willow dominated communities found on fine textured morainal and lacustrine slopes. DW is relatively common in the LSA, comprising 3.0% (1,690 ha) of the mapped area. It is generally found upslope of RW in typical conditions, and occasionally on the lower slopes of bedrock

outcrops with BL or TM below and SH above. Relative moisture is generally mesic (4) and occasionally submesic (3) at upper slope positions, and occasionally subhygric (5) at mid slope positions (Rescan 1997). Permafrost is common, particularly in the lower slope positions, occurring at 30 to 50 cm below the surface. Relative soil nutrients are generally medium (C), and occasionally poor (B) or rich (D).

Gray-leaved willow (*Salix glauca*) is the characteristic species of the DW (Plate 3.1-10). Dwarf birch (*Betula nana*) is also common and often extensive, but limited to surfaces of freeze-thaw mounds, along with occasional occurrences of crowberry (*Empetrum nigrum*) and *Vaccinium* species. Large-flowered wintergreen (*Pyrola grandiflora*), alpine arnica (*Arnica alpina* ssp. *angustifolia*), alpine milk-vetch (*Astragalus alpinus*), and Maydell's oxytrope are also common.

Plate 3.1-10. Typical Dry Willow (DW) ecosystem unit.

3.1.3.3 Emergent Marsh (EM)

The Emergent Marsh (EM) is the wettest ecosystem unit described in the LSA. It occurs on level organic plains along lakes, ponds and low-gradient streams (Plate 3.1-11 and 3.1-12). The EM is rarely wide-spread, often complexed with other ecosystem units, and not extensive enough to map. It comprises 2.4% (1, 344 ha) of the LSA, although this value is likely an underestimate of the true proportion. The EM occurs in areas where the water table is at the surface year-round, and surface and subsurface flows are continuous. Soil moisture is hydric (8) and soil nutrients are generally rich (D).

Water sedge (*Carex aquatalis*) is the characteristic species for the EM unit. Additional *Carex* species, along with marsh cinquefoil (*Potentilla palustris*), mare's tail (*Hippurus vulgaris*), marsh marigold (*Caltha palustris* var. *arctica*), Pallas's buttercup (*Ranunculus pallasii*), and giant water moss (*Calliergon giganticum*) are also common.

Plate 3.1-11. Typical Emergent Marsh (EM) ecosystem unit in southern portions of the LSA.

Plate 3.1-12. Typical Emergent Marsh (EM) ecosystem unit in northern portions of the LSA.

The EM unit typically forms narrow communities along lakes, ponds, and streams. It occurs in complexes with WM, PG and TM, and in narrow linear depressions with moving water in BM ecosystems. The EM is described in greater detail in the wetland field survey section of this report.

3.1.3.4 Low Bench Floodplain (FP)

The Low Bench Floodplain (FP) unit is an uncommon ecosystem type in the LSA (mapped in 0.2% - 128 ha – of the total area) that is restricted to narrow bands along active floodplains of rivers, streams and lakes (Plate 3.1-13). The FP unit was primarily field mapped in 2010 because the unit was less discernible on the satellite imagery used to complete local ecosystem mapping compared to the aerial photographs used for mapping in 1997. The FP occurs on saturated soils with relative moisture ranging from hygric (6) to hydric (8) with nutrients ranging from moderate (C) to rich (D). It typically occurs on active sandy fluvial plains and silty lacustrine slopes. The FP typically occurs in narrow strips between upslope RW communities and lakes, ponds or streams downslope.

Plate 3.1-13. Typical Low Bench Floodplain (FP) ecosystem unit (left) and RW (right).

Vegetation cover is typically moderate to high, but limited to species that are tolerant of seasonal inundation. Common species include *Equisetum* goose-grass (*Dupontia Fischeri* ssp. *psilosantha*), yellow water crowfoot (*Ranunculus gmelini*), marsh cinquefoil (*Potentilla palustris*), and mare's tail (*Hippurus vulgaris*). Moss cover is variable with no dominant species, although *Sphagnum* often occurs in thick blankets. In many areas, extensive scouring and/or sediment deposition have created disclimax communities.

3.1.3.5 Polygonal Ground (PG)

The Polygonal Ground (PG) ecosystem unit is defined by periglacial processes (i.e. freeze-thaw processes) rather than dominant vegetation or environmental conditions. It is characterized by disjunct communities due to abrupt microtopographical changes. Two types of PG occur in the LSA. High-centre polygons are described as a matrix of palsas surrounded by WM depressions (Plate 3.1-14). Low-centre types have a matrix of linear ridges underlain by ice-wedges (Plate 3.1-15). Palsa and ridge tops are

generally dry and support communities similar to BL or BM. Wet depressions are typically similar to the WM unit, although EM also frequently occurs. PG units are common in the LSA, accounting for 3.3% (1,870 ha) of the mapped area.

Plate 3.1-14. Aerial view of a typical Polygonal Ground (PG) ecosystem unit.

Plate 3.1-15. Polygonal Ground (PG) ecosystem unit showing low-centered ice-wedge ridges with the Wet Meadow (WM) ecosystem on either side.

