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REPORT ON

Geomorphology and Soils - Meliadine Access Road Meliadine Gold Project, Nunavut

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REPORT

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Executive Summary

An air photo assessment of geomorphic processes and surficial geology along the proposed all season access road for the Meliadine Gold Project was carried out. Occurrences of geomorphic and periglacial processes and surficial materials along the access road route were mapped to identify potential site conditions, soil displacement hazards and possible aggregate sources to be considered during engineering design and construction. The scope of work was limited to an office-based assessment along the approximately 40 kilometre long route (including a spur road to the Discovery Deposit) and extending up to 500 metres on either side of the proposed route. The results of the office-based assessment have been field verified. Field verification of the mapping comprised eight days of walking traverses along selected sections of the route and terrain observations along the road route from a helicopter. Limited gravel sampling was carried out at a series of shallow hand-dug soil pits at possible borrow pit sites along the route.

The area has low relief and is generally gently to moderately sloping with short steep slopes occurring locally on some glaciofluvial, wave-washed and bedrock surfaces. The terrain is dominated by veneers and blankets of washed till. Marine sediments comprising both beach and deltaic deposits occur locally and can be extensive in some areas. Weathered (frost-shattered) bedrock (felsenmeer), and bedrock outcrops occur locally. There are limited areas of glaciofluvial materials and shallow, discontinuous organic veneers occur in some poorly and very poorly-drained areas. Periglacial processes are most evident in areas underlain by morainal deposits and are typical of areas underlain by continuous permafrost, their surface expression is subdued in areas where there is a relatively thin cover of surficial materials over bedrock and in areas of well-drained granular sediments. Shallow, hand-dug soil pits excavated in July 2009 indicated thaw to depths generally less than half a metre on imperfectly- to poorly-drained, washed morainal surfaces. Thaw depths of a metre or more are present on well drained, coarse textured sediments.

Physical weathering (frost wedging and frost shattering) is evident on exposed bedrock surfaces and in areas of rubbly, weathered bedrock. Freezing and thaw induced displacement of soil can be expected along the road alignment, although these displacements are more likely to occur in imperfectly to poorly-drained materials underlain by fine-grained morainal sediments.

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GLOSSARY OF TERMS

Blanket	A layer of unconsolidated (surficial) material thick enough to mask minor irregularities of the surface of the underlying material, but still conforms to the general underlying topography. Generally greater that 1 metre (3+ feet) thick and possesses no constructional forms typical of the materials genesis; outcrops of the underlying material (*e.g.,* bedrock) are rare (Howes and Kenk 1997).
Diamicton	Non-sorted or poorly-sorted, heterogeneous sediments containing a wide range of particle sizes in a muddy matrix (Howes and Kenk 1997).
Fluvial (alluvial)	Materials transported and deposited by streams and rivers. Deposits generally consist of gravel and/or sand, and/or silt (and rarely clay). Gravels are typically rounded and contain interstitial sand. Commonly moderately- to well-sorted, and display stratification, although massive, non-sorted deposits do occur (Howes and Kenk 1997).
Glaciofluvial	Materials that exhibit clear evidence of deposition by glacial meltwater streams either directly in front of, or in contact with, glacier ice (Howes and Kenk 1997).
Lag	A residual accumulation of coarse rock fragments on a surface after the finer materials (sand, silt and clay) have been removed by wind or water.
Marine	Sediments deposited in salt or brackish water bodies by settling from suspension and submarine gravity flows, or sediments that have accumulated in the littoral zone through shoreline processes such as wave action and longshore drift (Howes and Kenk 1997).
Moraine or Morainal (till)	Materials transported beneath, beside, on, within, and in front of a glacier. The mineralogical, textural, structural and topographic characteristics of till deposits are highly variable and depend upon both the source of material and the mode of deposition. In general, till consists of well-compacted to non-compacted material that is non-stratified and contains a heterogeneous mixture of particle sizes, often in a matrix of sand, silt and clay (Howes and Kenk 1997).
Organic	Sediments composed entirely or largely of organic materials resulting from the accumulation of vegetative matter.
Veneer	A layer of unconsolidated (surficial) material too thin to mask minor irregularities of the surface of the underlying material. Generally between 0.1 and 1 metre (≤0.3 to 3+ feet) thick and possesses no constructional forms typical of the materials genesis (Howes and Kenk 1997). Outcrops of the underlying material (*e.g.*, bedrock) often occur.
Weathered BedrocK (residuum)	Bedrock decomposed or disintegrated in situ (in place) by processes of mechanical and/or chemical weathering. The character of weathered bedrock debris depends on the process of formation and the type of bedrock. Debris produced by mechanical weathering typically consists of angular fragments, often in a finer matrix. Bedrock that has been altered by chemical weathering usually contains a high proportion of residual silts and clays (Howes and Kenk 1997).

1.0 INTRODUCTION

Comaplex Ltd. is evaluating the feasibility of developing a mine at the Meliadine Gold Project (see Figure 1.1). As part of the project development, an all-weather access road will extend from Rankin Inlet, Nunavut, to the Meliadine Project site and two adjacent sites.

A terrain mapping project based on air photo interpretation and field assessment was carried out along the approximately 30 km long route proposed for the access road from Rankin Inlet to the Meliadine Camp (Tiriganiaq Deposit), spur access routes to the F-Zone Deposit and Discovery Deposit, as well as the areas around the deposits that may be occupied by excavations, waste areas and facilities.

The results of the mapping are contained in a series of Appendices, attached:

- Appendix A – Terrain Unit Descriptions and Interpretations
- Appendix B – Terrain Classification Codes and Terminology
- Appendix C - Site Photographs of Terrian Types
- Appendix D - Particle Size Sampling, Site Photographs, and Analyses
- Appendix E - Terrain Type Map Unit Figures
- Appendix F - Freeze and Thaw induced Displacement Hazard Figures
- Appendix G – Description of Orthorectification Process and Orthophoto Accuracy

The air photo interpretation was undertaken prior to and during the field mapping and sampling investigation along the proposed route. The field mapping and sampling program was undertaken to verify the results of the air photo interpretation, and to obtain samples gravel samples from a number of beach ridges traversed by the proposed road location that may be potential aggregate sources. Figure D.1, Appendix D identifies the gravel sampling sites. The Geological Survey of Canada (GSC) conducted extensive particle size sampling of till and marine washed till surfaces in the general area so were not sampled.

The gravel samples were submitted for particle size analysis to the Golder soils lab in Burnaby, BC. The results of these analyses are included in Appendix D of this report.

Terrain types (Appendix A) were mapped along the proposed road corridor for a distance of approximately 0.5 km either side of the proposed centerline. The selection of a 0.5 km buffer to each side of the proposed route was based on economic hauling distances for granular material and potential road alignments changes, while minimizing mapping costs.

2.0 OBJECTIVES AND SCOPE OF WORK

The objectives of the preliminary air photo interpretation were to:

1) Review current data including existing reports and topographic mapping of the proposed road route from Rankin inlet to the Meliadine Gold Project (Meliadine West and Meliadine East).

2) Map terrain and geomorphic processes along a total route of approximately 40 km (Meliadine Project main access and spur to Discovery Deposit) at an approximate 1:10,000 scale) using available black and white and colour air photos.

3) Prepare terrain hazard maps showing terrain susceptibility to periglacial processes.

4) Provide preliminary geotechnical engineering comments relating to the susceptibility of the various mapped terrains to periglacial processes.

The scope of work was limited to an office-based surficial geology assessment along the approximately 40 kilometre long routes for 500 metres on either side of the proposed alignment (see Figure 1.1). Field verification involved foot traverses along almost the entire length of the road location from Rankin Inlet to the Meliadine Camp and along the road location to the Meliadine East deposit.

The objectives of the route reconnaissance and sampling programs were:

1) To assess the continuity and lateral extent of areas of potentially suitable materials for road construction, and to assess general soil drainage and terrain conditions along the route;

2) To verify the results of previous air photo interpretation work and geophysical investigations;

3) To identify, locate and sample potential aggregate resources; and

4) To assess the preliminary route selection in advance of engineering design.

2.1 Methodology

The following tasks were carried out as part of the assessment methodology:

- A review was completed of existing and available terrain maps.
- A terrain map of surficial materials, permafrost and periglacial processes and soil drainage, and was prepared using 1:10,000 scale black and white and colour air photos provided by Comaplex.
- Mapping of the surficial materials and soil drainage followed the methods described for terrain mapping in BC (Resources Inventory Committee, 1996). The classification of terrain types, surficial geology, soils and geomorphic processes follows the classification system developed by Howes and Kenk in BC (Howes and Kenk, 1997). The Howes and Kenk classification system encompasses the mapping of the surficial material, the genesis of that surficial material, the morphology of the underlying bedrock surface and the

prevailing geomorphic processes. This classification system evolved from a terrain mapping system originally developed by the Geological Survey of Canada.

- Terrain lines were located using stereoscopic interpretation and drawn by hand on laser photocopies of the 1:10,000 scale air photos provided by Comaplex. The air photos provided by Comaplex were archive copies. It was not possible to obtain and map on original air photos due to the loss of the original photo negatives. Typically laser photocopying, though better than regular photocopying, results in some loss of air photo resolution. Consequently it should be assumed that the air photo interpretation and terrain mapping is not as accurate as can be achieved with original air photos.
- A series of ground traverses primarily along the proposed access road routes from Meliadine Lake to Rankin Inlet and other sites were used to calibrate and refine the preliminary mapping. The field program for ground confirmation of the mapped surficial materials, periglacial processes and soils along significant portions of the route was completed in July 2009. Access to the traverse locations was by helicopter. Weather during the field program varied from sunny days with light winds to cloudy days with moderate winds and occasional rain. Visibility was generally excellent except for occasional fog or low clouds that obscured more distant terrain.
- Following editing of the terrain mapping, the terrain lines were hand transferred to an orthophoto base to document the distribution of surficial material types and terrain conditions (see Appendices A and B), digitized and entered into ArcGIS. The orthophoto based terrain map (Appendix E) will be used in association with other surveys along the route to further refine access road locations and assist in road design.
- An assessment matrix was developed linking terrain types and soil drainage class to potential road construction-related issues in permafrost terrain. This matrix provides preliminary engineering and hazard interpretations for the various terrain types mapped along the proposed route (see Appendix A).
- Maps were prepared to document the spatial distribution of different terrain types (Appendix E) and potential terrain susceptibility to freeze/thaw processes (Appendix F).

The appended orthophoto terrain maps (Appendix E) display the various terrain types (surficial materials) in relation to the proposed road location. A number or number and letter identifies the terrain type occupying each map polygon. Appendix A lists the different terrain types along with geomorphologic process and apparent soil drainage conditions for each terrain type. Table 4-1 summarizes the surficial material types generally present along the road locations. Appendix F contains a companion series of orthophoto maps depicting soil displacement hazard ratings for the study area. A series of photographs, provided in Appendix C, illustrate the character of many of the terrain types described in Appendix A.

2.2 Mapping Limitations

In some areas, because of the complexity of the landscape, the intermixing of different surficial material and soil moisture conditions, and tonal differences among and across air photo flight lines, map unit designations for

terrain and soil drainage conditions may appear somewhat arbitrary and may not be entirely consistent from place to place. As noted above, the stereoscopic interpretation utilized laser photocopies of the original air photos, consequently there would have been some loss of resolution. As a result, the air photo interpretation and terrain mapping is likely not as accurate as might have been achieved with original air photos.

Small inclusions (*i.e.*, ≤10 percent) of materials or soil drainage classes, for example, well- or moderately well-drained beach sediments within a larger area of poorly- to imperfectly-drained wave washed materials are typically not delineated or identified in the map unit (polygon) symbol, even though they may be visible in the field and/or on air photos. Because of these limitations, it is likely that the reader will encounter surficial materials and soil drainage conditions other than those suggested by the mapping.

In most, but not all cases, terrain units occupying slightly less than one square centimeter (*i.e.*, ≤one hectare at 1:10,000 scale) on the map are not delineated. Other apparent discrepancies may occur due to changing water levels in shallow ponds and lakes. For example, while not entirely consistent, water levels observed during our July 2009 fieldwork appeared to be slightly lower than those visible on the July 1997 air photos used for the terrain mapping and for the base map orthophoto. We also noticed visible changes in water levels in some small ponds following one or two days of moderate rain.

Frozen ground occurred at depths of 0.30 to 0.60 metres in a number of the hand-dug soil pits excavated in late July 2009 to examine surficial materials. Difficulty in excavating hand-dug pits in washed morainal surfaces due to frozen ground prevented examination the character of the underlying deeper till.

3.0 DATA REVIEWED

The following is a list of data reviewed as part of the assessment:

- McMartin, I. 2000. Till Compostion Across The Meliadine Trend, Rankin Inlet Area, Kivalliq Region, Nunavut. Geological Survey of Canada Open File 3747.
- Paul, D., S. Hanmer, S. Tella, T.D. Peterson and A.N. LeCheminant. 2002. Geology, Compilation, bedrock geology of part of the Western Churchill Province, Nunavut-Northwest Territories; Geological Survey of Canada. Open File 4236. Scale 1:100,000.
- Comaplex Ltd. Black and white air photos dated 97/07/19 (FFB97033) and colour air photos dated 97/07/18 (FFC 97033), 1:10,000 scale, Air Photo Lines and numbers (Table 3.1).
- Golder Associates Ltd. 2005. Geomorphology and Soils, Meadowbank Project, Nunavut. Report prepared for Cumberland Resources Ltd.
- Tela, S. 1994. Geology, Rankin Inlet (55k/16), Falstaff Island (55J/13) and Quartzite Island (55J/11), District of Keewatin, Northwest Territories, Geological Survey of Canada, Open File Map 2968, scale 1:50,000.

Table 3-1: Air Photo Flight Lines and Numbers

Flight Line	Frame numbers	Format
L5	33-34	black and white
L6	43-45	black and white
L7	102-103	colour
L8	154-156	colour
L9	210-212	colour
L10	262-264	colour
L11	320-325, 328	colour
L12	358-370	colour
L13	409-412	colour
L14	452-456	colour
L15	505-510	colour
L16	557-564	colour
L17	601-605	colour

4.0 SITE GEOMORPHOLOGY, SOILS AND PERMAFROST CONDITIONS

The topography along the proposed access road corridor includes some level areas near Rankin Inlet, but the most of the road corridor traverses gently to moderately sloping hillsides and ridges of low relief. Elevations along the road locations and at the deposit sites range from a few meters to about 90 metres above sea level. Steeply sloping areas are present locally, but the road corridor avoid these areas. Past ice movement towards the southeast or east-southeast and local bedrock structure (joints) appears to control the location and pattern of steeper bedrock slopes and surface drainage networks.

Archean mafic metavolcanics and associated metasediments of the Rankin Inlet Group (Tela 1994) underlie the southern section of the proposed access road to a point about two kilometres northeast of the Meliadine River. From this point north to Meliadine Lake metamorphic rocks (schists) derived from the Rankin Inlet Group rocks dominate the proposed road location. The road location crosses an east-northeast trending band of Archean felsic to intermediate volcanic and associated metasediments (Tela 1994) a few kilometers north of the Meliadine River and the mid section of the road location crosses a west-northwest trending band of Proterozoic granites 13 to 14 kilometres north of Rankin Inlet.

The surficial geology of the area comprises low-lying, generally gently to moderately sloping blankets and occasional veneers of wave washed till (moraine), marine deposits (deltaic sediments, beaches and beach ridges), limited areas of weathered bedrock (felsenmeer) and occasional bedrock outcrops. Wave-modified glaciofluvial deposits (eskers) and associated beach deposits occur along the southwest edge of Meliadine Lake and on the east side of the Char River near Rankin Inlet. Most beach ridges and terraces overlie morainal landforms, but occasional areas mapped as beach ridges may result from the modification of glaciofluvial rather than morainal deposits. Sandy to gravelly marine deposits often appear as narrow beach ridges or berms running along the crests low, subdued morainal ridges. Flights of low, subdued beach ridges and/or terraces occur periodically throughout the study area. There are limited areas of fluvial sands and gravels along some stream margins. Gravelly to sandy marine deltaic deposits occur in the Rankin Inlet area immediately southwest of and between the Char and Meliadine Rivers. Shallow, discontinuous veneers of humic organic materials are present along some stream edges, lakeshores and locally form shallow discontinuous veneers overlying morainal and/or marine sediments in low-lying, poorly drained areas. Deep organic deposits are rare.

Within the study area changes in terrain type, material characteristics and soil drainage conditions (soil drainage class) can be quite subtle, but highly variable, due to the low relief and subdued nature of the topography. As well, there has been extensive, but sometimes subtle modification of the landscape and surficial materials by complex coastal processes. The entire area was submerged at the end of the last glaciation and emerged over time. Consequently, much of the terrain within the study area exhibits relict (emergent) coastline features or materials. These features include relict shore platforms, rocky islets, low coastline scarps, gravelly beach berms or ridges, shell accumulations, and gently sloping mantles (veneers and blankets) or terraces composed of well to poorly sorted sands and gravels, Coarse cobble and/or boulder lags overlying morainal materials can be found vertically and spatially across the landscape. These coarse backshore and foreshore deposits are often found in close proximity to, or spatially intermixed with veneers comprising silty sandy to fine sandy silty

diamictons (*i.e.*, marine washed till[1]) likely representative of lower energy, near-shore and/or offshore (below low tide) environments. These silty sandy to fine sandy silty surfaces often, but not always contain shells.

These relict coastal features and their distribution both vertically and spatially in the landscape suggests that coastal emergence did not occur at a constant rate and that there may have been stillstands[2] that lasted for indeterminate periods.

Permafrost and periglacial processes have further modified these emergent coastal features creating a very complex landscape.

Seepage was observed in many shallow soil pits dug in imperfectly to poorly-drained, washed morainal surfaces and in some gravelly or coarse sandy marine (beach) deposits located on mid and lower slopes. As noted earlier, frozen ground was encountered at depths of 0.30 to 0.60 metres in several of hand-dug soil pits on washed morainal surfaces and also in small pockets of deeper, well decomposed organic materials (peat).

Laboratory test including: grain size analysis, moisture content, hydrometer, liquid and plastic limits have been performed on a number of beach ridge gravel samples and one till sample. The results of these analyses are appended in Appendix D. Appendix D also contains a series of photographs illustrating the materials sampled at each site.

[1] Depending on an observers point of view these deposits could be considered marine washed till, marine veneers overlying till or glaciomarine deposits. The clay content in these diamictons tend to be quite low (generally ≤2 to 3 percent, [McMartin, 2000]) so we suggest that they do not necessarily represent unmodified morainal deposits (till). By comparison, some tills in areas north of Baker Lake, likely beyond the limit of marine influence, have clay contents ranging from 9 to 19 percent (Golder 2005). In low-lying areas along the Meliadine access road alignments some of these deposits appear to have been modified (*i.e.*, washed) by recent (Holocene) stream and/or lakeshore processes.

[2] The relative levels of the land and sea appear to remain the same for a prolonged period (*i.e.*, several centuries). This condition occurs either because there has been no change in land or sea level or because land and sea levels have risen or fallen the same amount (Bird, 2008).

Table 4-1: Summary of Surficial Geology Units

Map Unit Type[1]	Soil Cover	Ground Ice	Suitability for Road Construction
Organic – generally only as a minor component of other terrain units	Veneers (Ov), humic	Likely present	Poor
Marine (W)	Gravelly (can include boulders and/or cobbles) to sandy beach ridges, terraces and veneers. Both beach and deltaic deposits.	Limited near surface, but likely present at depth, especially where till is present under the marine sediments.	Moderate to good except where imperfectly to poorly drained. May be shallow over till.
Washed Morainal surfaces (washed till) (Mbv-W)	Diamictons. Gravelly to silty sandy to fine sandy silty veneers and possibly blankets (Mbv-W)	Limited near surface but present at depth. Possible excess ice at depth.	Moderate to poor, locally good on well drained gravel surfaces.
Morainal (assumed present under most washed morainal surfaces)	Blankets and likely some veneers, rubbly clasts in a fine grained matrix (M)	Possible excess ice (ice detected in soil)	Poor to Moderate
		Generally wet sites	Poor to Moderate
Glaciofluvial (F^G)	Sand or sand and gravel deposits (F^G)	Material is easy to excavate.	Good to moderate.
Weathered Bedrock (D) (Felsenmeer)	Rubbly mantles (Db)	Generally limited	Moderate, depending on grain size.
	Rubbly veneers (Dx, Dv) with veneers (Ov, Mv)	Generally limited	Moderate, depending on grain size.
Bedrock (R)	None	Generally limited	Likely good if quarried and crushed or as pit run for free-draining sub-grade.
	With blankets (Db, Mb-W)	Possible excess ice	Poor to Moderate
	With veneers (Dv, Mv-W)	Generally limited	Poor to Moderate

1) Map unit type based on most abundant surficial material interpreted from the air photos. Letter codes correspond to Howes and Kenk (1997).

5.0 PERIGLACIAL GEOMORPHOLOGY AND SOILS ASSESSMENT

The ground features and patterns observed on the air photos are typical of perglacial processes known to occur in permafrost terrain. The meaning and definition of the various geomorphic features and processes interpreted from the air photos follows the standard definitions given in Everdingen, 1998.

5.1 Observed Periglacial Processes

The periglacial processes present in the area fall into three main processes types as follows:

- Physical weathering of in situ materials:
  - Frost shattering: and
  - Frost wedging.
- Freezing induced displacement of soils:
  - Frost creep and creep of frozen ground;
  - Frost heave (and cryoturbation in general);
  - Frost jacking; and
  - Frost sorting.
- Thaw induced displacement of soils:
  - Solifluction is very limited: and
  - Thaw consolidation leading to thaw settlement.

The observed periglacial processes are typical of areas underlain by permafrost. The surface expression for these processes is locally subdued due to the relatively thin cover of surficial materials and the generally well-drained conditions in shallower surficial materials in some areas.

5.1.1 Physical Weathering

Frost wedging and frost shattering occur on exposed bedrock and in coarse-grained block fields (felsenmeer).

5.1.2 Freezing Induced Displacement

Evidence of cryoturbation of the marine (W), washed morainal (M-W), weathered bedrock or felsenmeer (D) and glaciofluvial soils (F^G) occurs in the form of patterned ground, primarily small, low hummocks, “mud boils” and cracks. We observed occasional stone rings in areas of weathered bedrock or areas of mixed till or marine sediments and weathered bedrock. These terrain features indicate that periglacial processes such as frost sorting, frost heave and frost creep are acting on the surficial materials within the study area. These processes result in uplift perpendicular to the ground surface during freezing. During thaw, the uplifted material settles vertically leading to some lateral displacement on sloping surfaces.

5.1.3 Thaw Induced Displacement

Thaw settlement was not discernable from the air photos, but is expected to occur in many areas along the proposed road locations as patterned ground is frequently present, especially in imperfectly and poorly-drained areas. Thaw consolidation leading to thaw settlement would be expected to occur following surface disturbance in areas where the soils and surficial materials are thicker (*e.g*. greater than two metres thick) and wetter (*e.g.* gently sloping or low-lying areas and low-lying areas near surface water). These areas will likely be more prone to thaw settlement than drier, thinner soils where bedrock is near the surface or well-drained, coarse marine sediments.

5.1.4 Rapid Thaw Induced Displacement

There is only very limited and very localized evidence for rapid mass-movement of slopes through detachment failures or retrogressive thaw slumping visible on the air photos. The likelihood of detachment failures and retrogressive thaw slumping within the project area appears low. There were no observed instances of rapid thaw induced displacement on our traverses along the proposed access road locations and only rare, small, localized areas of slow movement (*e.g*., solifluction).

6.0 DISCUSSION

The terrain along the proposed road route does not show any obvious features or processes that preclude the development of the access road provided appropriate permafrost engineering design methods that account for specific site conditions are used. However, where possible the road should be located on well-drained (dry), granular soils. Avoid sites underlain by finer grained, imperfectly- to poorly-drained, ice rich, frost susceptible marine sediments or washed tills where possible, as these soils may require significant ground treatment.

Ratings (upper-case letters) ranging from Low (L) to Very High (VH) indicating the likelihood for freezing and thaw induced soil displacement for each terrain type are listed in Appendix A and maps depicting the distribution of these conditions are provided in Appendix F. The displacement hazard rankings are qualitative and relative. Finer textured soils (*e.g.*, silty sands or sandy silts) are assumed to have a higher thaw/freeze displacement hazard than coarse textured soils (*e.g.*, gravels and coarse sands). Similarly, displacement hazard is also assumed to vary as the soil drainage class changes; that is, well- to moderately well-drained soils are assumed to be less vulnerable to freezing and thaw induced displacement than imperfectly- to poorly-drained soils.

The following table summarizes the susceptibility of various terrain types identified in the mapping to periglacial processes.

Some of the identified ground conditions will require conventional cold climate or permafrost engineering practices. As noted above, Appendix A identifies these terrain types as having a Moderate (M) to Very High (VH) displacement hazard that will likely require specific permafrost designs and construction methods. Table 6.1 summarises general engineering and construction methods that may be considered during the detailed design phase and used during the construction phase to manage ground displacement in permafrost terrain.

Additional field inspection may be necessary to assess specific poorly drained areas (*i.e.*, morainal deposits), to assess local variations in permafrost conditions and to assess alternative road locations.

Table 6-1: Susceptibility of Terrain to Periglacial Processes

Active Layer Process	Description	Susceptibility		
		Low	Moderate	High
Physical weathering of *in-situ* materials	Rockfall or Minor Rock Displacement Frost Shattering Frost Wedging	■ Non-bedrock areas. ■ Bedrock areas with slope gradients typically < 60%. ■ Rubbly gravelly beach ridges, platforms and veneers (gWrv).	■ Bedrock areas with slope gradients typically > 60%.	■ Observed rockfall areas.
Freezing induced displacements of soils	Frost creep Frost Jacking Cryoturbation	■ Felsenmeer (rDb). ■ Bedrock (R). ■ Veneers of wave washed till and/or marine sediments over bedrock. ■ Gravelly to coarse sandy beach ridges, terraces blankets and veneers. ■ Glaciofluvial deposits.	■ Similar terrain as "High" but with moderately well-drained to imperfectly-drained conditions.	■ Washed morainal veneers over deeper till or complexes of marine and morainal sediments. Imperfectly to poorly drained. ■ Polygons including obvious patterned ground dominated by frost boils and/or low soil hummocks.
Thaw induced displacements of soils	Thaw settlement Thaw Slumping	■ Felsenmeer (rDb). ■ Bedrock (R). ■ Veneers of washed till and/or marine sediments over bedrock ■ Gravelly beach ridges, terraces, blankets and veneers. ■ Glaciofluvial deposits.	■ Similar terrain as "High" but with moderately well-drained to imperfectly-drained conditions.	■ Washed morainal veneers over deeper till or complexes of marine and morainal sediments. Imperfectly to poorly drained. ■ Polygons including obvious patterned ground dominated by frost boils and/or low soil hummocks.

Table 6-2: Engineering and Construction Methods Based on Sensitivity to Freeze/Thaw Induced Displacements

Sensitivity to Ground Disturbance	Facility Type	Engineering/Construction Methods Based on Sensitivity to Ground Disturbance
Sensitive to Settlement or Heave	Bridge abutments, heated structures, water retaining structures, fuel storage tanks, and machine foundations, cut slopes. Structures will likely include modular units on grade supported foundations or skids.	Appropriate engineering design: ■ Excavate ice rich soils. ■ Excavate to bedrock. ■ Use thaw stable fills. ■ Manage drainage. ■ Fill to preserve permafrost. ■ Insulate/ventilate/refrigerate. ■ Realign/relocate if necessary. ■ Flatten cut slopes.
Moderately Sensitive to Settlement or Heave	Ditches, cut slopes, building pads, explosives and storage pads.	Appropriate engineering design: ■ Excavate ice rich soils as required or accept slight increase in annual maintenance associated with controlled subsidence. ■ Use thaw stable fills. ■ Manage drainage. ■ Fill to preserve permafrost. ■ Insulate. ■ Realign/relocate if necessary.
Insensitive to Settlement or Heave	Site roads, soil stockpiles, dry freight storage areas.	Appropriate engineering design: ■ Fill to preserve permafrost. ■ Use thaw stable fills where possible. ■ Annual maintenance. ■ Control drainage. ■ Insulate where possible.

7.0 RECOMMENDATIONS FOR ROUTE SELECTION

Based on the results of the air photo overview and of the current field studies and traverses, it is desirable from a geotechnical perspective to locate the road alignment along well-drained ridge and upper slope areas, which are underlain by gravelly beach deposits, gravelly washed till surfaces, or angular fragments of frost shattered bedrock or bedrock. Areas of silty sandy to fine sandy silty diamictons overlying deeper till even where moderately well-drained to imperfectly-drained will provide a less suitable base and will likely need to be covered with other materials to provide a suitable road subgrade. The marine gravels and gravelly washed till surfaces are considered to be excellent to good for at-grade support of road beds, provided that the thickness of these coarse materials is greater than the depth of annual thaw, and they are not underlain by frost susceptible soils within the active layer. Except in areas with visible bedrock outcrops or areas of weathered rock (felsenmeer) these gravelly materials are likely to be underlain by finer textured tills so it will be important to avoid disturbing or exposing the underlying till.

