Appendix V5-3J

2009 Freshwater Baseline Report, Hope Bay Belt Project

Hope Bay Mining Limited

NEWMONT™
NORTH AMERICA

2009 Freshwater Baseline Report, Hope Bay Belt Project

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February 2010

2009 FRESHWATER BASELINE REPORT, HOPE BAY BELT PROJECT

February 2010
Project #1009-002-05

Prepared for:

NEWMONT™
NORTH AMERICA

Hope Bay Mining Limited

Prepared by:

Rescan™
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Executive Summary

Rescan™
Engineers and Scientists

Executive Summary

Environmental baseline studies were conducted by Rescan Environmental Services Ltd. (Rescan) in 2009, on behalf of Hope Bay Mining Ltd. (HBML), for the Hope Bay Belt Project. The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound. The nearest communities are Omingmaktok (Bay Chimo; 75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The environmental baseline program conducted in 2009 was based on the plan to develop multiple deposits in the belt. The 2009 program was also based on Newmont's priorities as of early 2009, which included regulatory compliance with the existing Doris North Project permits and licences. Baseline work was primarily focused on the north end of the belt in 2009. This report presents the findings of the 2009 freshwater baseline study, and includes a comparison to historically collected data. Freshwater fisheries data are presented as a separate report.

The primary objective of the 2009 freshwater program was to collect additional aquatic baseline data relevant to the planned project to support permitting and project design. This report presents the methods used to collect and analyze the freshwater aquatic data for 2009 as well as a comparison of the results to historical site data.

The 2009 aquatic baseline program involved collecting information for the following: lake water quality (winter and summer), physical limnology (winter and summer), lake sediment quality, lake phytoplankton, lake zooplankton, lake benthos, stream water quality, stream sediment quality, stream periphyton, and stream benthos. The program included collecting samples from lakes and streams in areas that could potentially be influenced by future mining activities. Two reference lakes and their associated outflows located well away from potential Project activities were also sampled, as was a reference river location on the Angimajuq River. A total of 13 lakes and 12 streams/rivers were sampled in 2009.

Analytical results from all samples collected as part of the 2009 freshwater baseline program are provided as appendices to this report. The following text provides a brief summary of the various components sampled as part of the 2009 freshwater baseline program.

<u>Lake Physical Limnology</u>

During winter, the dissolved oxygen concentration in Project area lakes ranged from nearly anoxic (≤1 mg/L) in the bottom waters of Ogama, Little Roberts, and Wolverine lakes to supersaturated in the surface waters of several lakes (maximum of 16.9 mg/L in Glenn Lake). During the summer, dissolved oxygen levels ranged from 7.8 mg/L in Patch North to 13.2 mg/L in Reference Lake A. Winter water temperatures ranged between 0.2 and 2.1°C, with coldest temperatures near the surface ice and water warming with depth. During summer, lakes were generally well-mixed or weakly stratified.

Water clarity in most lakes surveyed was relatively low, as secchi depths were typically less than 2 m. Reduced water clarity was likely attributable to the re-suspension of fine sediments along the shorelines of lakes resulting from wave action and high winds common to the area. Euphotic zone depth ranged from 3.7 to 30.4 m and extended through the entire water column at most lakes, except the deepest or most turbid.

River water temperatures during winter ranged from 0 to 0.3°C at the sites surveyed along the Koignuk River. Dissolved oxygen concentrations were extremely high (16.19 mg/L) at the upstream site of the Koignuk River, and very low (2.17 mg/L) at the downstream site.

Lake Water Quality

Lakes in the study area were neutral to slightly basic (with pH ranging from 6.9 to 8.3) and contained variable concentrations of metals and nutrients. Water column parameters did not vary significantly with depth, as most lakes were shallow and well-mixed to weakly stratified. Seasonal water quality trends were apparent in some lakes, with winter concentrations of certain parameters greatly exceeding summer levels. This trend was particularly evident for total dissolved solids, total organic carbon, sulphate, total phosphorus, ammonia, nitrate, and several metals (e.g., chromium, copper, iron, and lead).

Nitrate concentrations ranged from below detection in several lakes to 0.177 mg/L in Ogama Lake. Lakes within the Doris and Little Roberts watersheds contained the highest nitrate levels. Concentrations of nitrite were generally below analytical detection limits. Ammonia concentrations ranged from below detection in several lakes to 0.133 mg/L in Wolverine Lake. The highest concentrations of ammonia were measured in Wolverine and Nakhaktok lakes, which are the lakes located furthest upstream in the Doris and Windy watersheds, respectively.

Total phosphorus concentrations ranged from 0.002 mg/L at Reference Lake B to 0.095 mg/L at Nakhaktok Lake. Based on the Canadian Council of Ministers of the Environment (CCME) recommended trigger ranges for total phosphorus, Windy Lake and Reference Lakes A and B would be categorized as ultra-oligotrophic to oligotrophic (depending on the season), Imniagut, Patch North and South, P.O., and Naiqunnguut lakes would be categorized as oligotrophic, while Little Roberts Lake (during winter only) and Nakhaktok Lake would be considered eutrophic systems. Doris Lake North and South ranged from mesotrophic to meso-eutrophic depending on the season.

Glenn Lake (in the Windy Watershed) tended to contain the highest average aluminum, copper, iron, and molybdenum concentrations, and the Windy Watershed as a whole had higher molybdenum levels than the other watersheds. Nickel concentrations in Imniagut Lake were markedly higher than other lakes, while zinc levels in Doris S also tended to be higher than other lakes. Average metal concentrations in lakes were generally below CCME guidelines, with the following exceptions: aluminum in P.O., Ogama, Naiqunnguut, and Glenn lakes; chromium in Wolverine and Glenn lakes; copper in Ogama, Naiqunnguut, and Glenn lakes; iron in Wolverine and Glenn lakes; and zinc in Doris Lake South. These elevated concentrations occur naturally within study area lakes.

Lake Sediment Quality

Lake sediments were largely composed of clay and silt, with lesser amounts of sand and little gravel. The proportion of fine particles in sediments increased with depth, except at Nakhaktok Lake. An increase in fine sediments (clay and silt) within a lake was generally associated with an increase in all parameters evaluated with the exception of phosphorus. There were few clear trends in sediment chemistry among lake sites, though sediments from Wolverine and Imniagut lakes in the Doris Watershed contained relatively high concentrations of total organic carbon, ammonium, total nitrogen, and total sulphur. Lake sediments were naturally elevated in arsenic, chromium, and copper, and concentrations of these metals were often higher than CCME interim sediment quality guidelines. Within-site annual variability was comparable in magnitude to within-year variability observed among sites.

Lake Phytoplankton

Lake phytoplankton biomass (as chlorophyll *a*) ranged from 0.3 to 26.9 µg chl *a*/L, and was highest in Ogama, Doris North and South, and Little Roberts lakes (in the Doris Watershed) and Nakhaktok Lake (in the Windy Watershed). Trends in phytoplankton abundance and biomass were similar. Phytoplankton taxonomic composition varied substantially among lakes, though cyanobacteria (blue-green algae) were consistently dominant at sites with high levels of phytoplankton abundance and biomass. In other lakes, the taxonomic assemblage was mainly composed of chlorophytes, cryptophytes, and diatoms. Phytoplankton richness and diversity ranged from 6 to 20 genera/sample and from 0.08 to 0.87, respectively, across all sites and seasons. Genera richness and diversity were consistently lowest at Nakhaktok and Doris North and South lake sites. Phytoplankton diversity and richness generally followed similar trends.

The taxonomic composition of epontic algae (algae living on the underside of the ice) in a particular lake was similar to the winter phytoplankton composition in that lake. The assemblage of epontic algae was mainly composed of cyanobacteria in Doris Lake North and South, chrysophytes and dinoflagellates in Little Roberts Lake, cryptophytes in Patch Lake North and South, and chrysophytes in Ogama Lake. Epontic richness ranged from 6 to 17 genera and followed a similar trend as diversity, which ranged from 0.26 to 0.88. Richness and diversity levels were consistently lowest at Doris South and highest at Ogama Lake.

Lake Zooplankton

In general, zooplankton abundance varied widely among lakes with no obvious watershed-specific trends. Zooplankton abundance ranged from 2,200 to 282,000 organisms/m^3, and Imniagut and Nakhaktok lakes contained the highest abundance levels. The zooplankton assemblage in lakes typically consisted of cladocerans, copepods, rotifers and protists. Zooplankton genera richness ranged from 3 to 12 genera/sample, and diversity ranged from 0.14 to 0.78. Richness and diversity were particularly low in Windy and Glenn lakes, but were relatively similar among the other sites surveyed.

Lake Benthos

Lake benthos densities ranged from 116 to 23,600 organisms/m^2. The highest levels of benthos density were found in Wolverine (13,300 organisms/m^2), Imniagut (23,600 organisms/m^2), Nakhaktok (7,700 organisms/m^2), and Little Roberts lakes (11,800 organisms/m^2). Lake benthic communities were generally dominated by dipterans (80% of individuals found), although pelecypods, ostracods, and oligochaetes were also prevalent. Benthic genera richness averaged 6 genera/sample, with an average diversity of 0.54. Benthic diversity and richness were generally highest in samples collected from the shallow depth zone, and Windy and Glenn lakes tended to have the lowest levels of diversity and richness.

Stream Water Quality

Streams and rivers in the study area were neutral to slightly basic (with pH ranging from 6.9 to 8.1). Seasonal trends were apparent in some Hope Bay Belt streams and rivers. Parameters such as nitrate, ammonia, total phosphorus, copper, chromium, and nickel tended to be highest in winter or during freshet and lowest during the summer. These trends were most apparent in Glenn Outflow Downstream and the Koignuk River sites. Turbidity levels were variable across streams, and were particularly high in Glenn Outflow Downstream during freshet.