3.1.3.6 Riparian Willow (RW)

The Riparian Willow (RW) unit occurs in areas that experience fluctuating water tables; predominantly active floodplains of streams and rivers, lake and pond edges, and occasionally upslope seepage sites (Plate 3.1-16 and 3.1-17). It occurs on fine fluvial sediments, and occasionally on lacustrine plains. RW was mapped on 3.7% (2,098 ha) of the LSA. Soils generally have a sandy or silty texture, although several plots occurred on fibric organic veneers. Relative soil moisture ranges from subhygric (5) to sub hydric (7). Relative soil nutrients are variable in response to organic inputs and range from poor (B) to rich (D).

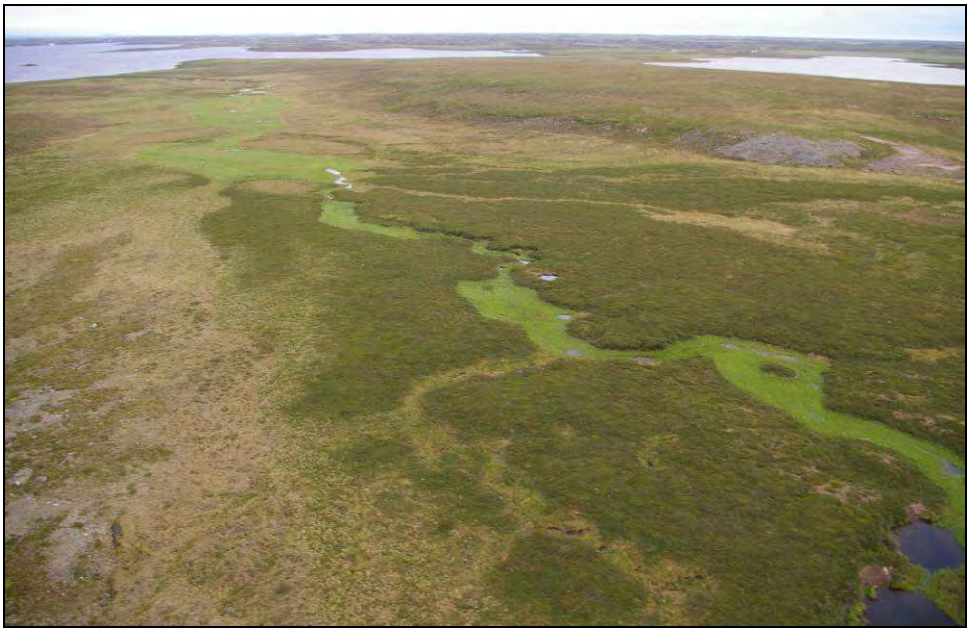

Plate 3.1-16. Aerial view of a typical Riparian Willow (RW) ecosystem unit (dark green) with the Emergent Marsh (EM) ecosystem unit along a stream (bright green).

Plate 3.1-17. Typical Riparian Willow (RW) ecosystem unit in autumn.

RW ecosystems are readily discernable from other shrub dominated units by the high willow cover and landscape position. Several species of willow are common (*Salix planifolia*, *S. lanata* and *S. pulchra*). The RW, especially in protected seepage sites, contain the tallest willows in the LSA, with thickets often exceeding one meter in height. Other common species include sedges (including *C. aquatilis), Eriophorum*, *Equisetium*, *Festuca* and *Calamagrostis* species, and coltsfoot (*Petasites frigidus*).

The RW unit rarely grades into other ecosystem units, but rather, boundaries are typically distinct, particularly downslope where it transitions to FP and EM. Ecosystem units upslope of RW are variable and include TM and WM in valley bottoms, and BL, DW, and SH along seepage site communities.

3.1.3.7 Eriophorum Tussock Meadow (TM)

The Eriphorum Tussock Meadow (TM) ecosystem unit is the most common and widespread unit in the LSA. It comprises 20.6% (11,628 ha) of the total mapped area. It occurs in a variety of lowland landscape positions on marine and lacustrine plains and gentle slopes (0 to 15%), and occasionally on fine textured fluvial and till. Significant surface seepages are typically present, but standing water is uncommon. Relative soil moisture is mesic (4) to subhydric (7) depending on landscape position. Relative soil nutrients are typically medium (C), but range from poor to medium (B-C) in drier locations dominated by dwarf birch, and occasionally medium to rich (C-D) in wet, willow dominated areas. Soil textures are typically organic veneers overlying silty loams and silty clays. Permafrost is ubiquitous at the organic/mineral soil transition, generally 30 to 65 cm from the surface, and frost boils occasionally occur.

The TM is characterized by the presence of distinct sheathed cotton-grass (*Eriophorum vaginatum*) tussocks (Plate 3.1-18). Other ecosystem units may have sporadic tussocks, but the TM is distinguished by a continuous occurrence of well formed, distinct tussocks (Plate 3.1-19). While *E. vaginatum* tussocks are known to vary in terms of topography, hydrology, soils, and pH, it is considered a common vegetation type across most of the Arctic (Walker et al. 1994). Mark et al. (1985) suggest that tussocks can be up to 187 years when mature. Within the TM, plant species favouring dry conditions, such as Arctic avens, alpine bilberry, Arctic heather and lichens, are found on the top and upper sides of the tussocks. Conditions are wetter in inter-tussock troughs, and these areas may be dominated by tall cotton-grass (*Eriophorum angustifolium*) and various species of *Carex* and mosses. Several species of willows (including *Salix lanata* ssp. *richardsonii* and *S. pulchra*) and to a lesser extent dwarf birch (*Betula nana*) occur sporadically or extensively on small to large mounds within the tussocks.