The spatial variability and thickness of coarse rubbly weathered bedrock materials is currently unknown. In some areas, these materials may form a veneer (<1 metre) or a blanket (>1 metre) overlying bedrock. It is unlikely that significant treatment, such as stripping and removal of frost-susceptible soils and replacement with clean granular fill, will be required in areas of weathered bedrock although local areas requiring specific treatment may be encountered.

7.1 General Geotechnical Comments

If the weathered bedrock deposits are determined to be shallow in thickness, bedrock may be exposed during road construction. Locally there may be significant quantities of marine or glaciofluvial gravels that will be suitable for road construction.

Additional comments and recommendations will be made during the design phase of the project, and will be based on the field mapping and sampling, and geophysical surveys carried out along the route.

7.1.1 Subgrade Preparation

As with any road, subgrade preparation may include, but not be limited to, the following activities:

- Management of surface water;
- Tundra vegetation removal;
- Ice, snow and frozen soil removal;
- Stripping of organic material;
- Excavation of thick peat deposits; and

- Excavation of loose mineral soils, cobbles and boulders.

The details for these tasks will be developed during detailed road design and will depend on the level of serviceability, desired construction schedule and the plans for any infrastructure that will be associated with the road.

8.0 SUMMARY AND RECOMMENDATIONS

The air photo mapping study indicates the route location to be generally underlain by:

- Fairly extensive areas of mineral soils composed of imperfectly to poorly drained, frost-susceptible washed till surfaces likely overlying fine textured till;
- Moderately extensive to limited areas of marine sediments (beaches and deltaic sediments) and gravelly washed till surfaces.
- Limited areas of fresh to slightly weathered bedrock outcrops and associated frost shattered bedrock fragments (felsenmeer) often in association with shallow veneers of gravelly marine or washed morainal materials.

The underlying till is likely comprised of a matrix of fine grained soil with coarse sub-angular to sub-rounded gravel, cobble and boulder particles and is likely frost-susceptible. Areas underlain by fine grained till may require treatment in preparation for the subgrade.

The granular marine deposits are considered to be thaw-stable where well to moderately well-drained. These deposits may locally provide good material for road construction. However, these deposits often comprise relatively shallow veneers over till. Some gravelly marine beach ridges may be deep enough and extensive enough to serve as aggregate sources.

Regional geologic mapping indicates that the bedrock along the access road route is dominated by mafic volcanics, and metasediments with lesser areas of intrusive and felsic volcanic rocks.

A series of rock quarries and borrow pits will need to be developed along the route alignment at efficient haul distances to allow construction of the access roads using suitable fill, subgrade and surfacing materials.

9.0 CLOSING REMARKS

We trust this information is sufficient. Should you require additional information, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIATES LTD.

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Terry Rollerson, M.Sc., P.Geo. (BC)
Senior Geoscientist

ORIGINAL SIGNED AND SEALED
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THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
ORIGINAL SIGNED P 049
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TPR/CJC/JAH/mrb

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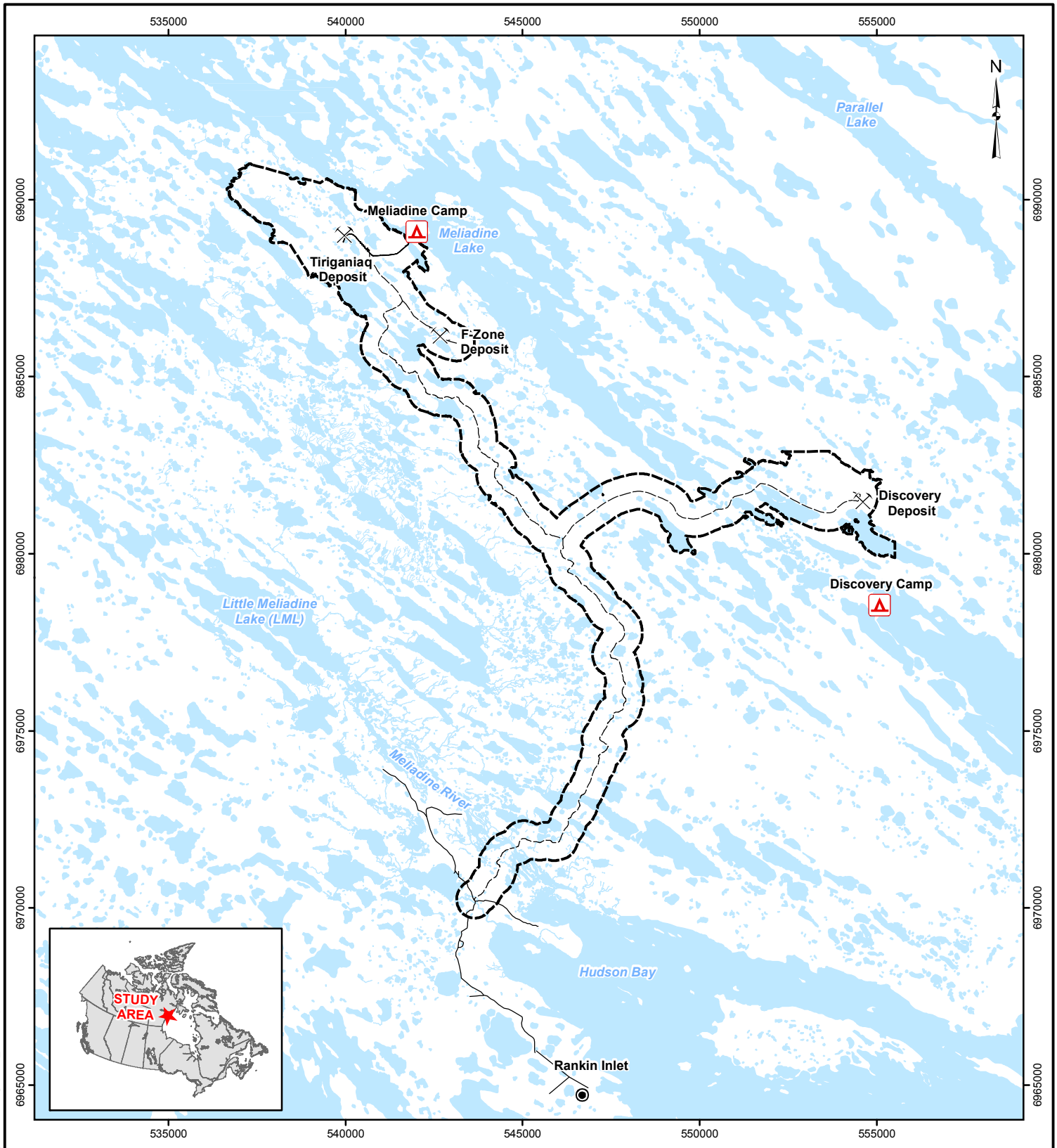

LEGEND

- Camp
- Proposed Mine Site
- Road - Existing
- Proposed Road
- Watercourse
- Local Study Area - Road
- Waterbody

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

LOCATION PLAN AND STUDY AREA

Golder Associates
Greater Vancouver Office, BC

PROJECT NO. 09-1426-0015			PHASE No. 4410	
DESIGN	JC	22 Dec. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	22 Dec. 2009		
CHECK	JEK	22 Dec. 2009		
REVIEW	CJC	28 Jan. 2010		

FIGURE 1

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APPENDIX A

Terrain Unit Descriptions and Interpretations

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
1	sWr to gWr likely over Mb	Relict beach ridges likely overlying till, occasionally with minor areas of bedrock or weathered (frost-shattered) bedrock.	Limited, but may occur at depth. W	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate variable deposit thickness
2A	sWrbvt to gWrbvt likely over Mb	Relict beach deposits of varying depth likely overlying till and locally weathered or frost-shattered bedrock and/or bedrock. May form blankets, single or multiple terraces, beach platforms, or flights of low, subdued beach ridges.	Limited near surface, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable to Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate may be relatively shallow
2B	sWbvt to gWbvt likely over Mb	Relict beach deposits of varying depth likely overlying till and locally weathered (frost-shattered) bedrock and/or bedrock. May include minor areas of washed till.	Limited near surface, likely at depth. MW/I.	Frost Heave Frost Sorting Frost Jacking Thaw Settlement	Stable Minor thaw settlement possible.	Stable to Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	M	L-M Adequate, ground water may be encountered near surface

[3] Soil drainage class R=rapidly, W=well, MW=moderately well, I=imperfectly, P=poorly, VP=very poorly., Slashes (/) indicate dominance as for terrain symbols.

[4] Note that the hazard ratings for thaw and freezing induced displacement are generalized interpretations. Conditions may vary substantively across map units. For example, bedrock dominated areas containing areas of weathered bedrock or washed till are classified as a low hazard but may contain localized areas with a moderate or high displacement hazard. Assume various periglacial and/or permafrost processes are active on all terrain types.

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
2C	sWbvt to gWbvt likely over Mb	As above	Possible near surface, likely at depth. I or I/P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Poor due to high water table, likely overlying till
2D	sWbvt to gWbvt likely over Mb	As above	Limited near surface, but likely at depth. P or P/I	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M-H Poor due to high water table, likely overlying fine-textured till
2E	sWbvt to gWbvt likely over Mb	As above.	Possible near surface and likely at depth. P/VP or VP/P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	H Poor due to high water table, likely overlying fine-textured till
3A	sWlp to gWlp	Sandy to gravelly deltaic terrace and or ridges. May include moderately to steeply sloping areas Locally may include beach deposits or wave washed morainal surfaces.	Limited near surface, but may occur at depth. W	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate may be relatively shallow

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
3B	sWlp to gWlp	Sandy to gravelly deltaic levels and/or plains, locally undulating. May include gently to moderately sloping areas. Locally may include beach deposits and/or wave washed morainal surfaces.	Limited near surface, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	M	L-M Good to adequate may be relatively shallow
3C	sWlp to gWlp	Sandy to gravelly deltaic level and/or plain. Shallow, discontinuous organic veneers may be present locally. Locally may include beach deposits.	Limited near surface, but likely at depth. I/P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Poor
3D	sWlp to gWlp	Sandy to gravelly deltaic level and/or plain. Shallow, discontinuous organic veneers may be present locally. Locally may include beach or stream deposits.	Limited near surface, but likely at depth. P, but locally may be I or VP	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	H Poor

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
4A	Wbv/Mbv-W to Mbv/Wbv-W	Mixtures of sandy to gravelly marine sediments and sandy to gravelly marine washed tills. The washed till surface often comprises a sandy to gravelly material but locally may comprise a silty fine sandy material. In either case these materials likely overlie finer textured till.	Limited near surface, but likely at depth. W/MW	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Minor to moderate thaw settlement possible under loading	Frost heave may result in some uplift of ground surface	Frost creep may occur under loading	M	L- M Adequate to poor, likely quite shallow over fine-textured till
4B	Wbv/Mbv-W to Mbv/Wbv-W	As above	Limited near surface, but likely to occur at depth MW/I or I/MW or I	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Minor to moderate thaw settlement possible under loading	Frost heave may result in some uplift of ground surface	Frost creep may occur under loading	M-H	M Adequate to poor, likely quite shallow over fine-textured till
4C	Wbv/Mbv-W to Mbv/Wbv-W	As above	Likely present I/P, P/I, P	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M-H Poor, likely overlying fine-textued till.

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
4D	Wbv/Mbv-W to Mbv/Wbv-W	As above	Likely present P/VP. VP/P	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	H-VH Poor, likely overlying fine-textued till
5A	Mbv-W and/or Mb-W	Blankets and/or veneers of marine washed, gravelly to lesser sandy till, or marine sands and/or gravels overlying till. Occasional very minor areas of weathered bedrock and/or very minor bedrock outcrops. Likely in a high energy shoreline environment for a period of time.	Limited near surface, but likely at depth W-MW	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	L- M Adequate to poor. Likely shallow veneers over fine-textured till.
5B	Mbv-W and/or Mb-W	As above	Likely present MW/I	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Adequate to poor. Likely quite shallow over fine-textured till.

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
5C	Mbv-W and/or Mb-W	Blankets of wave washed, silty fine sandy to fine sandy silty till, and/or marine sands or gravels overlying till. Occasional very minor areas of weathered bedrock, rarely with very minor bedrock outcrops. Shallow, discontinuous organic veneers may be present These areas were likely in a near-shore environment for a period of time (*i.e.*, below the low-tide line).	Likely present I/P	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M-H Poor, likely shallow veneers overlying fine-textured till.
5D	Mbv-W and/or Mb-W	As above.	Likely present/ P/I	Frost creep Frost heave Frost sorting Thaw settlement	Thaw settlement likely under loading.	Frost heave will result in uplift of ground surface	Frost creep may occur under loading	M-H	H Poor, likely shallow veneers overlying fine-textured till.
5E	Mbv-W and/or Mb-W	As above.	Likely present P, P//I	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading.	Frost heave will result in uplift of ground surface	Frost creep may occur under loading	M-H	H-VH Poor, likely shallow veneers overlying fine-textured till.

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
5F	Mbv-W and/or Mb-W	Blankets and veneers of marine washed till and/or marine sands or gravels overlying till. Lag boulders often present, shallow, discontinuous organic veneers usually present. Likely a near-shore environment. In some areas washing may have occurred in fresh water.	Likely present P/VP or VP/P small ponds or streams often present.	Frost creep Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading.	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	VH Poor
6A	$F^{G}r$-W	Gravelly glaciofluvial ridges (eskers) washed or altered by wave action.	Limited, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate
6B	F^{G}bs-W	Sandy to gravelly glaciofluvial slopes washed or altered by marine wave action. Slope gradients can range from gently to steeply sloping.	Limited, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Good to adequate

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
7A	Flt	Gravelly fluvial levels and or terraces, occasionally flooded.	Limited, but may occur at depth. W/MW	Stable	Stable Minor thaw settlement possible.	Stable Minor heave and uplift at ground surface.	Stable Frost creep may occur under loading	L-M	L Not applicable.
7B	gFl-sFl	Gravelly fluvial levels and or terraces. Subject to periodic flooding and/or tidal inundation.	Likely present I or I//P	Frost heave Frost sorting Frost Jacking Thaw settlement	Thaw settlement likely under loading	Frost heave may result in uplift of ground surface	Frost creep may occur under loading	M-H	M Not applicable.
8	arDbv	Veneers and blankets of weathered (frost-shattered) bedrock and occasionally minor washed till or marine veneers or minor bedrock outcrops.	Limited W, locally MW or I	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L	L Adequate to poor with bedrock likely at shallow depths
9A	Dbv/Mbv/R Dbv/Wbv/R	Veneers and/or blankets of weathered bedrock with lesser veneers and/or blankets of washed till or marine sands and gravels Minor bedrock outcrops.	Limited, but may occur at depth in deeper soils W/MW locally may be I	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L-M	L-M Bedrock at or near surface

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
9B	Dbv/Mbv/R Dbv/Wbv/R	As above.	Likely present MW-I and/or I-P	Frost Shattering Frost Wedging Frost Jacking Thaw settlement	Stable Thaw settlement possible.	Stable to Minor Instability	Frost creep may occur under loading	L-M	M Bedrock at or near surface
10	Dbv/Wv//R or Dbv/Mv//R	Dominated by areas of weathered bedrock with lesser discontinuous veneers or blankets of washed till or sandy or gravelly marine sediments. Very minor bedrock outcrops,	Limited, but may occur at depth in deeper soils W/MW, locally may be I	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L	L-M Bedrock at or near surface
11	Rri//Dv	Irregular bedrock outcrops and/or ridges and minor areas of weathered bedrock and/or colluvium.	Unlikely R//W	Frost Shattering Frost Wedging	Stable	Stable	Stable	L	L Bedrock at or near surface
12A	Mbv/Dbv or Wbv/Dbv or Mbv•Wbv/ Dbv	Blankets and veneers of marine washed till and/or marine sands and or gravels and locally with weathered bedrock occasionally with minor bedrock outcrops	Limited, likely at depth in deeper soils W/MW	Frost Shattering Frost Wedging	Stable	Stable to Minor Instability	Stable	L-M	L-M Bedrock may be near surface

New Terrain Number	Terrain Type	Terrain Description	Ground Ice Conditions/ Soil Drainage[3]	Typical Active Layer Processes	Thaw Stability	Freezing Stability	Frozen Stability	Potential Need for Permafrost Design and Construction Methods	Hazard for thaw and/or freezing induced displacement [4]/ Aggregate Suitability
12B	Mbv/Dbv or Wbv/Dbv or Mbv•Wbv/ Dbv	Blankets and veneers of marine washed till and/or marine sands and or gravels and locally with weathered bedrock occasionally with minor bedrock outcrops	Likely present MW/I or I/MW	Frost Shattering Frost Wedging Frost Jacking Thaw settlement	Stable Thaw settlement possible.	Stable to Minor Instability	Frost creep may occur under loading	L-M	M Bedrock may be near surface
12C	Mbv/Dbv or Wbv/Dbv or Mbv•Wbv/ Dbv	Blankets and veneers of marine washed till and/or marine sands and or gravels and locally with weathered bedrock occasionally with minor bedrock outcrops	Likely present I/P or P/I	Frost Shattering Frost Wedging Frost Jacking Thaw settlement	Stable Thaw settlement possible.	Stable to Minor Instability	Frost creep may occur under loading	M-H	H Bedrock may be near surface

APPENDIX B

Terrain Classification Codes and Terminology

TERRAIN CLASSIFICATION LEGEND[5]

Texture			
Symbol	**Name**	**Size (mm)**	**Other Characteristics**
a	blocks	>256	angular particles
b	boulders	>256	rounded & subrounded particles
k	cobble	64-256	rounded & subrounded particles
p	pebbles	2-64	rounded & subrounded particles
s	sand	2-.062	
z	silt	.062-.002	
c	clay	<.002	
d	mixed fragments	>2	mix of rounded and angular particles
g	gravel	>2	mix of boulders, cobbles and pebbles
x	angular fragments	>2	mix of rubble and blocks
r	rubble	2-256	angular particles
m	mud	<.062	mix of clay and silt
y	shells	-	shells or shell fragments
e	fibric	well-preserved fibre: (40%) identifies after rubbing	
u	mesic	intermediate decomposition between fibric and mesic	
h	humic	decomposed organic material; (10%) identified after rubbing	

Deliminiters		
Symbol	**Name**	**Definition**
•	bullet	components are approximately equal
/	single slash	approximately 60/40 component in front is dominant
//	double slash	approximately 80//20 component in front considerably more extensive

[5] Howes, D.E. and E. Kenk. 1997. Terrain Classification System for British Columbia (Revised Edition), Ministry of Environment, Ministry of Crown Lands, Victoria, BC, Canada.

Surficial Materials			
Symbol	**Name**	**Assumed Status of Formative Process**	**Description**
A	anthropogenic	(A)	Man-made or man-modified material
C	colluvial	(A)	Products of mass wastage
D	weathered rock	(A)	In situ bedrock
E	eolian	(I)	Materials deposited by wind action
F	fluvial	(I)	River deposits
F^G	glaciofluvial	(I)	Fluvial materials deposited by meltwater streams
I	ice	(A)	Permanent snow; glaciers and icefields
L	lacustrine	(I)	Lake sediments: includes littoral deposits
L^G	glaciolacustrine	(I)	Sediments deposited in glacial lakes
M	morainal	(I)	Material deposited directly by glaciers
O	organic	(A)	Accumulation/decay of vegetative matter
R	bedrock	(-)	Outcrops/rocks covered by less than 10 cm
U	undifferentiated	(-)	Layered sequence three materials or more
V	volcanic	(I)	Unconsolidated pyroclastic sediments
W	marine	(I)	Marine sediments: includes littoral deposits
W^G	glaciomarine	(I)	Sediments of glacial origin deposited in a marine environment

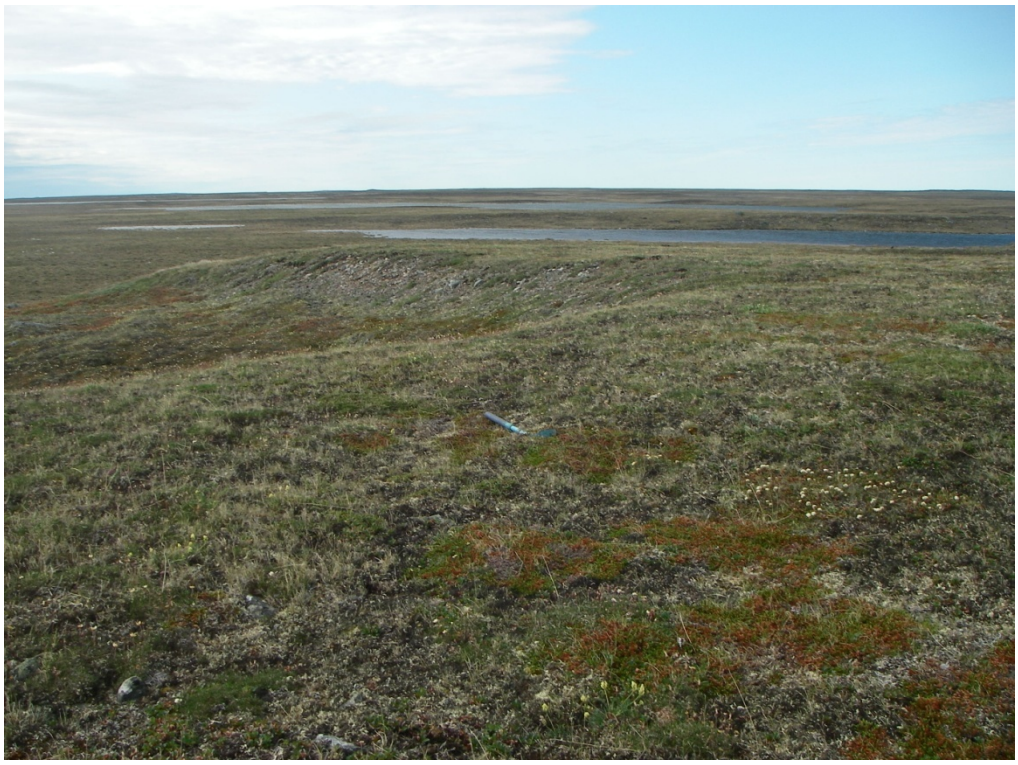
Qualifiers		
Symbol	**Name**	**Description**
G	glacial	Used to qualify surficial material where there is evidence that glacier ice affected the mode of deposition of material
A	active	Used to qualify surficial material and geomorphological processes with regard to their current state of activity
I	inactive	

Surface Expression		
Symbol	**Name**	**Description**
a	moderate slope	Unidirectional surface: 16 to 26°
b	blanket	A mantle of unconsolidated materials: >1 m thick
c	cone	A cone or sector of a cone: >15°
d	depression	A sharply demarked hollow
f	fan	A sector of a cone: up to 15°
h	hummocky	Hillocks and hollows, irregular plan: 15 to 35°
j	gentle slope	Unidirectional surface: 4 to 15°
k	moderately steep	Unidirectional surface 27 to 35°
m	rolling	Elongate hillocks: parallel in plan: 3 to 15°
p	plain	Unidirectional surface: 0 to 3 °
r	ridged	Elongated hillocks: parallel in plan: 15 to 35°
s	steep	Steep slopes: >35°
t	terraced	Step like topography
u	undulating	Hillocks and hollows: irregular in plan: 0 to 15°
v	veneer	Mantle of unconsolidated material: 10 cm to 1 m thick
w	mantle of variable thickness	Surficial material of variable thickness: (0 to about 3 m)
x	thin veneer	Similar to veneer (2-20 cm thick)

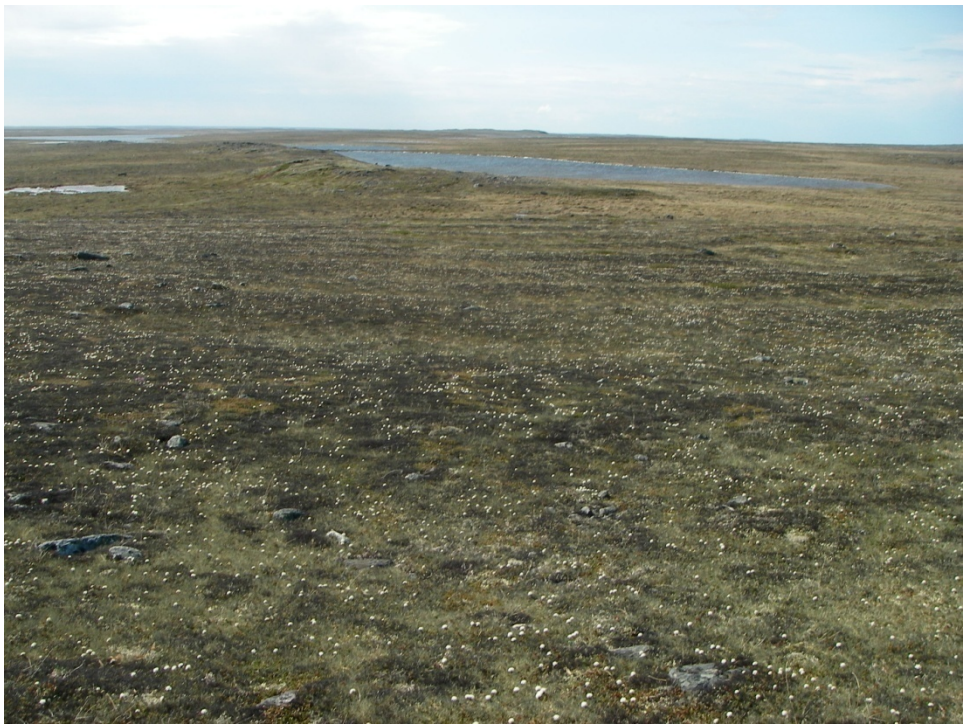
Geomorphological Processes			
Symbol	**Name**	**Assumed Status of Formative Process**	**Description**
A	avalanches	(A)	Terrain modified by snow avalanches
B	braiding	(A)	Diverging/converging channels: unvegetated bars
C	cryoturbation	(A)	Sediments modifies by frost heaving and churning
D	deflation	(A)	removal of sand and silt by wind action
E	channelled	(I)	channel formation by glacial meltwater
F	slow mass movement	(A)	slow down-slope movement of masses of cohesive or non-cohesive material and/or bedrock
H	kettled	(I)	depressions due to the melting of buried glacier ice
I	irregular channel	(A)	a single, clearly defined main channel displaying irregular turns and bends
J	anastamosing channel	(A)	A channel zone where channels diverge and converge around vegetated islands
K	karst	(A)	Processes associated with the solution of carbonates
L	surface seepage	(A)	Abundant surface seepage
M	meandering channels	(A)	Channels characterized by regular patterns of bends with uniformed amplitude and wave length
N	nivation	(A)	Erosion beneath and along the margin of snow patches
P	piping	(A)	subterranean erosion by flowing water
R	rapid mass movement	(A)	rapid downslope movement of dry, moist or saturated debris
S	solifluction	(A)	slow downslope movement of saturated overburden across a frozen or otherwise impermeable substrate
U	inundation	(A)	Seasonally under water due to high water table
V	gully erosion	(A)	Parellel/subparallel ravines due to erosion by various processes
W	washing	(A)	removal of fines by waves and running water
X	permafrost	(A)	Processes controlled by the presence of permafrost
Z	periglacial processes	(A)	Solifluction, cryoturbation and nivation processes occurring within a single unit

APPENDIX C

Site Photographs Terrain Types



Photograph 1: Terrain type 1- Well-drained beach ridge or berm near waypoint T021

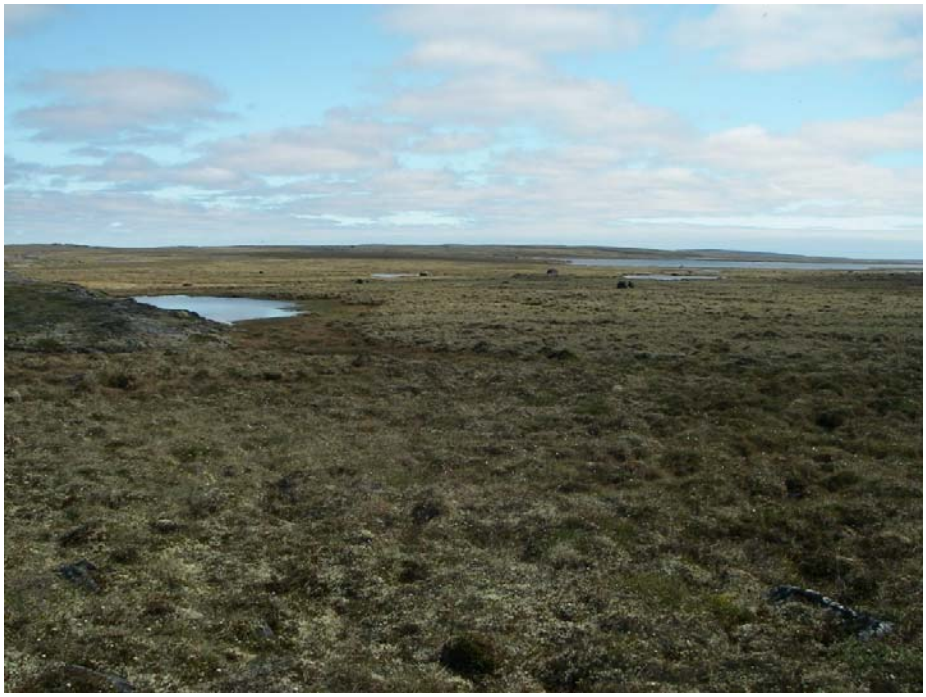


Photograph 2: Terrain type 2A. Flight of well to moderately well-drained, low, subdued beach ridges.

