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MELIADINE GOLD PROJECT

Aquatics Baseline Synthesis Report

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DRAFT REPORT

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EXECUTIVE SUMMARY

Comaplex Minerals Corporation (Comaplex) proposes to construct and operate a gold mine, known as the Meliadine Gold Project (Project) 30 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut (Figure 1-1). The proposed Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°04'45"N, 92°19'38"W), on Inuit Owned Land.

Watersheds within the study area include Meliadine Lake, several small watersheds on the Peninsula (Basins A through J), and the Meliadine River (including Little Meliadine Lake). Studies were also carried out on Chickenhead Lake in the near-by Atulik drainage as well as in Parallel Lake (north of Meliadine Lake), and in Lake W and Horseshoe Lake which drain into Little Meliadine Lake.

HYDROLOGY

This section of the baseline report was commissioned to characterize the prevailing hydroclimatic and hydrological parameters at the Meliadine Gold Project (Project) Area. The baseline is based on data collected by Golder in 2008 and 2009 (Golder 2008) and reported by previous studies by AGRA Earth and Environmental (AEE 1998a, 1998b, 1999) and AMEC (2000).

This baseline report characterizes hydroclimatic and hydrological parameters relevant to the Project, including the following:

- precipitation based on regional data and compared to site-specific data;
- lake evaporation and evapotranspiration from land surfaces, based on regional and local data;
- hydrological regimes of local waterbodies based on an examination of site-specific and regional data;
- local lake and watercourse ice regimes;
- development of a time series runoff model for the Outlets of Lake A1, Lake B2, Lake B7, and Chickenhead Lake.

Available Site and Regional Data

Local data include snow course surveys, which were undertaken from 1997 to 2000 and reinitiated in 2008 and 2009, to estimate spring runoff volumes. Additional local data include streamflows, water levels, and pan evaporation recorded during the same years in 1997, 1998, 1999, 2000, 2008, and 2009, and lake ice thickness at various locations in 1998, 1999, 2000, and 2009. Reliable data for regional Water Survey of Canada (WSC) hydrometric stations located on the Diana River, the Ferguson River, and the Lorrillard River are also available for periods of 7 years, 10 years and 8 years, respectively.

Regional temperature and precipitation data are available from several stations in Nunavut. The closest long term station is Rankin Inlet A, approximately 30 km south of the Project camp site. Climate data collection at Rankin Inlet A was initiated in 1981, and records are complete from 1981 to 2008, with the exception of 1993. The closest regional evaporation station estimates are from a long-term station operated by Environment Canada at Churchill, Manitoba. Marine ice information is available from the Canadian Ice Database.

Baseline Climate Conditions

Air Temperature

Air temperature at the Project site may fall below 0°C on any day of the year. The monthly mean air temperature is typically above 0°C for the months of June to September, and is below 0°C between October and May. July has been the warmest month and January has been the coldest month. The mean annual temperature for the period of record of 1981 to 2009 was -10.4°C.

Precipitation

Mean annual precipitation at the Project site, based on the hydrological year from October 1 to September 30, was estimated to be 411.7 mm after accounting for rainfall and snowfall undercatch. Approximately 51% of precipitation occurs as rain (207.1 mm) and 49% occurs as snow (199.1 mm). The 24-hour extreme rainfall intensity with a 10-year return period was estimated to be 1.9 mm/h, or 45.6 mm total depth. Corresponding values for the 100-year return period are 2.6 mm/h or 62.4 mm total depth.

Evaporation

Mean annual evaporation for small lakes in the Project area is estimated to be 323 mm between June and September.

Evapotranspiration

Evapotranspiration is estimated to range from 34 mm to 38 mm annually.

Snowpack Sublimation

Based on the terrain in the Project area, the mean annual loss of snowpack to sublimation and snow redistribution is estimated to vary between 46 and 52% of the total precipitation between October and May.

Wind Speed and Direction

The recorded prevailling winds are from north and north-northwest. The wind blows from the north and north-northwest direction more than 30% of the time, and the least frequent wind direction is west-southwest, with a frequency of 2.1%. The calm frequency is 2.8% of the time. The mean values for wind speed show that the north-northwest together with north and northwest winds have the highest speeds and tend to be the strongest.

Relative Humidity and Solar Radiation

The mean annual relative humidity at the Project site was estimated to be 85% and is similar to the mean annual relative humidity at Rankin Inlet A (77%).

The mean monthly global solar radiation recorded at the Project site varied from 3.8 MJ/m^2/d in September 2000 to 14.3 MJ/m^2/d in June.

Baseline Hydrological Conditions

Lake Ice Regime

Late-winter ice thickness on freshwater lakes in the Project area have ranged from 1.00 m to about 2.40 m. Ice covers usually develop by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July.

Water Yields

Derived mean annual water yields for Lake A1, Lake B2, Lake B7, and Chickenhead Lake vary from 162 mm (at Lake B7) to 171 mm (at Chickenhead Lake). These are similar to the long-term mean annual value of 194 mm at Diana River near Rankin Inlet.

Extreme Discharges

Flood peaks and low flow discharges of various durations and frequencies were derived for outflows of Lake A1, Lake B2, Lake B7 and Chickenhead Lake, and vary with watershed size, lake ouflow geometry, and upstream flow attenuation.

Conclusions

This ongoing climate and surface water hydrologic baseline provides a strong basis for environmental impact assessment and water management planning for the Project. The climate and hydrology characteristics described for the Project are based on long-term regional information as well as site-specific data that have been collected since 1997. The available data confirm that the Project fits within the established regional context of precipitation and runoff.

WATER AND SEDIMENT QUALITY

Streams of the study area are generally well-oxygenated freshwater streams characterized by low ionic strength, very soft to soft water hardness, low alkalinity, and neutral to alkaline pH. Major ions in stream waters were bicarbonate, calcium, chloride, and sodium. Measured nutrient concentrations were typical of oligotrophic waterbodies in subarctic regions. Baseline water quality parameters were less than Canadian Water Quality Guidelines (CWQG) for the protection of freshwater aquatic life (Canadian Council of Ministers of the Environment [CCME] 2007) and Guidelines for Canadian Drinking Water Quality (GCDWQ; Health 2008) with the exception of some parameters (i.e., nitrite, cadmium, chromium, lead, iron, manganese, selenium, silver, and phenol).

Most lakes of the study area are generally well-oxygenated freshwater lakes during open water conditions. Lakes were not thermally stratified during the open-water sampling events. Dissolved oxygen concentrations were low in the Peninsula lakes during under ice conditions, which likely limited their use by overwintering fish. In contrast, dissolved oxygen concentrations were higher during the winter in larger lakes such as Meliadine Lake, Little Meliadine Lake, and Peter Lake.

Lakes were generally characterized by low ionic strength, very soft to soft water hardness, low alkalinity, and neutral pH. Major ions in lakes waters were bicarbonate, calcium, chloride, sodium, and sulphate. Concentrations were higher under ice conditions, likely as a result of ice formation, which concentrated the ions in the remaining water column. The range of total alkalinity values during open water conditions indicated that the lake waters had low to moderate sensitivity to acid. Measured nutrient concentrations were typical of oligotrophic waterbodies in subarctic regions. Baseline water quality parameters were less than CWQG and GCDWQ with the exception of some parameters (i.e., dissolved oxygen, pH, cyanide, arsenic, cadmium, chromium, copper, lead, iron, manganese, zinc, and phenol).

Ponds A9, A13, A15, A38, A54, A56, and A57 in Basin A were markedly different from other lakes in the study area. These ponds were characterized by higher ionic strength, hard to very hard water, low alkalinity, and alkaline pH. Major ions are the same as in the lakes, but concentrations are higher. Concentrations of phosphorus, total metals, and organic compounds were similar to those in other lakes. However, there were more exceedances of CWQGs and GCDWQs for total dissolved solids, chloride, nitrate, nitrite, and phenol than in other lakes. Dissolved metal concentrations, particularly of iron and manganese, were also higher in these ponds.

Lake sediments in the study area consisted primarily of the sandy or silty fraction with a wide range of moisture contents. Concentrations of total organic carbon (TOC) were also variable across sites. Arsenic, chromium, and copper concentrations frequently exceeded Interim Sediment Quality Guidelines (ISQGs; CCME 2002). Arsenic concentrations occasionally exceeded the associated Probable Effect Level (PEL; CCME 2002). Concentrations of individual polycyclic aromatic hydrocarbons (PAHs) were either less than detection limits or less than corresponding ISQGs with the exception of one sediment sample (from Lake A8) that had a naphthalene concentration that was higher than the ISQG. Total volatile and total extractable hydrocarbons were detected in most samples. Chlorinated pesticides were analyzed in stations located in the east, south, and west basins of Meliadine Lake. Detectable concentrations of pp-dichlorodiphenyltrichloroethane (pp-DDT), pp-dichlorodiphenyldichloroethane (pp-DDD), pp-dichlorodiphenyldichloroethylene (pp-DDE), and quintozine were recorded in the east basin, whereas traces of Aroclor 1254 were found in the west basin sediments.