Nitrate and ammonia concentrations were frequently below detection limits, and reached a maximum of 0.56 and 0.044 mg/L (for nitrate and ammonia respectively) in Koignuk River Upstream during winter. Nitrite concentrations were always below detection limits. Total phosphorus levels were variable across stream sites, ranging from 0.002 mg/L (Wolverine Outflow in June) to 0.053 mg/L (Glenn Outflow Downstream in June). Within a watershed, total phosphorus concentrations generally increased with distance downstream. In the Doris Watershed, the lowest levels of total phosphorus were observed in Wolverine and Patch outflows, which would be categorized as ultra-oligotrophic and oligotrophic, respectively, based on the CCME trigger ranges for total phosphorus. Stream sites located furthest downstream in the Doris and Little Roberts watersheds (Doris and Little Roberts outflows) would be categorized as mesotrophic to meso-eutrophic. A similar trend was apparent in the Windy watershed, where the upstream Windy Outflow would be categorized as ultra-oligotrophic to oligotrophic, while the downstream Glenn Outflow Downstream would be considered mesotrophic to eutrophic. River sites ranged from oligotrophic to mesotrophic in the Angimajuq and from oligotrophic to meso-eutrophic in the Koignuk (depending on the season).

In general, concentrations of total metals were highest in Glenn Outflow Downstream and lowest in Windy Outflow. Molybdenum levels tended to be highest within the streams of the Windy Watershed compared to the other watersheds. These trends are consistent with the lake water quality data, indicating that the water quality of streams reflects the water quality of the upstream lakes that feed them. Average metal concentrations in streams and rivers were generally below CCME guidelines, with the following exceptions: aluminum in all streams/rivers except Wolverine, Doris, and Reference Lake A and B outflows; chromium in P.O. Outflow, Glenn Outflow Downstream, and the Koignuk River sites; copper in Glenn Outflow Downstream and Koignuk Midstream and Downstream; iron in P.O., Ogama, and Little Roberts outflows, Glenn Outflow Downstream, and the Angimajuq and Koignuk River sites; and lead in Koignuk Midstream. These elevated metal concentrations occur naturally within study area streams and rivers.

Stream Sediment Quality

Stream sediments consisted of a highly variable mixture of gravel, sand, silt and clay. Sediments in Reference Lake A Outflow were predominantly composed of sand, while sediments in the Angimajuq River Reference and in Reference Lake B, Ogama, and Doris outflows were mainly composed of gravel and sand. In all other surveyed streams, sediments were predominantly composed of a sand-silt mixture. There were few apparent trends in sediment chemistry among streams; however, stream sediments generally contained lower metal concentrations than lake sediments. Chromium concentrations in sediments were naturally elevated and were occasionally higher than CCME interim sediment quality guidelines.

Stream Periphyton

Periphyton biomass ranged from approximately 66 to 2,500 µg chl *a*/m^2, while density ranged from 58,000 to 400,000 individuals/cm^2 among stream sites. Biomass and density levels were particularly high in Ogama Outflow, the Koignuk River, and the Angimajuq River Reference. Diatoms were the dominant periphyton taxa in all streams surveyed. Genera richness ranged from 8 to 16 genera/sample and averaged 13 genera/sample. Periphyton diversity was relatively high at all sites (Simpson's diversity index between 0.57 and 0.87) except Windy Outflow (0.32).

Stream Benthos

Stream benthos density ranged from 770 to 25,100 organisms/m^2. Benthos density was highest in Doris Outflow. Ogama Outflow, Little Roberts Outflow, and the midstream portion of the Koignuk River also contained dense benthos communities. Stream benthos assemblages were dominated by dipterans, which represented~70% of the stream benthic organisms. Nematodes, oligochaetes, and ostracods were also common in study area streams. Benthic community richness ranged from 9 to 21 genera/sample, with an average of 15 genera/sample. Dipteran richness generally corresponded closely with community richness, and averaged 10 genera/sample. Simpson's diversity index averaged 0.73 for the entire benthic community, and 0.66 for dipterans.

Acknowledgements

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Acknowledgements

This report was prepared for Hope Bay Mining Ltd. (HBML) by Rescan Environmental Services Ltd. The 2009 aquatic fieldwork was conducted by Rescan scientists Katsky Venter (M.Sc.), Tonia Robb (Ph.D.), Mike Henry (Ph.D.), and Erin Forster (B.Sc.). The report was written by Katsky Venter (M.Sc.) and Carol Adly (M.Sc.) with support from Carolyn Duckham (B.Sc.), and Judith Eigenbrod (M.Sc.) and review by Mike Henry and Deborah Muggli (Ph.D.). The project was managed by Deborah Muggli.

Fieldwork was conducted with the enthusiastic and competent assistance of Tannis Bolt, Aaron Halushka, Janet Kadlun, Stephen Kuhoktak, Wynter Kuliktana, Irvin Kuptana, Ryan Thompson, and Morrey Wood.

Extensive support was provided by the Newmont Environment and Social Responsibility (ESR) Department, the Health, Safety and Loss Prevention (HSLP) Department, and camp management, as well as Great Slave Helicopters, Braden Burry Expediting, and Nuna Logistics.

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2009 FRESHWATER BASELINE REPORT, HOPE BAY BELT PROJECT

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Engineers and Scientists

1. Introduction

The Hope Bay Belt Property is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the south shore of Melville Sound (Figure 1-1). The nearest communities are Omingmaktok (75 km to the southwest of the property), Cambridge Bay, and Kingaok (Bathurst Inlet; 160 km to the southwest of the property).

The property consists of a greenstone belt running in a north/south direction, approximately 80 km long, with three main gold deposit areas. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is located in the southern end. The northern portion of the property consists of several watershed systems that drain into Roberts Bay, and a large river (Koignuk River) that drains into Hope Bay. Watersheds in the southern portion of the belt ultimately drain into the upper Koignuk, which drains into Hope Bay.

Newmont Mining Corporation (Newmont) acquired the property in 2008, and initially decided to consider the property as a whole to evaluate various options for responsible, long-term development of the belt. However, as of the fall of 2009, Hope Bay Mining Ltd. (HBML), a fully owned subsidiary of Newmont, has decided to proceed with developing the already-permitted Doris North Project, which consists of a two-year underground gold mine in the north end of the belt.

The environmental baseline program conducted in 2009 was based on the plan to develop multiple deposits in the belt, as indicated in Figure 1-2. The 2009 program was also based on HBML's priorities as of early 2009, which included regulatory compliance with the existing Doris North Project permits and licences. Baseline programs for ecosystem mapping, vegetation, soils, and socio-community were deferred to 2010. Baseline work was primarily focused on the north end of the belt in 2009.

Results from the 2009 environmental baseline program are being reported in a series of reports, as follows:

- 2009 Hydrology Baseline Report;
- 2009 Meteorology Baseline Report;
- 2009 Freshwater Baseline Report;
- 2009 Freshwater Fish and Fish Habitat Baseline Report;
- 2009 Marine Baseline Report; and
- 2009 Marine Fish and Fish Habitat Baseline Report.

In addition, baseline information obtained during 2009 was used to generate various compliance reports as specified in the Doris North Project Certificate (e.g. the Wildlife Monitoring & Mitigation Program Report), the Doris North Type A Water Licence, and the Doris North Roberts Bay Jetty Fisheries Authorization. Archaeology work was also conducted in 2009 and is being reported separately.

This report presents the results from the 2009 Freshwater Baseline Report portion of the 2009 environmental baseline program. Results from the freshwater fish community and habitat work are provided in a separate report.

The 2009 freshwater baseline program involved collecting information for the following: lake water quality (both winter and summer), lake physical limnology (both winter and summer), lake sediment quality, lake phytoplankton (both winter and summer), lake zooplankton, lake benthos, stream water quality, stream sediment quality, stream periphyton, and stream benthos. Aquatic components were sampled from numerous lakes and streams contained within three drainage basins in the northern portion of the belt that could potentially be influenced by future Project activities. Aquatic components were also sampled in the Koignuk River, a major river adjacent to the property. Two reference lakes and their associated outflows located well away from potential Project activities were also included in the 2009 program, as was a reference river location on the Angimajuq River.

Analytical results from all samples collected as part of the 2009 freshwater baseline program are provided as appendices to this report. Chapter 2 of this report presents the sampling locations and methods used for the 2009 freshwater baseline work, and results from the samples collected are presented in graphical and tabular form in Chapter 3.