Photograph 3: Terrain type 2B. Moderately well to imperfectly-drained blanket of beach sands.

Photograph 4: Terrain type 2C. Imperfectly to poorly drained blanket of beach sands.

Photograph 5: Terrain type 2D. Poorly to imperfectly-drained beach sands, near waypoint R726.



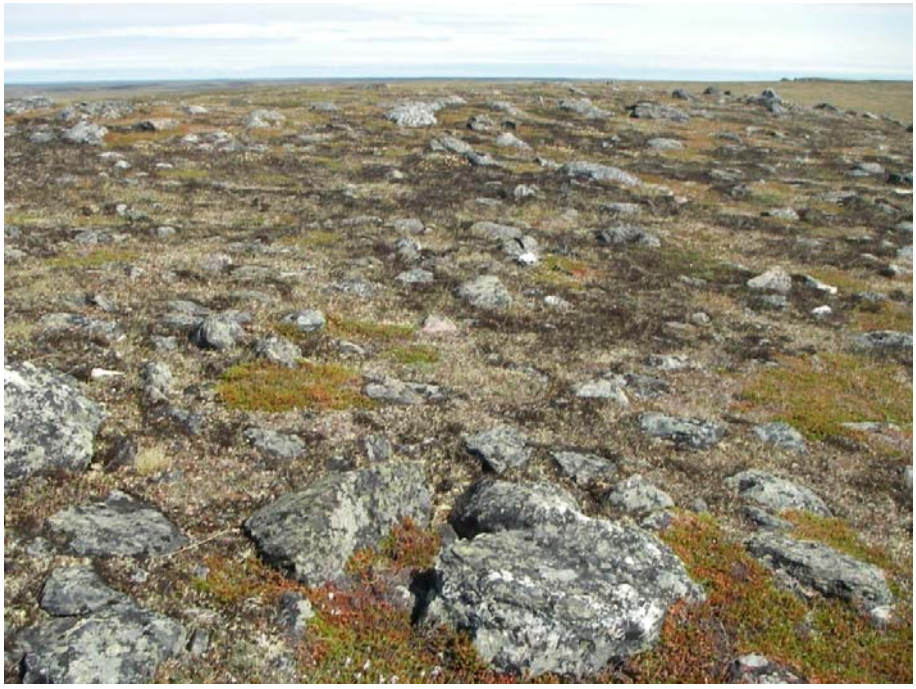
Photograph 6: Terrain type 2E. Poorly to very poorly -drained beach sands and/or gravels (grassy area in the middle distance) near waypoint R63.

Photograph 7: Terrain type 3A. Well-drained, sandy to gravelly deltaic terrace – left bank Char River.

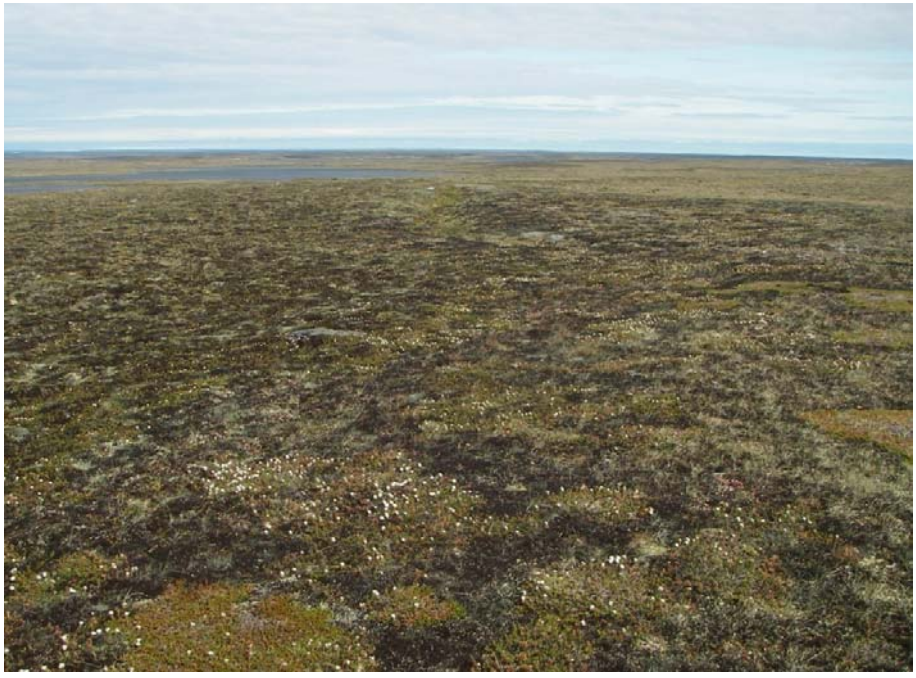
Photograph 8: Terrain type 3B. Well to moderately well-drained deltaic sands and gravels.

Photograph 9: Terrain type 3C. Imperfectly to poorly-drained deltaic sands and/or gravels.

Photograph 10: Terrain type 3D. Poorly-drained, deltaic sands and/or gravels.

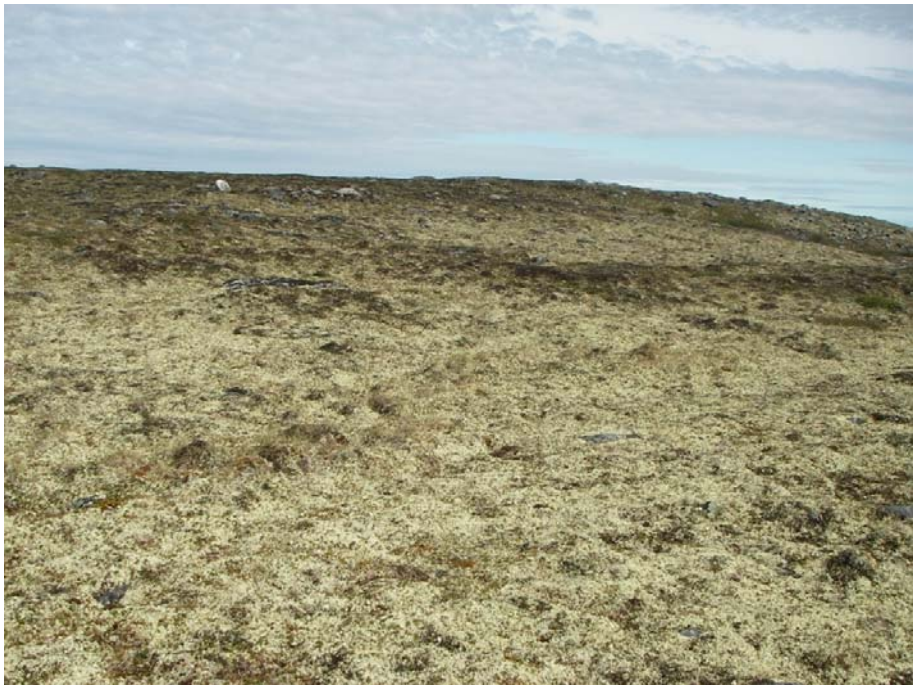


Photograph 11: Terrain type 4A. Well-drained, washed till surface within a complex map unit of washed morainal and marine sediments.



Photograph 12: Terrain type 4A. An area of well-drained beach gravels within a complex map unit of washed till and marine sediments.

Photograph 13: Terrain type 4A. Well-drained soil developed in a washed till surface within a complex map unit.



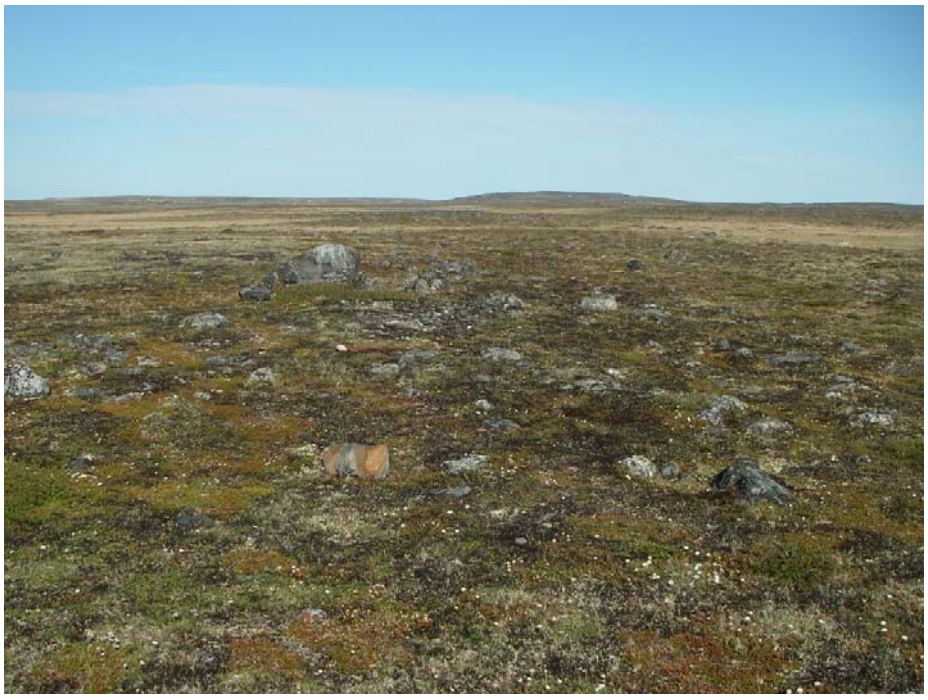
Photograph 14: Terrain type 4B. Moderately well to imperfectly-drained slopes likely dominated by washed till with lesser marine sands gravels.

Photograph 15: Terrain type 4C. An imperfectly to poorly–drained portion of a complex of washed till and marine sediments.

Photograph 16: Terrain type 4C. Imperfectly–drained soils in an area of mixed washed till and marine sediments.

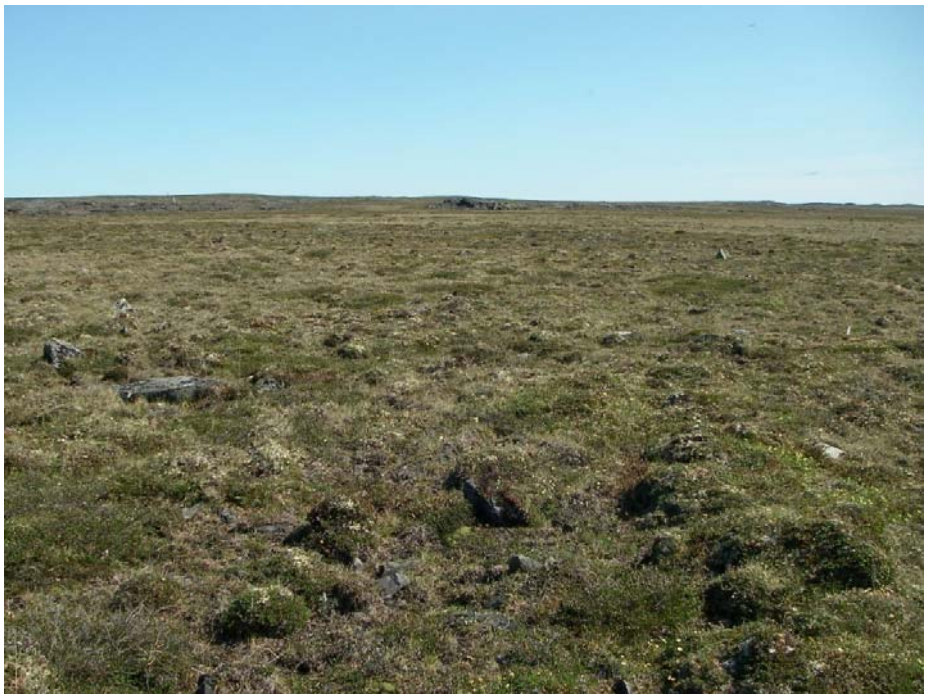
Photograph 17: Terrain type 4C. Poorly –drained portion of a complex of washed till and marine gravels or sands, possibly a relict beach platform. The left side of the photograph shows a moderately well-drained area of terrain type 5B.

Photograph 18: Terrain type 4D. Poorly to very poorly -drained, complex of washed till and marine gravels or sands. The well-drained washed till and bedrock surface to the left may be a relict coastline scarp.



Photograph 19: Terrain type 5A. Well to moderately well- drained, washed morainal (till) surfaces.

Photograph 20: Terrain type 5B. Moderately well to imperfectly drained, washed morainal surface.



Photograph 21: Terrain type 5C. Imperfectly with lesser poorly-drained, wave-washed morainal surfaces.

Photograph 22: Terrain type 5D. Poorly drained with lesser imperfectly-drained, washed morainal surfaces.

Photograph 23: Terrain type 5E. A poorly drained, wave-washed morainal surface.

Photograph 24: Terrain type 5F. Poorly to very poorly-drained washed moraine with minor organic veneers.

Photograph 25: Terrain type 5F. Discontinuous, well humified, organic veneers occur in some terrain type 5F areas.

Photograph 26: Terrain type 6A. Well-drained, wave-modified, glaciofluvial ridges (eskers) with well to moderately well-drained mid and lower slopes (terrain type 6B).

Photograph 27: Terrain type 7A. Well-drained fluvial level and/or terrace.

Photograph 28: Terrain type 7B. Imperfectly drained fluvial level (i.e., low grassy area left center of photograph).

Photograph 29: Terrain type 8. Well-drained, weathered (frost-shattered) bedrock (felsenmeer).

Photograph 30: Terrain type 9A. Well-drained weathered bedrock and lesser washed morainal and/or marine sediments, and minor bedrock outcrops.

Photograph 31: Terrain type 9B. A small area of imperfectly to poorly-drained weathered bedrock with lesser washed till and/or marine sediments and minor bedrock outcrops. These areas are often too small to map as distinct terrain units.

Photograph 32: Terrain type 10. Weathered bedrock with washed morainal and/or marine sediments, very minor bedrock.

Photograph 33: Terrain type 11. Bedrock ridge with weathered bedrock near waypoint T043

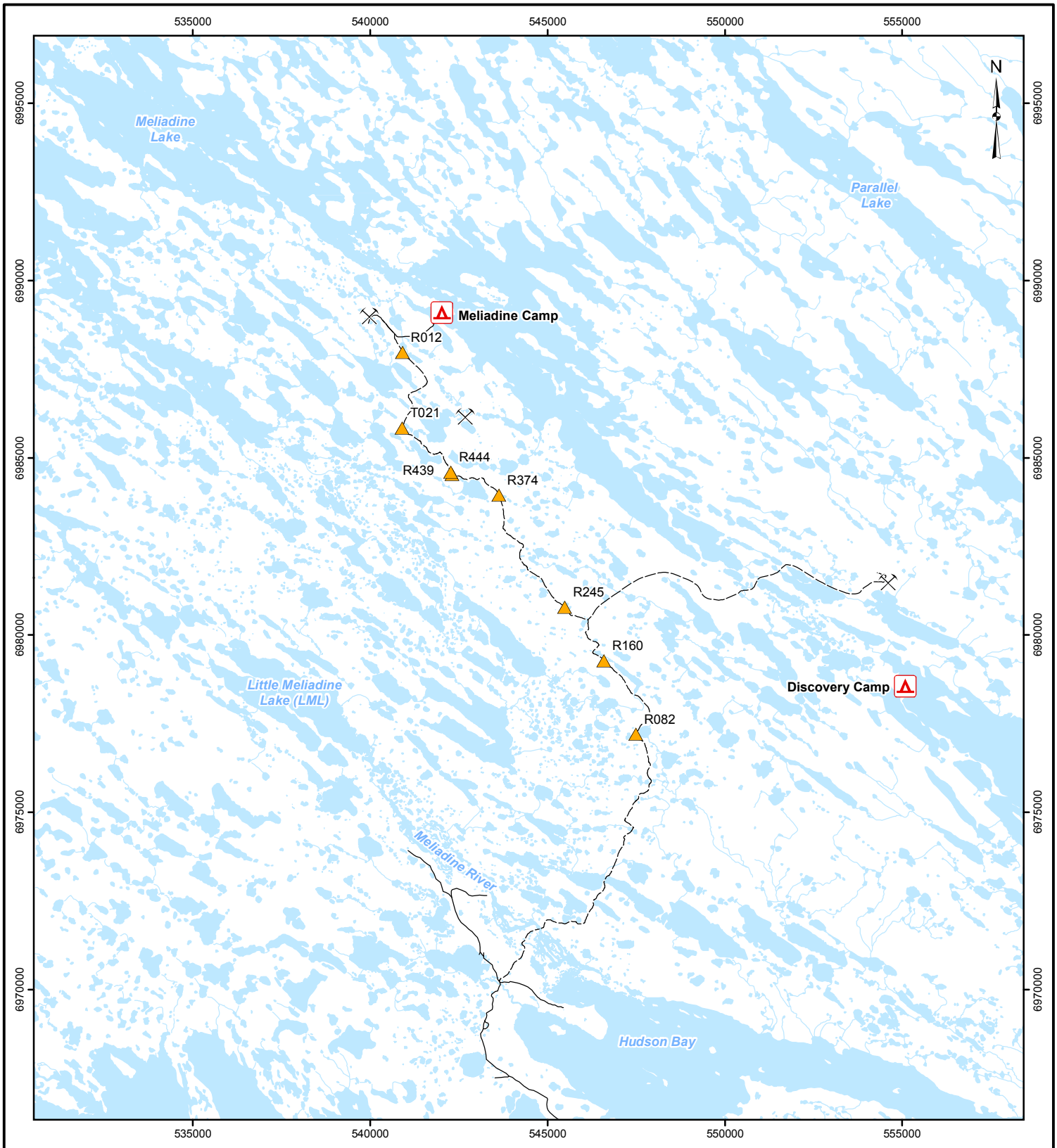
Photograph 34: Terrain type 12A. Well-drained washed till or beach sediments and minor weathered bedrock.

Photograph 35: Terrain type 12B. Moderately well to imperfectly drained washed till, lesser weathered bedrock.

Photograph 36: Terrain type 12C. Imperfectly to poorly drained washed till or marine sediments, lesser weathered bedrock.

APPENDIX D

Particle Size Sampling, Site Photographs, and Analyses



LEGEND

- Camp
- Gravel/ Till Sample Site
- Proposed Mine Site
- Proposed Road
- Road - Existing
- Watercourse
- Waterbody

3 0 3

SCALE 1:150,000 METRES

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

GRAVEL AND TILL SAMPLE SITE LOCATIONS

Golder Associates
Greater Vancouver Office, B.C.

PROJECT NO. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	03 Dec. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	03 Dec. 2009		
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

FIGURE D.1

N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\GIS\projects\3700\figure-D.1_gravel_sample_sites.mxd

Table D1: Particle Size Sampling Sites and Locations by Waypoint

Sample Number[6]	Waypoint[7]	Photograph Numbers	Notes
G1A	near T021	Photograph 1	upper slope
G1B	near T021	Photograph 2	ridge crest, large fragments ~30-40% by volume
G2A	~30 m NW of R444	Photograph 3	mid slope, water table at 0.6 m
G2B	~20 m WNW of R439	Photograph 4	ridge crest, large fragments likely ≤10% by volume
G3A	near R374	Photograph 5	mid slope, large fragments likely ≤5% by volume
G3B	near R374	Photograph 6	ridge crest, large fragments ~ 30-40% by volume
G4A	near R245	Photograph 7	lower slope NE side of ridge
G4B	near R245	Photograph 8	mid slope SW side of ridge
G4C	near R245	Photograph 9	ridge crest, large fragments likely ≤5% by volume
G5A	near R160	Photograph 10	terrace SW side of ridge, water table at 0.6 m
G5B	near R160	Photograph 11	ridge crest on side of large crack
G6A	near R082	Photograph 12	ridge crest, large fragments likely ≤20% by volume
G6B	near R082	Photograph 13 D	mid slope beach ridge W side of ridge, water table at ~0.6 m
G6C	near R082	Photograph 14	mid slope E side of ridge, large clasts ≤5% by volume
T1	~30 m SSE of R012	Photograph 15	low, subdued, morainal ridge, poorly drained

Table D2: Sample Waypoint Coordinates

Waypoint	UTM Coordinates
R012	15 V 540909 6987985
R082	15 V 547487 6977212
R160	15 V 546588 6979276
R245	15 V 545483 6980784
R374	15 V 543623 6983950
R439	15 V 542301 6984532
R444	15 V 542264 6984603
T021	15 V 540895 6985846

[6] G=gravel sample. T1=till sample

[7] R=original road location waypoint, T=supplementary waypoint – taken July 2009

Photograph 1: Sample site G1A upper slope of beach ridge near waypoint T021. Pick is 0.65 m long.

Photograph 2: Sample site G1B, beach ridge crest near waypointT021.

Photograph 3: Sample site G2A, mid slope of low beach ridge near waypoint R444

Photograph 4: Sample site G2B, at waypoint R, crest of beach ridge.

Photograph 5: Sample site G3A, near waypoint R374, mid slope of beach ridge.

Photograph 6: Sample site G3B, near waypoint R374, near crest of beach ridge.

Photograph 7: Soils at site G3B, near waypoint R374, not sampled.

Photograph 8: Sample site G4A, near waypoint R245, lower slope of a beach ridge.

Photograph 9: Sample site G4B, mid slope of a low beach ridge.

Photograph 10: Sample site G4C, crest of a low beach ridge near waypoint R245.

Photograph 11: Sample site G5A, beach terrace near waypoint R160.

Photograph 12: Sample site G5B, beach ridge crest, near waypoint R160.

Photograph 13: Sample site G6A, beach ridge crest, near waypoint R082. Rx hammer is 0.4 m long.

Photograph 14: Sample site G6b, mid slope of beach ridge, near waypoint R082.

Photograph 15: Sample site G6c, mid slope of beach ridge, near waypoint R062

Photograph 16: Sample site T1, poorly drained soils along the crest of a low, subdued morainal ridge, near waypoint R012.

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LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

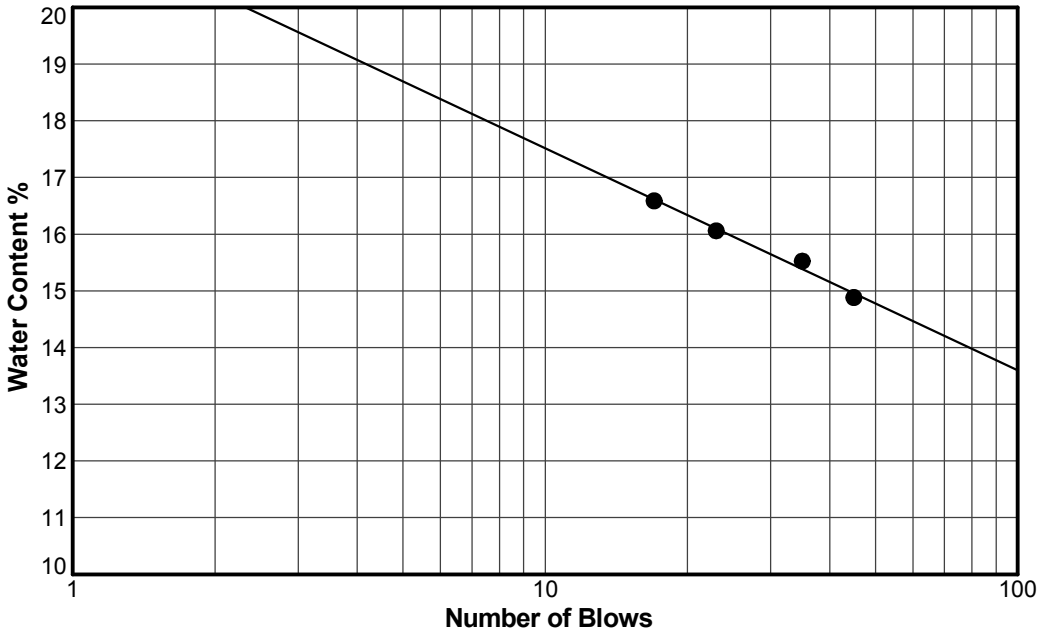
Reference(s)
ASTM D 4318-05

Client:	Comaplex Minerals Corporation	**Sample Location:** T-1	
Project:	Meliadine Gold Project	**Sample No.:** T-1	**Esis No.:** BURNAS0000021134
Location:	Nunavut	**Depth Interval (m):** 0.00 to 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Test Method: A-Multi Point	**Preparation Method: Wet**

SUMMARY	
Percent Passing #40 Sieve (%)	**83**
Liquid Limit	**16**
Plastic Limit	**14**
Plasticity Index	**2**
Natural Water Content (%)	**14**
Liquidity Index	**0**