AQUATIC HABITAT

Ground and aerial surveys were conducted at numerous streams within the Peninsula basins to assess habitat suitability for fish use with special reference to fish movements and spawning and/or rearing potential. Habitat for fish was dominated by shallow runs; other habitat types encountered included riffles, pools and riffle/boulder garden combinations. High quality habitats occurred in pools and deeper run habitats that were present mainly in larger streams connecting the primary chains of lakes in each Peninsula basin. Coarse substrates and abundant instream cover in these larger streams provided suitable habitat for Arctic Grayling spawning and rearing.

Numerous ponds were also investigated to assess habitat suitability for fish. Ponds were predominantly shallow with substrates dominated by fines, and contained poor to moderate fish habitat. Where fish were present, Ninespine Stickleback was the dominant species. Some fishless ponds contained moderate to high habitat quality. In contrast, habitat quality was rated low to moderate in many of the ponds where fish presence was confirmed. Regardless of the habitat potential ratings, ponds in close proximity to fish-bearing waterbodies (e.g., Meliadine Lake) had a higher likelihood to support small-bodied fish. This suggested that fish presence was more closely related to connectivity and proximity to fish-bearing waterbodies than to the quality of habitat encountered.

Lake bathymetric surveys were carried out in the east and south basins Meliadine Lake, in 13 Peninsula lakes and ponds and in Chickenhead Lake. The east basin of Meliadine Lake (2212 ha) contributes approximately 21% to the entire area of the lake. It is separated from the rest of the lake by a shallow and narrow constriction that may result in separation of the east basin from the rest of the lake during winter. Owing to the high shoreline development index and the shallow nature of the lake, the littoral zones (i.e., less than 6 m in depth) contribute approximately 66% to the lake's area. The mean depth of the east basin was estimated at 4.5 m. The south basin of Meliadine Lake (1135 ha) contributes 11% to the entire area of the lake and has a maximum depth of 22 m. The littoral zones account for approximately 72% of the lake's area. The mean depth of the south basin was estimated at 4.3 m.

The surveyed Peninsula lakes and ponds ranged from 0.4 ha (Pond B10) to 89.7 ha (Lake A8) in surface area. Only 4 lakes had depths of 4 m or greater; the deepest spot was recorded in Lake B7 (5.1 m). As most of lakes' volume is contributed by the surface 2 m layer of water, which becomes ice in winter, some of the shallower lakes (e.g., B4, J1 and D1) may freeze to the bottom. The deep water zones in lakes B7, B6, A6, A8, B2, and B5 appear to be sufficient to allow fish to overwinter.

LOWER TROPHIC LEVELS

Periphyton

Periphyton communities in streams were dominated by Cyanophyta (cyanobacteria), with both Bacillariophyta (diatoms) and Chlorophyta (green algae) common at most sites. Chlorophyll *a* concentrations in the smaller streams (Basins A, B, D) were higher than Meliadine Lake outflows and the Lower Meliadine River. Higher productivity at these small sites could be due to warmer temperatures and high nutrient inputs coming from the lakes, resulting from larger surface area to volume ratios. Conversely, ash-free dry mass (AFDM) was higher at the larger outflows/rivers than in the smaller streams, indicating that the organic content of the periphyton was higher in the outflows/rivers. This may be reflecting the large, deeper water habitats (i.e., more stable flows throughout the year) that receive less light penetration. Variability among sites and between years was high, with no consistent trend.

Periphyton communities in lakes were also dominated by Cyanophyta, with both Bacillariophyta and Chlorophyta common at most sites. The chlorophyll *a* and AFDM concentrations were low, indicating oligotrophic conditions. The majority of sites had chlorophyll *a* concentrations below 4 $\mu g/cm^2$ and AFDM concentrations below 50 $\mu g/cm^2$. Both chlorophyll *a* and AFDM concentrations were higher in the Peninsula lakes than in the large lakes. Greater productivity in these small sites could be due to warmer temperatures, high nutrient input and high light penetration. The scouring effects of larger waves that would be expected in Meliadine Lake proper would limit periphyton production.

Phytoplankton

Chlorophyll *a* concentrations in all lakes were below 3.1 mg/m^3, indicative of oligotrophic conditions. In general, the phytoplankton community biomass of each site was dominated by Chrysophyta (golden-brown algae). Chlorophyta (green algae), Pyrrophyta (dinoflagellates) and Bacillariophyta (diatoms) were also abundant at most sites. Cyanophyta (cyanobacteria) did not have a high biomass at any site, but were numerically abundant.

The smaller Peninsula lakes typically had higher phytoplankton biomass, chlorophyll *a* and taxonomic richness compared to the larger lakes (i.e. Meliadine, Peter and Little Meliadine lakes). Smaller lakes may be more productive due warmer temperatures and higher nutrient inputs, which may occur due to their larger surface area to volume ratios.

Additionally, phytoplankton biomass, chlorophyll *a* and taxonomic richness tended to be highest in 1998 suggesting that regional processes such as weather may have been more favourable to phytoplankton growth in 1998. Seasonal and interannual variation tended to be low at some sites, and high at others, with no consistent trends. The phytoplankton communities of the sampled waterbodies in the Study Area were similar in many respects to the communities of many other lakes in the Arctic and sub-Arctic.

Zooplankton

Zooplankton biomass was relatively consistent among the larger lakes (i.e., Meliadine, Peter and Little Meliadine lakes) but was highly variable among the smaller Peninsula lakes. Sites B2 and B7 had particularly high zooplankton biomass during the summer. The factors responsible for the high biomass are not known, but may include an abundance of food (phytoplankton) or reduced grazing pressure from fish. *Holopedium gibberum* (a particularly large cladoceran that possesses a large gelatinous sheath which may limit predation from fish) was the dominant species at most sites (including B2 and B7). Zooplankton community biomass was typically highest in early summer, coinciding with warm temperatures and high phytoplankton biomass The zooplankton communities included no uncommon or rare species, and were similar in many respects to the communities of many other small lakes in the Arctic and sub-Arctic region.

Benthic Macroinvertebrates

Benthic invertebrate densities at the majority of streams ranged from 10 000 to 30 000 individuals/m^2. Chironomidae (midges), Coelenterata (hydroids) and Oligochaeta (aquatic earthworms) were generally the most dominant taxa. Nematoda (roundworms), Hydracarina (aquatic mites) and Ostracoda (seed shrimp) were also common. Orthocladiinae was the most dominant Chironomid taxon in every stream sampled in the Study Area. Chironomini, Diamesinae, Tanypodinae and Tanytarsini were also present at most sites.

Taxonomic richness values at the Meladine Lake outflows and the Lower Meladine River were much lower than at the Peninsula streams (11 to 16 taxa/site, identified at the family level versus 16 to 22 taxa/site, respectively). Given the relatively high SDI values for both groups of streams, this indicates that most streams have moderate to high diversity with few taxa that are overly dominant.

The benthic macroinvertebrate communities in the streams of the Meliadine Study Area were representative of subarctic systems. The species composition and low densities reported by the present study and by other investigations are indicative of oligotrophic systems (i.e., low productivity and short growing seasons). The densities reported in the present study, however, indicate greater productivity than the streams of central mainland sub-Arctic.

Benthic invertebrate densities at the majority of lakes in the Study Area ranged from 10 000 to 90 000 individuals/m^2, with Peninsula lake densities much greater than those in large lakes. Benthic invertebrate communities in lakes varied, and there were no consistently dominant taxa. Chironomidae, Nematoda, Ostracoda, and Copepoda were common at most sites. The most dominant chironomid taxon was Tanytarsini, followed by Chironomini and Diamesine. Other chironomids included Prodiamesinae, Orthocladiinae and Tanypodinae.

Taxonomic richness was similar between the Peninsula and large lakes with 6 to 10 taxa/site (identified at the family level). The benthic macroinvertebrate communities in the lakes of the Meliadine Study Area were representative of sub-Arctic systems; however, the densities reported by the present study indicate greater productivity in the Study Area than in lakes located in central mainland sub-Arctic.

FISH POPULATIONS

Species Composition and Relative Abundance

Substantial fishing effort (over 800 sampling events) was applied between 1997 and 2009 during investigations of fish communities in the Meliadine Study Area. Field biologists used angling, backpack electrofishing, fyke nets, gill nets, minnow traps, and a fish fence to sample fish communities in 155 waterbodies, most of which (*n*=140) comprised small lakes, ponds and interconnecting streams in the Peninsula basins These sampling efforts resulted in the capture of 19 722 fish. The overall catch was comprised of 9 species, 5 of which are members of the Salmonidae family. Threespine Stickleback were most prevalent (33% of total catch) followed by Arctic Char (20%), Ninespine Stickleback (16%), Cisco (14%), Arctic Grayling (10%) and Lake Trout (4%). Round Whitefish, Slimy Sculpin, and Burbot comprised only a small portion of the catch. The large contribution of Arctic Char to the total catch resulted from a fish fence program in the lower Meliadine River during the annual fall migration of this species from Hudson Bay into freshwater systems. Similarly, the predominance of Threespine Stickleback reflected their abundance in near-shore areas of Meliadine Lake and susceptibility to capture.