Transitions from TM to other ecosystem units are generally gradual and somewhat difficult to detect. The TM typically occurs in ecosystem polygons that also include, but not limited to, WM, BL, PG and EM.

3.1.3.8 Wet Meadow (WM)

The Wet Meadow (WM) ecosystem unit is a wet community that typically occurs on water-receiving lacustrine and marine lower slopes (0 to 5%) and plains (Plate 3.1-20). It is the third most common unit in the LSA, comprising 12.9% (7,275 ha) of the mapped area. WM is predominantly found on fibric and mesic organic veneers over fine textured (<20% coarse fragments) silty clays and silty loams, and occasionally coarser material. Permafrost generally occurs at the organic to mineral soil boundary at a depth of 20 to 50 cm. Relative moisture regime is generally hygric to subhydric (6-7). Relative soil nutrients range from medium (C) to rich (D) and occasionally poor (B). Ice wedges and low transverse wedges of organic or mineral soils are common.

Plate 3.1-18. Typical Eriophorum Tussock Meadow (TM) ecosystem unit.

Plate 3.1-19. Close-up of typical E. vaginatum tussocks.

One or more vegetation associations comprise the WM in any given area. These associations are specific plant communities that develop within a particular range of conditions (SMR, SNR, hydrodynamism, and pH) that define the WM. Two sedge associations, water sedge and tall cottongrass, were identified during field surveys by Rescan (1997) and one additional association, chordroot sedge, was identified in 2010. The ecosystem mapping does not distinguish among the vegetation associations within the WM because these fine-scale differences cannot be detected on the satellite imagery. The association types are described in greater detail in the wetland section of this report and in Rescan (1997).

Plate 3.1-20. Typical Wet Meadow (WM) ecosystem unit.

Water sedge (*Carex aquatilis)* and tall cottongrass (*Eriophorum angustifolium*) are the most characteristic species of the WM. Other frequently occurring species include *Carex membranacea, C. atrofusca*, *C. misandra*, *C. vaginata*, *C. capillaris*, and *C. rariflora*. Sudetan lousewort (*Pedicularis sudetica*), an indicator of saturated organic soils, is typically present, although in trace amounts.

The WM unit typically occurs in lower landscape positions in combination with TM, EM, BL and BM. Transition to other ecosystem units is generally rapid and marked by reduced *Carex* diversity, and increased shrub cover or tussocks. WM commonly forms small portions of large TM ecosystem polygons along seepage channels, and extensive pure communities in low positions. It is also typically complexed in PG units.

3.1.4 Local Ecosystems within a Regional Context

Direct comparisons between the occurrence of ecosystem units at the local and regional scales could not be made due to differences in classification methods. The regional WKSS ELC system is more generalised and results in multiple local ecosystem units correlating with one or more ELC units (Table 3.1-1). In addition, the ELC contains an unclassified ELC unit, while the LSA mapping contains multiple non-vegetated codes. Therefore, a generalised comparison was made by grouping the LSA and ELC results by landscape position (Table 3.1-1 and 3.1-2). This comparison indicates that upland ecosystems are more prevalent in the RSA (40.4% in RSA vs. 27.5% in the LSA) and lowland ecosystems are more common in the LSA (49.8% in the LSA vs. 39.8% in the RSA). The difference in the lowland comparison is actually larger as 19.6% of the RSA is classified as shallow water, which includes ponds, shallow open water, and ecosystems dominated by emergent vegetation.

Ponds are considered to be non-vegetated units in the LSA mapping, and grouped in the 'other' category (other includes non-vegetated units and the ELC unclassified unit, with the RSA containing 19.8% and the LSA containing 20.1%). The exact amount of ponds mapped in the RSA is not known, but it is reasonable to suggest that half or more of the 19.8% is ponds. Therefore, it is assumed that lowland ecosystems are roughly twice as common in the LSA compared to the RSA, and perhaps five times as common if the shallow water unit is removed entirely. In particular, Eriophorum Tussock Meadow (TM) occurs on 20.6% of the LSA, while the similar WKSS Tussock/Hummock ELC unit only

comprises 7.9% of the RSA. Marine ecosystems were not included in the WKSS ELC and have been excluded from this comparison.