EB	**19/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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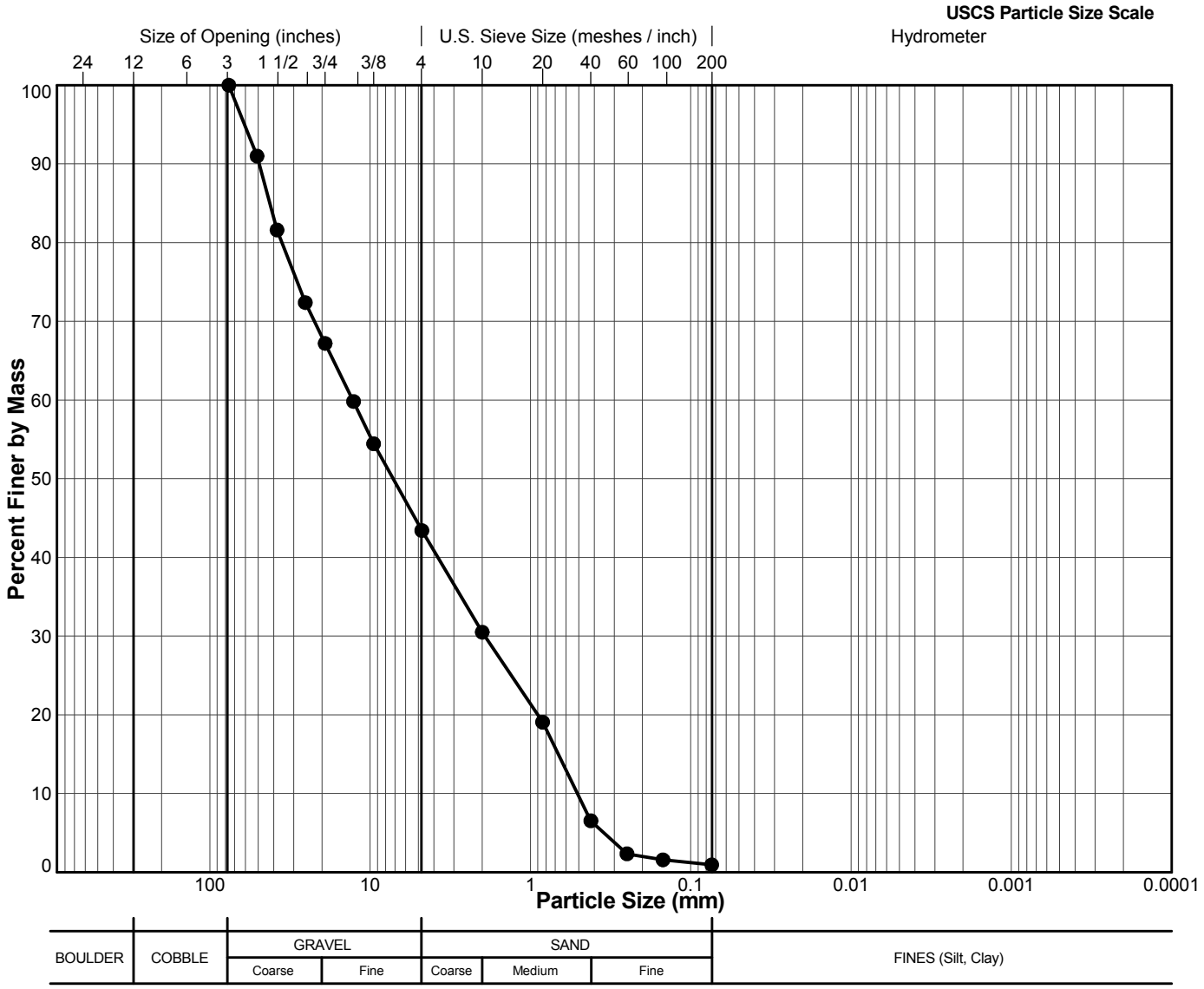
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G1A	
Project:	Meliadine Gold Project	**Sample No.:** G1A	**Esis No.:** BURNAS0000021120
Location:	Nunavut	**Depth Interval (m):** 0.00 to 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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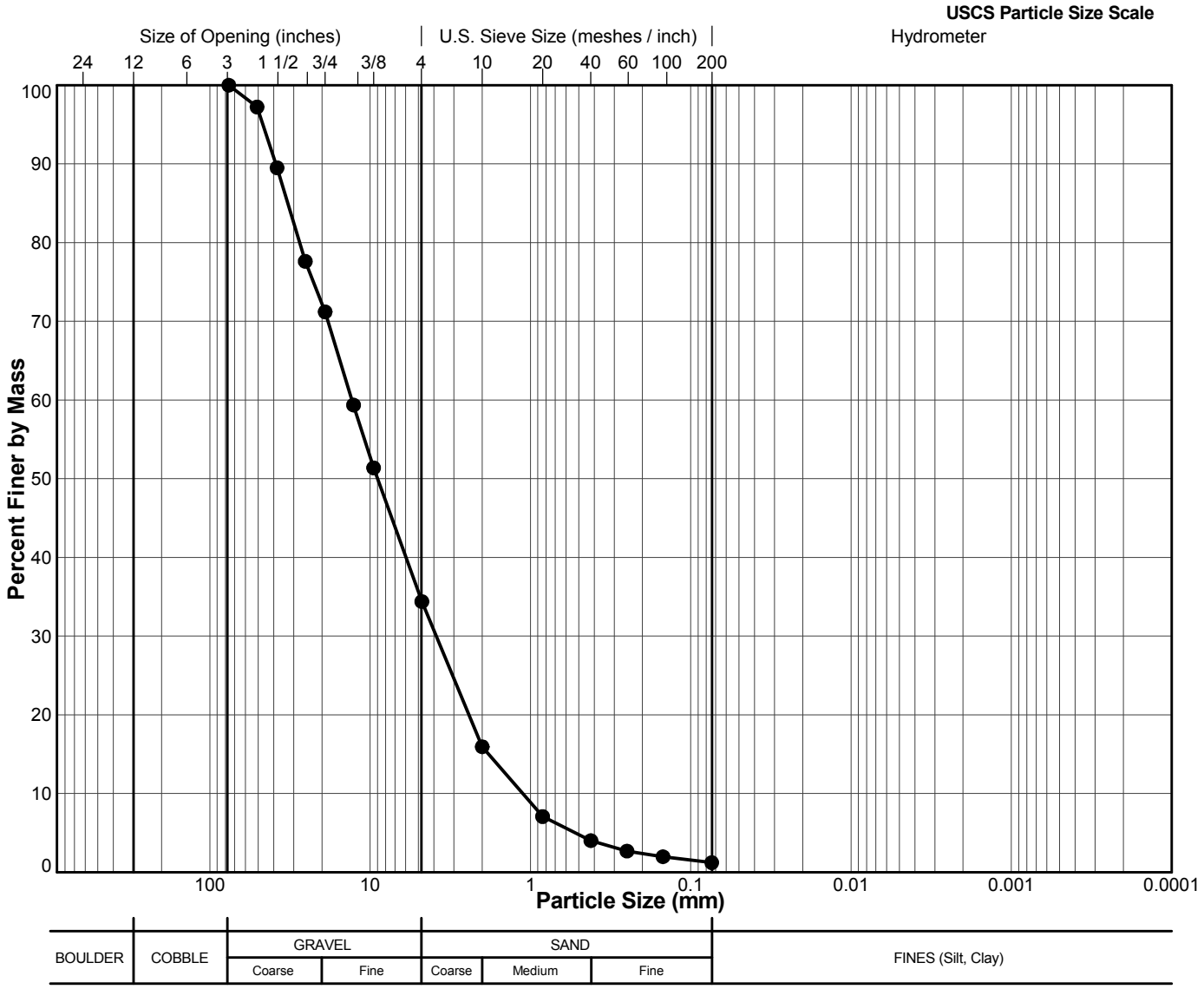
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G1B	
Project:	Meliadine Gold Project	**Sample No.:** G1B	**Esis No.:** BURNAS0000021121
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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PARTICLE SIZE ANALYSIS OF SOILS

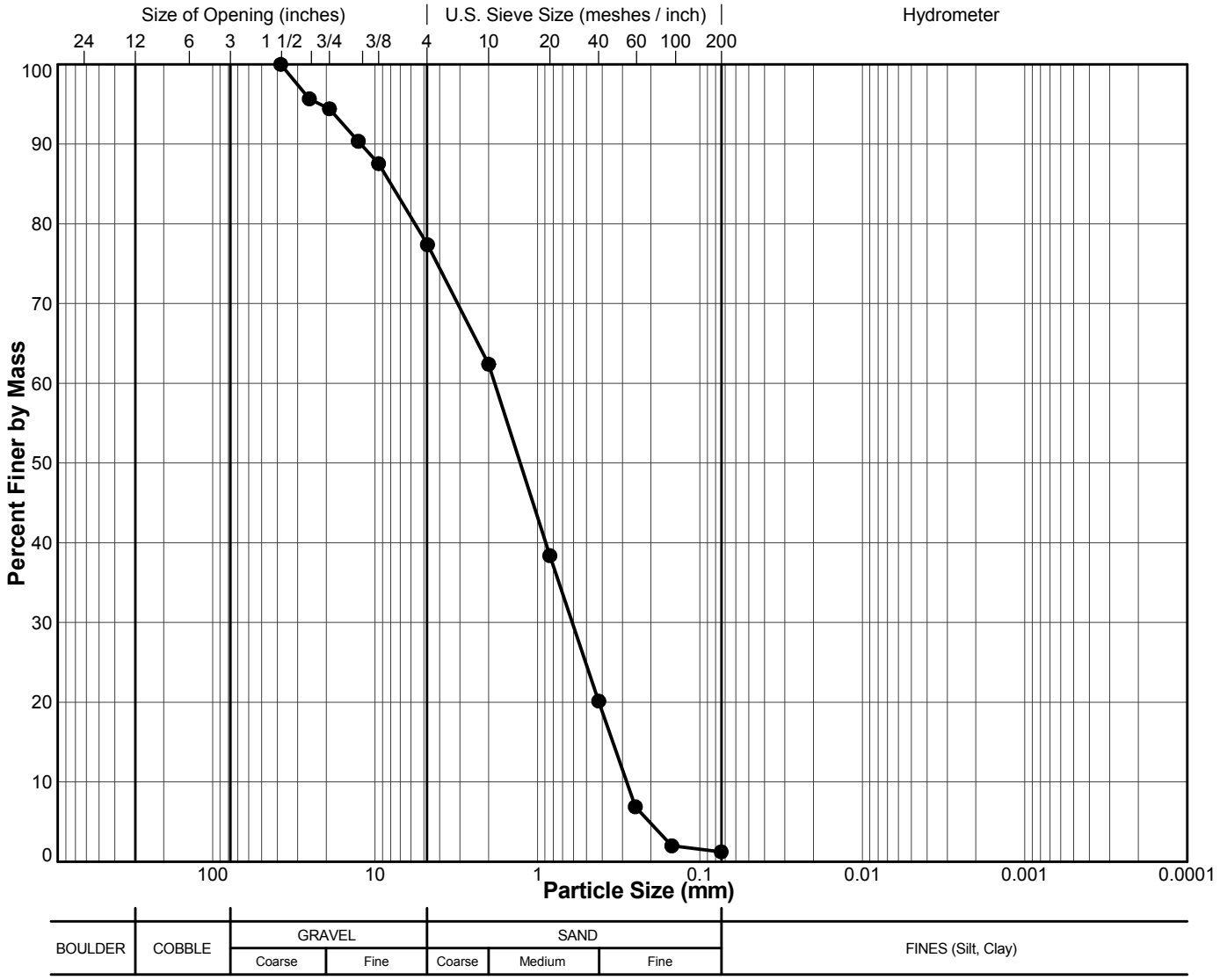
Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G2A	
Project:	Meliadine Gold Project	**Sample No.:** G2A	**Esis No.:** BURNAS0000021122
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**38.1**	**Shape:**	**N/A**
		Hardness:	**N/A**

USCS Particle Size Scale



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Tech	Date	Checked	Date

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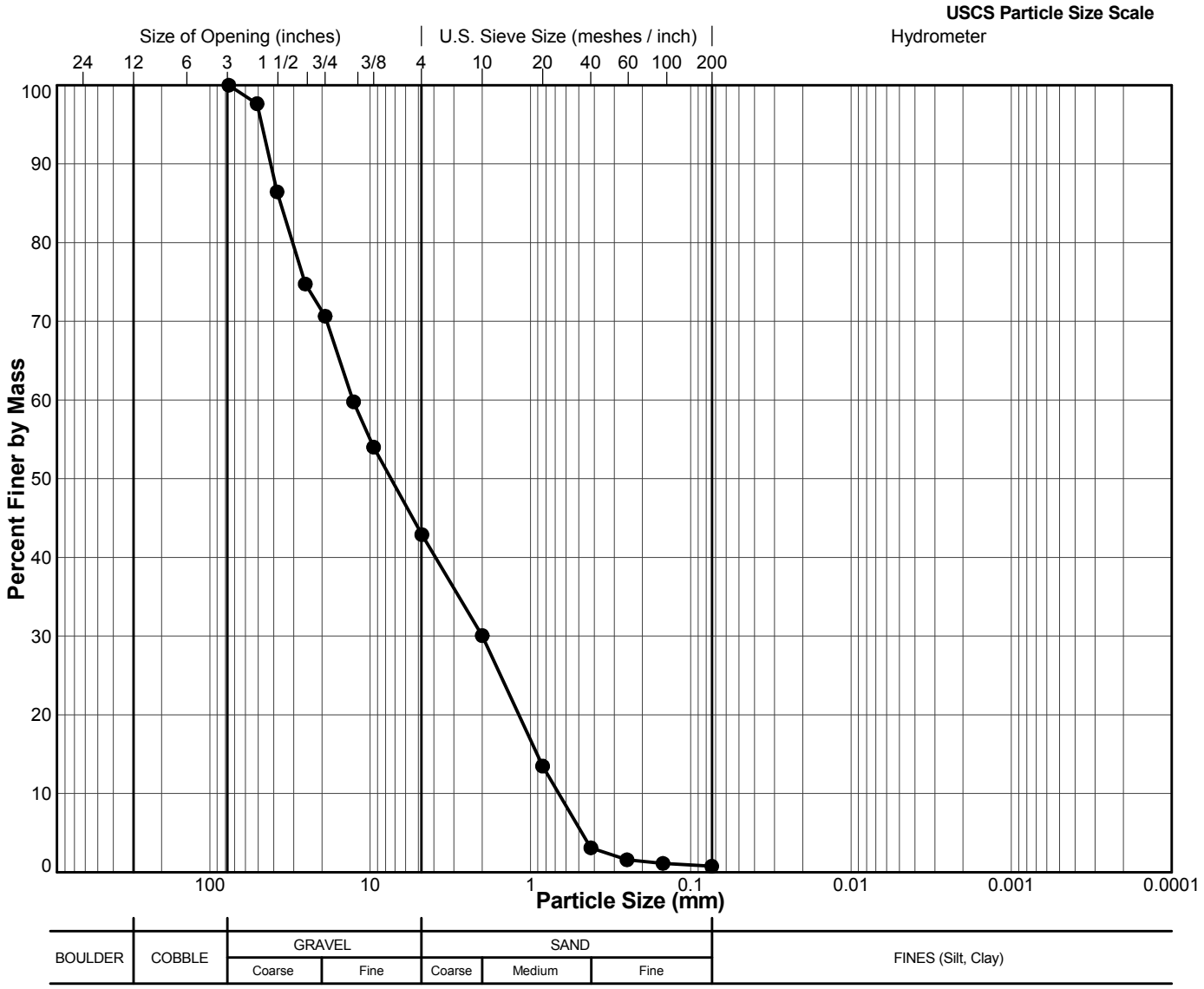
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G2B	
Project:	Meliadine Gold Project	**Sample No.:** G2B	**Esis No.:** BURNAS0000021123
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
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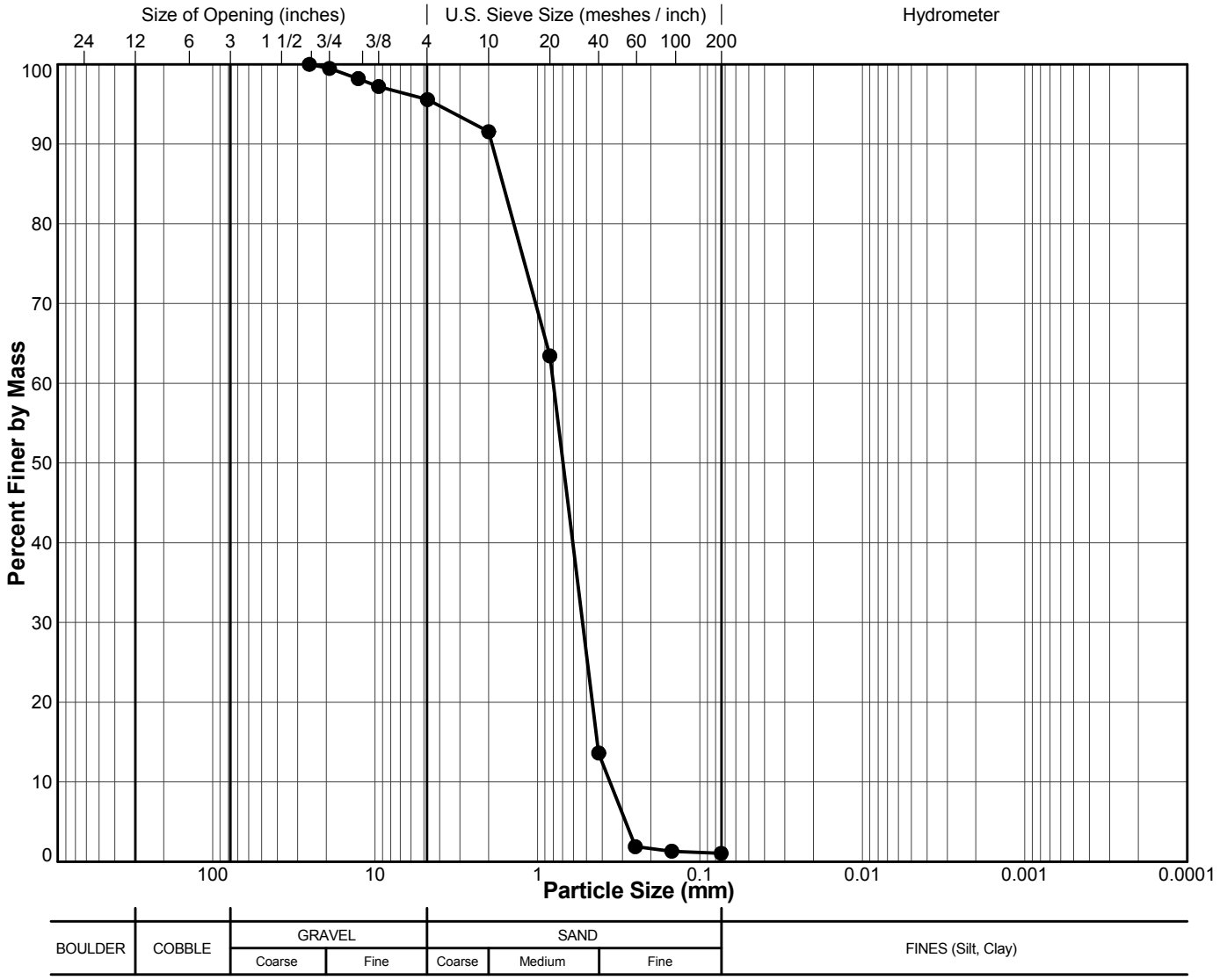
Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G3A	
Project:	Meliadine Gold Project	**Sample No.:** G3A	**Esis No.:** BURNAS0000021124
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**25.4**	**Shape:**	**N/A**
		Hardness:	**N/A**

USCS Particle Size Scale



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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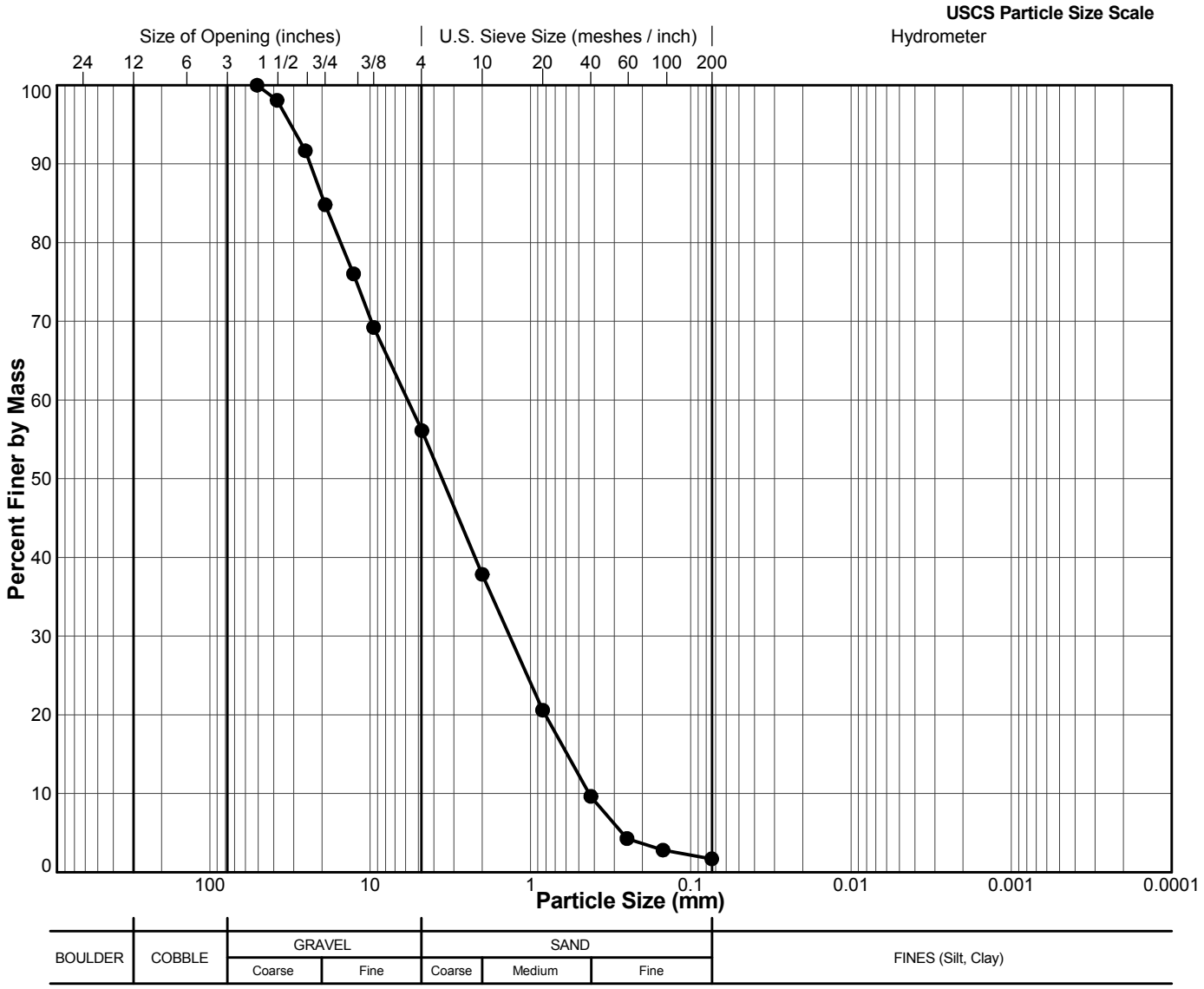
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G3B	
Project:	Meliadine Gold Project	**Sample No.:** G3B	**Esis No.:** BURNAS0000021125
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**50.8**	**Shape:**	**N/A**
		Hardness:	**N/A**



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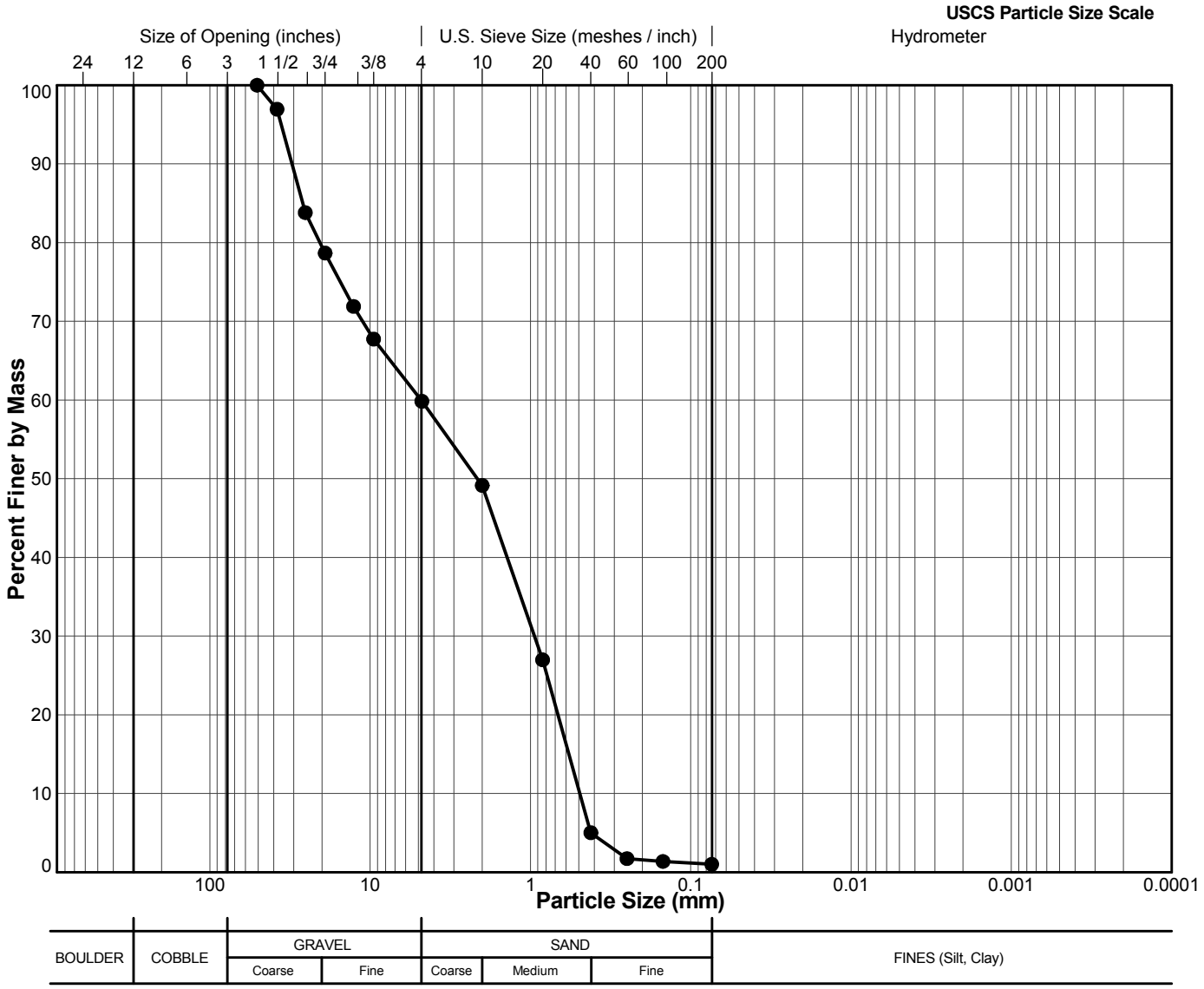
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G4A	
Project:	Meliadine Gold Project	**Sample No.:** G4A	**Esis No.:** BURNAS0000021126
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**50.8**	**Shape:**	**N/A**
		Hardness:	**N/A**



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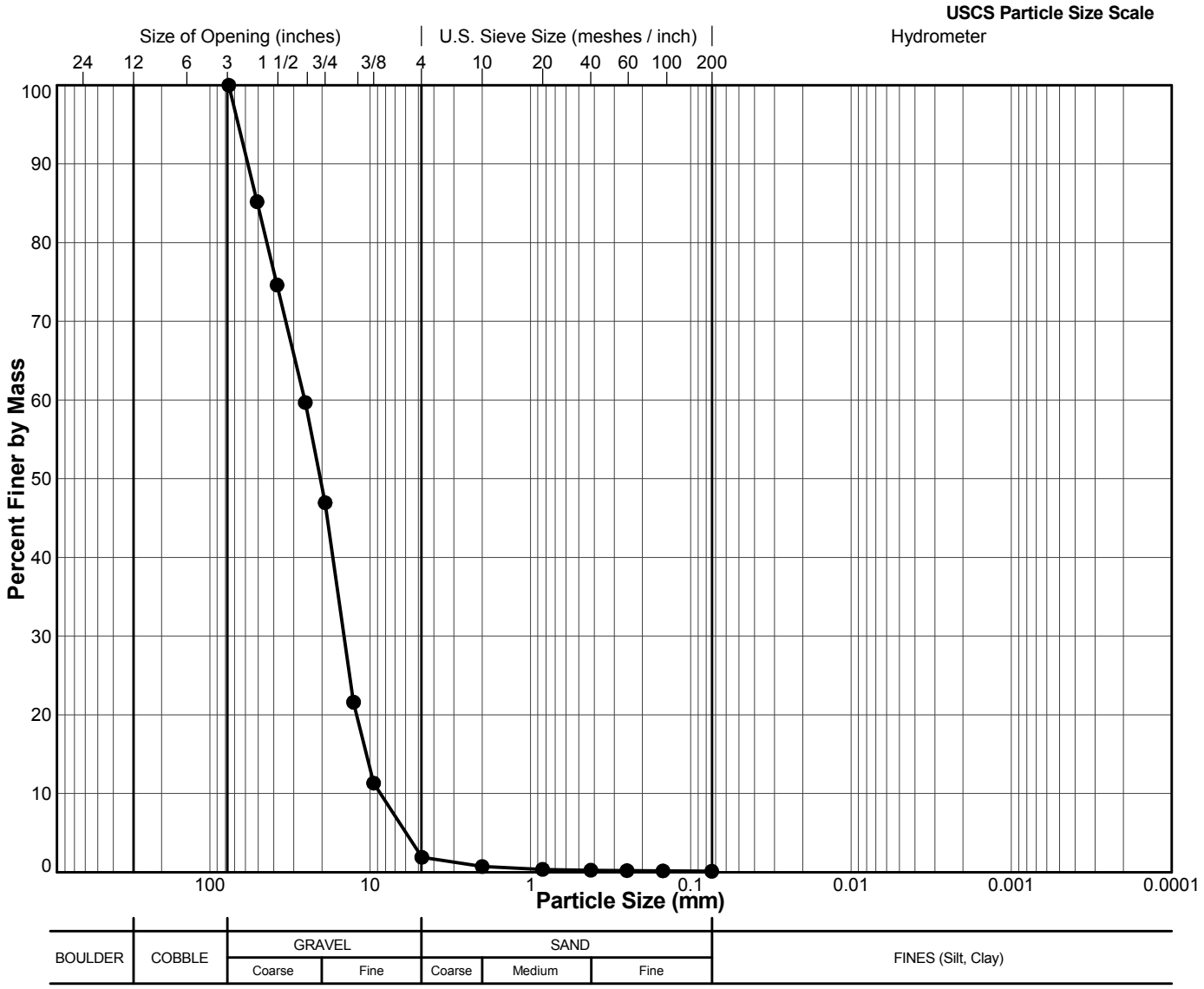
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G4B	
Project:	Meliadine Gold Project	**Sample No.:** G4B	**Esis No.:** BURNAS0000021127
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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PARTICLE SIZE ANALYSIS OF SOILS