The total catch in Meliadine Lake (9984 fish) was dominated by Threespine Stickleback (62%) and Cisco (25%); Arctic Char and Lake Trout were also common (5% each). Lake Trout were represented by all size classes, whereas only juvenile Arctic Char were captured during summer. Adult Arctic Char use the lake mainly in late fall (during spawning) and in winter. Arctic Grayling (2%) and Round Whitefish (1%) were mainly represented by adults. The predominance of Threespine Stickleback in the catch was due to the high numbers of this species caught by fyke nets set in the near-shore areas. It is noteworthy that Ninespine Stickleback were absent from the catch, despite the abundance of this species in adjacent streams, lakes and ponds of the Peninsula basins

The total catch in Peninsula Basins (5485 fish) was dominated by Ninespine Stickleback (56%) and Arctic Grayling (25%) but also included all other species present in the study area. Ninespine Stickleback appeared to prefer the Peninsula waterbodies (especially shallow ponds and the smaller streams) over the open lake environment of Meliadine Lake. Arctic Grayling use the Peninsula streams extensively for spawning and rearing, and appear to overwinter in some of the deeper Peninsula lakes. The size of the Arctic Grayling population in Lake B7 was estimated at 1345 fish. Cisco were also common in the larger Peninsula lakes where they are likely year-round residents. Arctic Char and Lake Trout and were also captured; however, they tended to use only the lowermost sections of the basins in close proximity to Meliadine Lake and were not encountered in the upper Peninsula lakes (e.g., B7, A6). Although absent from Meliadine Lake catches in the summer, adult Arctic Char were encountered in the Peninsula lakes, but only in Lakes D1 and D7.

The total catch in Little Meliadine Lake (208 fish) was dominated by Round Whitefish (44%), followed by Lake Trout (25%), Arctic Char (13%), Cisco (10%), and Arctic Grayling (9%). The Meliadine River downstream of Little Meliadine Lake is used as a corridor for Arctic Char migrations to and from the sea. The fish fence catch (n=3761) near the estuary during late summer and fall was dominated by Arctic Char (86%), with Arctic Grayling, Round Whitefish, Lake Trout and Cisco also recorded.

Life History

Life history data were collected for 11 083 fish, including Arctic Char (n=3879), Arctic Grayling (n=1938) and Lake Trout (n=706). Analyses of length-frequency distribution, length-weight relationships, length-at-age, and diet were performed for each basin to facilitate comparisons among watersheds. The results are briefly described, for the main species, in the following sections.

Arctic Char ranged from 61 to 777 mm in fork length. Age classes between 1 and 10 years were represented in the aged sample. The fastest rate of growth (approximately 120 mm per year) occurred between ages 5 and 6 and likely corresponds to the time that smolts make their first migration to sea. The size of the Arctic Char captured by the fish fence in Meliadine River indicated significant differences between the early, middle, and late stages of the run; large fish returned from the sea earlier than the smaller fish and the final phases of the run were dominated by the first-year sea migrants.

Lake Trout ranged from 43 to 965 mm in fork length. Age classes between 1 and 30 years were represented. Approximately half of 143 Lake Trout stomachs examined contained no food items. Lake Trout diet consisted primarily of fish (71% of the total food volume) with invertebrates (primarily amphipods) accounting for the remainder.

Arctic Grayling ranged from 20 to 435 mm in fork length. Age classes between 0 and 11 years were represented. Growth increments during the first 5 years of life averaged approximately 50 mm in length per year; the older fish grew considerably slower (about 20 mm per year). In contrast to the other species examined most (84%) of Arctic Grayling stomachs contained food. The diet consisted mainly of invertebrates (87% of the total food volume), with Ninespine Stickleback accounting for the remainder.

Fish Movements

During the 1997 to 2008 studies, 3460 fish in the study area were marked with Floy tags. The majority (76%) were Arctic Char, followed by Arctic Grayling (11%), Lake Trout (6%), Round Whitefish (5%), Cisco (29%), and Burbot (0.1%). Subsequent fishing effort by the study team and tags returned by local fishermen resulted in 1740 tag recapture events. These recapture events involved 1380 fish (40% of all fish tagged), of which 1081 fish were recaptured once and 299 fish were recaptured multiple times during the course of the study. Most of the recapture events (n=1004) were based on tag returns by local fishermen during subsistence fishing in Little Meliadine Lake and several areas of Hudson Bay.

A total of 2633 Arctic Char were marked with Floy tags. Almost half (49.9%) of the marked fish were recaptured at least once. The results indicated that a substantial portion of the population (998 fish or 37.9% of the marked total) had been harvested by the local fishermen. Most of the harvested fish were captured in the immediate vicinity of Rankin Inlet: Prairie Bay (*n*=242), lower Meliadine River (*n*=81), and Little Meliadine Lake (*n*=548). Other freshwater harvest locations included Meliadine Lake (*n*=13), upper Meliadine River (*n*=7), and Diana River system (*n*=11). Marine harvest locations outside of Prairie Bay (*n*=45) were widespread and ranged between Chesterfield Inlet to the north and Corbett Inlet to the south of Rankin Inlet.

The radio telemetry program was implemented in two phases during the study. The first phase was carried out in 1997 to 1999 and involved tracking of 68 fish (Arctic Char, Lake Trout and Arctic Grayling) implanted with radio transmitters. The second phase was carried out in 2000 and 2001 and focused on implanting radio transmitters in 12 pre-spawning Arctic Char and tracking their movements in an attempt to determine their spawning and overwintering habitats.

Radio tracking of Arctic Char demonstrated movements between Hudson Bay and Meliadine Lake, with many fish overwintering in Little Meliadine Lake. Pre-spawning fish implanted with radio transmitters in the west basin of Meliadine Lake in September 2000 demonstrated extensive movements and rapid dispersal of the implanted fish, suggesting that Arctic Char spawning may occur in several areas widely distributed throughout Meliadine Lake, but appeared to be focussed on the north shores of the west and central basins. Subsequent tracking in April 2001 revealed that all fish were within 9 km of their early winter locations, suggesting limited movements during winter. In contrast, at least half of the implanted fish left Meliadine Lake in June 2001 to undergo migrations to Hudson Bay. Some selected the seaward route through the south outlet of Meliadine Lake (Meliadine River), whereas others migrated downstream through the west outlet of Meliadine Lake into Peter Lake and the Diana River system, suggesting that both outlets of Meliadine Lake are equally important as migration corridors for post-spawning fish during their spring return to the sea.

Most (9 of 13) radio tagged Lake Trout moved less than 15 km during the 1997 to 1999 tracking program and remained within 9 km of their release locations. Nevertheless, they demonstrated movements between Lake D1 and the upper Meliadine River and between east and central basins of Meliadine Lake. The remaining 4 Lake Trout exhibited more extensive movements, with 2 individuals moving a total distance of 17 and 20 km throughout the east basin of Meliadine Lake and 2 others moving between the east basin and west basins of Meliadine Lake for a total distance of 41 and 45 km.

Most (14 of 19) Arctic Grayling radio tagged in 1997 exhibited limited movements and remained within the respective Peninsula lakes where they had been released. One individual tagged in Lake A6 moved to Lake A1 and back in June 1998, likely in relation to spawning activities. The 5 remaining Arctic Grayling tagged in 1997 had moved out of their release lakes (D1, D7, and B2) into the south basin of Meliadine Lake by July 1997. Three of these fish stayed in the south basin of Meliadine Lake throughout the 1997 to 1998 tracking program, while two fish exhibited extensive movements of about 40 km each, visiting other Peninsula lakes (B4, B2, K2) and the west basin of Meliadine Lake. Four Arctic Grayling radio tagged in August 1998 in Lake B5 remained within the same lake over the winter and throughout the open water period in 1999, suggesting that the upper Peninsula lakes are used by resident populations year-round.

Metal Analysis of Fish Tissues

Analyses of muscle, liver, and kidney tissues collected from Arctic Char, Lake Trout, Round Whitefish, Cisco and Arctic Grayling indicated generally low levels of metal accumulation. Concentrations of aluminium, arsenic, lead, mercury, and zinc in Lake Trout tissues were higher in Meliadine Lake than in Parallel Lake, which was selected as a control basin for long term monitoring. Mercury concentrations in Lake Trout tissues were strongly correlated with fish size. A small proportion (3 of 30) of Lake Trout muscle tissue samples from Meliadine Lake exceeded the food consumption guideline of 2.5 µg/g (dry weight). Round Whitefish tissues indicated similar concentrations between Meliadine and Parallel lakes. In contrast to Lake Trout, mercury concentrations in Round Whitefish were weakly correlated with fish size and none of the muscle tissue samples exceeded the food consumption guidelines. Analytical results for Cisco and Arctic Grayling also documented low metal concentrations in the tissue samples collected from these species.