PROJECT # 1009-002-01 ILLUSTRATION # a23708w May 21 2009

Figure 1-1

Hope Bay Belt Project Location

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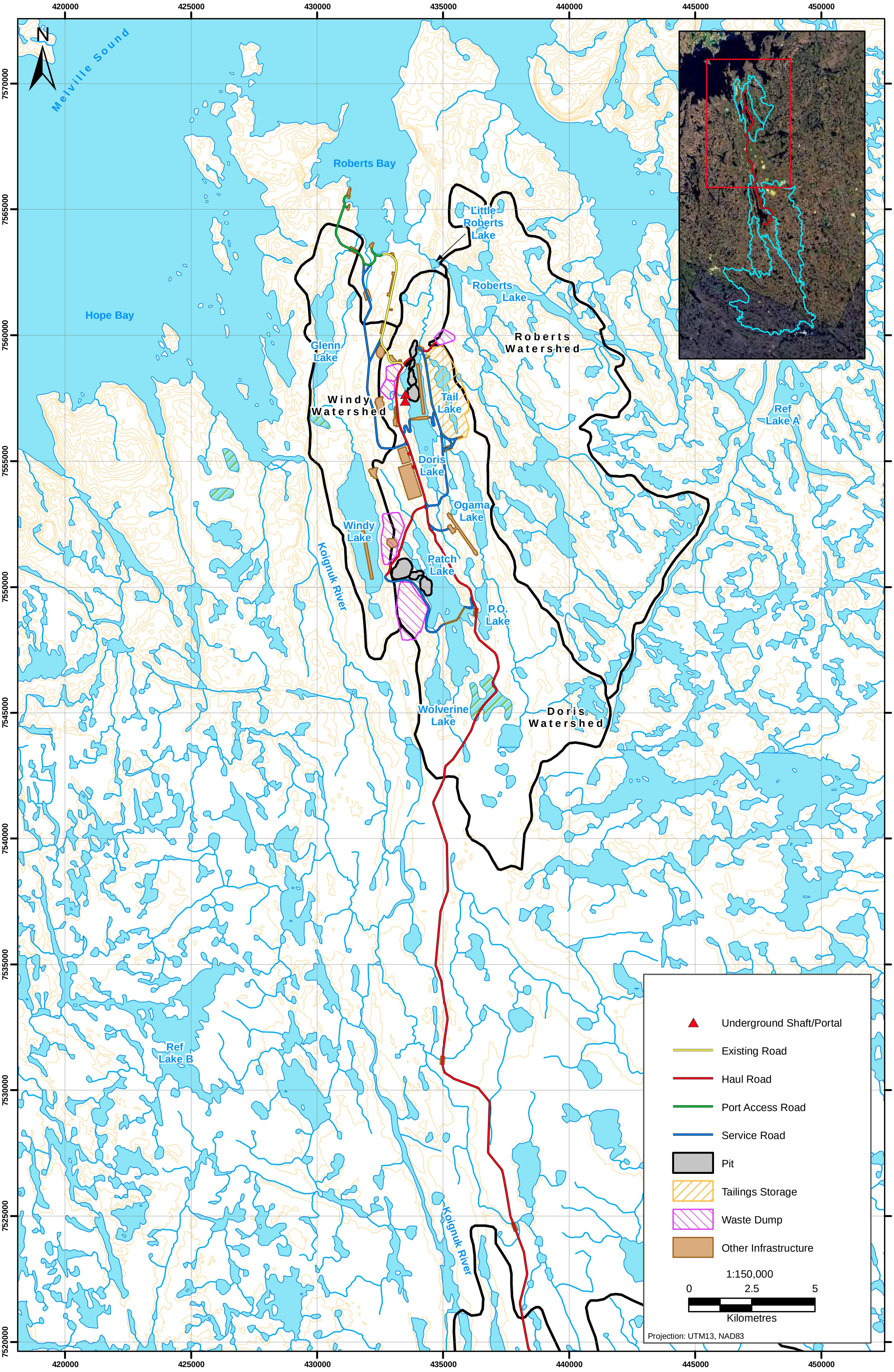

Figure 1-2

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Site Layout Options Considered for 2009 Baseline Program

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2. Methods

2. Methods

2.1 MONITORING LOCATIONS AND SAMPLING PROGRAM

In 2009, baseline studies were conducted to complement existing data in preparation for an Environmental Impact Statement. These studies focused on the northern portion of the belt as well as reference areas well away from future Project activities.

The following components were sampled as part of the 2009 freshwater baseline program:

Lakes:

- Winter Lake Water Quality & Limnology;
- Winter Phytoplankton and Epontic Algal sampling;
- Open-water Season Lake Water Quality & Limnology;
- Lake Sediment Quality;
- Lake Phytoplankton Assemblages;
- Lake Zooplankton Assemblages; and
- Lake Benthic Invertebrate Communities.

Streams:

- Winter Stream Water Quality;
- Open-water Season Stream Water Quality;
- Stream Sediment Quality;
- Stream Periphyton Assemblages; and
- Stream Benthic Invertebrate Communities.

Tables 2.1-1 and 2.1-2 present the lakes and streams sampled, along with the aquatic components examined in 2009. Table 2.1-3 provides a summary of the sampling details for each aquatic component, including the sampling frequency and replication. Table 2.1-4 and 2.1-5 presents the dates each aquatic component was sampled at each site. Figure 2.1-1 presents an overview of the study area sampling locations in 2009 along with the major drainage basins. Figures 2.1-2a to 2.1-2m present lake maps depicting lake bathymetry (where available) and 2009 sampling locations.

2.2 PHYSICAL LIMNOLOGY

In 2009, physical limnology measurements were taken from both lakes and rivers in late April/early May and again from lakes in August. Sampling locations were selected from one of the following: a previously sampled site, the deepest section in the lake, or a spatially significant location (i.e., within and outside of mine footprints, or near future on-shore tailings or waste rock piles). In lakes with no bathymetric information or prior sampling history, winter sampling occurred near the middle of the lake, or in the middle of any obvious basins as estimated by the surrounding topography. At such sites, course-level bathymetry (using a depth sounder) was carried out prior to summer sampling and the sampling location moved if deeper areas were found.

Table 2.1-1. Lake Water, Sediment, and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2009

Watershed	Site Name	Abbreviated Name	Winter Water Quality & Limnology	Winter Algal Sampling	Summer Water Quality & Limnology	Sediment Quality	Aquatic Biology
Doris	Wolverine Lake	Wolverine	X		X	X (1)	X (1)
	Imniagut Lake	Imniagut			X	X (1)	X (1)
	Patch Lake South	Patch S	X	X	X	X (2)	X (2)
	Patch Lake North	Patch N	X	X	X	X (2)	X (2)
	P.O. Lake	P.O.			X	X (1)	X (1)
	Ogama Lake	Ogama	X	X	X	X (1)	X (1)
	Doris Lake South	Doris S	X	X	X	X (2)	X (2)
	Doris Lake North	Doris N	X	X	X	X (2)	X (2)
Little Roberts	Little Roberts Lake	Little Roberts	X	X	X	X (1)	X (1)
Roberts	Naiqunnguut Lake	Naiqunnguut	X		X	X (1)	X (1)
Windy	Nakhaktok Lake	Nakhaktok	X		X	X (2)	X (2)
	Windy Lake	Windy	X		X	X (2)	X (2)
	Glenn Lake	Glenn	X		X	X (2)	X (2)
Ref A	Reference Lake A	Ref Lk A	X		X	X (2)	X (2)
Ref B	Reference Lake B	Ref Lk B	X		X	X (2)	X (2)
Ref C	Reference Lake C	Ref Lk C	X				

Note: Values in parenthesis for lake benthos and sediment quality indicate the number of sampling depths per lake. Although sampled as indicated, data for Reference Lake C (discontinued reference site) are only presented in the appendices.

Table 2.1-2. Stream Water, Sediment and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2009

Watershed	Site Name	Abbreviated Name	Winter Water Quality & Limnology	Summer Water Quality	Sediment Quality	Aquatic Biology
Doris	Wolverine Outflow	Wolverine OF		X	X	X
	Patch Outflow	Patch OF		X	X	X
	P.O. Outflow	P.O. OF		X	X	X
	Ogama Outflow	Ogama OF		X	X	X
	Doris Outflow	Doris OF		X	X	X
Little Roberts	Little Roberts Outflow	Little Roberts OF		X	X	X
Windy	Windy Outflow	Windy OF		X	X	X
	Glenn Outflow Downstream	Glenn OF D/S		X	X	X
Koignuk River	Koignuk River Upstream	Koignuk U/S	X	X	X	X
	Koignuk River Midstream	Koignuk M/S	X	X	X	X
	Koignuk River Downstream	Koignuk D/S	X	X	X	X
Ref A	Reference Lake A Outflow	Ref Lk A OF		X	X	X
Ref B	Reference Lake B Outflow	Ref Lk B OF		X	X	X
Ref C	Reference Lake C Outflow	Ref Lk C OF		X		
Angimajuq	Angimajuq River Reference Site	Angimajuq R. Ref		X	X	X
Aimaokatalok River	Aimaokatalok River Reference Site	Aim. R. Ref	X			

Note: Although sampled as indicated, data from Ref C OF and Aim. R. Ref. (discontinued reference sites) are only presented in the appendices.

Table 2.1-3. Sampling Details for Water Quality, Sediment Quality, and Aquatic Biology, Hope Bay Belt Project, 2009

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing
Lakes			
Winter Lake Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n=1 @ 1 m below the ice and 2 m above water-sediment interface + 20% replication	April/early May; coincident with winter DO/T profiles
Summer Lake Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n=1 @ 1 m below the surface and 2 m above water-sediment interface + 20% replication	August; coincident with biological lake surveys
Winter Limnology			
Dissolved oxygen/temperature profile	1 x	once over deepest area of lake, or at lake station	April/early May; coincident with winter water quality
Summer Limnology			
Dissolved oxygen/temperature profile; Secchi depth	1 x	once over deepest area of lake, or at lake station	August; coincident with biological lake surveys
Lake Sediment Quality			
Physical, nutrients, metals	1 x	n=3 @ shallow and mid or deep depth strata	August; coincident with lake surveys
Winter Phytoplankton*			
Microcystin concentrations	1 x	n= 1@ 1 m below ice	April/early May; coincident with winter water quality
Biomass (as chlorophyll *a*)	1 x	n= 1@ 1 m below ice	April/early May; coincident with winter water quality
Abundance and taxonomy	1 x	n= 1@ 1 m below ice	April/early May; coincident with winter water quality
Winter Epontic Algae*			
Taxonomy	1 x	n= 1; scraping from bottom of ice (qualitative sample)	April/early May; coincident with winter water quality
Summer Phytoplankton			
Biomass (as chlorophyll *a*)	1 x	n=3 @ 1 m	August; coincident with lake surveys
Abundance and taxonomy	1 x	n=3 @ 1 m	August; coincident with lake surveys
Zooplankton			
Abundance and taxonomy	1 x	n=3 vertical hauls from1 m above bottom	August coincident with lake surveys
Lake Benthos			
Density and taxonomy	1 x	n=3 @ shallow and mid or deep depth strata	August coincident with lake surveys
Streams/Rivers			
Winter River Water Quality			
Physical, nutrients, total & dissolved metals	1 x	n=2	Late April/early May

(continued)

Table 2.1-3. Sampling Details for Water Quality, Sediment Quality, and Aquatic Biology, Hope Bay Belt Project, 2009 (completed)

Monitoring Parameter	Sampling Frequency	Sample Replication and Depths	Sampling Dates/Timing
Summer Stream Water Quality			
Physical, nutrients, total & dissolved metals	3 x	n=2	freshet (early June), summer (August), fall (September)
Stream Sediment Quality			
Physical, nutrients, metals	1 x	n=3	July; coincident with stream water quality and periphyton plate installation
Periphyton			
Biomass (as chlorophyll *a*)	1 x	n=3	artificial samplers installed in July; retrieved in August
Density and taxonomy	1 x	n=3	artificial samplers installed in July; retrieved in August
Stream Benthos			
Density and taxonomy	1 x	n=3	July; coincident with stream water quality and periphyton plate installation

**At Patch (N and S), Ogama, Doris (N and S), and Little Roberts lakes only.*

2.2.1 Winter Lake Physical Limnology

Before collecting the physical profiles (and later water samples), a 10-inch diameter ice auger was used to drill a hole through the ice. Once the hole was drilled, a weighted metered line was used to measure the bottom depth, with extreme care taken to minimize any disturbance to lake sediments. Water column profiling and water quality sampling depths were calculated based on bottom depth.