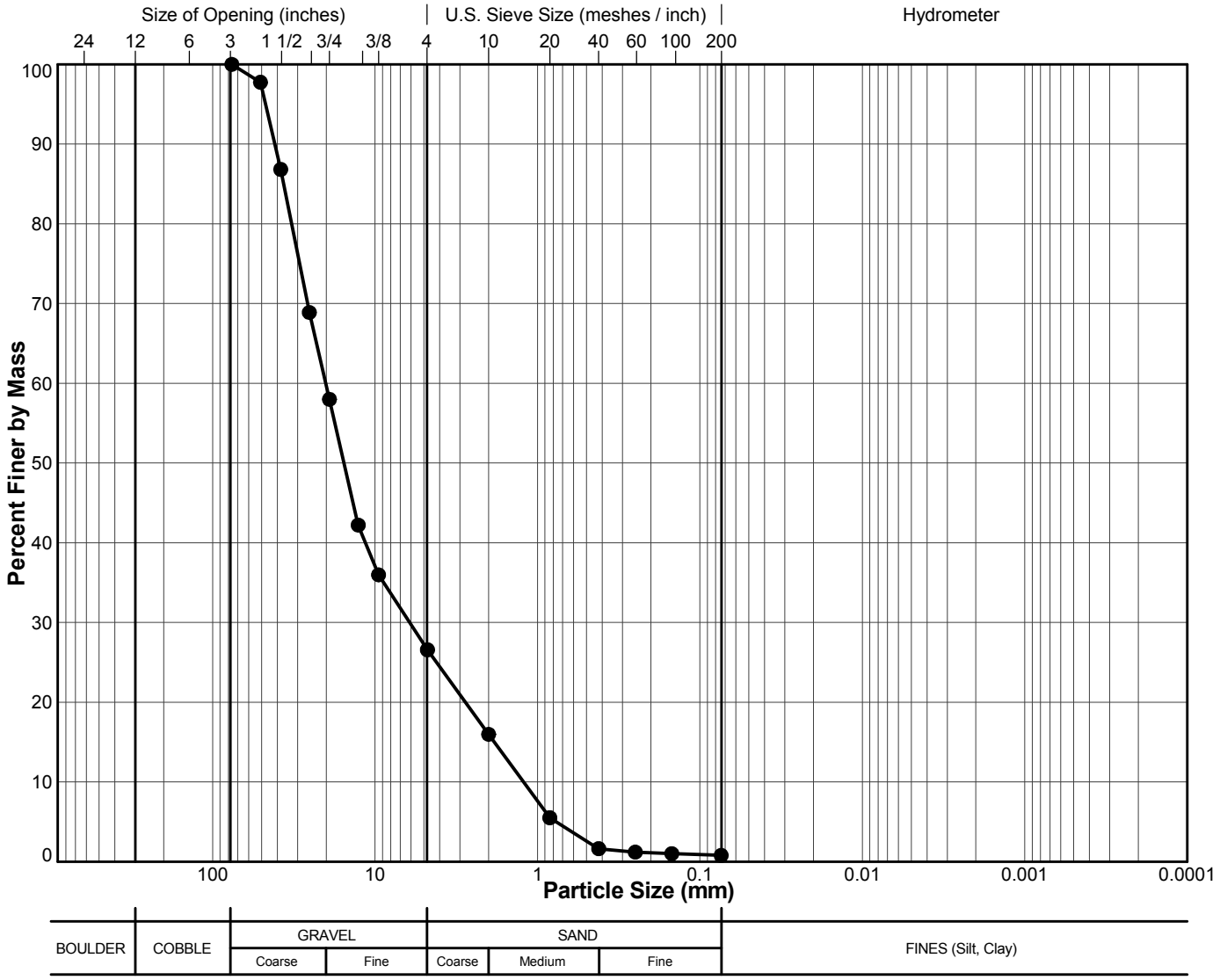
Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G4C	
Project:	Meliadine Gold Project	**Sample No.:** G4C	**Esis No.:** BURNAS0000021128
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**

USCS Particle Size Scale



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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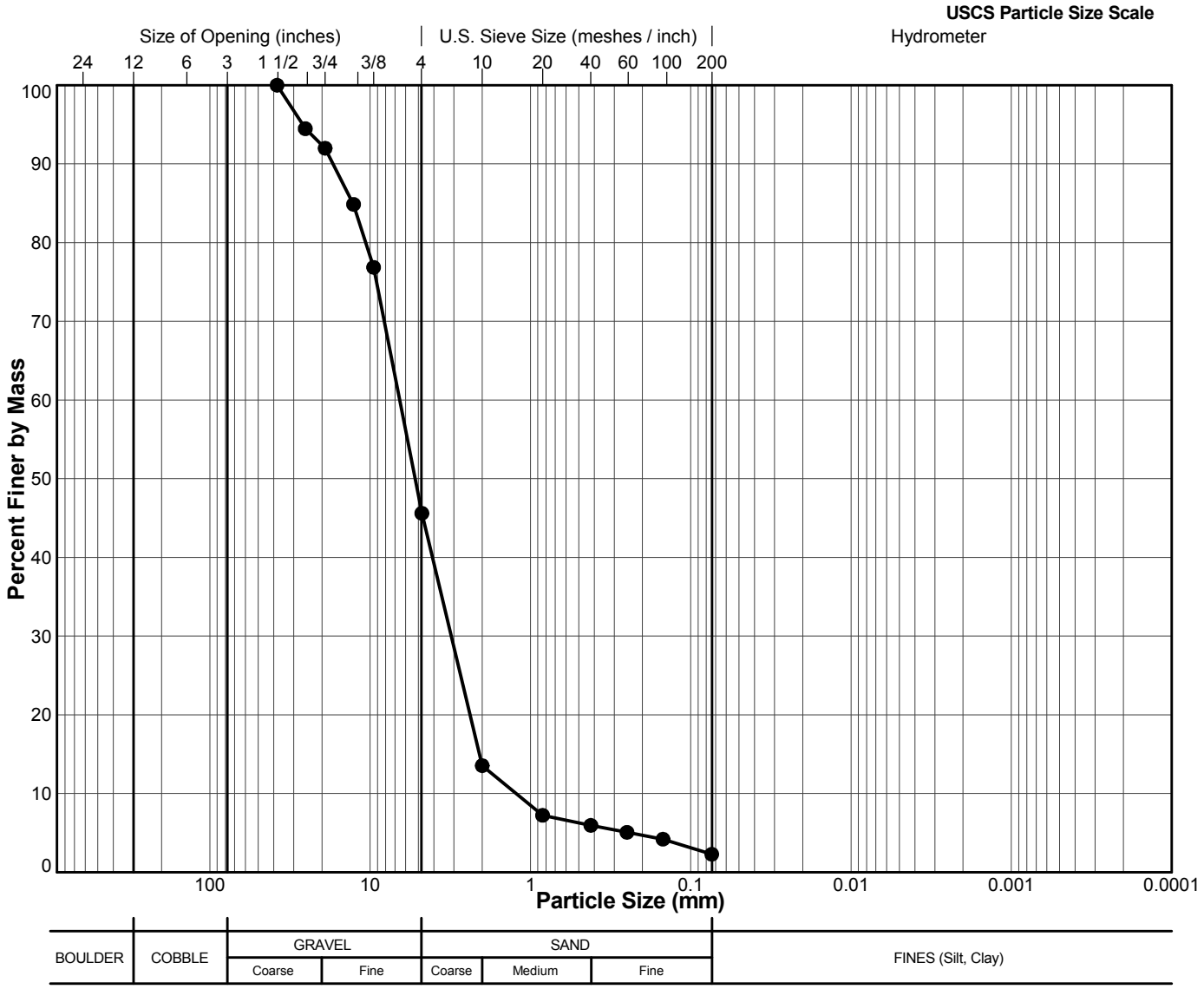
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G5A	
Project:	Meliadine Gold Project	**Sample No.:** G5A	**Esis No.:** BURNAS0000021129
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**38.1**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	12/08/2009	LP	19/08/2009
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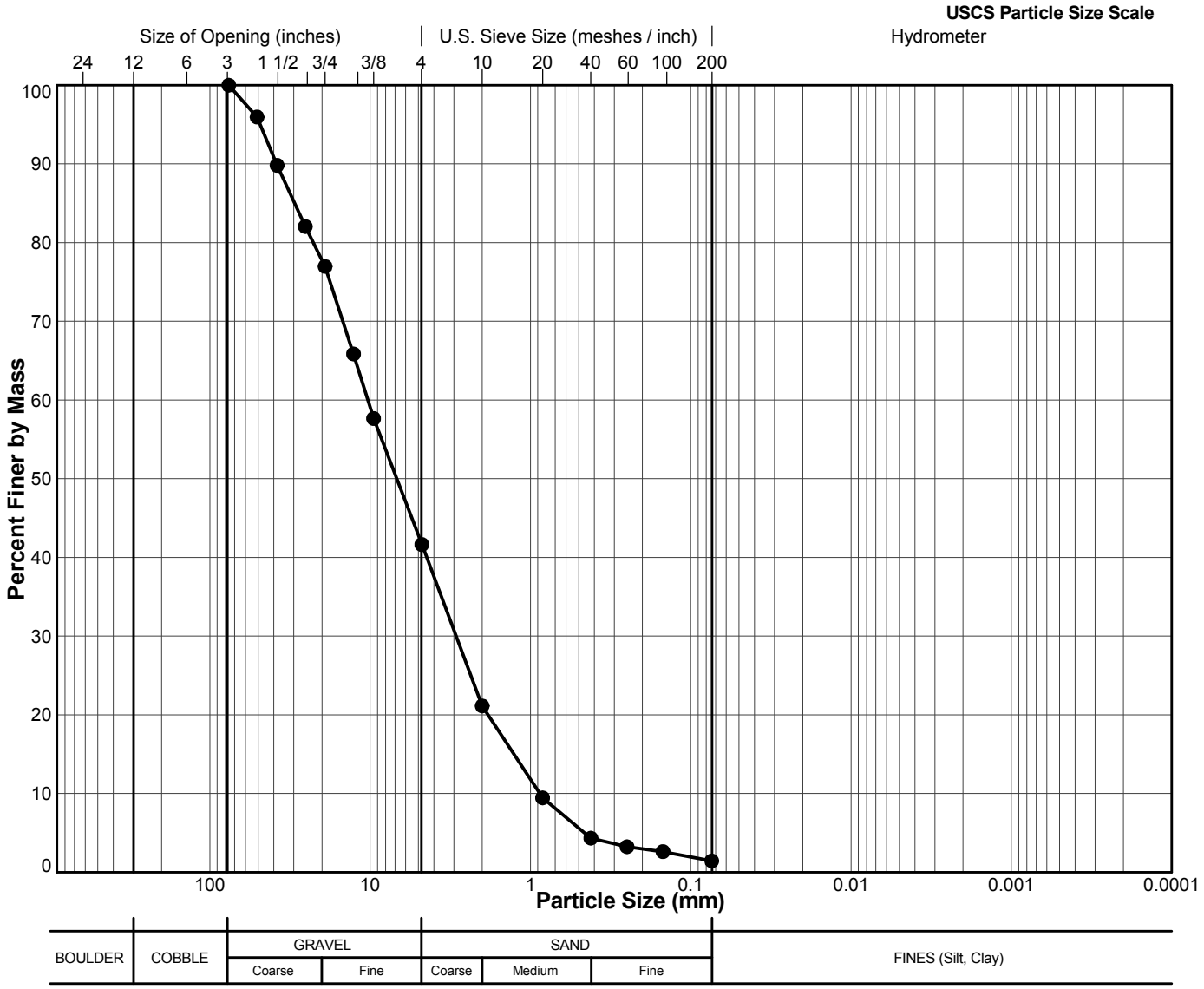
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G5B	
Project:	Meliadine Gold Project	**Sample No.:** G5B	**Esis No.:** BURNAS0000021130
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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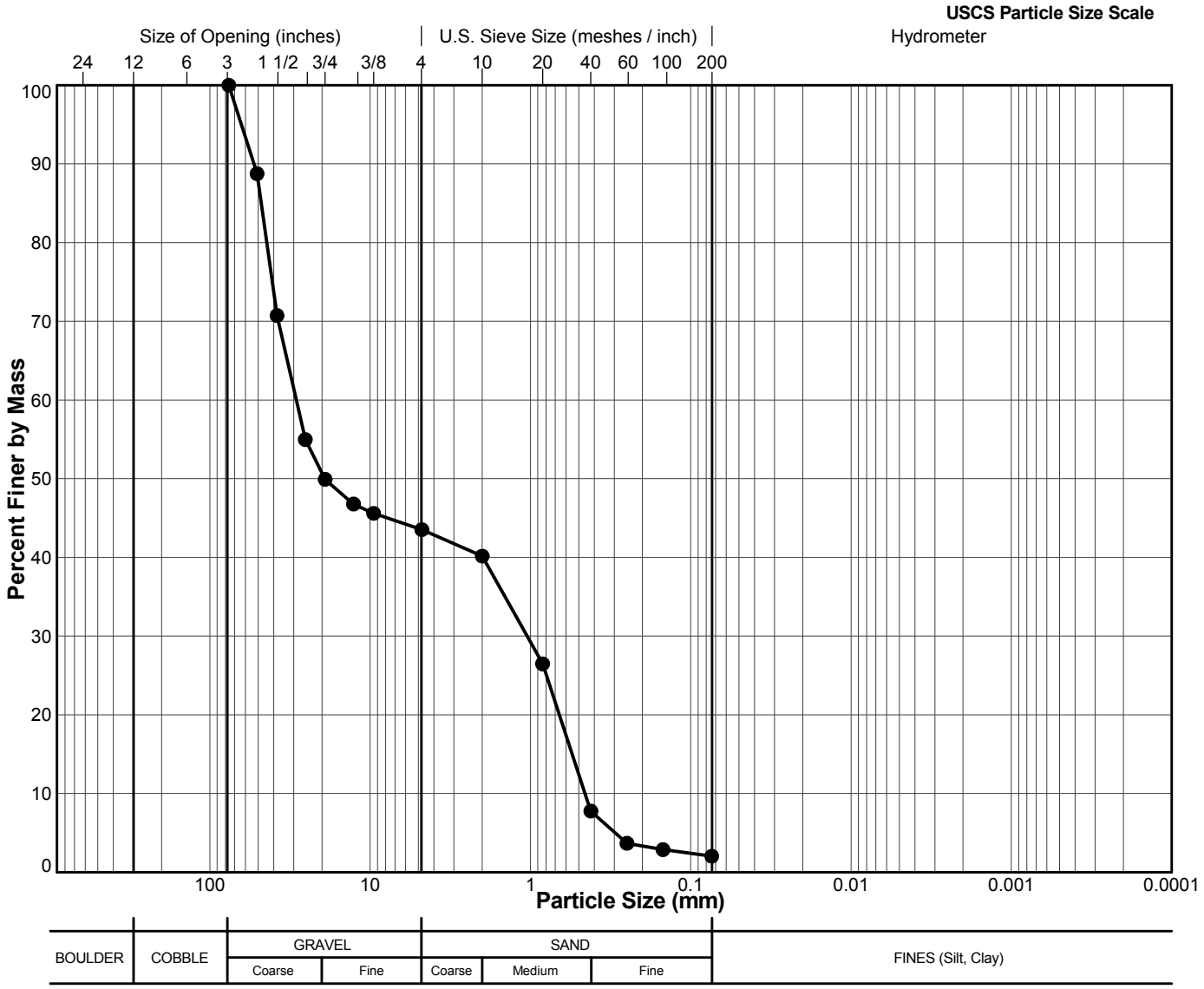
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G6A	
Project:	Meliadine Gold Project	**Sample No.:** G6A	**Esis No.:** BURNAS0000021131
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



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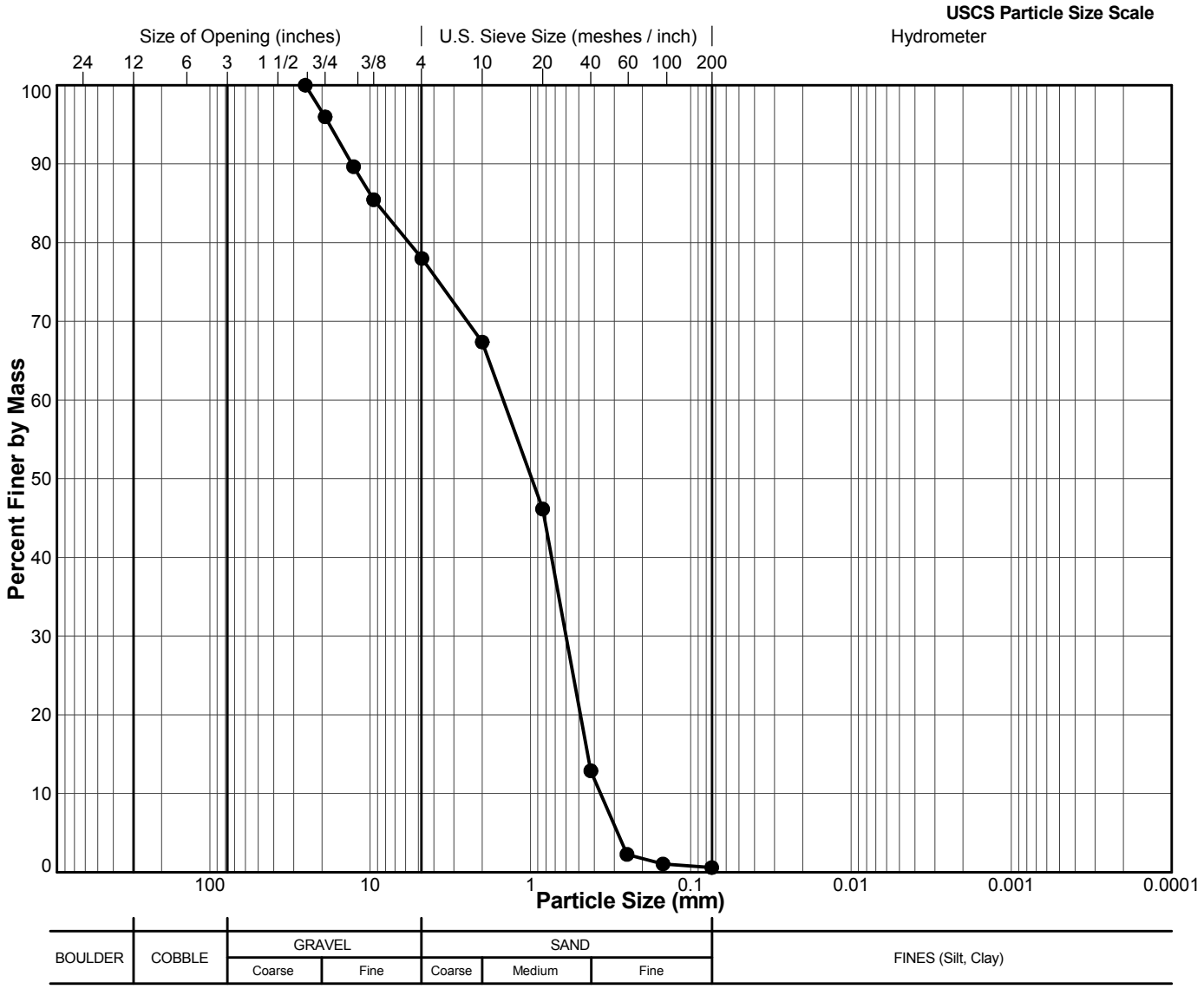
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G6B	
Project:	Meliadine Gold Project	**Sample No.:** G6B	**Esis No.:** BURNAS0000021132
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**25.4**	**Shape:**	**N/A**
		Hardness:	**N/A**



EB/GP	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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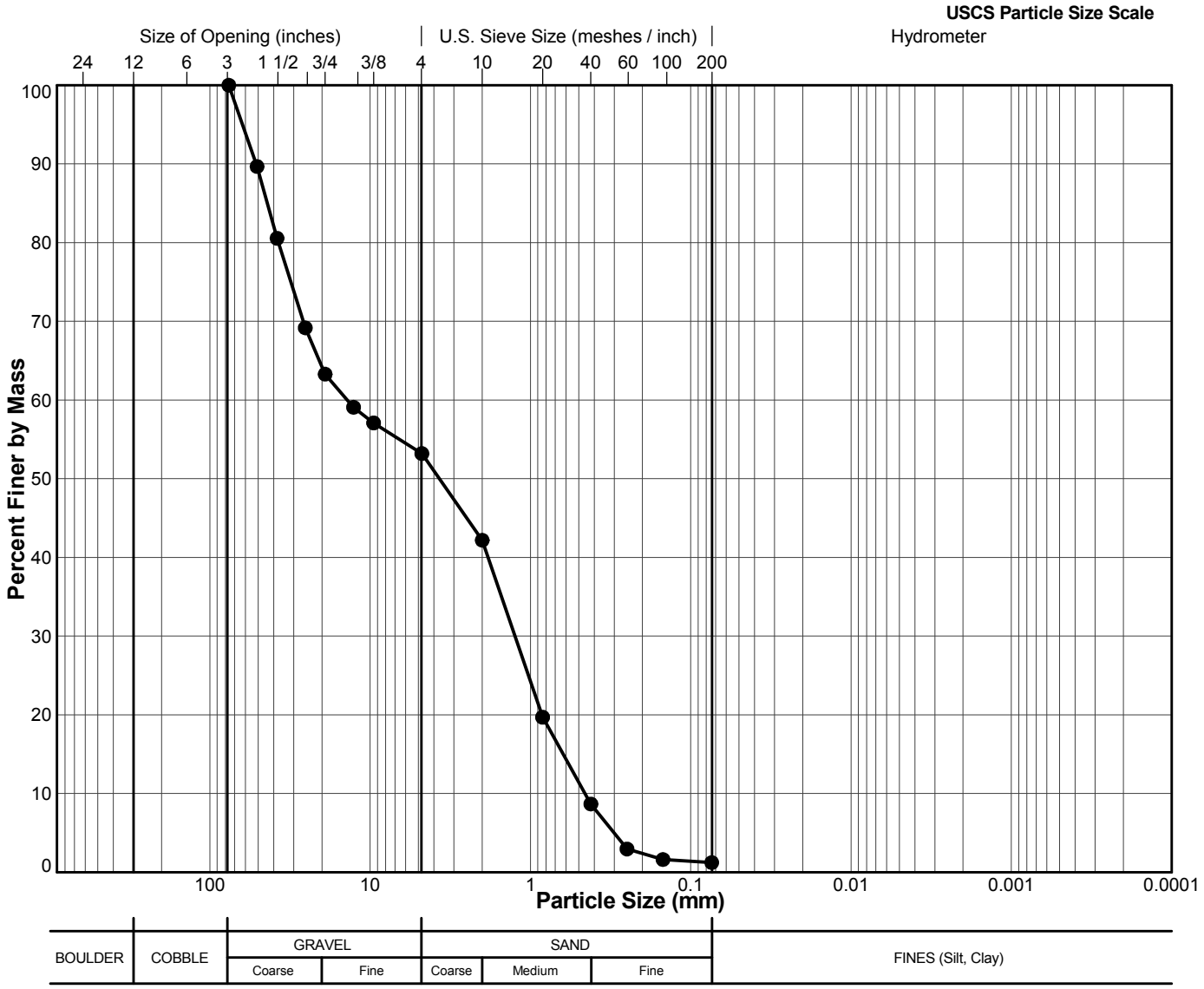
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** G6C	
Project:	Meliadine Gold Project	**Sample No.:** G6C	**Esis No.:** BURNAS0000021133
Location:	Nunavut	**Depth Interval (m):** 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):		**Method:**	
Max. Particle Size (mm):	**76.2**	**Shape:**	**N/A**
		Hardness:	**N/A**



GP/EB	**12/08/2009**	**LP**	**19/08/2009**
Tech	Date	Checked	Date

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PARTICLE SIZE ANALYSIS OF SOILS

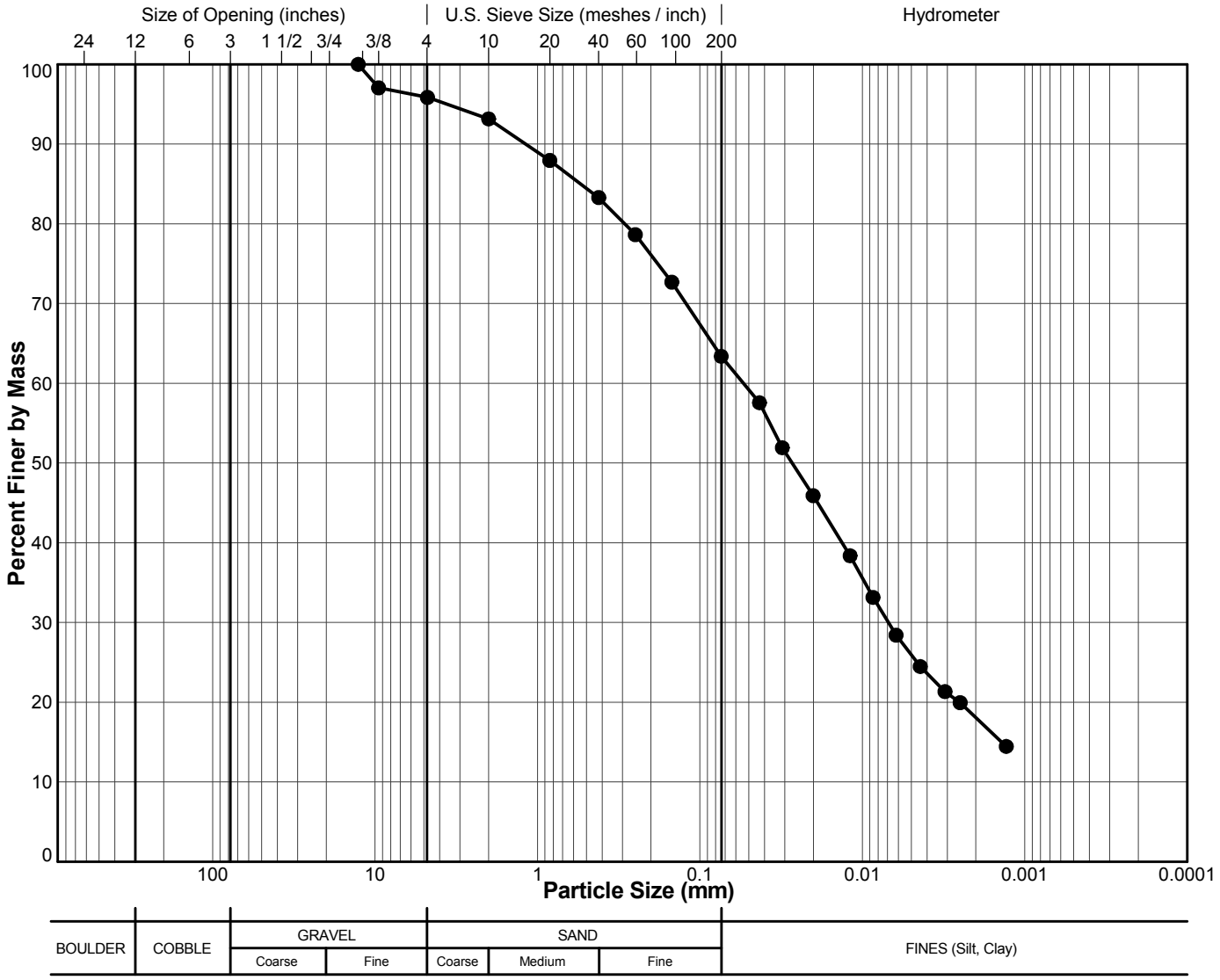
Reference(s)
ASTM D 422-63 (2007)

Client:	Comaplex Minerals Corporation	**Sample Location:** T-1	
Project:	Meliadine Gold Project	**Sample No.:** T-1	**Esis No.:** BURNAS0000021134
Location:	Nunavut	**Depth Interval (m):** 0.00 to 0.00	
Project No.:	09-1426-0015 **Phase:** 3700	**Lab Schedule No.:** 146	

Other Remarks: **N/A**

Specific Gravity (assumed):	**2.76**	**Method:**	**Split, Washed**
Max. Particle Size (mm):	**12.7**	**Shape:**	**N/A**
Dispersion Method:	**Stirring**	**Hardness:**	**N/A**

USCS Particle Size Scale



EB	**18/08/2009**	**LP**	**19/08/2009**
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WATER CONTENT DETERMINATION

Reference(s)

Client:	Comaplex Minerals Corporation	**Project No.:** 09-1426-0015 **Phase:** 3700	
Project:	Meliadine Gold Project	**Lab Schedule No.:** 146	
Location:	Nunavut		

Sample Location	Sample No.	Sample Interval		Water Content (%)
		Depth (m)	Bottom (m)	
G1A	**G1A**	0.00	0.00	**3.4**
G1B	**G1B**	0.00		**2.2**
G2A	**G2A**	0.00		**5.8**
G2B	**G2B**	0.00		**1.2**
G3A	**G3A**	0.00		**4.5**
G3B	**G3B**	0.00		**3.5**
G4A	**G4A**	0.00		**2.5**
G4B	**G4B**	0.00		**0.1**
G4C	**G4C**	0.00		**2.2**
G5A	**G5A**	0.00		**4.1**
G5B	**G5B**	0.00		**1.8**
G6A	**G6A**	0.00		**2.1**
G6B	**G6B**	0.00		**3.6**
G6C	**G6C**	0.00		**2.4**
T-1	**T-1**	0.00	0.00	**14.2**