STREAM CROSSING ASSESSMENTS

Watercourses investigated along the proposed road corridors were diverse with respect to habitat potential for fish. Aquatic habitat at crossings along both road corridors was highly variable, with some streams supporting spawning and rearing, whereas others were dry or contained poor fish habitat. Habitat quality was poor to moderate at most sites with the Meliadine River crossing having the greatest potential to support multiple life stages of fish. Fish were captured or observed at 10 of 14 sites assessed; Arctic Grayling were registered at 4 sites, Ninespine Stickleback at 10 sites, and Slimy Sculpin at 1 site.

Within the Meliadine West road corridor, Site M2.1 (Meliadine River) was of particular importance. The presence of deep run and pool areas indicated high quality habitat for various life-stages of fish species known to inhabit the river. Other noteworthy watercourses within the Meliadine West road corridor include Site M23.7, where Slimy Sculpin were captured, and habitat quality for rearing and migration were rated as moderate to high. Sites M5.0, M11.5, and M22.6 also featured suitable rearing habitat for Arctic Grayling. Although not confirmed by egg sampling, Sites M5.0 and M11.5 are likely used by Arctic Grayling for spawning based on the availability of suitable habitat and/or the presence of Arctic Grayling juveniles in the catch. In contrast, Sites M3.0, M3.9, M6.7, M8.6, and M13.3 had relatively poor fish habitat potential, as evidenced by a lack of fish captures and only 12 observed fish (Ninespine Stickleback) at Sites M3.0 and M13.3. Shallow depths, dry channels (e.g., Site M6.7), poor spawning substrates (detritus), and a lack of instream cover contributed to poor habitat ratings.

Within the Discovery road corridor, Site D5.8 provided high quality spawning and rearing habitat for Arctic Grayling, as evidenced by captures of juvenile fish and collection of Arctic Grayling eggs In contrast, Sites D1.2 and D6.7 featured poor quality fish habitat because of shallow depths and an absence of well defined channels.

LIST OF ACRONYMS

AAS	Atomic absorption spectrophotometry
AB	Alberta
ADCP	Acoustic doppler current profiler – Workhorse Rio Grande
AEE	AGRA Earth and Environmental Ltd.
AFDM	Ash-free dry mass
AMEC	AMEC Earth and Environmental Ltd.
APHA	American Public Health Association
ANOVA	Analysis of variance
BC	British Columbia
BHC	Benzene hexachloride
BTEX	Benzene, toluene, ethylbenzene, xylene
CCME	Canadian Council of Ministers of the Environment
CCREM	Canadian Council of Resource and Environment Ministers
CID	Canadian Ice Database
CVAFS	Cold vapour atomic fluorescence spectrophotometry
CWQG	Canadian Water Quality Guidelines
Comaplex	Comaplex Minerals Corporation
CPUE	Catch-per-unit-effort
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
df	Degrees of freedom
DOC	Dissolved organic carbon
E	East
EIFAC	European Inland Fisheries Advisory Commission
ET	Evapotranspiration
ISQG	Interim Sediment Quality Guideline
GCWQG	Guidelines for Canadian Drinking Water Quality
GC-FID	Gas chromatography with flame ionization detection
GC-MS	Gas chromatography mass spectrophotometry
GD	Granger and Gray (GD Relationship)
Golder	Golder Associates Ltd.
GPS	Global positioning system
ICP-AES	Inductively coupled argon plasma/atomic emission spectrophotometry
ICP-MS	Inductively coupled plasma mass spectrophotometry
IDF	Intensity-duration-frequency
MFL	Minimum Fork Length
MSC	Meteorological Services of Canada

N	North
NT	Northwest Territories
N/A	Not applicable
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PEL	Probable effect level
Project	Meliadine Gold Project
Q	Discharge
QA	Quality assurance
QC	Quality control
QA/QC	Quality assurance/quality control
R	Rainfall
RL&L	R.L.&L. Environmental Services Ltd.
S	South
SD	Standard deviation
SDI	Simpson diversity index
SWE	Snow water equivalent
SWI	Specific work instructions
TDS	Total dissolved solids
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TSS	Total suspended solids
US EPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
W	West
WL	Water level
Wr	Relative weight
WSC	Water Survey of Canada

UNITS

°	Degree
°C	Degrees Celsius
°C•d	Degree-day
%	Percent
>	Greater than
≥	Greater than or equal to
<	Less than
≤	Less than or equal to
CFU/100 mL	Colony forming unit per one hundred millilitres

cm	Centimetre
g	Gram
g/cm^3	Grams per cubic centimetre
h	Hour
ha	Hectare
km	Kilometre
km^2	Square kilometre
m	Metre
m^2	Square metre
m^3	Cubic metre
m^3/d	Cubic metres per day
m^3/s	Cubic metres per second
mg	Milligram
mg/kg dw	Milligrams per killigram dry weight
mg/L	Milligrams per litre
mg $CaCO_3/L$	Milligrams per litre as calcium carbonate
mg N/L	Milligrams per litre as nitrogen
min	Minute
µg	Microgram
µg/L	Micrograms per litre
mL	Millilitre
mm	Millimetre
$MJ/m^2/d$	Megajoules per square metre per day
NTU	Nephelometric turbidity unit
pH	Measure of the acidity or basicity of a solution
s	Second
µm	Micrometre
µS/cm	MicroSiemens per centimetre

GLOSSARY

Alkalinity	A measurement (expressed in milligrams per litre of calcium carbonate) of the capacity of water to neutralize acids. The concentration is measured based on the presence of naturally available bicarbonate, carbonate, and hydroxide ions.
Ammonia-nitrogen	The overall concentration of nitrogen in both the ionized (NH_4^+) and molecular (NH_3) forms of dissolved ammonia. The ammonia concentration is reported as nitrogen, where the weight of the nitrogen is ignored in the analysis.
Anoxia	The complete depletion of dissolved oxygen (DO) in the aquatic environment.
Baseline	A surveyed or predicted condition that serves as a reference point on which later surveys are coordinated or correlated.
Bathymetry	The measurement of underwater depth.
Bioaccumulation	The accumulation of a chemical substance in an organism such that the amount in the organism is greater than the amount lost. Bioconcentration refers to uptake from water, whereas bioaccumulation refers to uptake from both water and food.
Bioavailable	Available for uptake by an aquatic organism
Biochemical oxygen demand	A measurement of the relative oxygen requirement of a water sample.
Buffering capacity	The capacity of water to receive inputs of acids or bases without changing pH.
Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life	Guidelines established by the Canadian Council of Ministers of the Environment and used to assess the potential effects of the concentration of different water quality parameters upon aquatic life (e.g., fish, aquatic plants, and benthic invertebrates).
Concentration	Quantifiable amount of a chemical in environmental media, such as water or sediment.
Conductivity	A measure of the ability of water to carry an electrical current. This measurement is directly related to the amount of positively and negatively charged ions in the water and can be correlated with the concentration of total dissolved solids (TDS).
Dissolved oxygen	The amount of free oxygen dissolved in water, usually expressed in milligrams per litre (mg/L), parts per million (ppm), or percent of saturation (%). Adequate concentrations of dissolved oxygen are necessary for fish and other aquatic organisms.
Dissolved organic carbon (DOC)	The dissolved portion of organic carbon in water; it is made up of humic substances and partly degraded plant and animal materials.
Duplicate field sample	A second sample collected at the same time and from the same location, repeating the same collection procedure as the original sample. The sample is used to detect variability at a sampling station and to verify the field sampling method.
Duplicate laboratory sample	A field sample that is split into two samples by the laboratory and tested separately. These samples are used to assess the reproducibility of the laboratory results (i.e., laboratory method and analyses).

Ekman grab sampler	Cube-shaped mechanical device with a spring-loaded opening that is lowered to the bottom of a waterbody and triggered to close thereby collecting a sample of the bottom sediment.
Electrofishing	Use of electricity to immobilize and capture fish.
Eutrophic	Trophic state classification for lakes characterized by high productivity and nutrient inputs.
Fecundity	The number of reproductive products that can be produced by an organism; the number of eggs produced annually by a female fish.
Field blank	A sample that is prepared in the field using ultrapure, distilled, or deionized water provided by the laboratory. These samples are treated in the field in the same way as the field samples. They are used to detect sample contamination during the collection, shipping, and analysis of samples.
Floy Tag	Small, pleastic identification tag inserted into the dorsal surface of the fish near the dorsal fin.
Fyke Net	A passive capture device in which a lead net directs fish into a trap through a series of funnels. A fish can readily find its way into the trap through the funnels, but not out of it.
Grab sample	A single sample collected at a particular time and place that represents the composition of the water or sediment only at that time and place.
Groundwater	That part of the subsurface water that occurs beneath the water table, in soils and geologic formations that are fully saturated.
Guidelines for Canadian Drinking Water Quality (GCDWQ)	Guidelines issued by Health Canada that are used to assess the suitability of water for human consumption.
Hardness	A characteristic of water caused by the presence of positively charged ions such as calcium, magnesium, iron, and manganese. This parameter is expressed in milligrams per litre of calcium carbonate.
Hydrocarbons	An organic compound containing only carbon and hydrogen; there are 4 classes of hydrocarbons: alkanes, alkenes, alkynes, and aromatic.
Interim Sediment Quality Guidelines (ISQG)	Recommended maximum concentration of a chemical in sediment, indicated to be protective of aquatic organisms.
Lentic	Relating to still water, such as ponds and lakes.
Life History	The series of changes undergone by an organism between birth and death.
Limnology	The study of open fresh and more rarely saline water bodies, specifically lakes and ponds (both natural and man-made), including their physical, chemical, and biological properties. Limnology traditionally is closely related to hydrobiology, which is concerned with the application of the principles and methods of physics, chemistry, geology, and geography to ecological problems.
Limnology (vertical) profile	An in situ measurement consisting of taking readings of physical parameters or samples at certain depth increments in a water column of a lake.
Lotic	Relating to running water such as streams and rivers