Measurements for water column structure (including temperature and dissolved oxygen) were collected using a YSI dissolved oxygen/temperature meter. At shallow lake stations (<20 m), temperature and dissolved oxygen values were recorded at 0.5 m intervals, while at deep lake stations (>20 m), values were recorded at 1 m intervals. As the meter consumes oxygen while taking a reading, the probe was gently agitated to ensure a continual flushing of 'new' water. The profiles ended at ~1 m above the sediment surface to reduce suspension of bottom sediments.

2.2.2 Summer Lake Physical Limnology

Summer temperature and dissolved oxygen profiles were measured at the same locations that winter samples were collected, unless new bathymetric data prompted the relocation of a sampling site. Summer water column temperature and dissolved oxygen data were collected using the same equipment employed during winter sampling.

Light attenuation was estimated in each lake using a Secchi Disk. Measurements were collected at each site by lowering the disk (20-cm diameter, black and white) on a metered line through the water column on the shaded side of the boat until it disappeared from sight. The depth of disappearance was identified as the Secchi depth (D_s), which was then used to calculate the depth of the euphotic zone.

Table 2.1-4. Lake Sampling Dates, Hope Bay Belt Project, 2009

		Winter			Summer					
Watershed	**Lake**	**DO/Temp**	**Water Quality**	**Phytoplankton and Epontic**	**DO/Temp & Secchi Depth**	**Water Quality**	**Sediment Quality**	**Phytoplankton**	**Zooplankton**	**Benthos**
Doris	Wolverine	Apr. 26	Apr. 26 (3)	NC	Aug. 6	Aug. 6 (1)	Aug. 6 (3.5)	Aug. 6	Aug. 6	Aug. 6 (3.6)
	Imniagut	NC	NC	NC	Aug. 7	Aug. 8 (1)	Aug. 8 (3)	Aug. 7	Aug. 8	Aug. 8 (3)
	Patch S	Apr. 24	Apr. 23 (3, 12.5)	Apr. 24	Aug. 11	Aug. 14 (1)	Aug. 11 (3, 14)	Aug. 11	Aug. 11	Aug. 11 & 12 (3, 13.7)
	Patch N	Apr. 23	Apr. 23 & 24 (3)	Apr. 23	Aug. 9	Aug. 9 (1, 6)	Aug. 9 & 11 (2.6, 8.2)	Aug. 9	Aug. 9	Aug. 9 & 11 (2.7, 8.2)
	P.O.	Apr. 26	NC	NC	Aug. 10	Aug. 14 (1)	Aug. 10 (3)	Aug. 10	Aug. 10	Aug. 10 (3.3)
	Ogama	May 5	May 5 (3)	Apr. 26	Aug. 14	Aug. 14 (1, 3)	Aug. 15 (4.3)	Aug. 14	Aug. 14	Aug. 14 (4.3)
	Doris S	Apr. 22	Apr. 22 & 24 (3, 4)	Apr. 21	Aug. 17	Aug. 17 (1, 8)	Aug. 17 (4.3, 10.9)	Aug. 16	Aug. 17	Aug. 17 (4.3, 10.9)
	Doris N	Apr. 21	Apr. 21 & 24 (3, 11.5)	Apr. 22	Aug. 15	Aug. 15 (1, 11.5)	Aug. 15 (4.1, 14.2)	Aug. 15	Aug. 16	Aug. 15 (4.1, 14.2)
Little Roberts	Little Roberts	May 5	May 5 (3)	May 5	Aug. 7	Aug. 9 (1)	Aug. 7 (2.6)	Aug. 7	Aug. 7	Aug. 7 (2.6)
Roberts	Naiqunnguut	Apr. 26	Apr. 26 (2)	NC	Aug. 10	Aug. 14 (1)	Aug. 10 (4.4)	Aug. 10	Aug. 10	Aug. 10 (4.4)
Windy	Nakhaktok	Apr. 27	Apr. 27 (4)	NC	Aug. 6	Aug. 6 (1, 6)	Aug. 6 (3.5, 7.5)	Aug. 6	Aug. 6	Aug. 6 (3.5, 7.6)
	Windy	Apr. 27	Apr. 27 (4, 15.5)	NC	Aug. 9	Aug. 10 (1, 16)	Aug. 9 (3.7, 18)	Aug. 6	Aug. 9	Aug. 9 (3.4, 18)
	Glenn	May 6	May 3 (3, 9.5)	NC	Aug. 8	Aug. 9 (1, 17.5)	Aug. 8 (4.5, 19.5)	Aug. 8	Aug. 8	Aug. 8 (4.5, 19.5)
Ref A	Ref Lk A	May 31	May 31 (3, 26)	NC	Aug. 13	Aug. 14 (1, 29)	Aug. 12 & 13 (3.4, 31.5)	Aug. 12	Aug. 12 & 13	Aug. 13 (3.4, 31.5)
Ref B	Ref Lk B	May 31	May 31 (3, 6)	NC	Aug. 16	Aug. 16 (1, 7.5)	Aug. 16 (4.7, 9.4)	Aug. 16	Aug. 16	Aug. 16 (4.7, 9.4)
Ref C	Ref Lk C	May 31	May 31 (3, 11)	NC	NC	NC	NC	NC	NC	NC

Values in parenthesis are the approximate sampling depths in meters
NC - Not Collected
Note that data collected for Ref Lk C are not discussed in this report; this was a discontinued reference site.

Table 2.1-5. Stream Sampling Dates, Hope Bay Belt Project, 2009

		Winter		Summer				
						Periphyton		
Watershed	**Stream**	**DO/Temp**	**Water Quality**	**Water Quality**	**Sediment Quality**	**Installation**	**Retrieval**	**Benthos**
Doris	Wolverine OF	NC	NC	Jun.21	NC	NC	NC	NC
	Patch OF	NC	NC	Jun. 21, Aug. 18, Sep. 14	Jul. 23	Jul. 23	Aug. 18	Jul. 23
	P.O. OF	NC	NC	Jun. 21, Aug. 18, Sep. 14	Jul. 23	Jul. 23	Aug. 18	Jul. 23
	Ogama OF	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul.22 & 23	Jul. 23	Aug. 18	Jul. 23
	Doris OF	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul. 21	Jul. 21	Aug. 18	Jul. 21
Little Roberts	Little Rob. OF	NC	NC	Jun. 21, Aug. 18, Sep. 14	Jul. 22	Jul. 21	Aug. 18	Jul. 22
Windy	Windy OF	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul.22 & 23	Jul. 22	Aug. 18	Jul. 22
	Glenn OF D/S	NC	NC	Jun. 21, Aug. 18, Sep. 15	Jul. 23	Jul. 21	Aug. 18	Jul. 23
Koignuk River	Koignuk U/S	May 4	May 4	Jun. 21, Aug. 21, Sep. 14	Jul. 24	Jul. 26	Aug. 21	Jul. 24
	Koignuk M/S	May 23	May 23	Jun. 21, Aug. 22, Sep. 14	Jul. 24	Jul. 24	Aug. 22	Jul. 24
	Koignuk D/S	May 4	May 4	Jun. 21, Aug. 21, Sep. 14	Jul. 24	Jul. 24	Aug. 21	Jul. 24
Ref A	Ref Lk A OF	NC	NC	Jun. 21, Aug. 23, Sep. 15	Jul. 26	Jul. 26	Aug. 23	Jul. 26
Ref B	Ref Lk B OF	NC	NC	Jun. 21, Aug. 23, Sep. 14	Jul. 26	Jul. 26	Aug. 23	Jul. 26
Angimajuq	Angimajuq R. Ref	NC	NC	Jun. 21, Aug. 23, Sep. 15	Jul. 26	Jul. 26	Aug. 23	Jul. 26
Aimaokatolok River	Aim. R. Ref	May 1	May 1	NC	NC	NC	NC	NC

NC - Not Collected

Note that data collected for Aim. R. Ref are not discussed in this report; this was a discontinued reference site.