	Checked	Date

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APPENDIX E

Terrain Type Map Unit Figures

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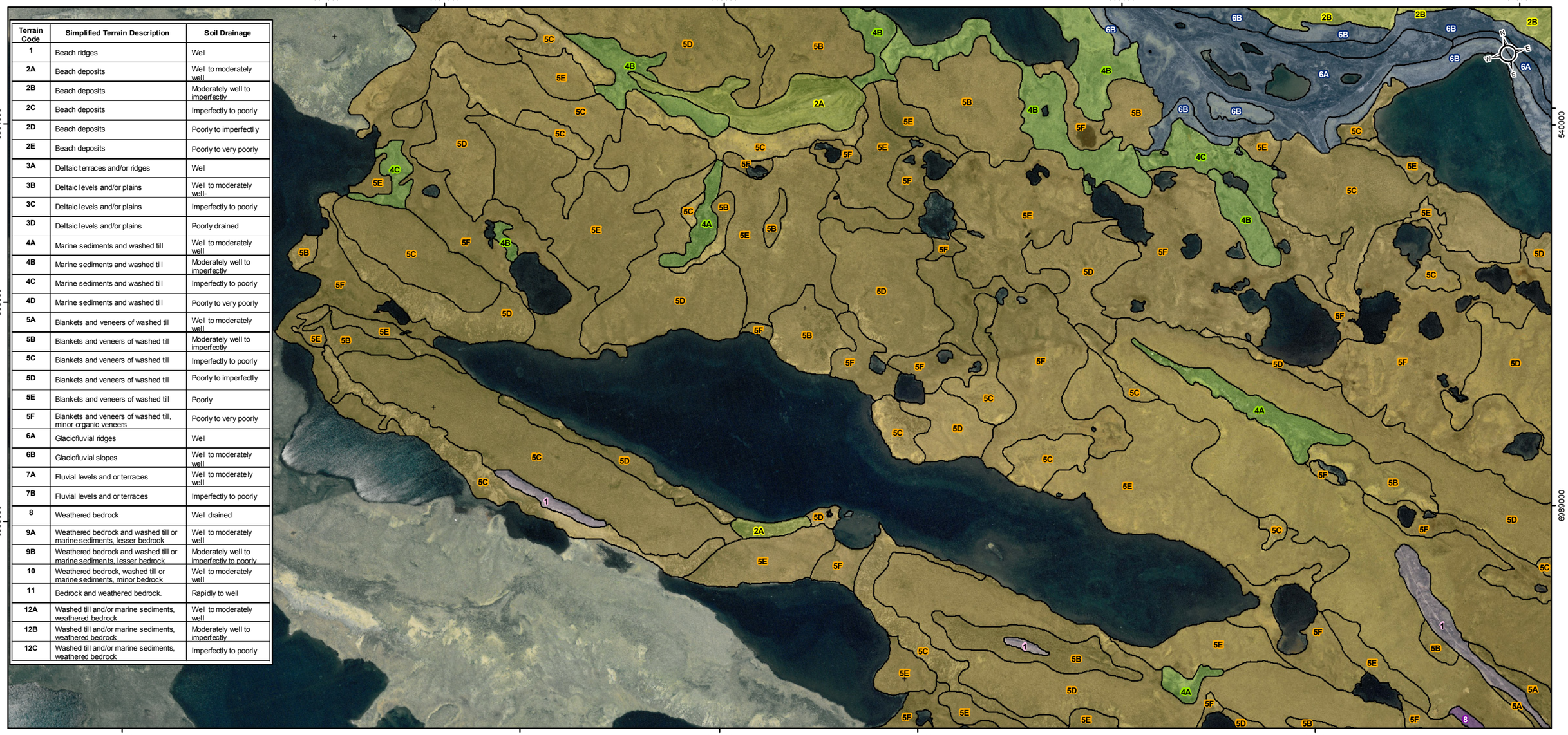


Terrain Code	Simplified Terrain Description	Soil Drainage
1	Beach ridges	Well
2A	Beach deposits	Well to moderately well
2B	Beach deposits	Moderately well to imperfectly
2C	Beach deposits	Imperfectly to poorly
2D	Beach deposits	Poorly to imperfectly
2E	Beach deposits	Poorly to very poorly
3A	Deltaic terraces and/or ridges	Well
3B	Deltaic levels and/or plains	Well to moderately well-
3C	Deltaic levels and/or plains	Imperfectly to poorly
3D	Deltaic levels and/or plains	Poorly drained
4A	Marine sediments and washed till	Well to moderately well
4B	Marine sediments and washed till	Moderately well to imperfectly
4C	Marine sediments and washed till	Imperfectly to poorly
4D	Marine sediments and washed till	Poorly to very poorly
5A	Blankets and veneers of washed till	Well to moderately well
5B	Blankets and veneers of washed till	Moderately well to imperfectly
5C	Blankets and veneers of washed till	Imperfectly to poorly
5D	Blankets and veneers of washed till	Poorly to imperfectly
5E	Blankets and veneers of washed till	Poorly
5F	Blankets and veneers of washed till, minor organic veneers	Poorly to very poorly
6A	Glaciofluvial ridges	Well
6B	Glaciofluvial slopes	Well to moderately well
7A	Fluvial levels and or terraces	Well to moderately well
7B	Fluvial levels and or terraces	Imperfectly to poorly
8	Weathered bedrock	Well drained
9A	Weathered bedrock and washed till or marine sediments, lesser bedrock	Well to moderately well
9B	Weathered bedrock and washed till or marine sediments, lesser bedrock	Moderately well to imperfectly to poorly
10	Weathered bedrock, washed till or marine sediments, minor bedrock	Well to moderately well
11	Bedrock and weathered bedrock.	Rapidly to well
12A	Washed till and/or marine sediments, weathered bedrock	Well to moderately well
12B	Washed till and/or marine sediments, weathered bedrock	Moderately well to imperfectly
12C	Washed till and/or marine sediments, weathered bedrock	Imperfectly to poorly

LEGEND

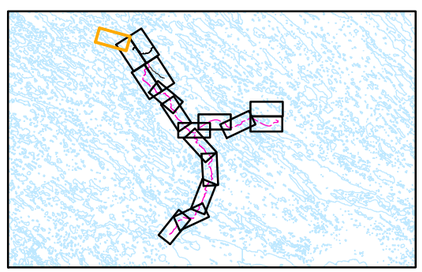
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

REFERENCE

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



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TITLE
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REVIEW	CC	01 Feb. 2010			

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LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

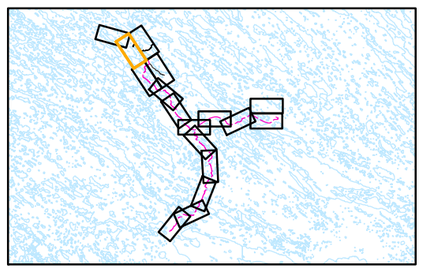
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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MAP 2 OF 17

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PROJECT No. 09-1426-0015			PHASE No. 3700	
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GIS	JW	24 Nov. 2009	**E. 2**	
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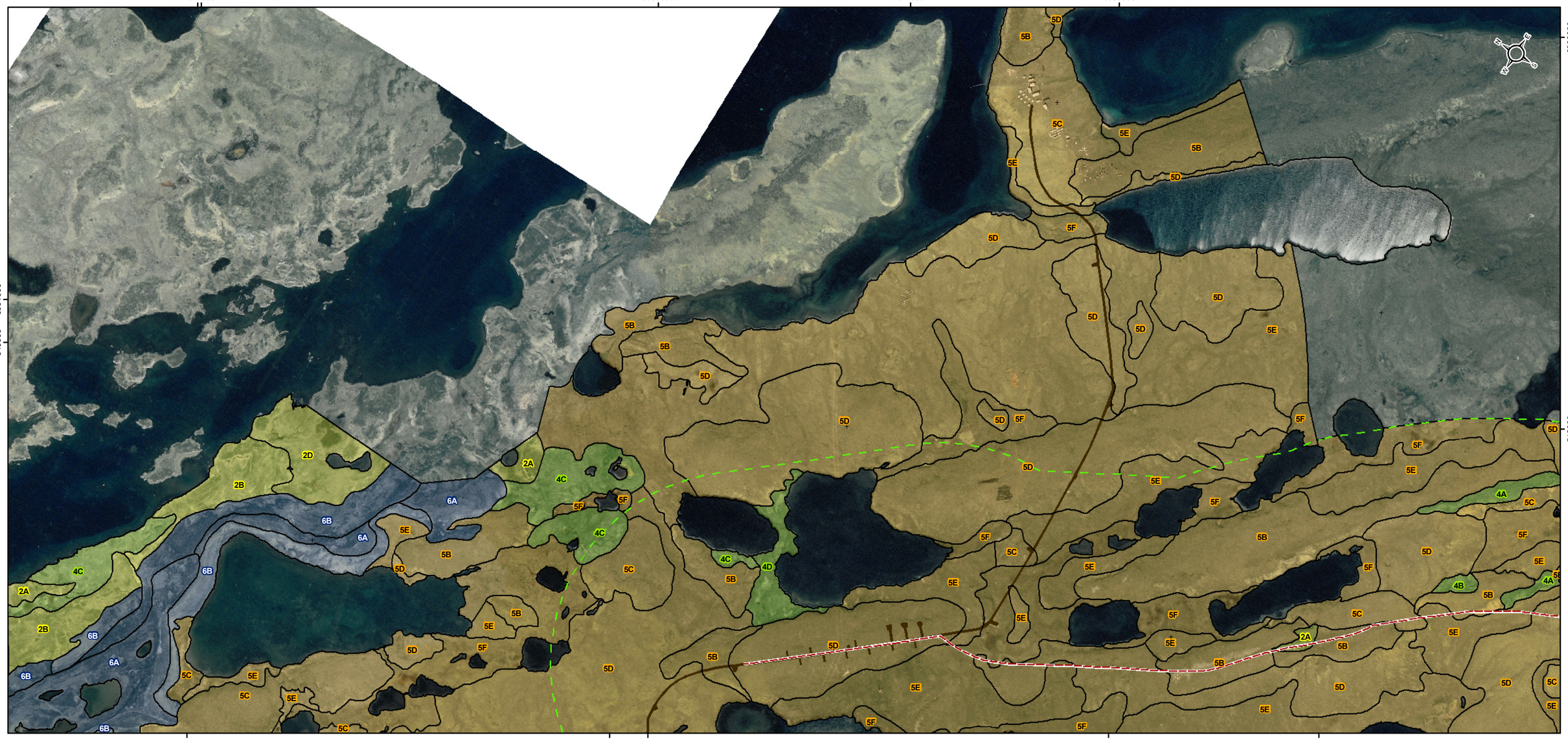


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

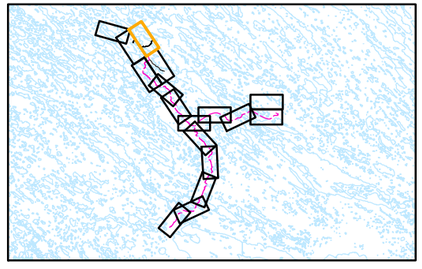
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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GIS	JW	24 Nov. 2009	E. 3		
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LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
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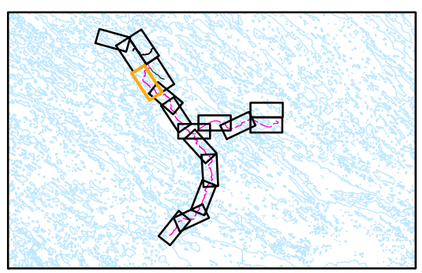
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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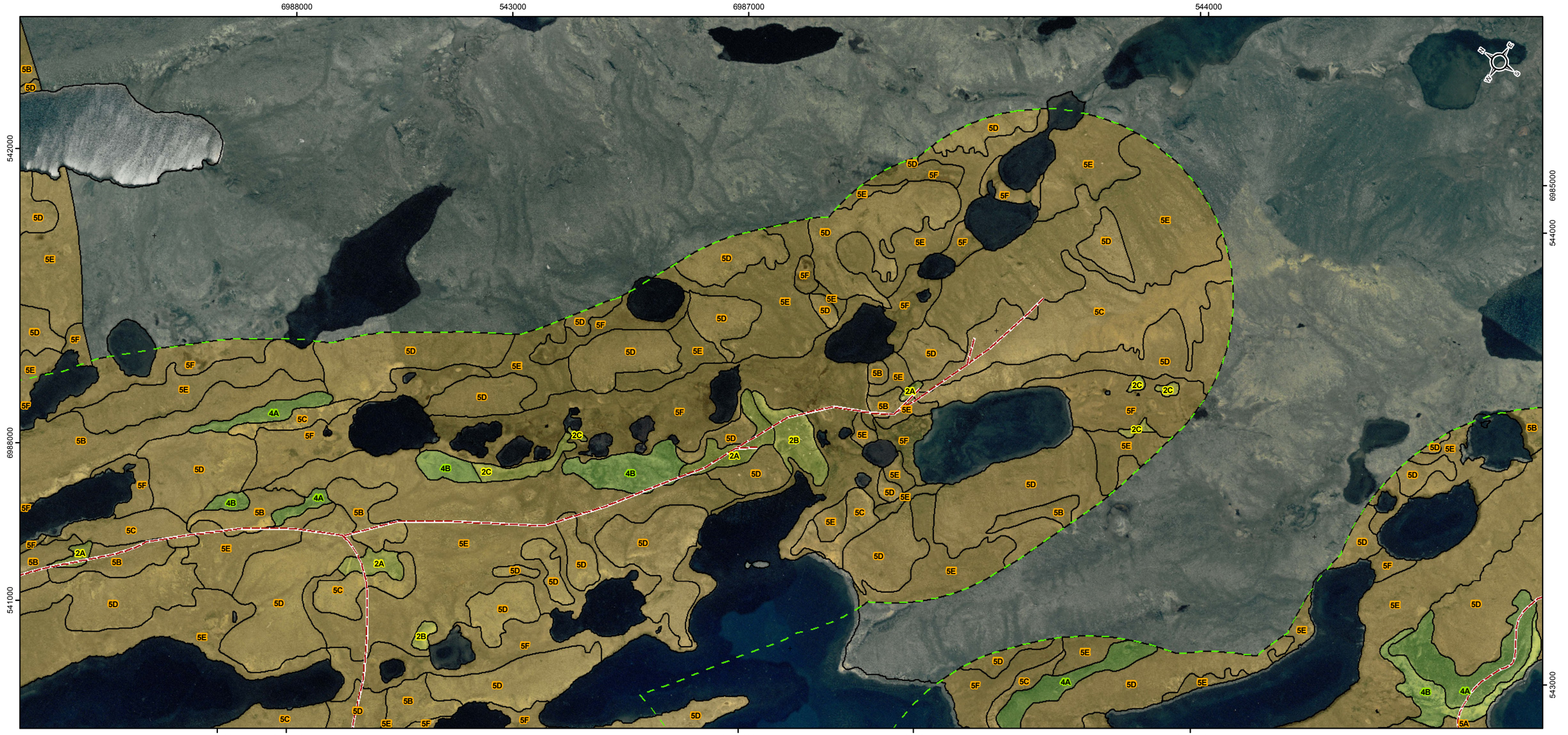

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
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- 7 - Fluvial Level and/or Terrace
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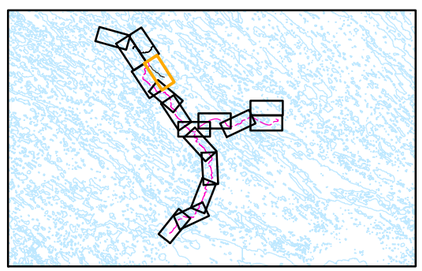
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	**E. 5**	
REVIEW	CC	01 Feb. 2010		

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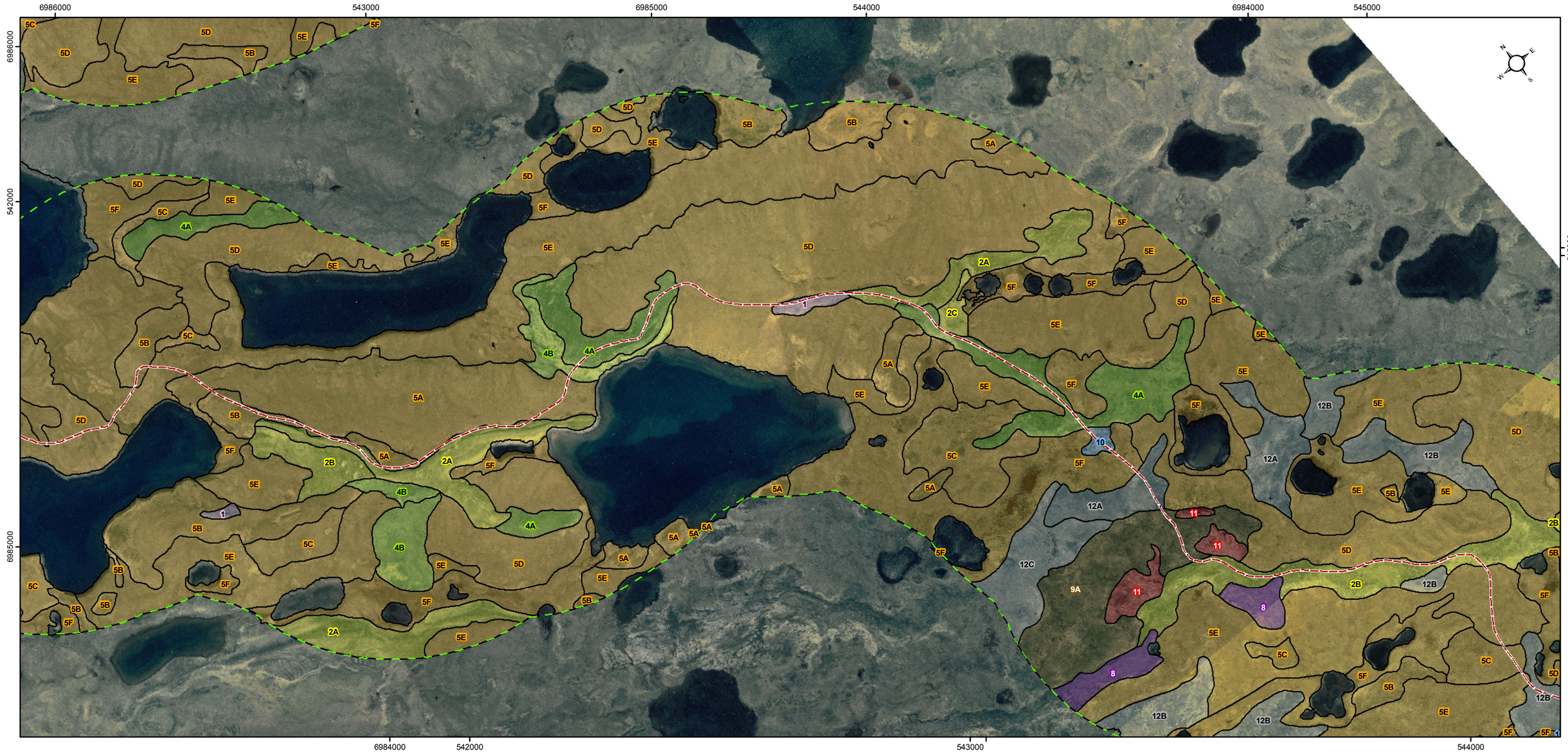


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

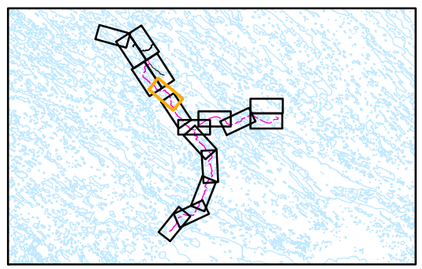
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN		REV. 0
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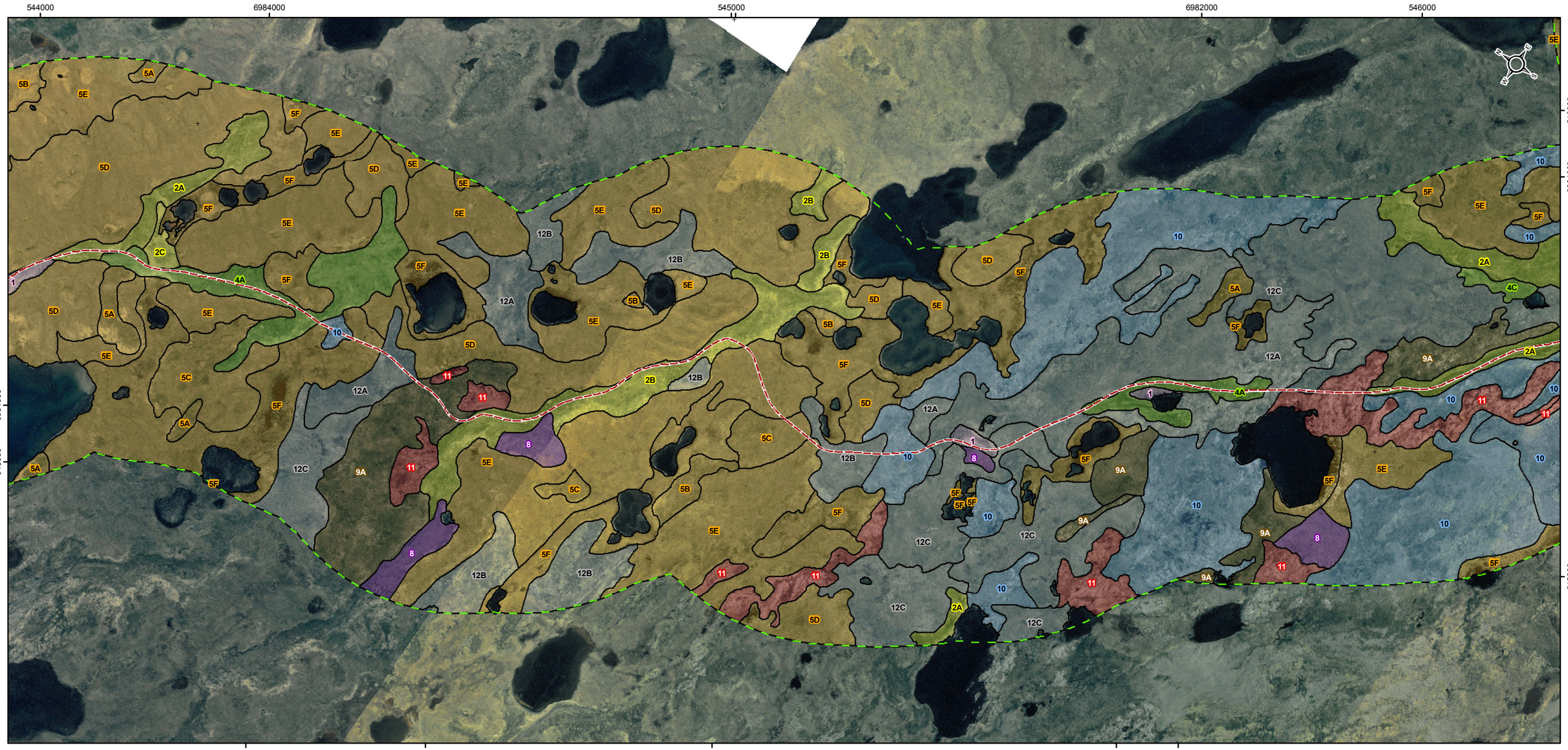


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

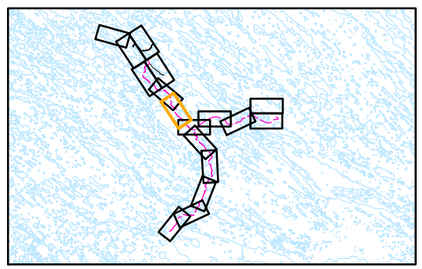
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
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MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 7 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN		REV. 0
GIS	JW	24 Nov. 2009	**E. 7**		
CHECK	TR	01 Feb. 2010			
REVIEW	CC	01 Feb. 2010			

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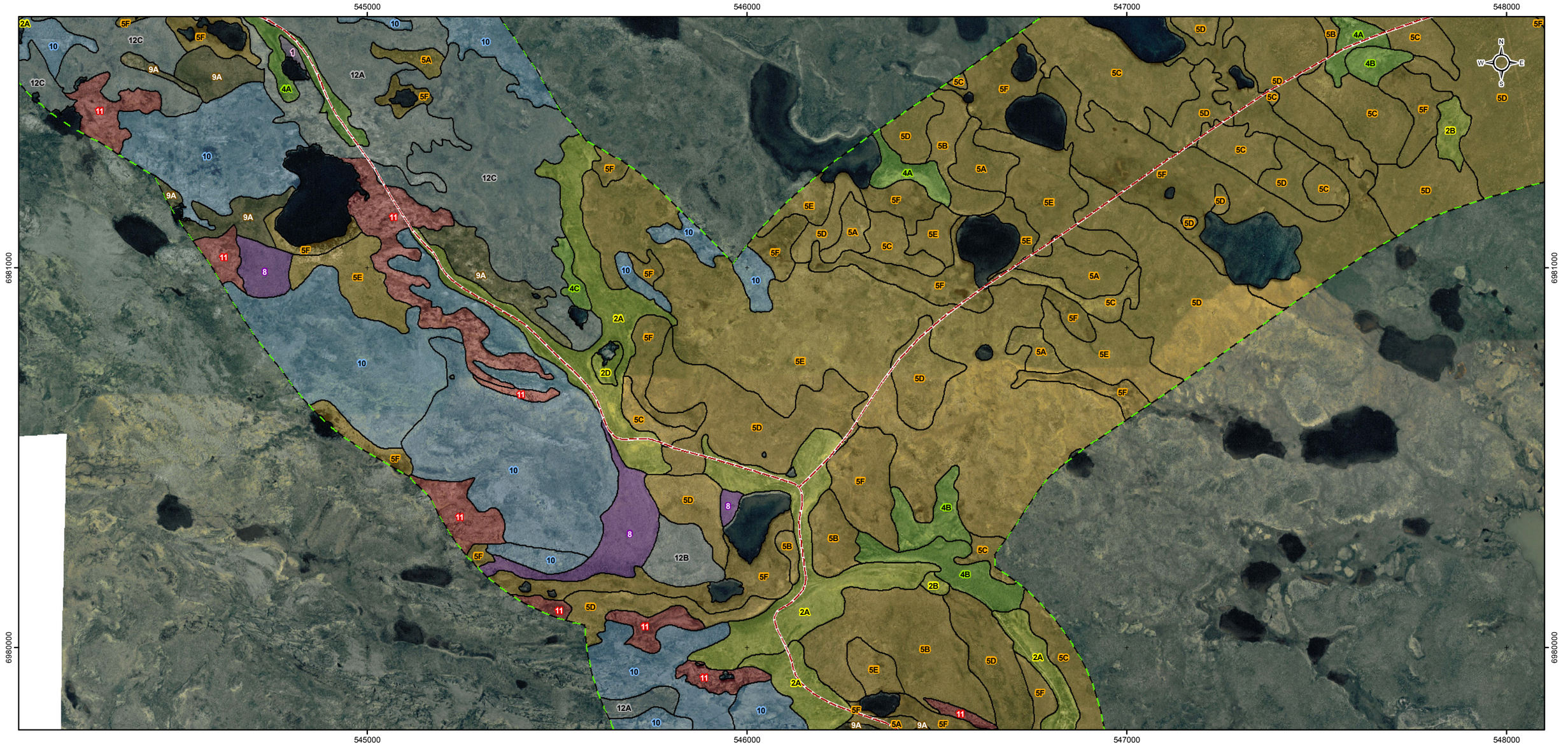


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

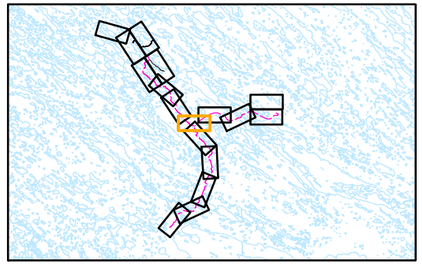
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
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NUNAVUT

TITLE
TERRAIN CODE
MAP 8 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

E. 8

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547000 548000 549000 550000

6982000

6981000

N W E S

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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