Matrix spike	A laboratory produced sample containing a known concentration of a given parameter to measure the accuracy of laboratory equipment.
Mesotrophic	Trophic state classification for lakes characterized by moderate productivity and nutrient inputs (particularly total phosphorus).
Method blank	A laboratory grade, pure water sample that is subjected to all laboratory procedures. This is used to detect possibility of cross-contamination between samples in the laboratory.
Method detection limit (DL)	The lowest concentration at which individual measurement results for a specific analyte are statistically different from a blank (that may be zero) with a specified confidence level for a given method and representative matrix.
Morphology	A set of linear, area, and volumetric parameters of a waterbody or watershed that describe geometric features and provide a background for a hydrologic description of a waterbody or drainage area.
Nitrate + nitrite	The sum of the concentrations of nitrate and nitrite.
Nutrients	Environmental substances (elements or compounds) such as nitrogen or phosphorus, which are necessary for the growth and development of plants and animals.
Oil and grease	The concentration of all hydrocarbons found in water, whether it is from mineral or petroleum (both artificial and natural) sources.
Oligotrophic	Trophic state classification for lakes characterized by low productivity (i.e., little aquatic plant or animal life) and low nutrient inputs (particularly total phosphorus).
Open water conditions	The period of time when the surface of a waterbody is completely free of ice.
Organic compounds	Substances composed of one or more carbon atoms.
Organochlorines	Any of the various hydrocarbon pesticides that contain chlorine.
pH	The negative log of the concentration of the hydronium ion. The pH is a measure of the acidity or alkalinity of all materials dissolved in water, expressed on a scale from 0 to 14, where 7 is neutral, values below 7 are acidic, and values over 7 are alkaline.
Phenol	A class of toxic compounds derived from benzene that can originate naturally in the aquatic environment through the decomposition of organic matter. These compounds can originate artificially through the contamination of the aquatic environment by plastics, herbicides, and disinfectants. They can also be introduced as a by-product in industrial processes.
Polycyclic Aromatic Hydrocarbons (PAH)	Organic compounds comprised of two or more aromatic rings. These compounds are by-products of combustion and can be emitted into the environment from both natural and anthropogenic sources.
Probable Effects Level (PEL)	Concentration of a chemical in sediment above which adverse effects on an aquatic organism are likely.
Quality Assurance / Quality Control procedures	Procedures used by field personnel and laboratories to ensure data quality.
Radio telemetry	The use of radio waves to transmit the readings of a measuring instrument to a device that can record the readings.

Radio transmitter	Transmitter that is the part of a radio system that transmits signals using radio waves.
Secchi Depth	A parameter used to determine the clarity of surface waters. The measurement is made with a "Secchi" disk, a black and white disk that is lowered into the water and the depth is recorded at which it is no longer visible. A secchi depth recording of 1 m indicates that the device was last visible at 1 m below the surface. High secchi depth readings indicate clearer water that allows sunlight to penetrate to greater depths. Low readings indicate turbid water which can reduce the passage of sunlight to bottom depths. Limited light penetration can be a factor in diminished aquatic plant growth beneath the surface, thus reducing the biological re-aeration at lower depths.
Sediment	Solid material that is transported by, suspended in, or deposited from water. It originates mostly from disintegrated rocks; it also includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope soil characteristics, land usage and quantity and intensity of precipitation.
Soluble	Referring to a substance that can be easily dissolved in a solvent such as water.
Specific conductivity	(See also Conductivity). A conductivity reading normalized to a temperature of 25ºC. This allows valuable comparisons to be made.
Stratification	The separation of lakes into 3 layers: well mixed top layer, middle layer (see Thermocline), and a bottom layer. In freshwater lakes, stratification usually occurs as a result of temperature effects that cause changes in water density. Stratification may also affect vertical changes in water quality.
Total dissolved solids (TDS)	The dissolved matter found in water comprised of mineral salts and small amounts of other inorganic and organic substances.
Total extractable hydrocarbons	Refers to hydrocarbons within the range of weights observed in diesel and fuel oil (i.e., C11 to C30).
Total Kjeldahl nitrogen (TKN)	The sum of organic nitrogen and ammonia.
Total organic carbon	A measure of the concentration of organic carbon in water or sediment, it is determined by the oxidation of the organic matter into carbon dioxide. Organic matter in soils, aquatic vegetation, and aquatic organisms are major sources of organic carbon.
Total petroleum hydrocarbons (TPH)	A measurement of the overall concentration of petroleum hydrocarbons found in the water.
Total suspended solids (TSS)	A measurement of the concentration of particulate matter found in water.
Total volatile hydrocarbons	Refers to hydrocarbons within the range of weights observed in gasoline (i.e., C5 to C10).

Trip blank	A water sample prepared by the laboratory and shipped to the field sampling location and then subsequently returned to the laboratory unaltered. These samples are used to detect sample contamination during preparation, preservation, or transport between field and laboratory.
Trophic state	Eutrophication is the process by which lakes are enriched with nutrients, increasing the production of rooted aquatic plants and algae. The extent to which this process has occurred is reflected in a lake's trophic classification or state: oligotrophic (nutrient poor), mesotrophic (moderately productive) and eutrophic (very productive and fertile).
Turbidity	Refers to the relative clarity of a water body. It is a measure of the extent to which light penetration in water is reduced from suspended materials such as clay, mud, organic matter, colour, or plankton.
Under ice conditions	The period of year when the lakes are partially or completely covered with ice.
Volatile	Referring to a substance that can be easily changed from solid or liquid form to a vapour.

The scientific style and format used in this report follows the recommendations outlined in the "Scientific Style and Format – The CSE Manual for Authors, Editors, and Publishers" 7th Edition prepared by the Council of Scientific Editors. This 2006 publication recommends the preferred format for use of numbers in the text (i.e., use of numerals for numbers with the exception of zero and one, or at the beginning of a sentence), the modern format for citing references, as well as many other style and format conventions.

This report also uses the National Standard of Canada SI Metric Units as identified in the CAN/CSA-Z234.1-00 Metric Practice Guide (Reaffirmed 2006) prepared by the Canadian Standards Association.

Common names of fish species in this report follow the guidelines of the American Fisheries Society.

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Background

Comaplex Minerals Corporation (Comaplex) proposes to construct and operate a gold mine, known as the Meliadine Gold Project (Project) 30 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut (Figure 1-1). The proposed Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°04'45"N, 92°19'38"W), on Inuit Owned Land.

The study area is within the zone of continuous permafrost approximately 400 km north of the tree line with typical sub-arctic vegetation. The terrain is dominated by glacial landforms that include drumlins of glacial till, eskers consisting of gravels and sands and numerous shallow lakes. The glacial deposits form low relief ridges oriented in a northwest-southeast direction. Regional drainage patterns are controlled by these ridges and the prevailing permafrost.

Watersheds within the study area include Meliadine Lake, several small watersheds on the Peninsula (Basins A through J), and the Meliadine River (including Little Meliadine Lake). Studies were also carried out on Chickenhead Lake in the near-by Atulik drainage as well as in Parallel Lake (north of Meliadine Lake), and in Lake W and Horseshoe Lake which drain into Little Meliadine Lake.

1.2 Objectives

1.2.1 Hydrology Baseline

The hydrology section of the baseline report was commissioned to characterize the prevailing hydroclimatic and hydrological parameters at the Meliadine Gold Project area. The baseline is based on data collected by Golder in 2008 and 2009 (Golder 2008) and reported by previous studies (AGRA Earth and Environmental (AEE) 1998a, 1998b, 1999; AMEC 2000).

This baseline report characterizes hydroclimatic and hydrological parameters relevant to the Project, including the following:

- precipitation based on regional data and compared to site-specific data;
- lake evaporation and evapotranspiration from land surfaces, based on regional and local data;
- hydrological regimes of local waterbodies based on an examination of site-specific and regional data;
- local lake and watercourse ice regimes; and
- development of a time series runoff model for the Outlets of Lake A1, Lake B2, Lake B7 and Chickenhead Lake.

1.2.2 Water Quality Baseline

This section of the baseline report describes the baseline water quality for the study area. These data include water chemistry in lakes during open water and under ice conditions.

The specific objectives of the water quality baseline were as follows:

- to describe the baseline open water conditions in streams, and open water and under ice conditions in lakes of the study area;
- to discuss seasonal and spatial variation of water quality parameters; and
- to compare baseline water quality data with applicable guidelines for the protection of aquatic life and human health.