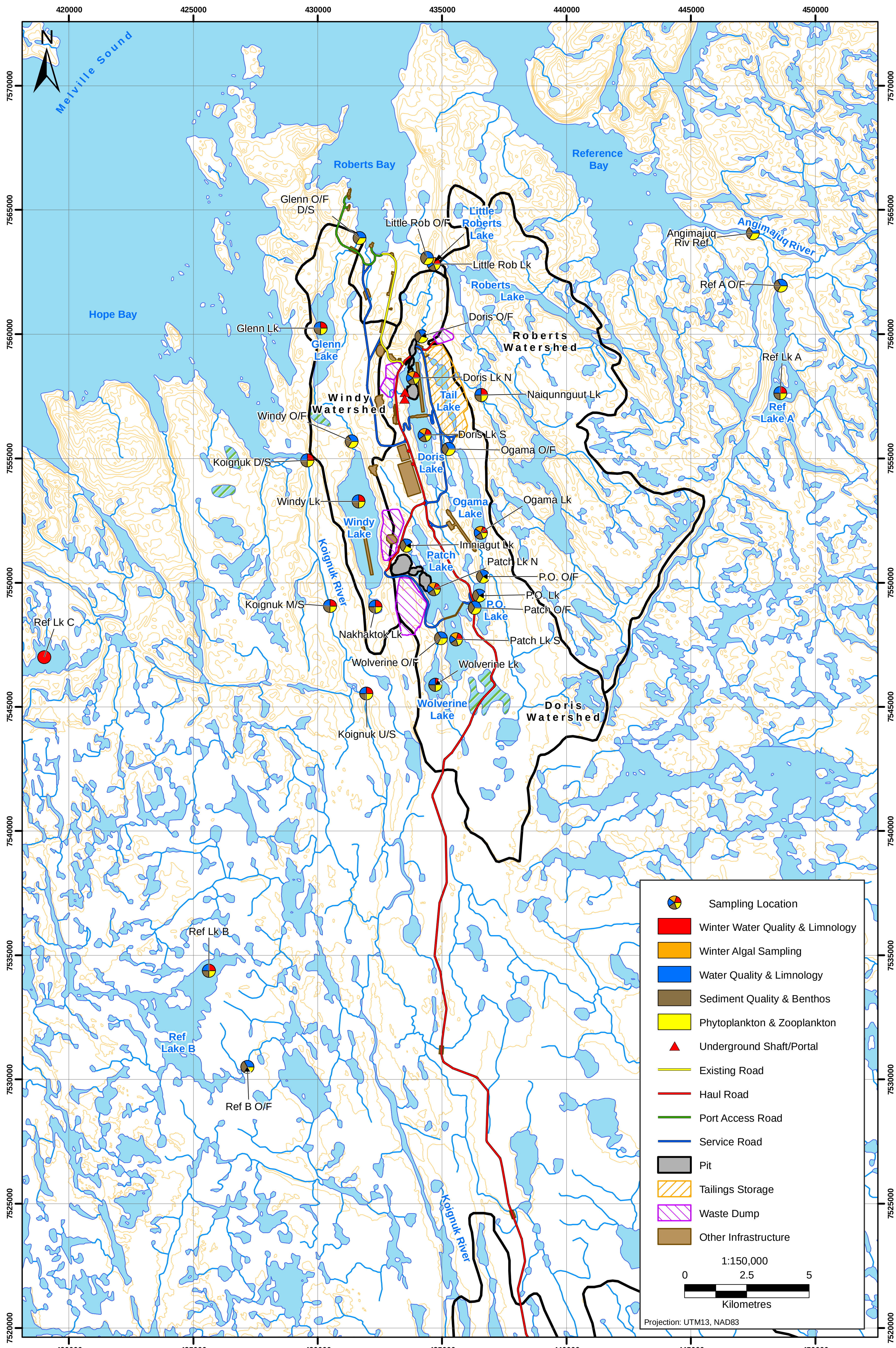


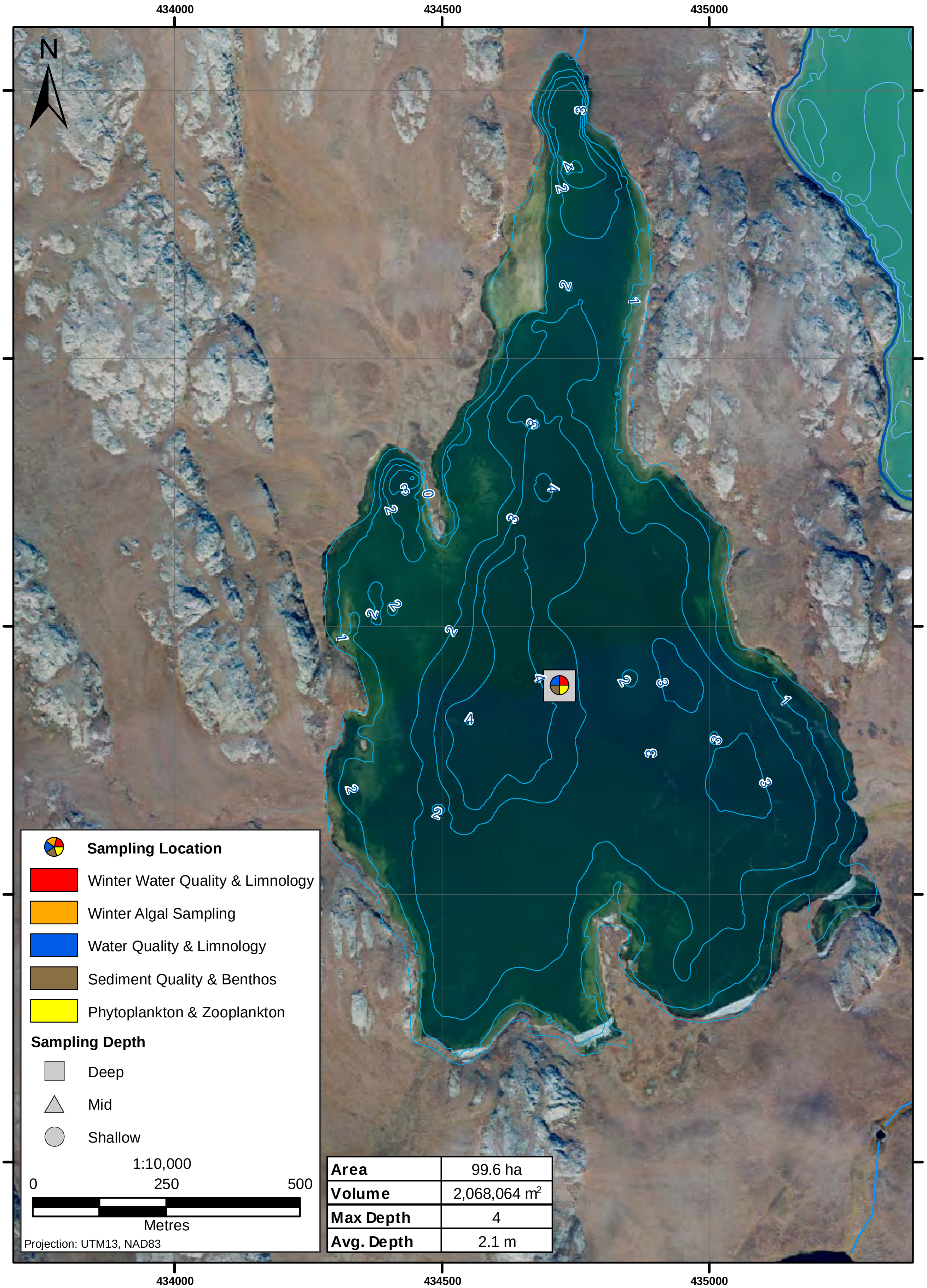
Figure 2.1-1

NEWMONT The Gold Company

Water Quality, Sediment Quality, and Aquatic Biology Sampling Locations, Hope Bay Belt Project, 2009