Table 3.1-1. WKSS ELC Summary and Landscape Position

ELC Code	WKSS ELC Unit	Local Ecosystem Unit(s)	Landscape Position	Area (ha)	% of RSA
4	Wetland (Sedge Meadow)	Wet Meadow (WM), Polygonal Ground (PG) and Emergent Marsh (EM)	Lowland	37,192	4.8
6	Tussock/Hummock	Eriophorum Tussock Meadow (TM)	Lowland	60,898	7.9
11	Riparian Tall Shrub	Riparian Willow (RW)	Lowland	18,649	2.4
17	Low Shrub	Dry Willow (DW) and Betula-Moss (BM	Lowland	38,936	5.1
5	Shallow Water	Ponds (PD) and Shallow Open Water (OW)	Lowland	150,709	19.6
0	Unclassified	NA	Other	7,674	1.0
2	Deep Water	Lakes (LA) and Salt Water (SW)	Other	108,899	14.1
15	Boulder Association	Blockfield (BI)	Other	4,790	0.6
16	Bare Ground	Barren (BA) and Exposed Soil (ES)	Other	5,972	0.8
18	Gravel Deposit	Barren (BA) and Exposed Soil (ES)	Other	25,500	3.3
1	Lichen Veneer	Carex-Lichen (CL)	Upland	10,507	1.4
3	Esker Complex	Carex-Lichen (CL) and Dwarf Shrub-Heath (SH)	Upland	1,533	0.2
7	Heath Tundra	Dryas Herb Mat (DH) and Betula-Ledum-Lichen (BL)	Upland	127,670	16.6
10	Bedrock Association	Rock Outcrop (RO) and Carex-Lichen (CL)	Upland	31,086	4.0
13	Heath/Boulder	Carex-Lichen (CL) and Dwarf Shrub-Heath (SH)	Upland	11,943	1.6
14	Heath/Bedrock	Dryas Herb Mat (DH) and Carex-Lichen (CL)	Upland	128,042	16.6
TOTAL				**770,000**	**100.0**

Table 3.1-2. LSA Ecosystem Unit Summary and Landscape Position

Map Code	Description	Landscape Position	Total LSA (ha)	Percent of LSA
BM	Betula-Moss	Lowland	2,017	3.58
DW	Dry Willow	Lowland	1,690	3.00
EM	Emergent Marsh	Lowland	1,344	2.39
FP	Low Bench Floodplain	Lowland	128	0.23
OW	Shallow Open Water	Lowland	11	0.02
PG	Polygonal Ground	Lowland	1,870	3.32
RI	River	Lowland	779	1.38
RW	Riparian Willow	Lowland	2,098	3.73
TM	Eriophorum Tussock Meadow	Lowland	11,628	20.66
WM	Wet Meadow	Lowland	7,275	12.93
BE	Beach	Marine	87	0.15
MB	Marine Backshore	Marine	68	0.12
MI	Marine Intertidal	Marine	3	0.01
BA	Barren	Other	6	0.01
BI	Blockfield	Other	346	0.61

(continued)

Table 3.1-2. LSA Ecosystem Unit Summary and Landscape Position (completed)

Map Code	Description	Landscape Position	Total LSA (ha)	Percent of LSA
ES	Exposed Soil	Other	103	0.18
LA & PD	Lakes and Ponds	Other	5,859	8.01
MS	Mine Spoils	Other	16	0.03
SW	Salt Water	Other	451	0.80
BL	Betula-Ledum-Lichen	Upland	8,775	15.59
CL	Dry Carex-Lichen	Upland	667	1.19
DH	Dryas Herb Mat	Upland	4,892	8.69
RO	Rock Outcrop	Upland	5,032	8.94
RU	Rubble	Upland	20	0.03
SH	Dwarf Shrub-Heath	Upland	1,111	1.97
TOTAL			**56,277**	**100.00**

3.2 FIELD SURVEYS

The following sections describe the number and type of local ecosystem sample plots established during the 2010 field season. Terrestrial survey plots are described first and wetland survey plots are described separately as different methodologies were used for data collection. However, there is overlap between the wetter terrestrial ecosystem units and multiple wetland types as the ecosystem units are much more generalized (e.g., the emergent marsh ecosystem unit can be further classified into wetland form types such as lacustrine marsh, slope marsh, or basin marsh).

3.2.1 Terrestrial Field Surveys

A total of 166 sample plots and 166 visual plots were surveyed within the LSA in 2010 to characterize the local ecosystem units (Figures 3.2-1a-c). TM, BL and DH were the most commonly sampled ecosystem units, accounting for 28%, 20%, and 13% of sample plots respectively (Table 3.2-1). The field data is reported in Appendix 10. In addition to the 12 ecosystem units that were sampled, three plots were established in two non-vegetated units (block field and rock outcrops). Visual plots were quick assessments recorded while traversing between sample plots. In visual plots, limited data beyond the ecosystem unit were recorded, and they typically described multiple ecosystem units observed in the larger polygon for mapping purposes.

Data from the terrestrial field plots were used to modify some of the Rescan (1997) ecosystem unit descriptions. The data were also used to confirm ecosystem mapping classification and polygon boundaries.

3.2.2 Wetland Field Surveys

The water, soils, and vegetation information collected during the field surveys was used to classify the wetlands to federal class and form (B.G. Warner and C.D.A Rubec 1997). Four of the five classes (fen, bog, marsh, and open water) were identified during field surveys (Table 2.5-3). Within the wetland classes, nine types of wetland forms were differentiated based upon surface morphology, surface pattern, water type, and soil characteristics.