The description of water quality is based on historical data (1994, 1995, and 1998 to 2000) and data collected from more recent field programs (2007 to 2009) within the study area. All data were compiled into a database that was used to describe the baseline water quality.

1.2.3 Sediment Quality Baseline

This section of the baseline report describes the baseline sediment quality for the study area. These data include sediment chemistry in lakes during open water conditions.

The specific objectives of the sediment quality baseline were as follows:

- to describe and discuss the baseline sediment conditions in lakes of the study area;
- to discuss seasonal and spatial variation of sediment quality parameters; and
- to compare baseline sediment quality data with applicable guidelines for the protection of aquatic life.

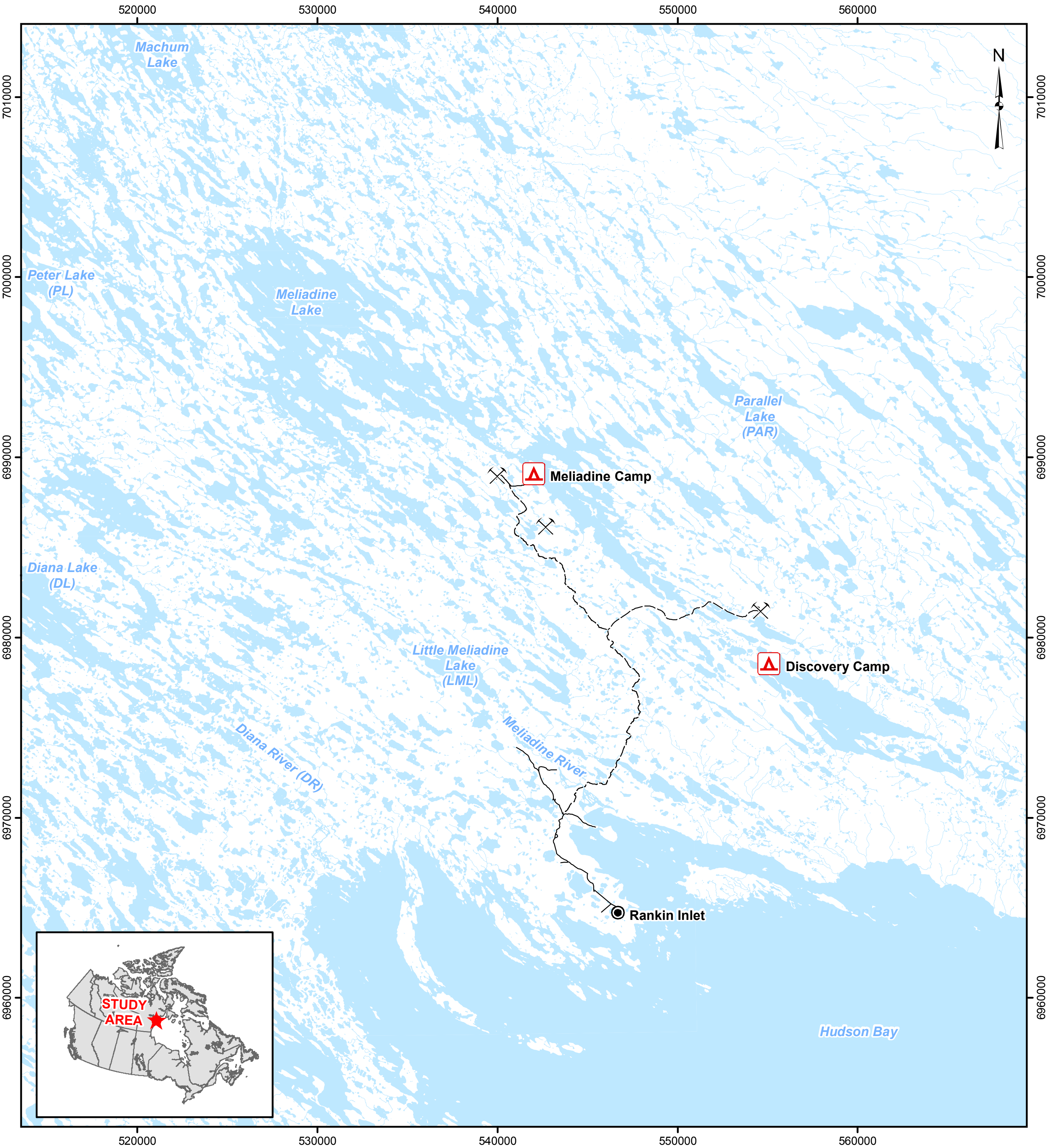
The description of sediment quality is based on historical data (1994, 1995, and 1998) and data collected from more recent field programs (2008 and 2009) within the study area. All data were compiled into a database that was used to describe the baseline sediment quality.

1.2.4 Aquatic Habitat and Biota Baseline

The aquatic biota section of the baseline report summarizes aquatic habitat, lower trophic level communities, fish populations, and stream crossing assessments in the Meliadine Gold Project area. The results are based on data collected from 1997 to 2009, with the objectives focused on the following:

- to describe aquatic habitat in streams, ponds, and lakes, including lake bathymetry,water temperature monitoring, and in-situ water quality measurements;
- to evaluate lower trophic level communities, including periphyton, phytoplankton, zooplankton, and benthic macroinvertebrates;
- to assess fish populations in the study area, including
  - distribution, composition, and abundance of species in streams, ponds, and lakes;
  - life history characteristics of the common fish species;

- movements of Arctic Char and other species through radio telemetry, fish fence operations and fish tagging programs;
- analysis of metal concentrations in fish tissues; and
- to describe fish habitat and fish use of streams crossed by a proposed road.



LEGEND

- Camp
- Proposed Mine Site
- Road - Existing
- Proposed Road
- Watercourse
- Waterbody

6 0 6

SCALE 1:300,000 KILOMETRES

PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

LOCATION OF THE MELIADINE GOLD PROJECT

DRAFT

REFERENCE

Base data obtained from Comaplex Minerals Corporation
Projection: UTM Zone 15 Datum: NAD 83

Golder Associates
Edmonton, Alberta

PROJECT NO. 09-1373-0010			PHASE No. 1000	
DESIGN	LV	28 Oct. 2009	SCALE AS SHOWN	REV. 0
GIS	CDB	28 Oct. 2009	**FIGURE 1-1**	
CHECK	LV	22 Nov. 2009		
REVIEW	CO	22 Nov. 2009		

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2.0 STUDY AREA

Meliadine Lake has a drainage area of 107 km^2, a maximum length of 31 km, and features a highly convoluted shoreline of 465 km in length and over 200 islands. Unlike most lakes, it has two outflows that drain into Hudson Bay through two separate river systems. Most drainage occurs via the Meliadine River, which originates at the south end of the lake. Meliadine River flows for a total distance of 39 km through a series of waterbodies until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a distance of 70 km). Due to its large size, Meliadine Lake was divided into 4 primary basins; East Basin, South Basin, Central Basin and the West Basin.

Several small watersheds drain into Meliadine Lake from the Peninsula between the south and east basins of Meliadine Lake. These Peninsula watersheds comprise an extensive network of lakes, ponds, and interconnecting streams. For the purposes of this study, lakes in the study area are differentiated from ponds by their depth; lakes are waterbodies that do not freeze to bottom (i.e., in the study area, maximum depth greater than 2 m), whereas ponds are shallower, normally freeze to bottom during winter and are isolated from other waterbodies during most of the year (Welch 1985). The lakes within the Peninsula are generally small (<90 ha in area) and shallow (<5 m in maximum depth). They are connected to each other (and to Meliadine Lake) through short stream sections; however, they can often be isolated by limited flow during summer/fall and frozen stream conditions during winter.

Sampling was also carried out in Control Lake, which drains into the south basin of Meliadine Lake from the south. This lake was selected as a control basin because of the absence of past and likely future drilling activities. Additional sampling was conducted in Chickenhead Lake within the Discovery Area following the extension of the project in this basin. Chickenhead Lake (135.5 ha in area) is located in the headwaters area of the Atulik River watershed, which flows into the Hudson Bay approximately 40 km east of the Meliadine River mouth. Streams located along a proposed road corridor linking Rankin Inlet to the study area were also surveyed. Ten of the watercourse crossings sampled were located along a primary corridor extending from Rankin Inlet to the proposed Project site. Three additional crossings were located along a secondary corridor that extends from the primary road to the Discovery Area, located approximately 16 km southeast from the Meliadine West camp.

To facilitate presentation of the results, sampled waterbodies within the study area were designated by letter codes (Figure 2-1, Table 1-2). Individual lakes and ponds within the Peninsula Basins A through J were assigned identification numbers preceded by the basin letter designation (e.g., Lake A1). In general, lakes and ponds were numbered relative to their position in the drainage with numbers increasing in the upstream direction of the longest chain of waterbodies. Subsequently, all tributary chains within the watershed were numbered starting with the lowermost tributary lake or pond on the north side of a basin’s outlet and continuing along the periphery of the main waterbody chain. Similarly, interconnecting streams between lakes and/or ponds were designated using the corresponding lake/pond identification numbers (e.g., Stream B6-7 connects Lake B6 and Lake B7 in Basin B).