250 0 250

SCALE 1:10,000 METRES

PROJ

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TITLE

TERRAIN CODE
MAP 9 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0	
GIS	JW	24 Nov. 2009	E. 9		
CHECK	TR	01 Feb. 2010			
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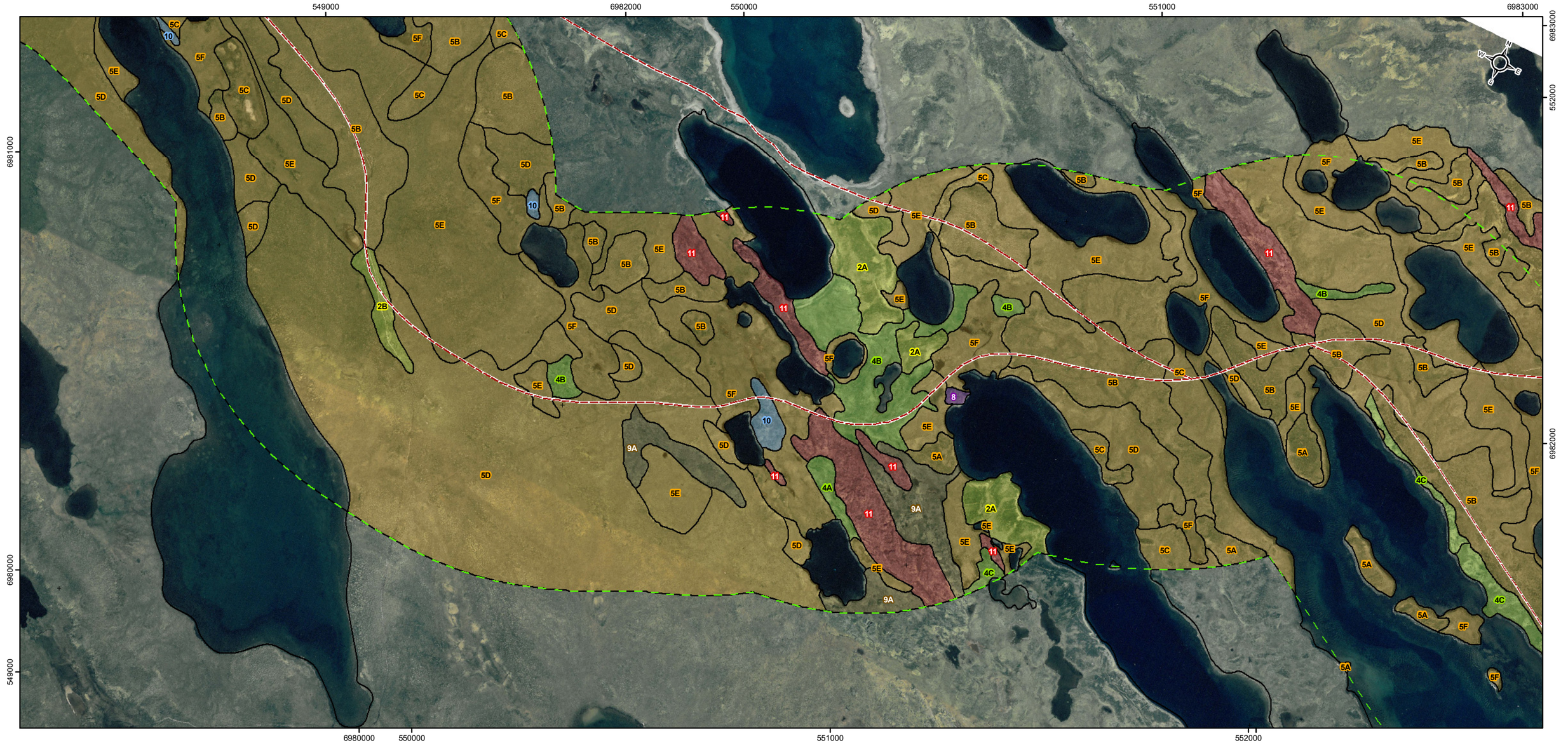


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

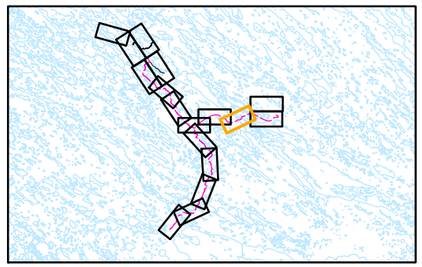
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 10 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN		REV. 0
GIS	JW	24 Nov. 2009	**E. 10**		
CHECK	TR	01 Feb. 2010			
REVIEW	CC	01 Feb. 2010			

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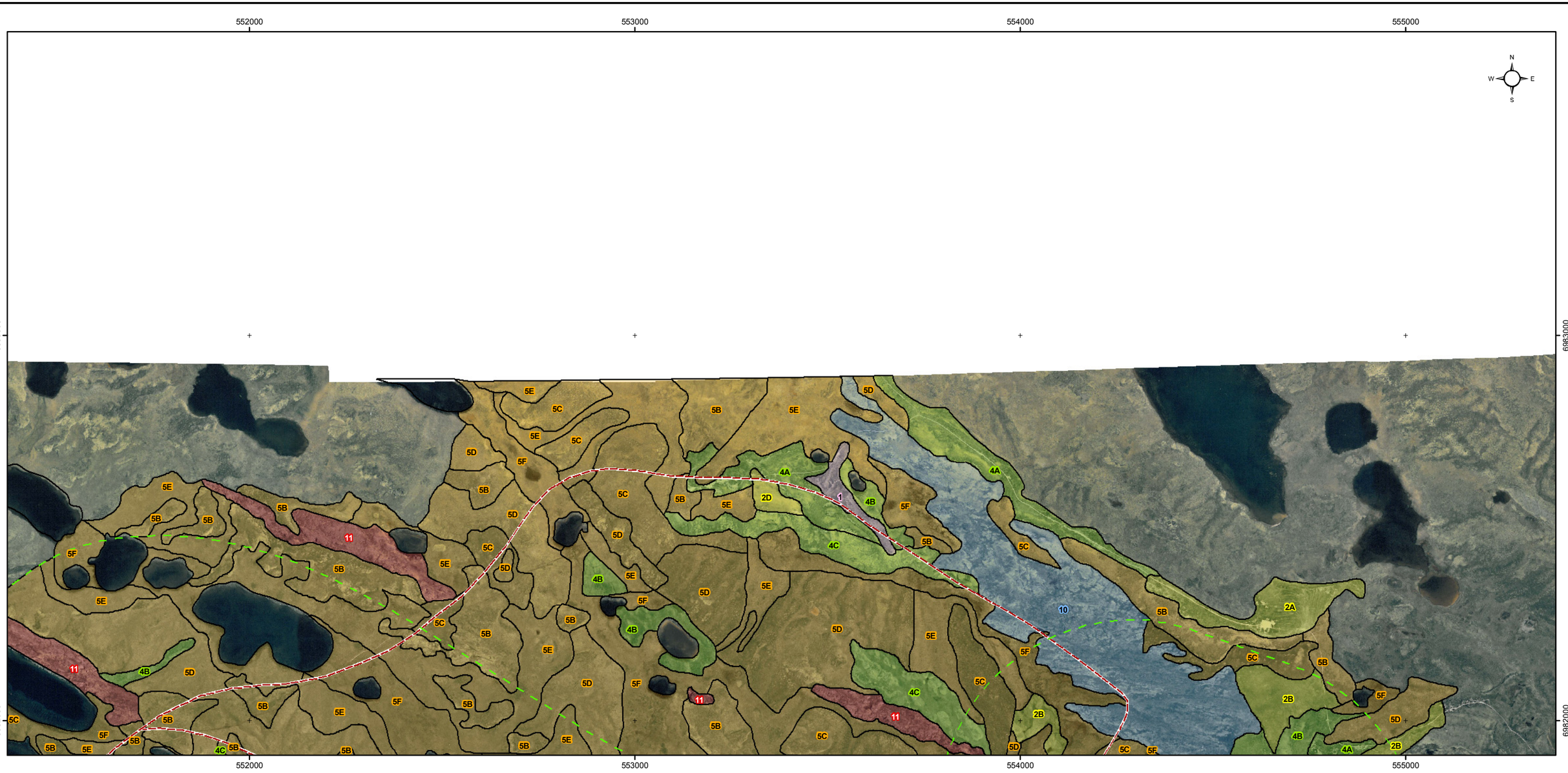


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

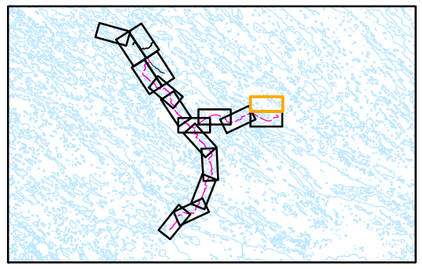
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 11 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN		REV. 0
GIS	JW	24 Nov. 2009	E. 11		
CHECK	TR	01 Feb. 2010			
REVIEW	CC	01 Feb. 2010			

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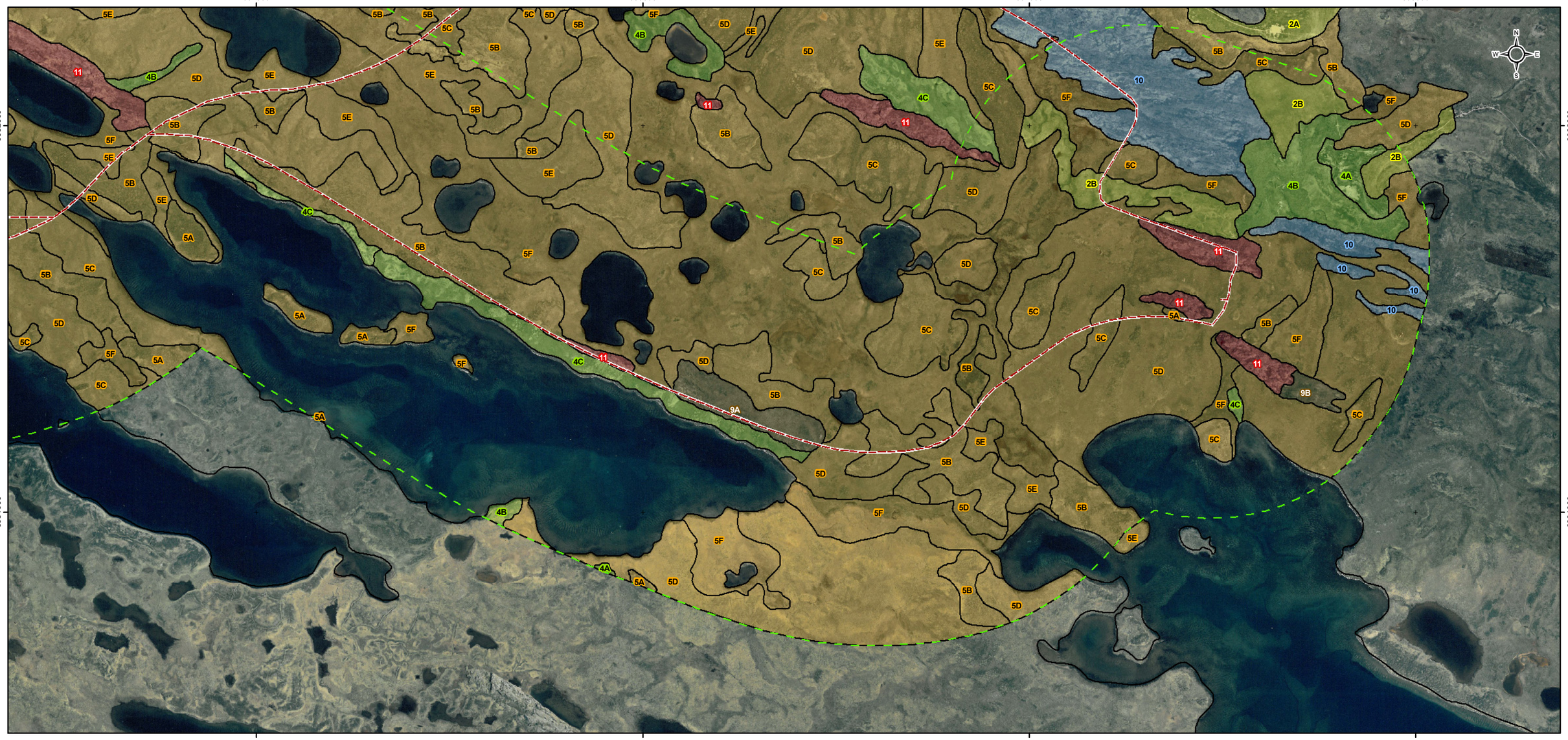
6981000



LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

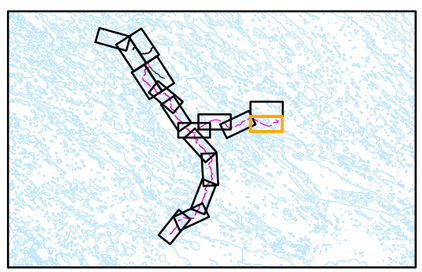
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ

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TITLE

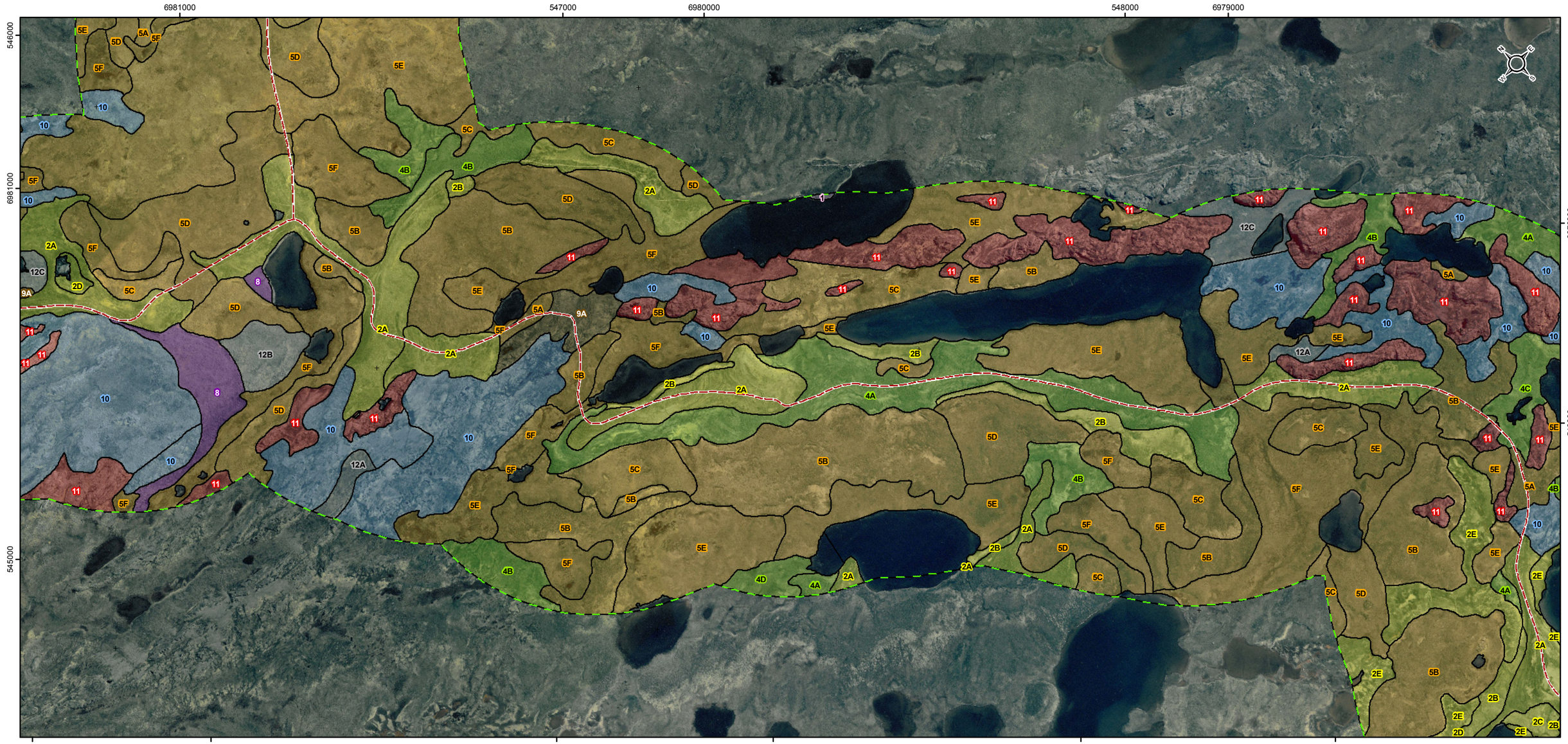
TERRAIN CODE
MAP 12 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

E. 12

N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\GIS\projects\3700\Appendix-E_terrain_code.mxd



LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

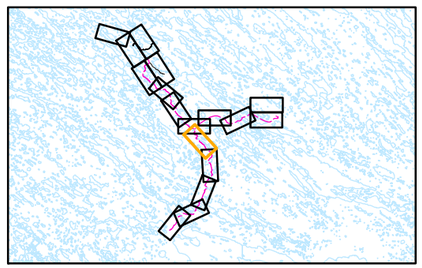
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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PROJ
COMAPLEX MINERALS CORP
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MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 13 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009	**E. 13**	
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

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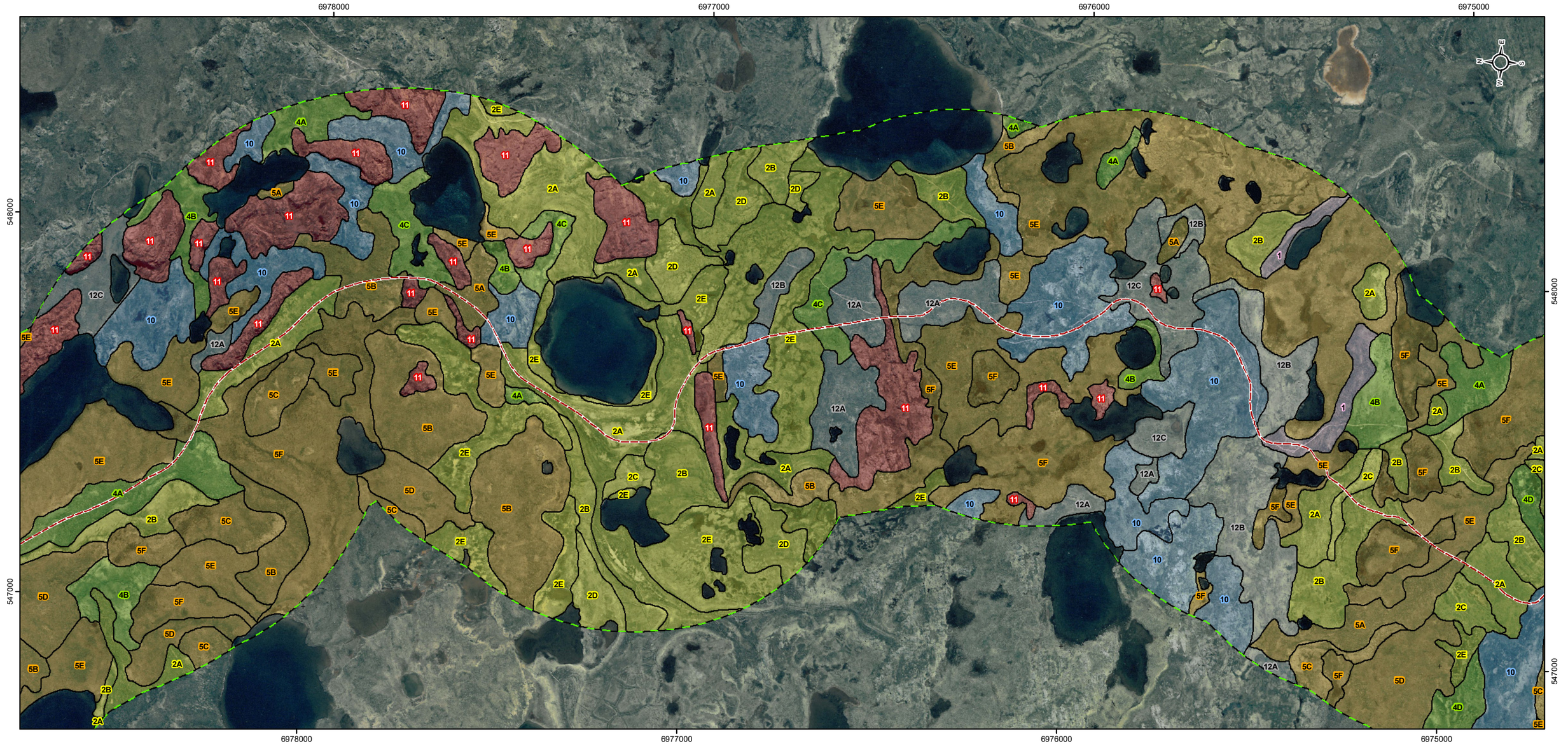


LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

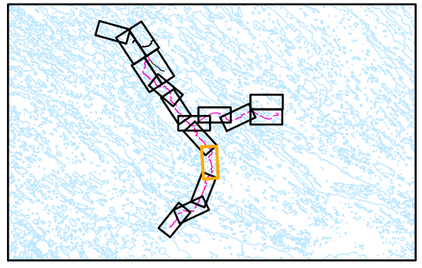
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 14 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009	**E. 14**	
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

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LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

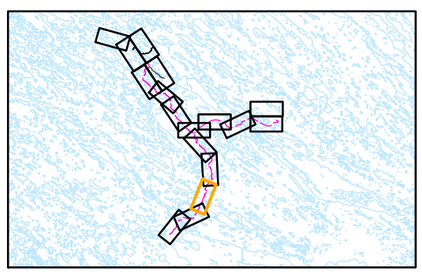
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 15 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	**E. 15**	
REVIEW	CC	01 Feb. 2010		

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6972000 544000 545000 6973000 546000 547000

544000 6971000 6973000

545000 6971000 546000 547000 6972000 548000 548000

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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

250 0 250
SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
TERRAIN CODE
MAP 16 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

E. 16

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6970000 543000 6969000 545000 546000

6969000 544000 6970000 545000 6971000 546000

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

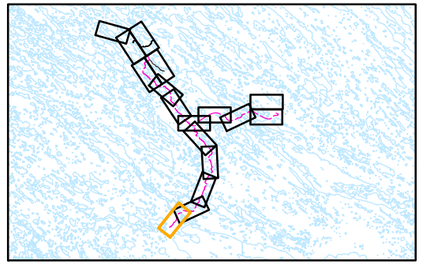
Terrain Code *

- 1 - Beach Ridge
- 2 - Beach Deposit
- 3 - Deltaic Terrace, Level, and/or Ridge, Plain
- 4 - Marine Sediment and Washed Till
- 5 - Blanket and Veneer of Washed Till
- 6 - Gaciofluvial Ridge or Slope
- 7 - Fluvial Level and/or Terrace
- 8 - Weathered Bedrock
- 9 - Weathered Bedrock and Washed Till or Marine Sediments, Lesser Bedrock
- 10 - Weathered Bedrock and Washed Till or Marine Sediment, Minor Bedrock
- 11 - Bedrock and Weathered Bedrock
- 12 - Washed Till and/or Marine Sediment, Weathered Bedrock
- LAKE

* See Figure 1 For Terrain Code Definitions

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

TERRAIN CODE
MAP 17 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	**E. 17**	
REVIEW	CC	01 Feb. 2010		

APPENDIX F

Freeze and Thaw Induced Displacement Hazard Figures

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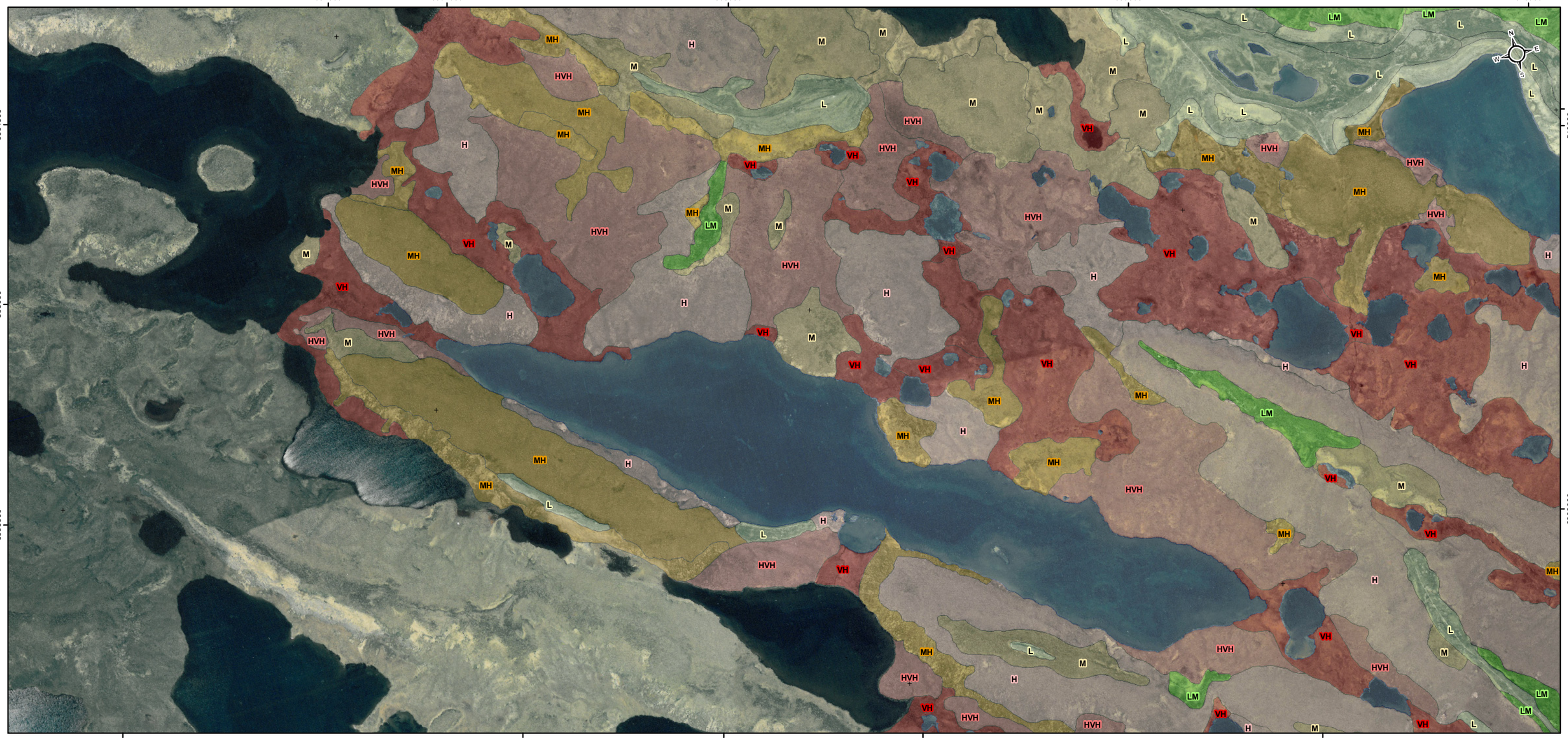


LEGEND

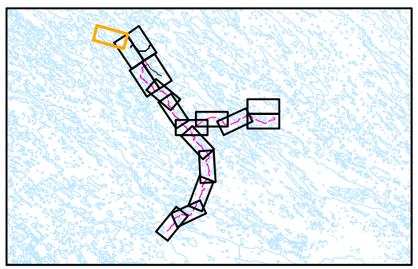
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250
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PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISPLACEMENT HAZARD MAPPING
MAP 1 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009	F. 1	
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

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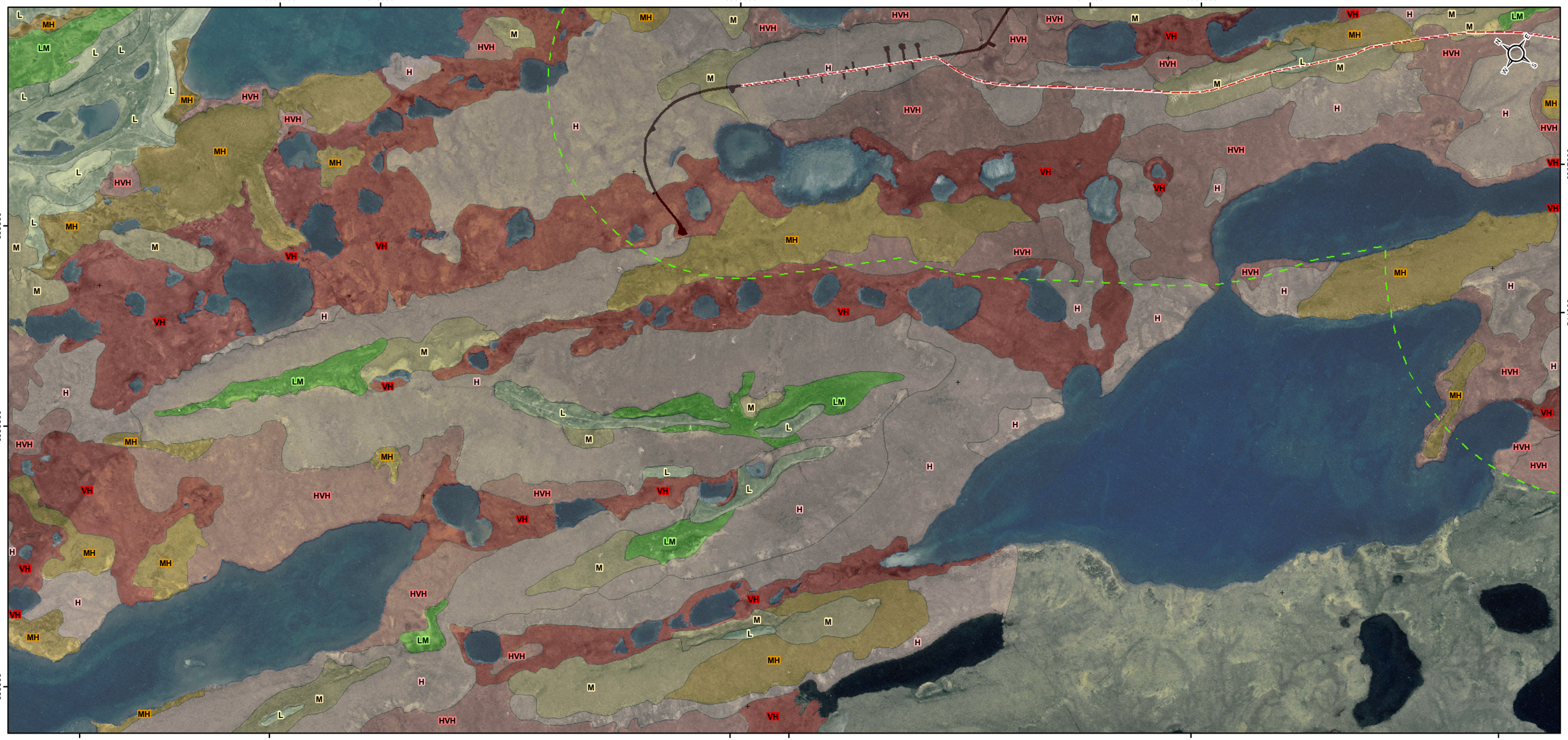