PROJECT # 1009-002-12 GIS # HB-20-007a March 01 2011

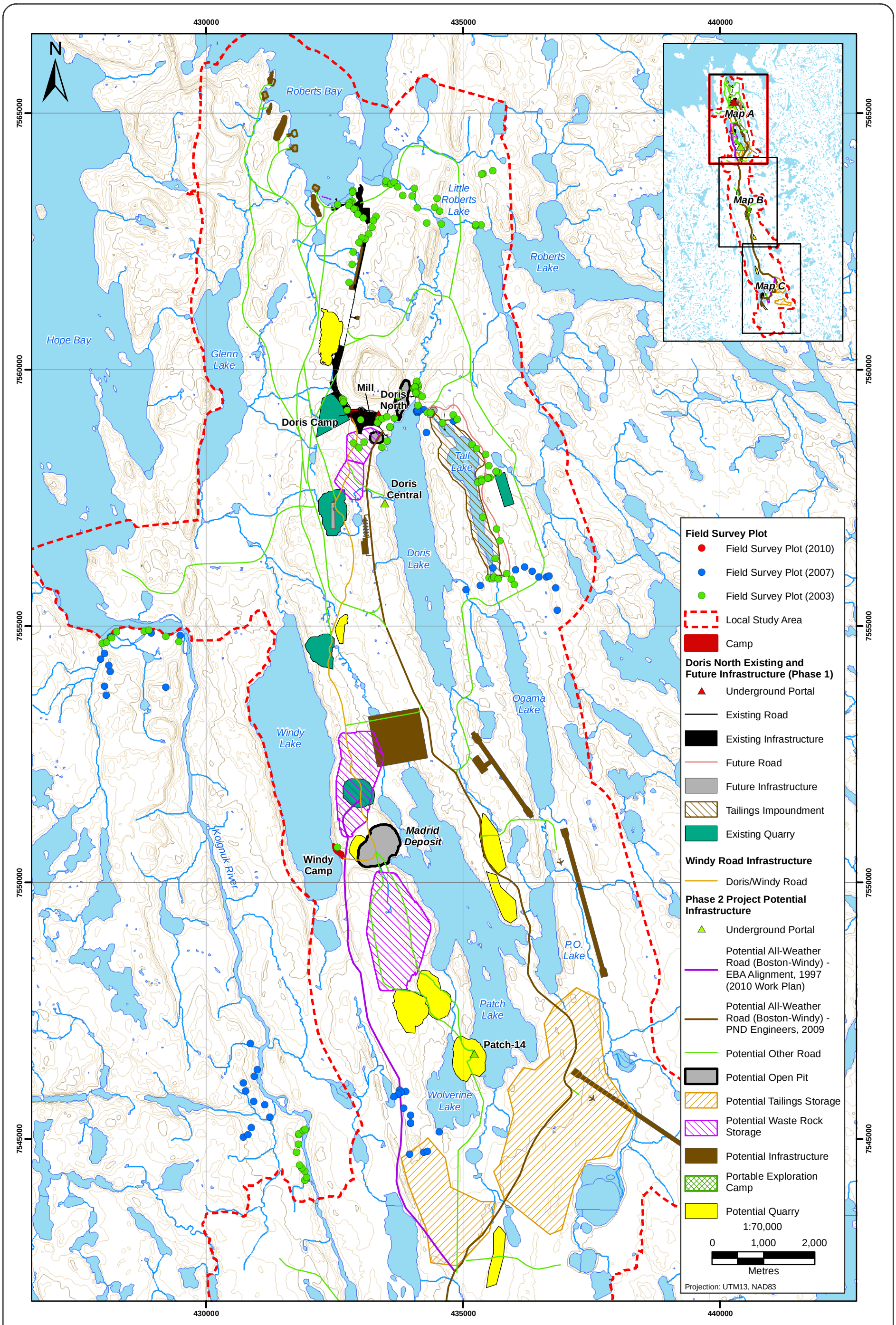

Figure 3.2-1a

NEWMONT NORTH AMERICA

Ecosystem Mapping Field Survey Locations - North End of Belt

Figure 3.2-1a

Rescan Engineers & Scientists

PROJECT # **1009-002-12** GIS # **HB-20-007b** *March 01 2011*