Table 1-2: Naming System for Waterbodies in the Meliadine Study Area

Naming Code	Description
A, B, C, D, E, F, G, H, J	Watersheds within Peninsula on Meliadine Lake
CHL	Chickenhead Lake
CON	Control Lake
DR	Diana River
HB	Hudson Bay
HSL	Horseshoe Lake (part of LML drainage)
LML	Little Meliadine Lake
ML	Meliadine Lake
ML-C	Meliadine Lake (Central Basin)
ML-E	Meliadine Lake (East Basin)
ML-MR	Meliadine Lake outlet to Meliadine River
ML-PL	Meliadine Lake outlet to Peter Lake
ML-S	Meliadine Lake (South Basin)
ML-SE	Meliadine Lake (Southeast portion of South Basin)
ML-W	Meliadine Lake (West Basin)
MR	Meliadine River
MR-L	Lower Meliadine River (downstream of LML)
MR-U	Upper Meliadine River (between LML and ML)
PAR	Parallel Lake
PB	Prairie Bay (part of Hudson Bay)
PL	Peter Lake

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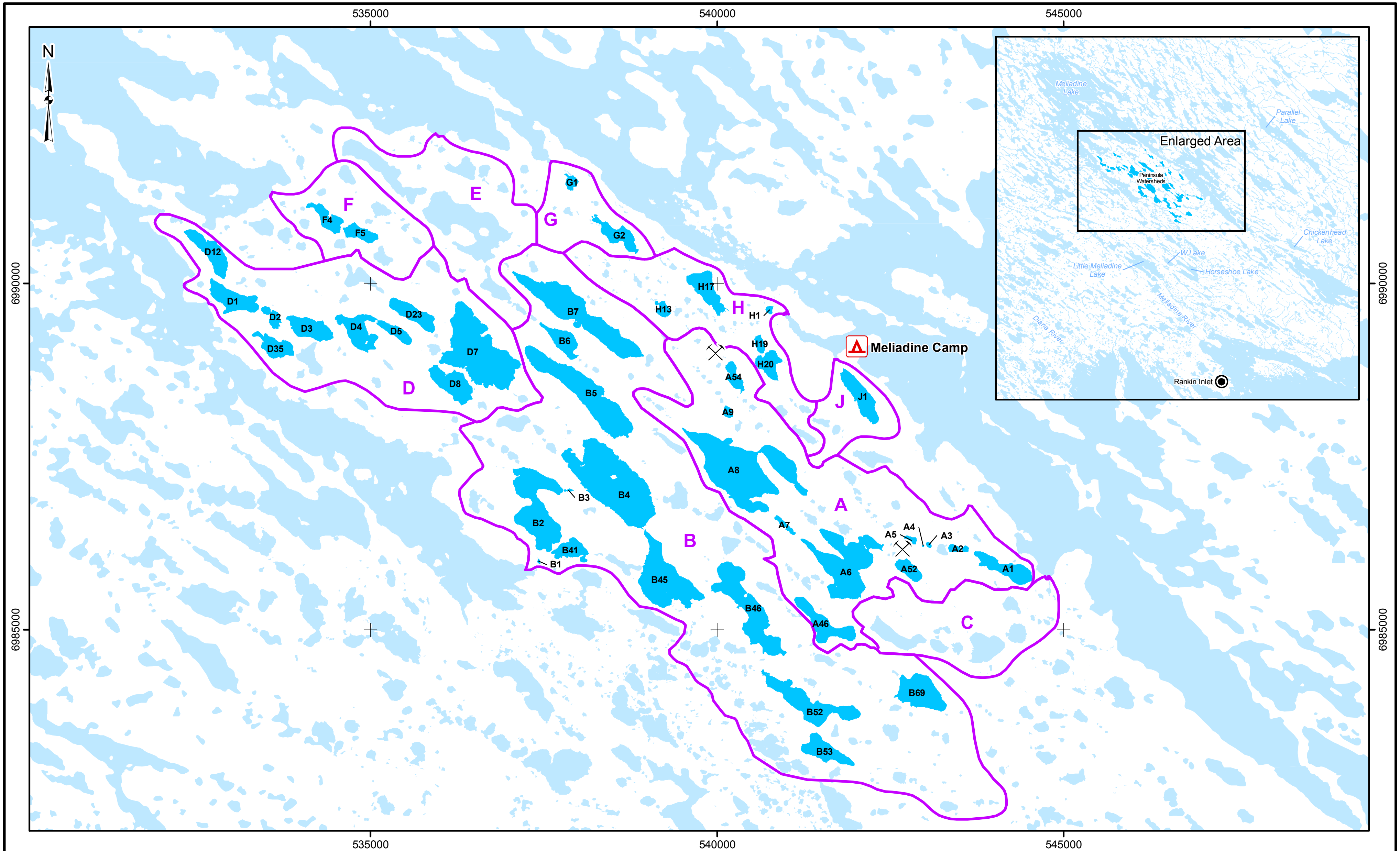

LEGEND

- Camp
- Proposed Mine Site
- Sampled Waterbody
- Waterbody
- Watershed Boundary

1.5 0 1.5

SCALE 1:75,000 KILOMETRES

DRAFT

REFERENCE

Base data obtained from Comaplex Minerals Corporation

Projection: UTM Zone 15 Datum: NAD 83

PROJECT

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

MAIN WATERBODIES ON THE PENINSULA FOR MELIADINE GOLD PROJECT

Golder Associates
Edmonton, Alberta

PROJECT No. 09-1373-0010			PHASE No. 1000	
DESIGN	DC	27 Nov. 2009	SCALE AS SHOWN	REV. 0
GIS	CDB	27 Nov. 2009		
CHECK			FIGURE 2-1	
REVIEW				

3.0 SUMMARY OF ALL WORK COMPLETED

3.1 Hydrology

Hydrometric data were collected at main basins including the Meliadine and Diana basins and at Peninsula stations including outlets of Lakes A1, A6, B2, B4, B5, B7, D5 and G2, and Control Lake, Lake A54 and Lake A8. Additional hydrometric data were also collected for Chickenhead Lake, Peter Lake, and the Char River. Rain gauge data are also available. These data were obtained from field programs in 1997, 1998, 1999, 2000, 2008, and 2009 (AEE 1998a, 1998b, 1999; AMEC 2000; Golder 2008). Basic information including available parameters, location, period of record, and alternate names of these stations is presented in Table 3-1. The station locations are presented in UTM format in Zone 15V and refer to the most recent locations. Alternate names refer to previous naming conventions used in previous reports (AEE 1998a, 1998b, 1999; AMEC 2000).

Table 3-1: Hydrometric and Rain Gauge Stations, 1997 to 2009

Hydrometric Station	UTM Zone 15 NAD 83		Period of Record	Parameters	Automated (Y/N)	Alternate Names
	Easting (m)	Northing (m)				
Meliadine Lake Main Outlet	530780	6989640	1997 to 2000 2008 to 2009	Q, WL	Y (1997 to 2000)	Meliadine River at Meliadine Lake Outlet
Meliadine Lake West Outlet	523818	7000994	1997 to 2000 2008 to 2009	Q, WL	Y (1997 to 2000)	West Outlet of Meliadine Lake
Meliadine River near the Mouth	544835	6971643	1997 to 2000 2008 to 2009	Q, WL	Y (1997 to 2000)	-
Meliadine Lake	530573	6995555	1997 to 2000 2008 to 2009	WL	Y	-
Diana River near Rankin Inlet	526374	6973649	1997 to 1999	Q, WL	Y	-
Diana Lake	514458	6983733	1997 to 1999	WL	N	-
Peter Lake	511770	6990277	1997 to 1999	WL	N	-
Char River near Rankin Inlet	544000	6970000	2000	Q, WL	N	-
Lake A1	544479	6985918	1997 to 2000 2008 to 2009	Q, WL	Y	Peg Creek
Lake A6	542374	6986171	1997 to 1998	Q, WL	Y	Peg Lake
Lake B2	537375	6986232	1998 to 2000 2008 to 2009	Q, WL	Y	Woodstock Lake
Lake B4	538050	6987087	1997 to1998	Q, WL	Y	Newy Lake
Lake B5	538430	6987824	1998	Q, WL	Y	Bud Lake
Lake B7	537935	6989488	1998 to 2000 2008 to 2009	Q, WL	Y	Woody Lake
Lake D1	532693	6989813	2009	Q, WL	Y	-
Lake D5	535088	6989471	1997 to 1998	Q, WL	Y	-
Lake G1	537797	6991573	2009	Q	N	-
Lake G2	538189	6990970	2009	Q	N	-
Control Lake	533052	6987678	1997	Q, WL	Y	-
Chickenhead Lake	553835	6981017	2009	Q, WL	Y	-
Lake A54	540417	6988473	2008 to 2009	WL	N	-
Lake A8	540728	6986693	2009 to 2009	Q, WL	N	-
Rain Gauge	542310	6989078	1997 to 2000 2008 to 2009	R	Y	-

Note: Q = discharge
WL = water level
R = rainfall; m = metres; - = no alternate names

3.2 Water Quality

Water quality data in streams and lakes were collected during 9 studies performed between 1994 and 2009 (Table 3-2, 3-3). Surface grab water quality samples were collected from 10 lake stations in August 1994 (Dillon 1994). These stations were located in lakes on the Peninsula draining into Meliadine Lake (specifically, from Basins A, B, C, D, and E); in Chickenhead Lake (part of the Atulik Lake drainage basin), and in DI2 Lake, which is part of a watershed that drains into the southeast basin of Meliadine Lake. Surface grab samples were also collected from 7 lake stations and 2 stream stations in the Meliadine Lake and Atulik Lake drainage basins in July 1995 (Dillon 1995).