Figure 2.1-1

Rescan Engineers & Scientists



Area	99.6 ha
Volume	2,068,064 m^2
Max Depth	4
Avg. Depth	2.1 m

Figure 2.1-2a

NEWMONT The Gold Company

Environmental Sampling Locations for Wolverine Lake

Rescan Engineers & Scientists

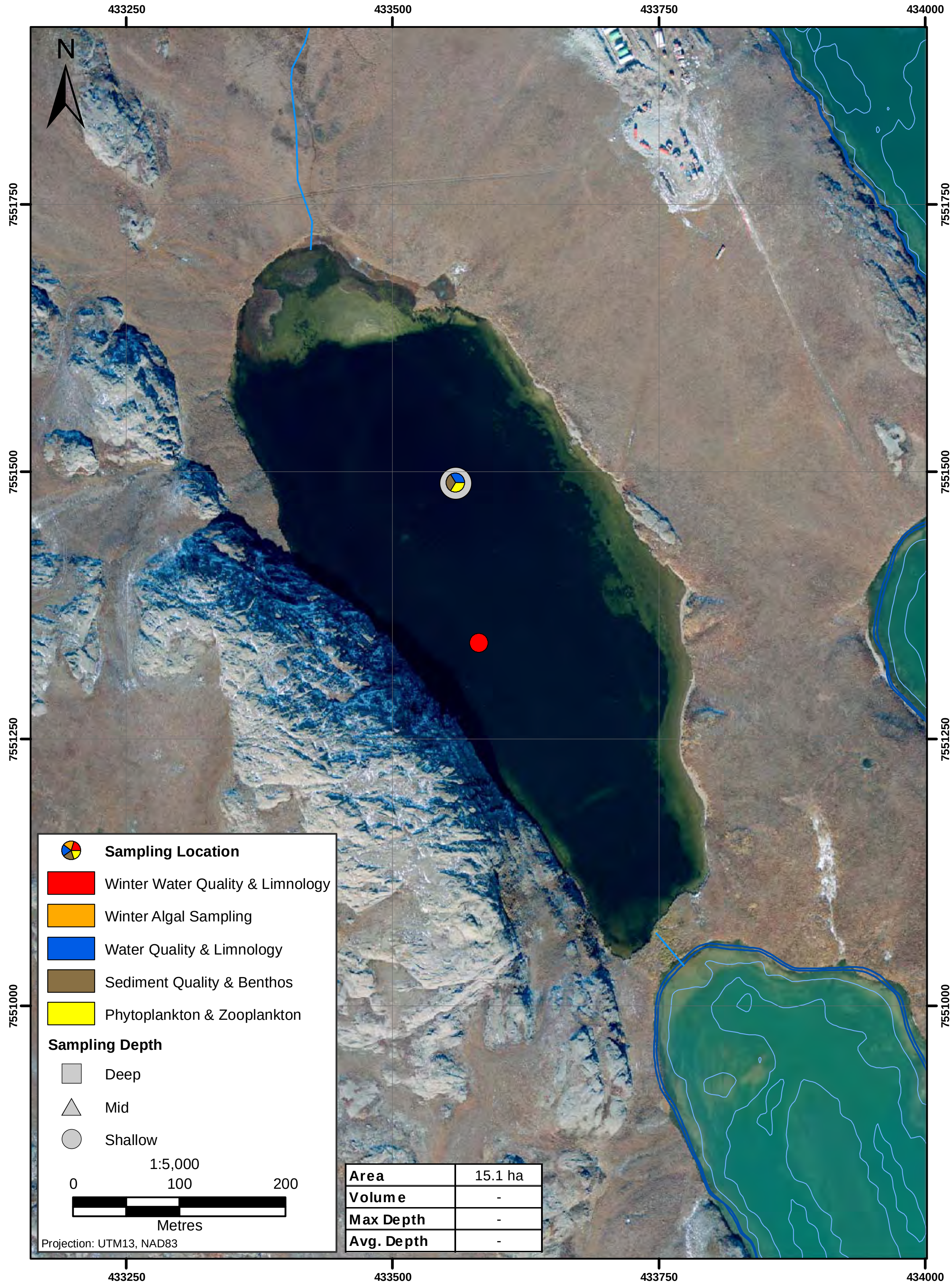


Figure 2.1-2b

Environmental Sampling Locations for Imniagut Lake

NEWMONT The Gold Company

Rescan Engineers & Scientists

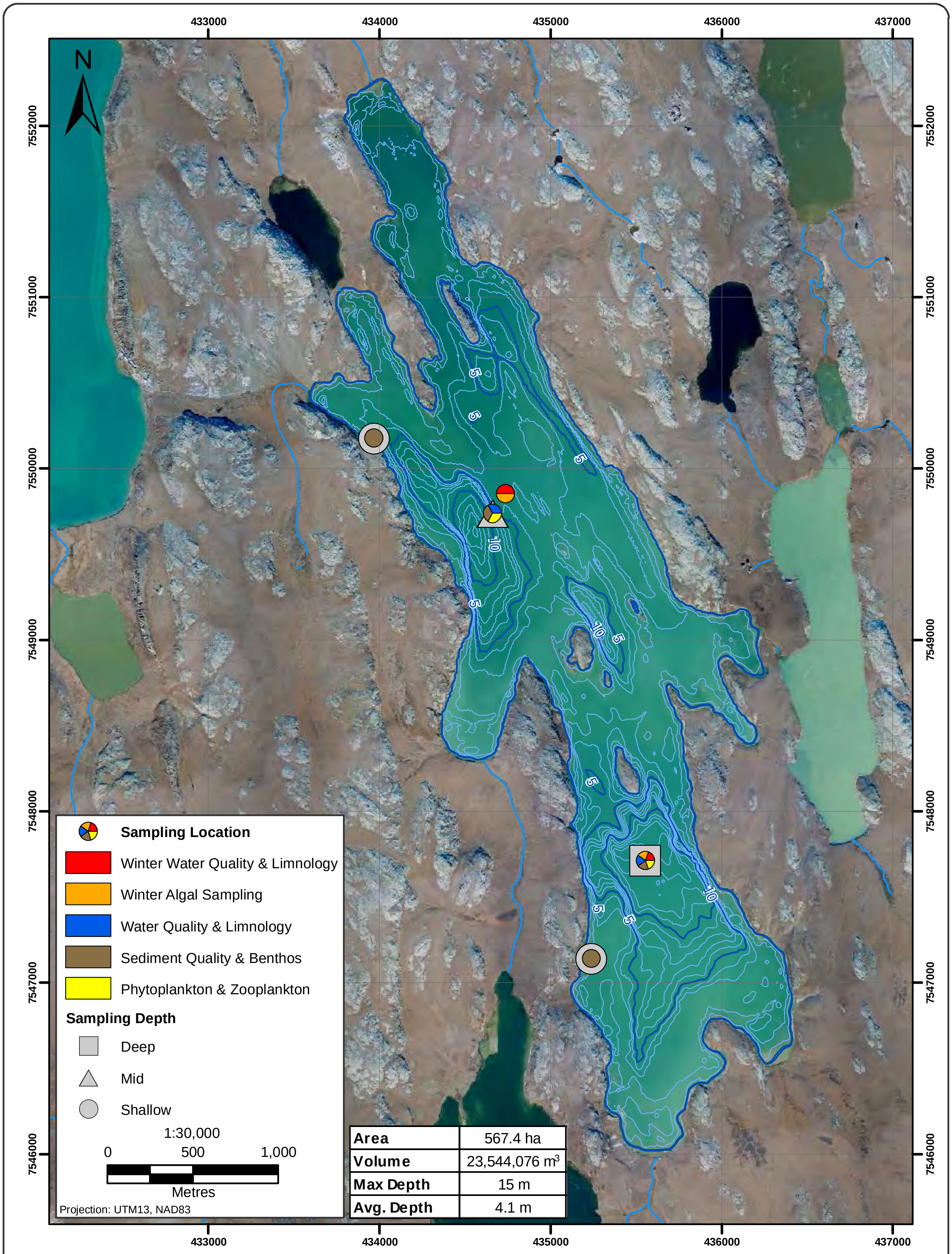
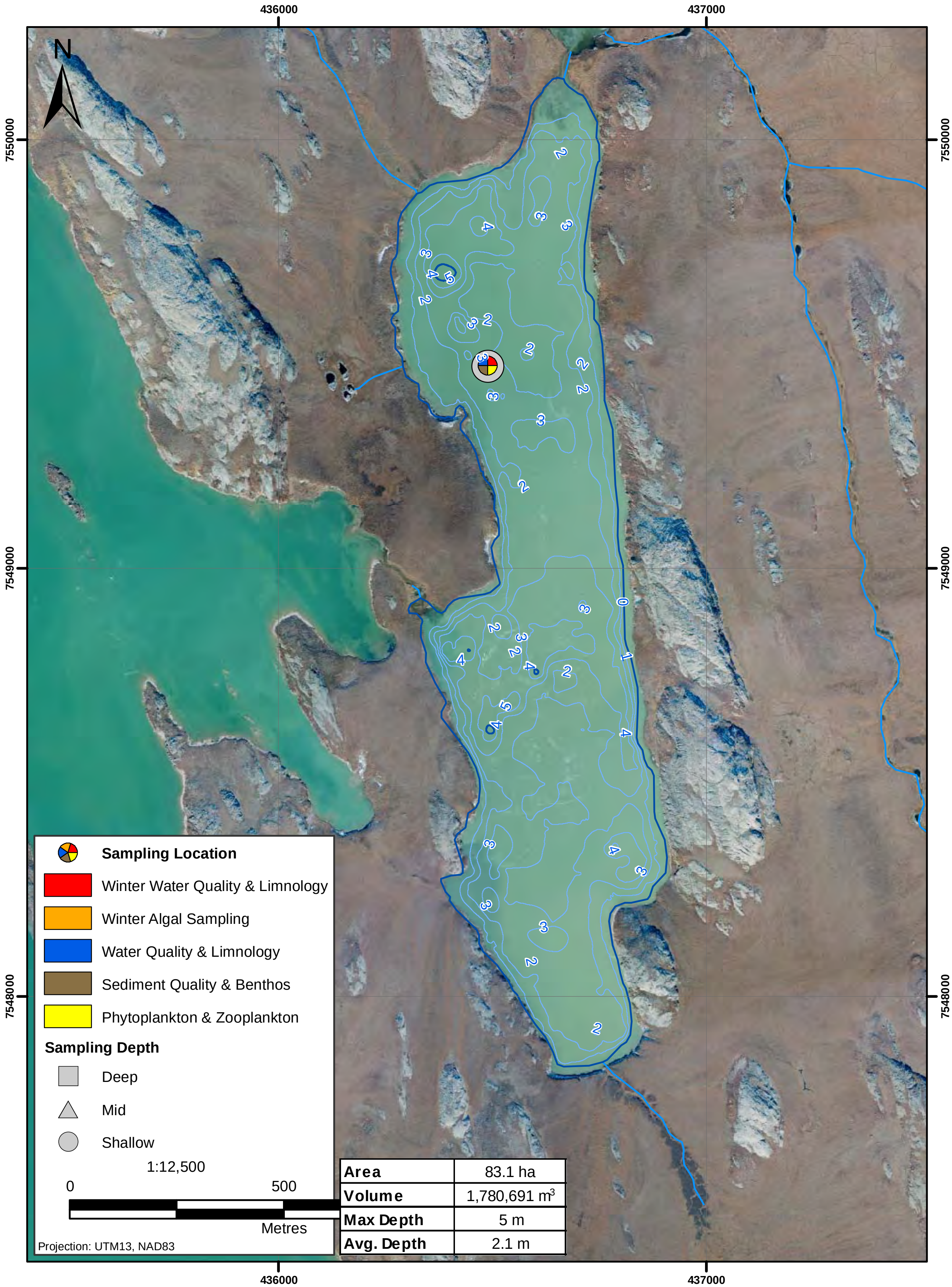