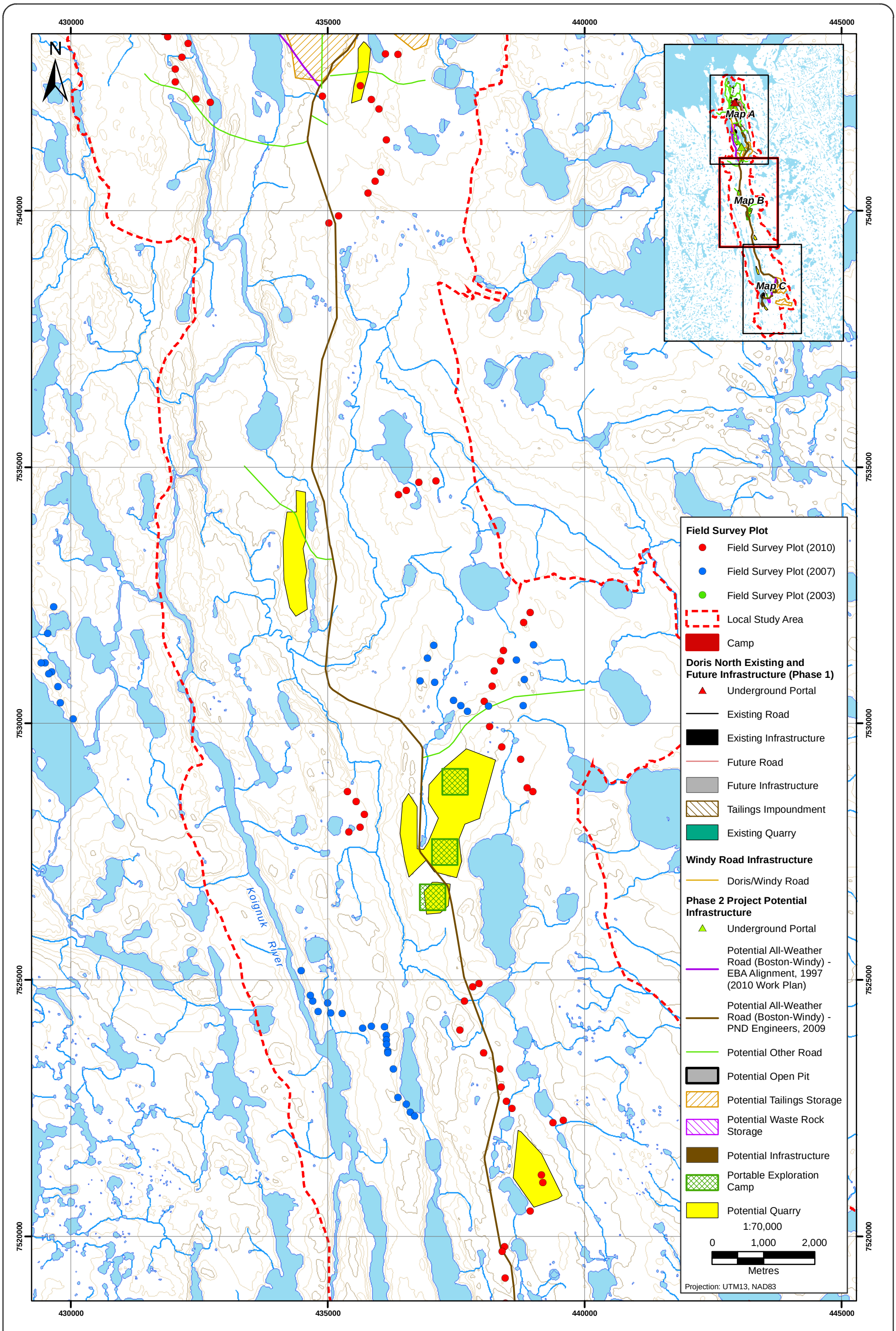

Figure 3.2-1b

NEWMONT NORTH AMERICA

Ecosystem Mapping Field Survey Locations - Mid Belt

Figure 3.2-1b

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PROJECT # **1009-002-12** GIS # **HB-20-007c** *March 01 2011*