RL&L performed 4 water quality baseline studies between 1997 and 2000. Most sampling occurred in 1997 and 1998. During these 2 studies, grab samples were collected from streams located on the Peninsula draining into Meliadine Lake (specifically, from Basins A, B, D, and G); from the 2 streams discharging from Meliadine Lake into Peter Lake and Meliadine River; from the stream discharging from Peter Lake to Diana Lake; and in the Meliadine River. Most stream stations were sampled both in the spring and summer/fall. Samples were also collected from stations in lakes on the Peninsula (specifically, from Basins A, B, D, and G); in Meliadine Lake (multiple stations); in Peter Lake; in Little Meliadine Lake; and in Hudson Bay. Lake samples were collected in summer, fall, and winter (under-ice).

Two smaller baseline studies were performed by RL&L in 1999 and 2000. These studies focused on a few streams and lakes near the proposed mine site. Stations included 2 streams in Basins A and B, the outlet of Meliadine Lake to Meliadine River, 4 lakes in Basin A and B, and one station in Meliadine Lake. These stations were sampled during the summer only.

The 2008 and 2009 baseline studies were designed to update the existing water quality database. Most stream stations were sampled in spring and summer. Stations included streams in Basins A and B, streams in the Discovery Area, and the outlet of Meliadine Lake to Meliadine River. Lake stations were sampled in the summer and winter (under ice) and included lakes in Basins A and B, multiple stations in Meliadine Lake, one station in Chickenhead Lake (part of the Atulik Lake drainage basin), and one station in Control Lake.

In addition to the above studies, Comaplex provided water quality data collected in 2007 for sampling locations mandated by the water licence issued by the Nunavut Water Board (S. Barham, Comaplex, 2008a, pers. comm.). Water quality data from stream and lake stations in Basin A and from one station in Control Lake were added to the baseline database.

Table 3-2: Water Quality Sampling Program in Lakes, 1994 to 2009

Sample Name	Basin	1994	1995	1997	1998	1999	2000	2007	2008	2009
Meliadine Lake Drainage										
DI4 (in Meliadine Lake)	Meliadine Lake		Summer						Summer	
ML-E	Meliadine Lake			Summer and Fall	Winter, Summer, and Fall				Summer	Winter
ML-A	Meliadine Lake									Winter and Summer
East basin of ML in the "toe of the boot" (BOOT-1)	Meliadine Lake								Summer	Summer
East basin of ML at the outlet of the "toe of the boot" (BOOT-2)	Meliadine Lake								Summer	Winter and Summer
ML-W	Meliadine Lake			Summer and Fall	Winter and Summer				Summer	
ML-S	Meliadine Lake			Summer and Fall	Winter, Summer, and Fall					
ML-SE	Meliadine Lake				Winter and Summer	Summer	Summer		Summer	Winter
Peninsula Lakes										
A1 (aka PL-06 in Dillon 1994)	Peninsula Basin A	Summer		Fall						
A5 (aka PL-05 in Dillon 1994)	Peninsula Basin A	Summer								
A6 (aka Peg Lake; aka PL-03)	Peninsula Basin A	Summer		Summer and Fall	Winter and Summer	Summer	Summer			Winter and Summer

Table 3-2: Water Quality Sampling Program in Lakes, 1994 to 2009 (continued)

Sample Name	Basin	1994	1995	1997	1998	1999	2000	2007	2008	2009
A8 (aka Lake A8; aka PL-01)	Peninsula Basin A	Summer		Summer and Fall	Summer and Winter			Summer and Fall	Summer	Winter
A9	Peninsula Basin A							Summer and Fall		
Pond A13	Peninsula Basin A							Summer and Fall		
Pond A15	Peninsula Basin A							Summer and Fall		
Pond A38	Peninsula Basin A							Summer and Fall		
Pond A52	Peninsula Basin A									
Pond A54 (aka Lake A54)	Peninsula Basin A							Summer and Fall	Summer	
Pond A56	Peninsula Basin A							Summer and Fall		
Pond A57	Peninsula Basin A							Summer and Fall		
B2	Peninsula Basin B			Summer and Fall	Winter, Summer, and Fall	Summer	Summer			
B5	Peninsula Basin B			Summer and Fall	Winter, Summer, and Fall	Summer	Summer		Summer	Winter
B6	Peninsula Basin B								Summer	Winter and Summer
B7 (aka Woody Lake)	Peninsula Basin B			Summer and Fall	Late Winter, Summer, Fall, and Early Winter				Summer	Winter

Table 3-2: Water Quality Sampling Program in Lakes, 1994 to 2009 (continued)

Sample Name	Basin	1994	1995	1997	1998	1999	2000	2007	2008	2009
Pond B8	Peninsula Basin B				Early Winter					
Pond B9	Peninsula Basin B				Early Winter					
Pond B10	Peninsula Basin B				Early Winter					
B36 (aka PL-2 in Dillon 1994)	Peninsula Basin B	Summer								
C5 (aka PL-04 in Dillon 1994)	Peninsula Basin C	Summer								
D1	Peninsula Basin D			Summer	Winter					
D7 (aka MB-1/MB-3 in Dillon 1994)	Peninsula Basin D	Summer		Summer and Fall	Winter					
E3 (aka MB-2 in Dillon 1994)	Peninsula Basin E	Summer								
G2 (1997 Control Lake)	Peninsula Basin G			Summer						
Little Meliadine Lake (LML)	Little Meliadine Lake				Winter, Summer, and Fall					
DI2 Lake										
DI2	Other	Summer	Summer							
Control Lake										
Control Lake	Control Lake				Summer	Summer	Summer	Summer and Fall	Summer	Winter
Peter Lake Drainage										
Peter Lake (PL)	Peter Lake				Winter and Summer					
Atulik Lake Drainage										

Table 3-2: Water Quality Sampling Program in Lakes, 1994 to 2009 (continued)

Sample Name	Basin	1994	1995	1997	1998	1999	2000	2007	2008	2009
DI1 (aka Chickenhead Lake)	Atulik Lake Basin	Summer	Summer						Summer	Winter
DI3 (aka Atulik Lake)	Atulik Lake Basin		Summer							
DI5	Atulik Lake Basin		Summer							
Hudson Bay										
Ocean	Ocean				Summer					

Table 3-3: Water Quality Sampling Program in Streams, 1995 to 2009

Sampling Location	Drainage System	1995	1997	1998	1999	2000	2007	2008
Meliadine Lake Drainage								
Outflow of Watershed B of the Discovery Area into Meliadine Lake (NEW-1)	Meliadine Lake Drainage							Spring and Summer
Outlet of DI4 Lake into Meliadine Lake (DI-4)	Meliadine Lake Drainage							Summer
Peninsula Streams								
A7-8	Peninsula Drainage - Basin A		Spring	Spring and Summer			Summer and Fall	Spring and Summer
A5-6	Peninsula Drainage - Basin A		Spring	Spring and Summer				
A0-1	Peninsula Drainage - Basin A		Spring	Spring and Summer	Spring	Spring		

Table 3-3: Water Quality Sampling Program in Streams, 1995 to 2009 (continued)

Sampling Location	Drainage System	1995	1997	1998	1999	2000	2007	2008
B6-7	Peninsula Drainage - Basin B		Spring	Spring and Summer				Spring and Summer
B5-6	Peninsula Drainage - Basin B			Spring and Summer				
B4-5	Peninsula Drainage - Basin B		Spring and Summer	Spring and Summer				Spring and Summer
B3-4	Peninsula Drainage - Basin B		Spring	Spring and Summer				
B1-2	Peninsula Drainage - Basin B		Spring and Fall	Spring and Summer	Spring	Spring		
D6-7	Peninsula Drainage - Basin D		Spring and Summer					
D0-1	Peninsula Drainage - Basin D		Spring and Summer					
G1-2 (1997 Control Lake outlet to ML)	Peninsula Drainage - Basin G		Spring					
Meliadine River								
ML to Meliadine River (ML-MR)	Meliadine River Drainage		Spring and Fall	Spring and Summer	Spring	Spring		Spring and Summer
Meliadine River to Ocean (MR-L)	Meliadine River Drainage			Spring and Summer				
Peter Lake Drainage								
ML to Peter Lake (ML-PL)	Peter Lake Drainage		Spring and Fall	Spring and Summer				