Figure 2.1-2c

NEWMONT
The Gold Company

Environmental Sampling Locations for Patch Lake

Rescan
Engineers & Scientists



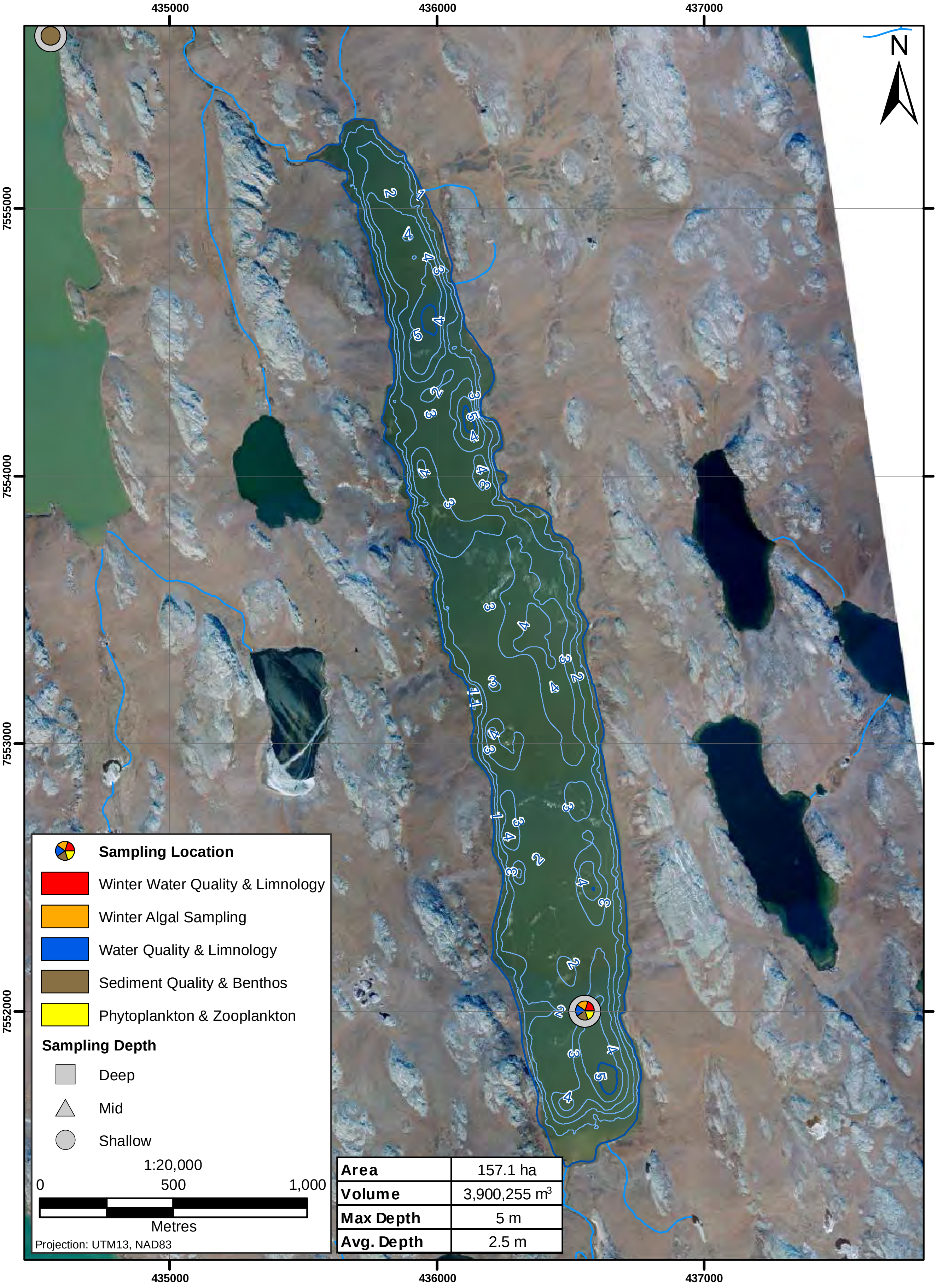
Area	83.1 ha
Volume	1,780,691 m^3
Max Depth	5 m
Avg. Depth	2.1 m

Figure 2.1-2d

Environmental Sampling Locations for P.O. Lake

NEWMONT The Gold Company

Rescan Engineers & Scientists

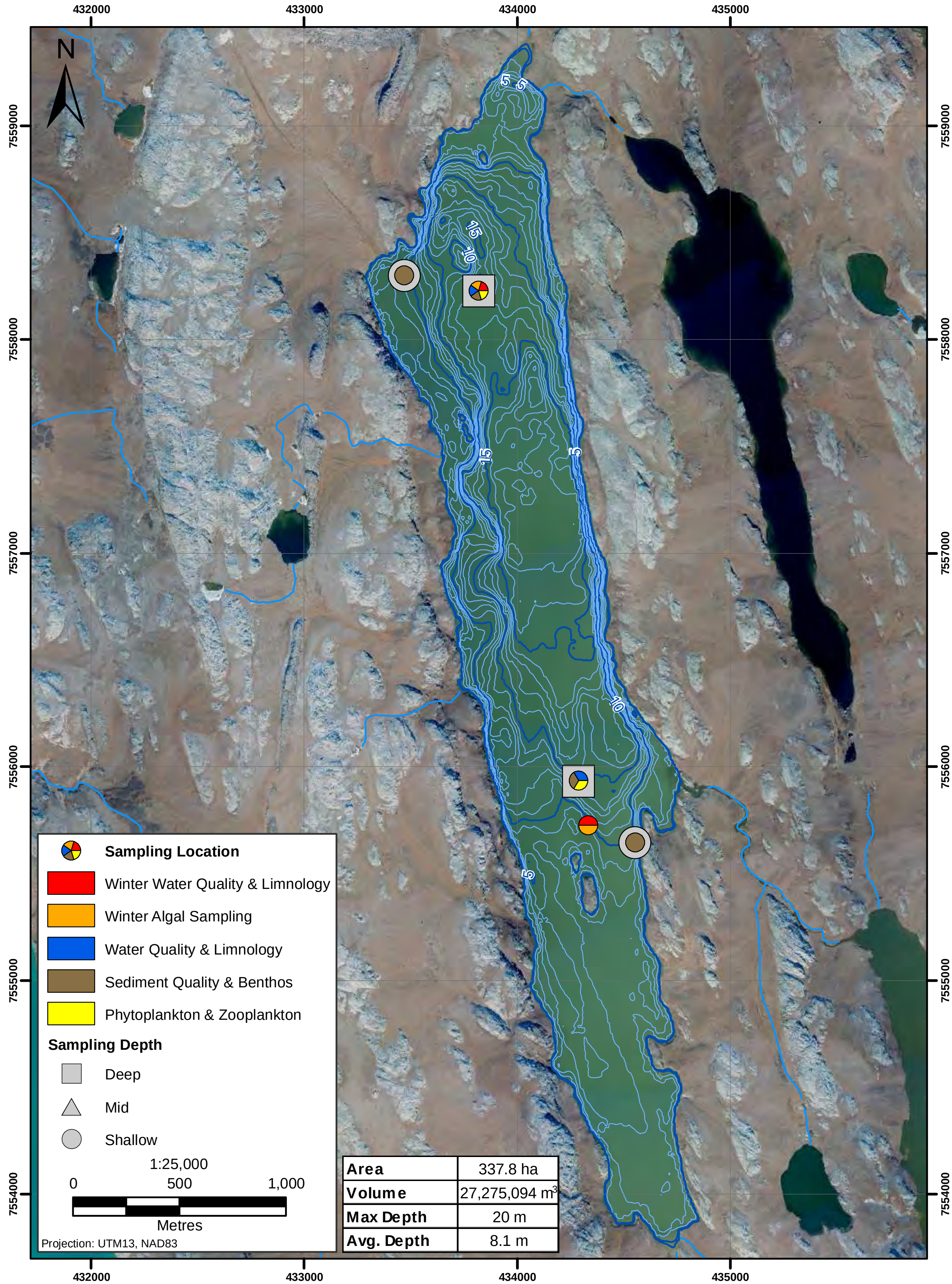


NEWMONT The Gold Company

Figure 2.1-2e

Environmental Sampling Locations for Ogama Lake

Rescan Engineers & Scientists



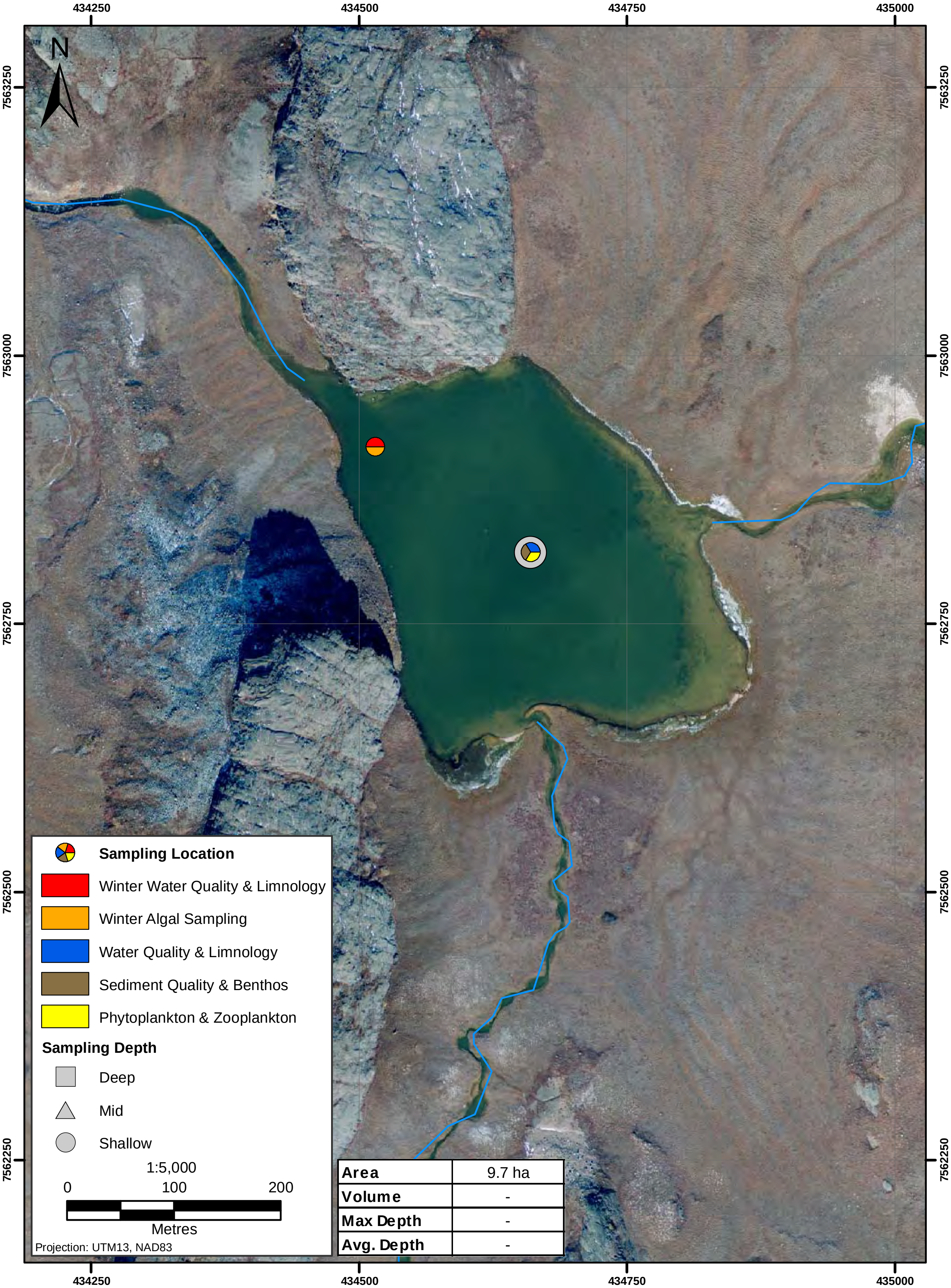
Area	337.8 ha
Volume	27,275,094 m³
Max Depth	20 m
Avg. Depth	8.1 m