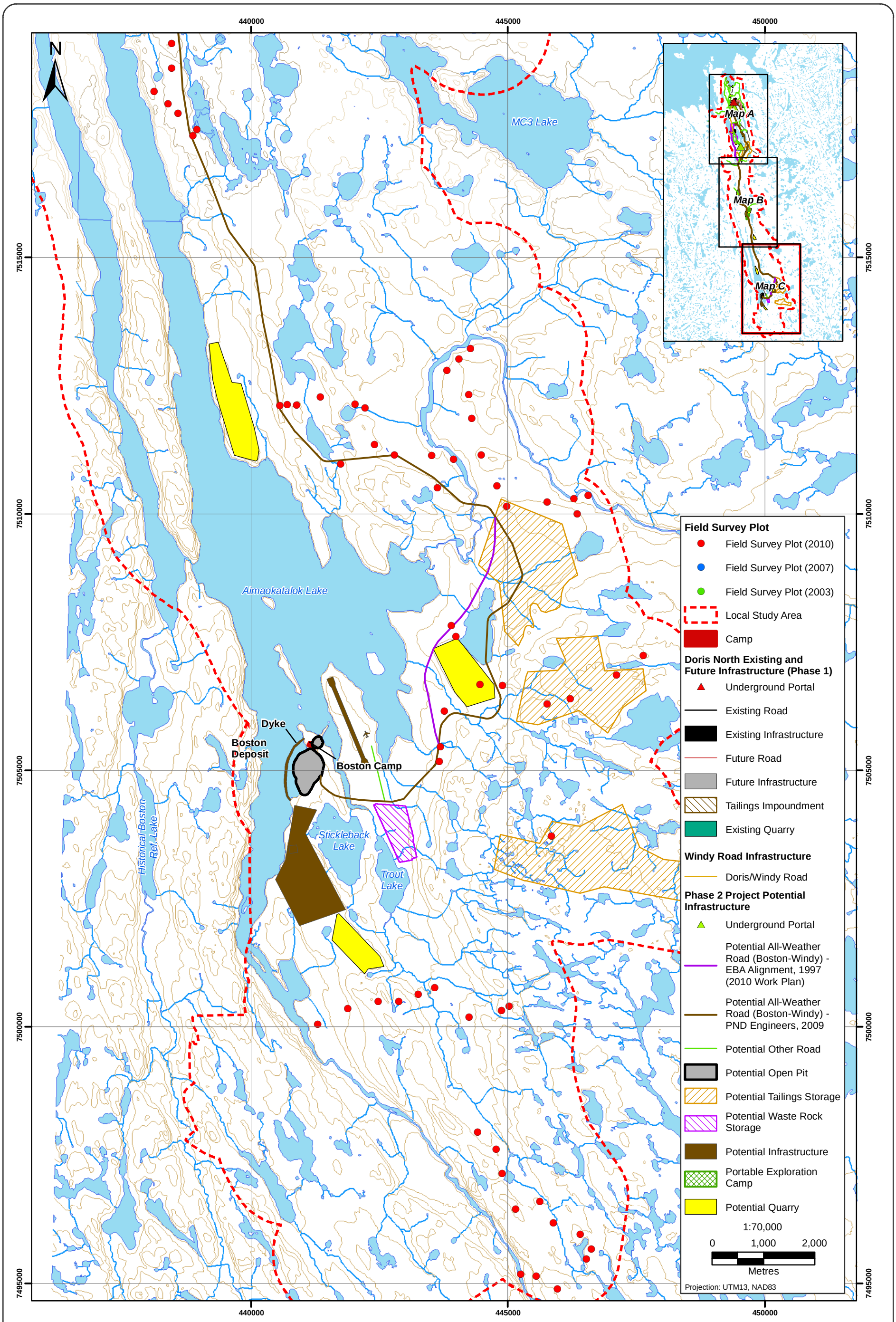

Figure 3.2-1c

NEWMONT NORTH AMERICA

Ecosystem Mapping Field Survey Locations - South End of Belt

Figure 3.2-1c

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Table 3.2-1. Distribution of Terrestrial Field Plots by General Ecosystem Unit

General Ecosystem Unit	Number of Field Plots	Proportion of Field Plots
Blockfield	1	0.6
Betula-Ledum-Lichen	33	19.9
Betula-Moss	9	5.4
Dry Carex-Lichen	11	6.6
Dryas Herb Mat	22	13.2
Dry Willow	5	3.0
Emergent Marsh	2	1.2
Low Bench Floodplain	3	1.8
Polygonal Ground	3	1.8
Rock Outcrop	2	1.2
Riparian Willow	7	4.2
Dwarf Shrub-Heath	11	6.6
Eriophorum Tussock Meadow	46	27.7
Wet Meadow	11	6.6
Total	**166**	**100.0**

A total of 52 ground surveys (using the Wetland Habitat Identification Form, WHIF) and 40 visual surveys were conducted within the LSA in 2010 (Figures 3.2-1a-c). The majority (75%) of the surveyed wetlands occurred as complexes. Table 3.2-2 summarizes the distribution of the primary wetland class and form type identified at each ground plot. The distribution of secondary and tertiary classes and forms within wetland complexes are summarized in Appendix 9.

Table 3.2-2. Distribution of Ground Wetland Plots by Class and Form Type

Class	Primary Wetland Form[1]	Number of Wetland Field Plots	Percent of Total Wetland Plots
Fen	horizontal fen	11	21.2
	lowland polygon fen	19	36.5
Bog	lowland polygon bog	8	15.4
	peat mound bog	3	5.8
	palsa bog	0[2]	0.0
Marsh	lacustrine marsh	4	7.7
	slope marsh	1	1.9
	basin marsh	1	1.9
Open Water	shallow open water	n/a[2]	0.0
Terrestrial sites		5	9.6
Total		**52**	**100**

[1] *This field represents the primary wetland type identified at the field plot*
[2] *Present as sub-dominant community only. See Appendix 9*

Over half (58%) of the wetlands surveyed were characterized as fens (Table 3.2-2). Bogs were the next most common wetland types surveyed, accounting for 23% of field plots. Of the form types, lowland polygon fens were surveyed most frequently (36.5%), followed by horizontal fens (21.2%) and lowland

polygon bogs (15.4%). The ecological characteristics and typical vegetation communities for each of these ecosystems are summarized in the following text.

Eight wetland plots were established in the North end of the belt. Considering all wetland forms (i.e. those identified as primary, secondary, and tertiary forms), the most common forms observed near Doris Camp were horizontal fens (n=5) and peat mound bogs (n=3; Appendix 9; Figure 3.2-2a). Other wetland forms that were identified in the north end of the belt were tussock tundra (n=1), slope marshes (n=2), lowland polygon fens (n=2), and lowland polygon bogs (n=2).

Twenty-three wetland plots were sampled in the Mid Belt (Table 3.2-2; Figure 3.2-2b). The most common forms observed in this area were lowland polygon fens (n=17), lowland polygon bogs (n=10), and lacustrine marshes (n=9). When observed, lowland polygon fens were most often the primary wetland form and were often associated with bog wetland forms. Other wetland forms that were identified in the Mid-Belt were shallow open water (n=4), horizontal fens (n=5), basin marsh (n=1), palsa bog (n=1), and peat mound bogs (n=4).

Twenty-one wetland plots were sampled in the South end of the belt (Table 3.2-2; Figure 3.2-2c). This area had the widest range of wetland units observed in the LSA. The most common form observed in this area was the lowland polygon fen (n=11). Lowland polygon fens were almost always observed in wetland complexes with bog wetland forms. Horizontal fens (n=4), tussock meadow (n=1), tussock tundra (n=2), peat mound bogs (n=5), dwarf birch-Labrador tea-lichen (n=1), slope marshes (n=1), seepage marsh (n=1), palsa bog (n=2), and lacustrine marshes (n=3) were all observed in lesser amounts in the South end of the belt.

3.2.3 Fens

Fens are nutrient-medium peatland ecosystems dominated by sedges and brown mosses. Mineral-bearing groundwater is within the rooting zone, and minerotrophic plant species are common (MacKenzie and Moran 2004). Fens can have fluctuating water tables, and as a result they are often rich in dissolved minerals. Surface water flow can be direct, either through channels, pools, or other open features that can often form characteristic surface patterns. The vegetation in fens is closely related to the depth and chemistry of groundwater. Shrubs occupy drier sites and minerotrophic graminoids (narrow-leaved vegetation) are typically found in wetter sites (Warner and Rubec 1997).

Fens are widespread throughout the LSA on level to slightly sloping terrain that receive surface runoff and/or groundwater. Saturated soils are common throughout the growing season due to very low rates of evapotranspiration, as well as a continual supply of moisture from within the soil profile due to seasonal permafrost melting. Fens occur on a number of substrates but most commonly as sedge peat veneers over fine-textured mineral soils. Other substrates include medium textured soils. Permafrost varies in extent depending on the thickness of the organic layer that acts as an insulator (Black 1976). Organic matter reduces the soil diurnal damping depth during the warmer months of the year which mitigates seasonal permafrost melting (Hinkel 1997).

Two wetland fen form types (horizontal fens and lowland polygon fens) were identified during field surveys. Table 3.2-3 presents a summary of the site characteristics at fen sites within the LSA.

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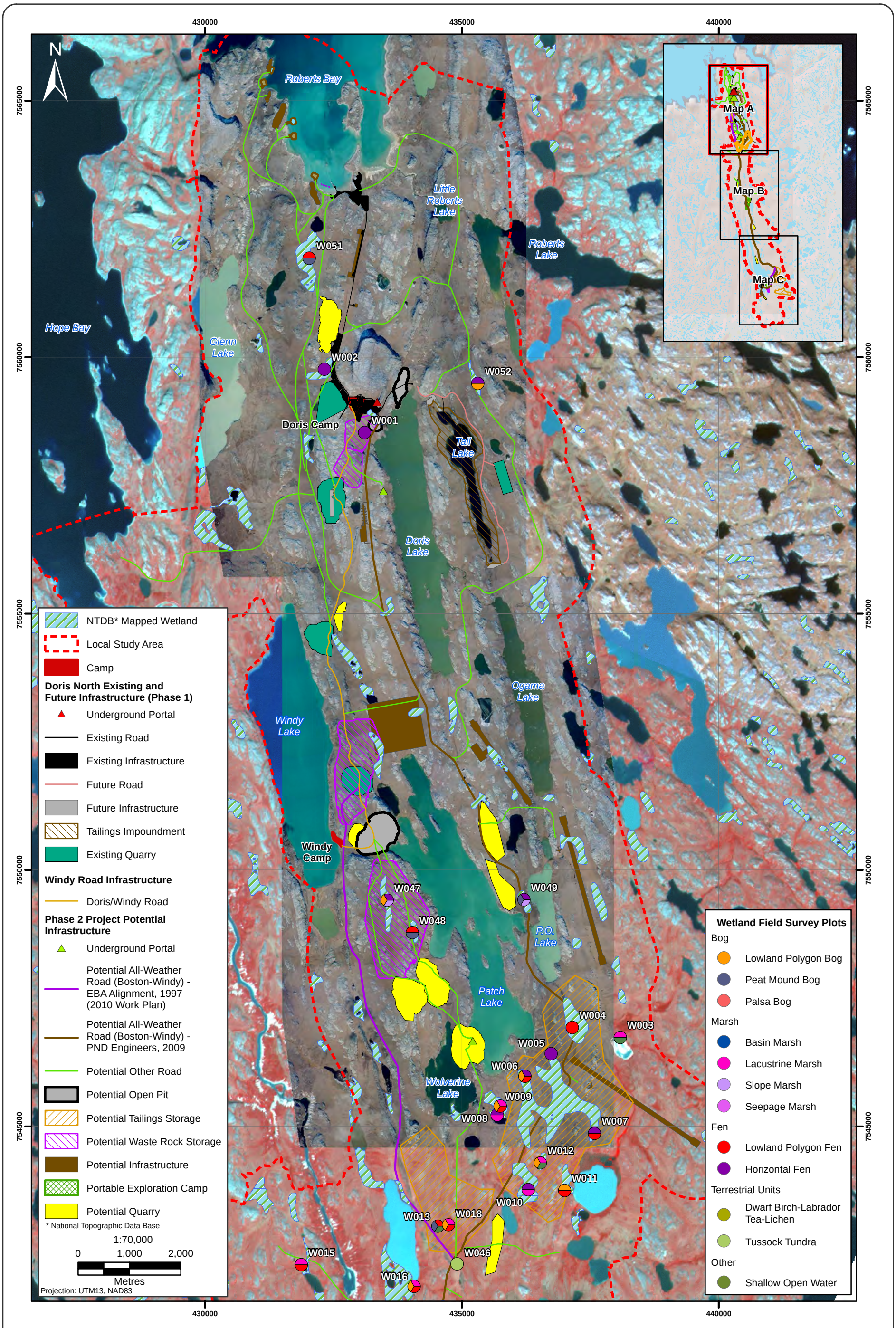

Figure 3.2-2a

NEWMONT NORTH AMERICA

Wetland Field Survey Plots and Wetland Classification; North End of Belt

Figure 3.2-2a

Rescan™ Engineers & Scientists