Figure 2.1-2f

NEWMONT The Gold Company

Environmental Sampling Locations for Doris Lake

Rescan Engineers & Scientists



Area	9.7 ha
Volume	-
Max Depth	-
Avg. Depth	-

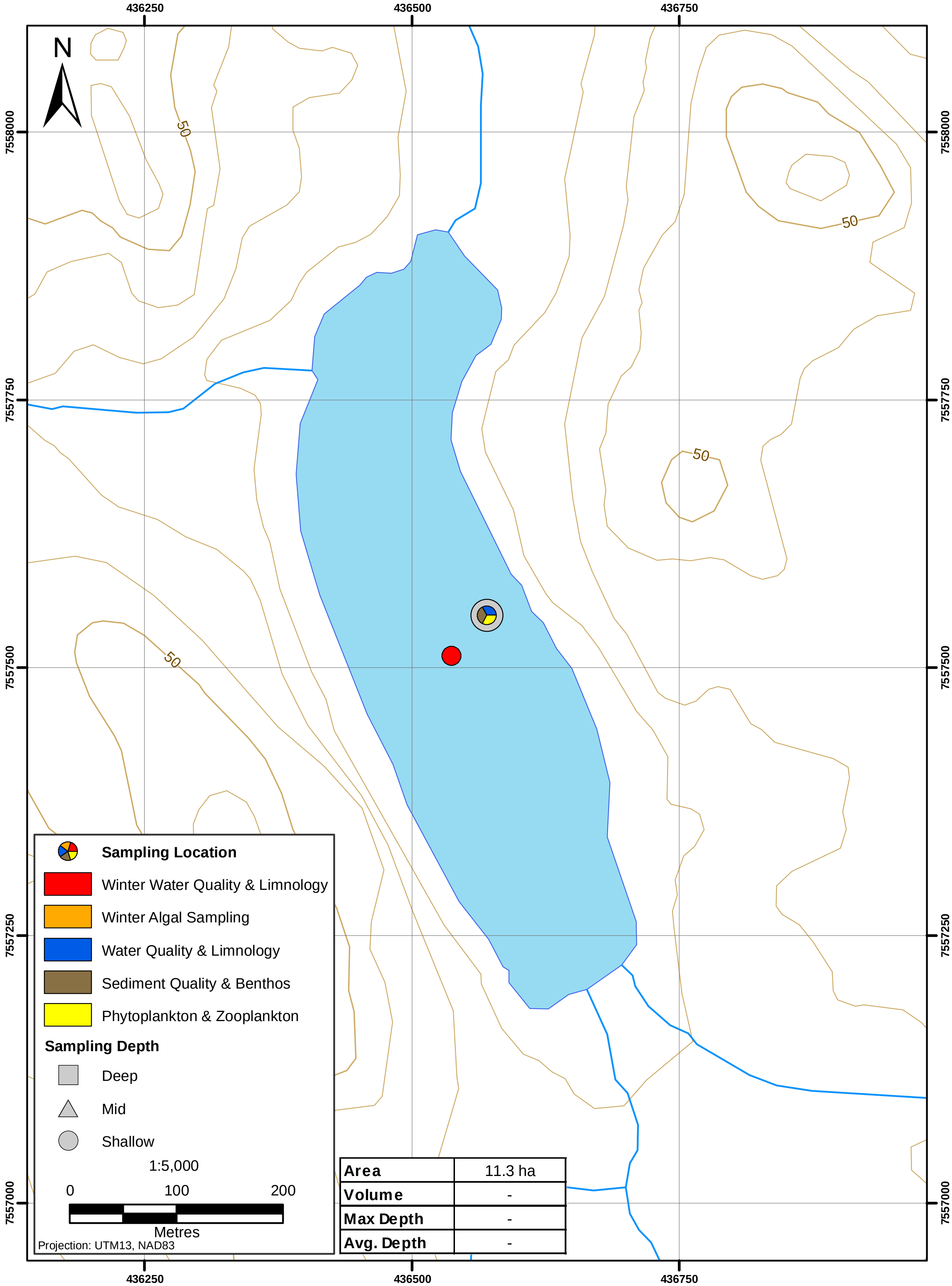
Figure 2.1-2g

NEWMONT The Gold Company

Environmental Sampling Locations for Little Roberts Lake

Rescan Engineers & Scientists

PROJECT # 1009-002-05 GIS # HB-01-009j October 23 2009



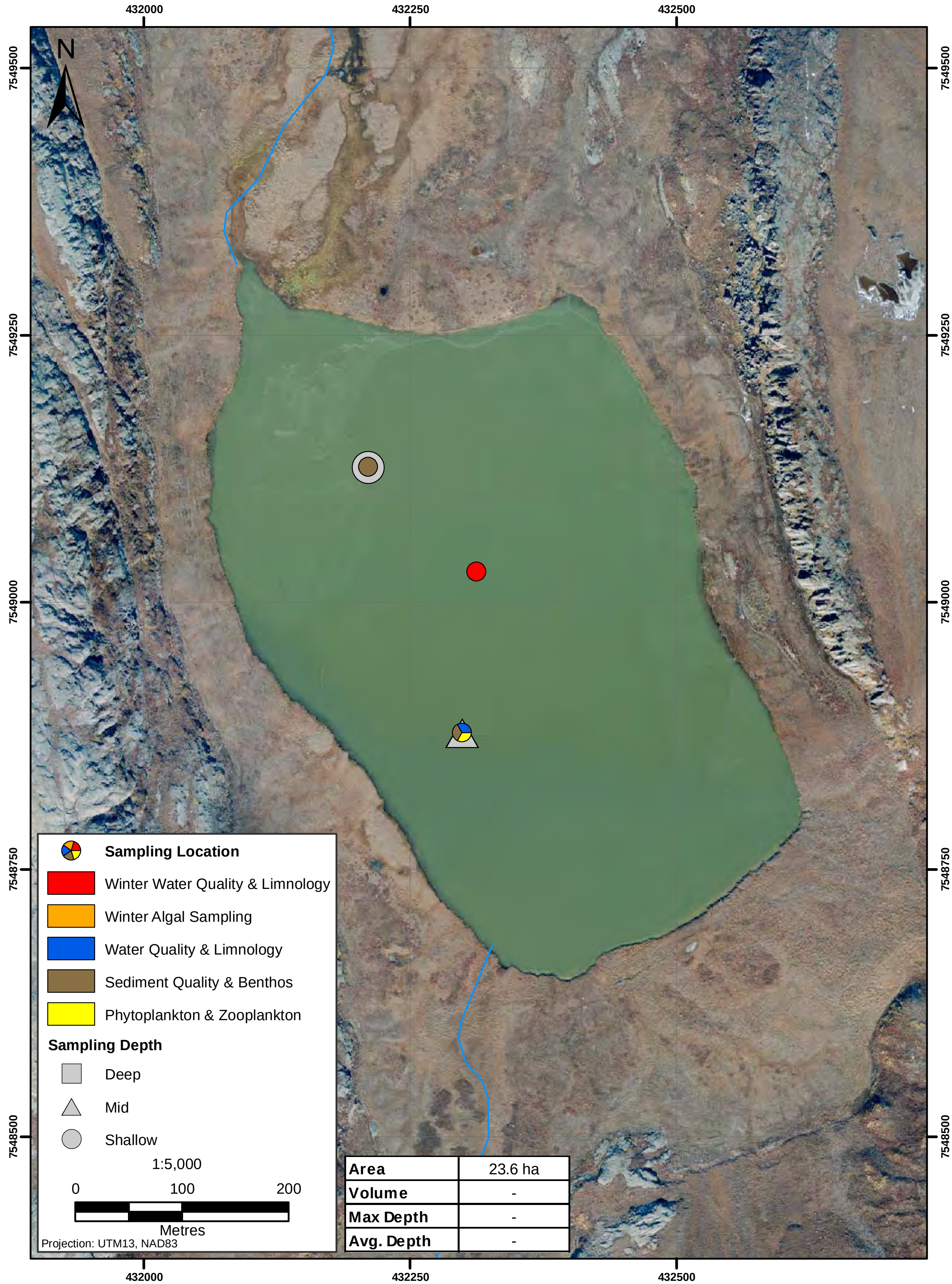
Area	11.3 ha
Volume	-
Max Depth	-
Avg. Depth	-

Figure 2.1-2h

NEWMONT The Gold Company

Environmental Sampling Locations for Naiqunnguut Lake

Rescan Engineers & Scientists



Area	23.6 ha
Volume	-
Max Depth	-
Avg. Depth	-

NEWMONT The Gold Company

Environmental Sampling Locations for Nakhaktok Lake

Figure 2.1-2i

Rescan Engineers & Scientists