LEGEND

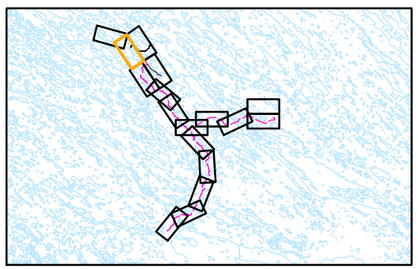
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 2 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN		REV. 0
GIS	JW	24 Nov. 2009	F. 2		
CHECK	TR	01 Feb. 2010			
REVIEW	CC	01 Feb. 2010			

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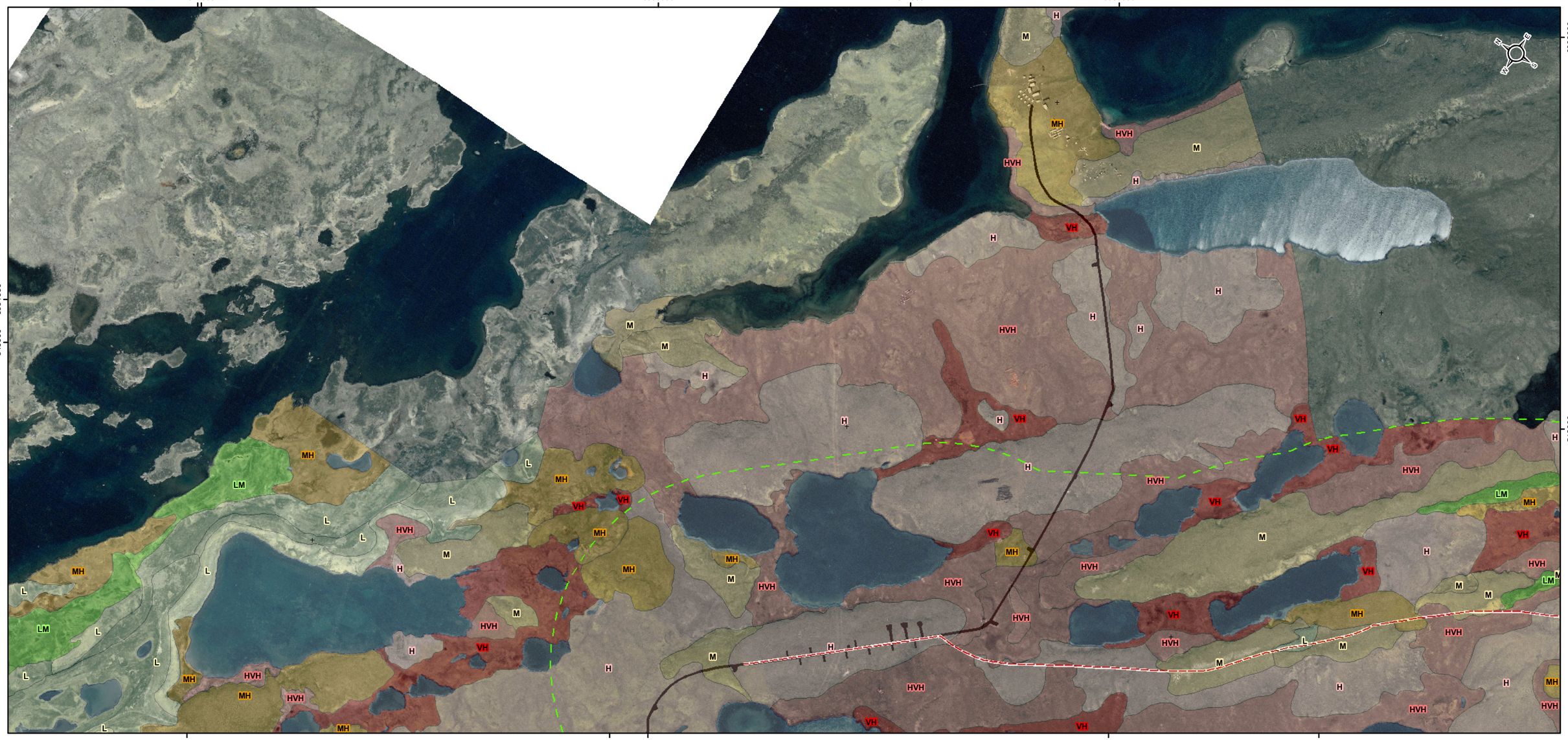
6991000 540000 542000 6988000

6990000 540000 6989000 6988000 541000



LEGEND

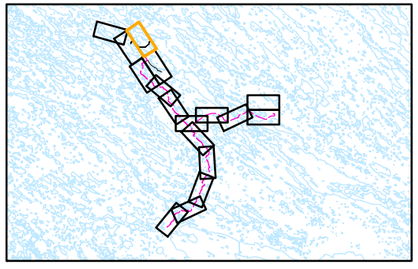
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 3 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009	F. 3	
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

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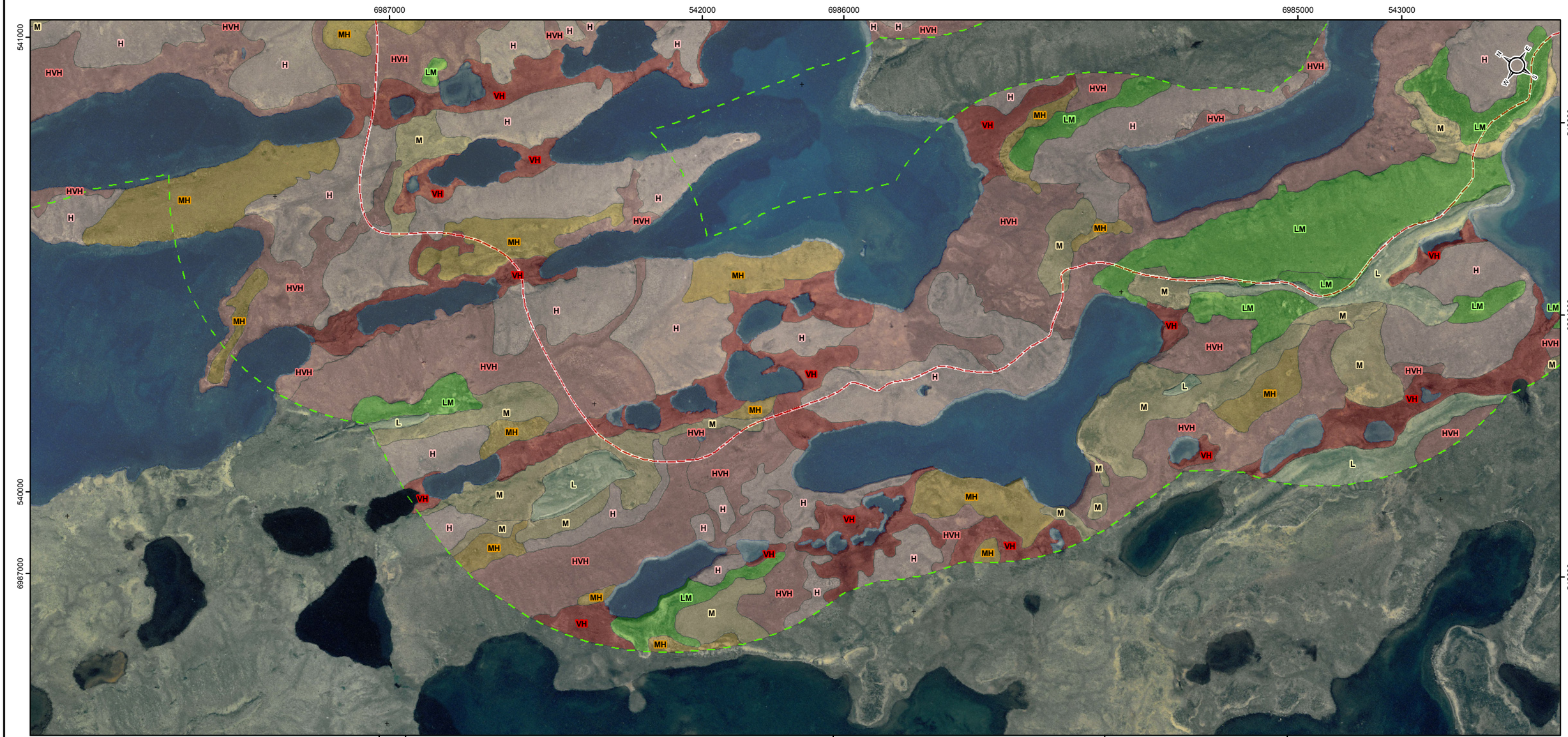


LEGEND

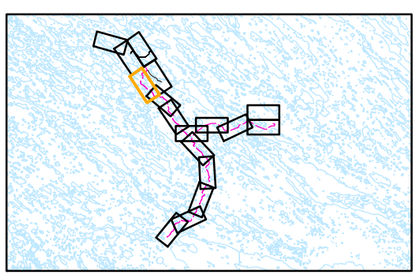
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 4 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	F. 4	
REVIEW	CC	01 Feb. 2010		

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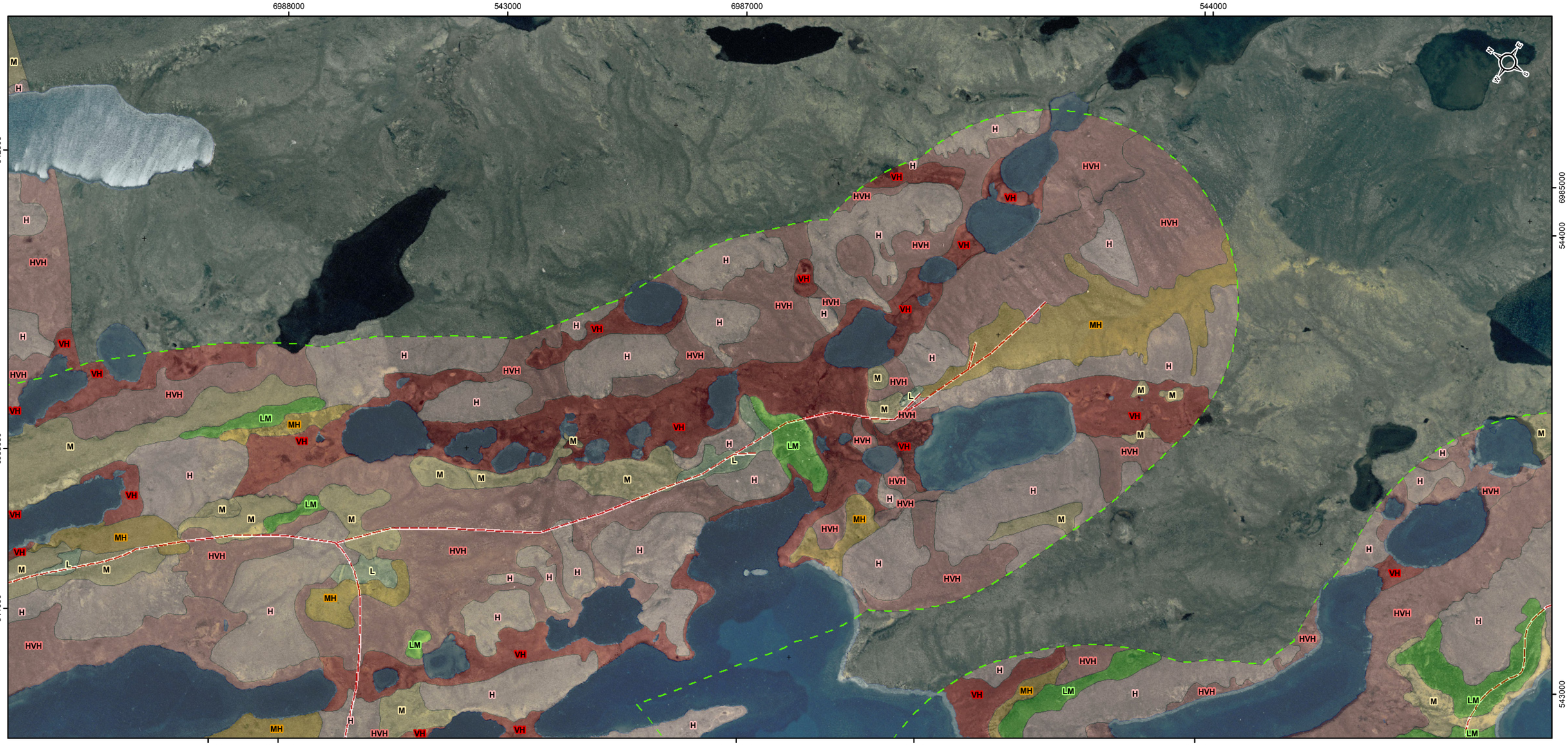


LEGEND

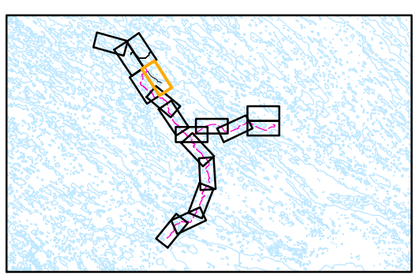
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISPLACEMENT HAZARD MAPPING
MAP 5 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	F. 5	
REVIEW	CC	01 Feb. 2010		

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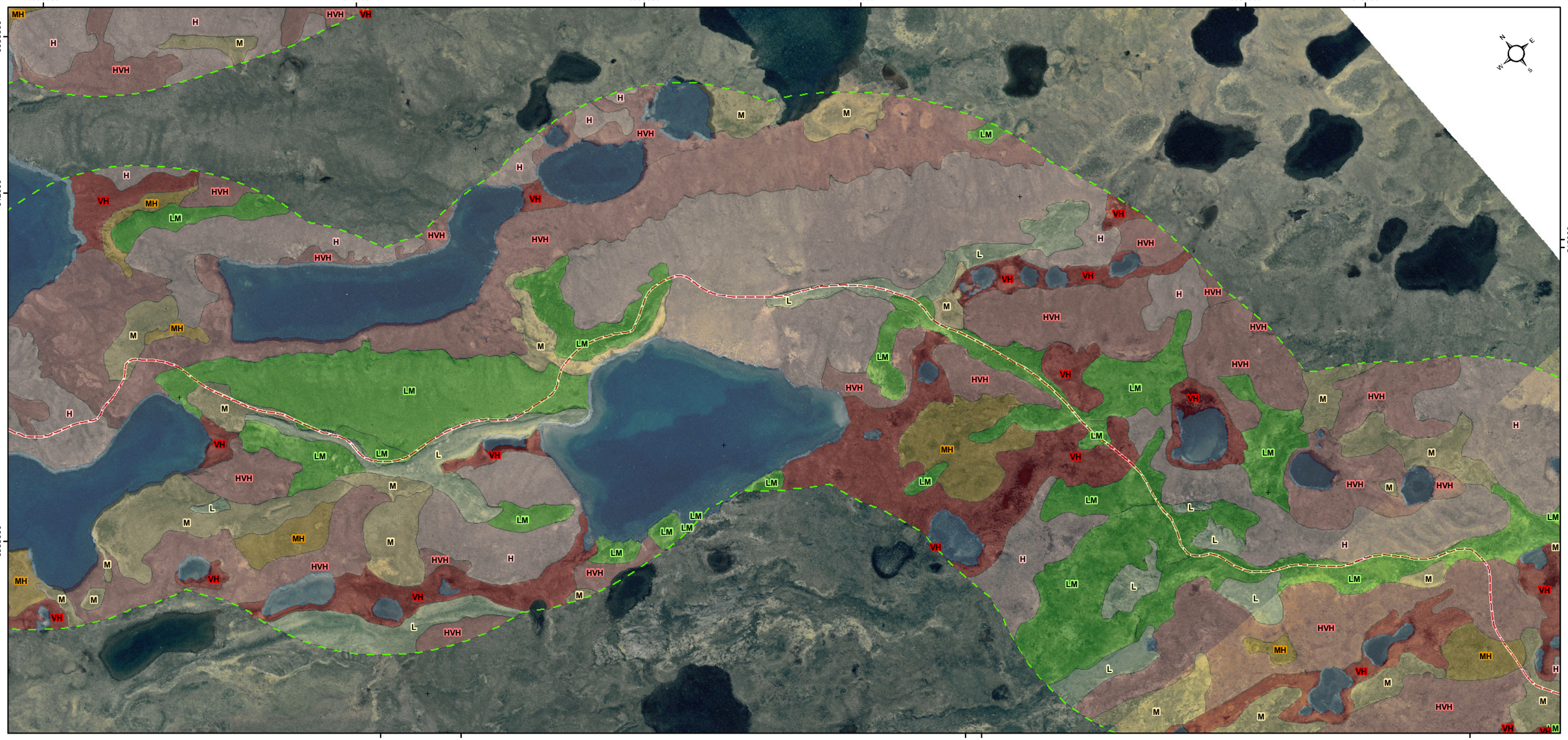


LEGEND

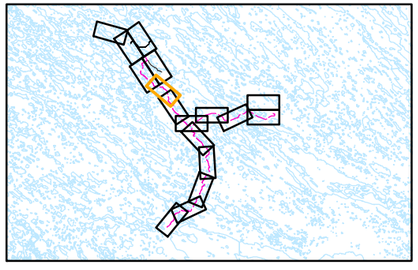
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 6 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	F. 6	
REVIEW	CC	01 Feb. 2010		

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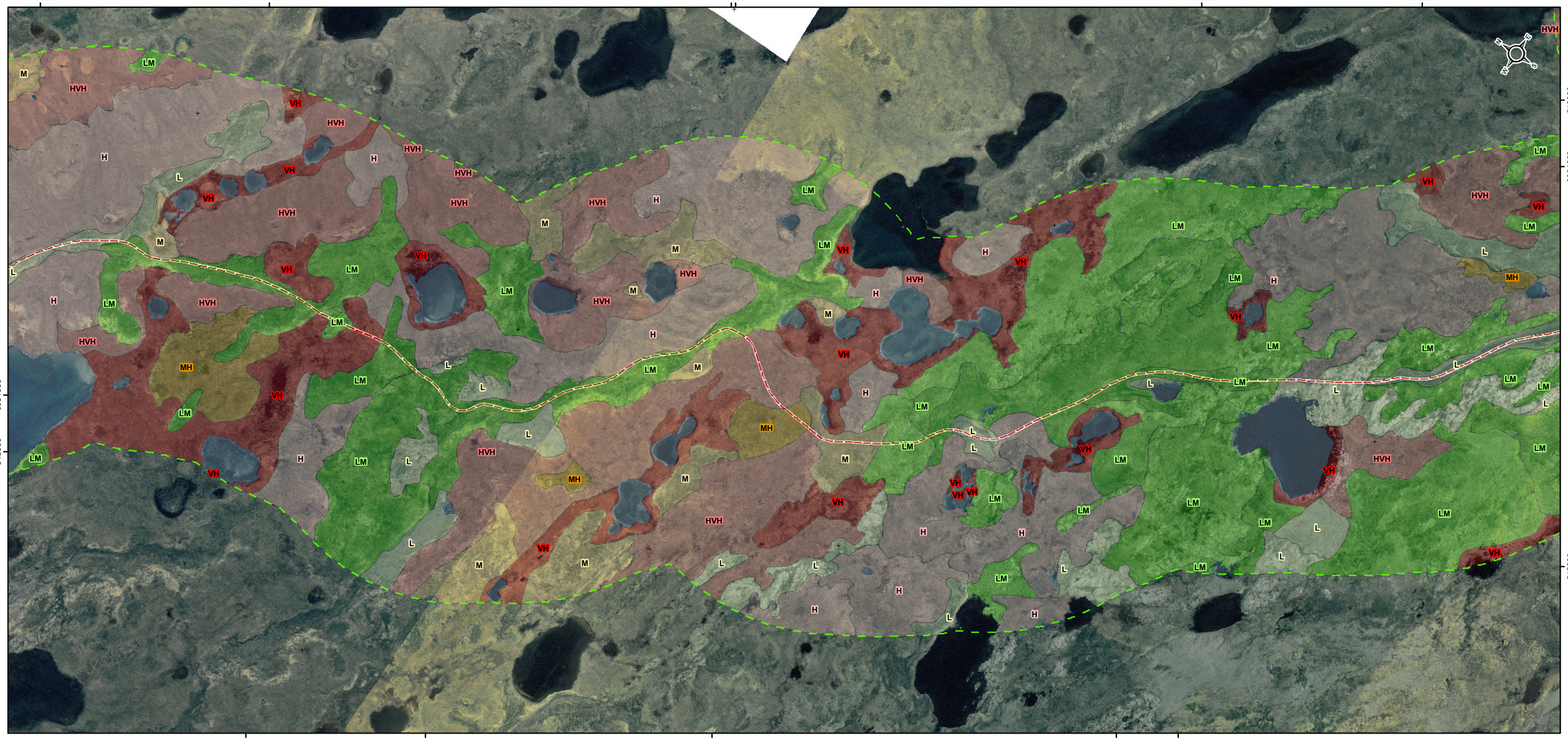


LEGEND

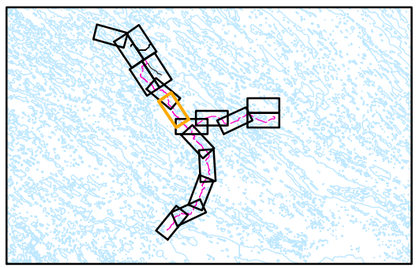
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ

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MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING MAP 7 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0	
GIS	JW	24 Nov. 2009	F. 7		
CHECK	TR	01 Feb. 2010			
REVIEW	CC	01 Feb. 2010			

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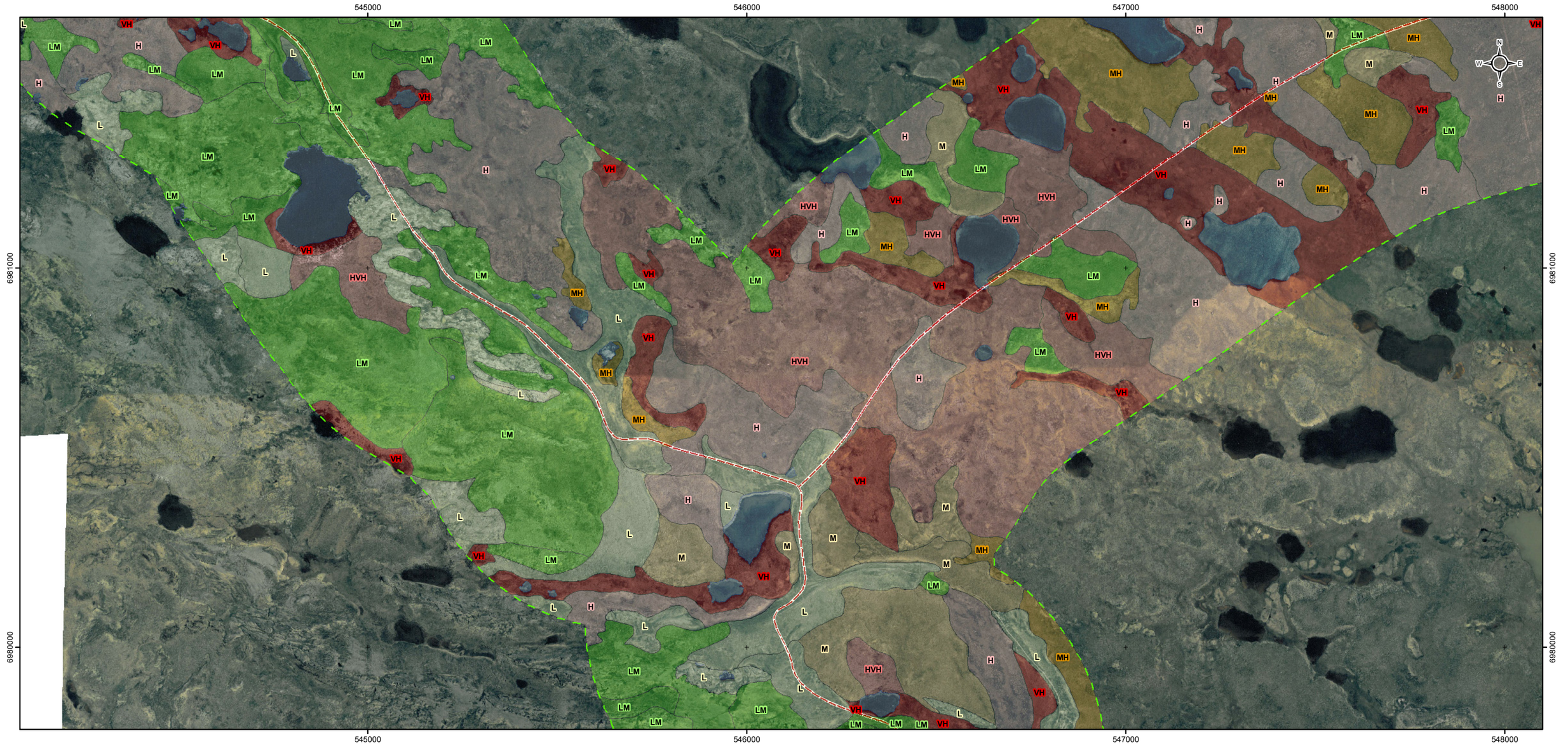


LEGEND

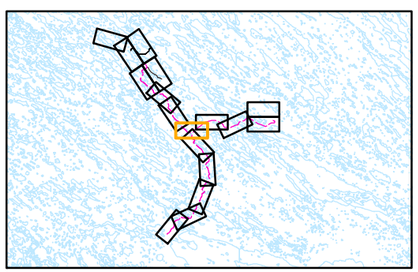
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ
COMAPLEX MINERALS CORP
COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISPLACEMENT HAZARD MAPPING
MAP 8 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	**F. 8**	
REVIEW	CC	01 Feb. 2010		

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547000 548000 549000 550000

6982000

6981000

N W E S

H M MH VH HVH LM L

547000 548000 549000 550000

250 0 250

SCALE 1:10,000 METRES

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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

PROJ

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NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING MAP 9 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	F. 9	
REVIEW	CC	01 Feb. 2010		

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549000 6982000 550000 551000 6983000

6981000 552000

6980000 549000

6980000 550000 551000 552000

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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

250 0 250

SCALE 1:10,000 METRES

PROJ

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COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 10 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

F. 10

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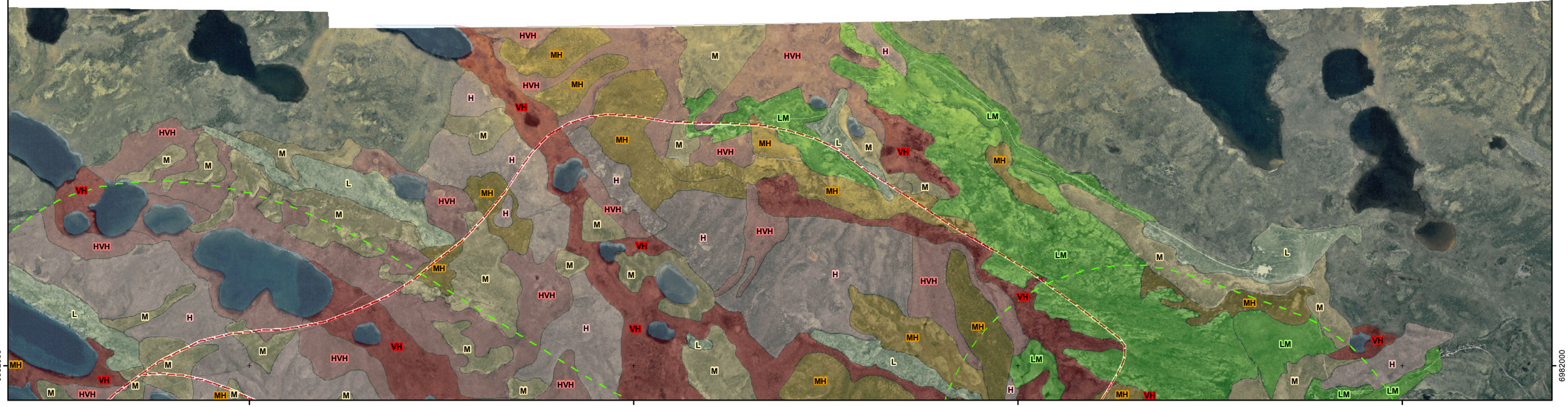
6983000 6982000

N W E S



LEGEND

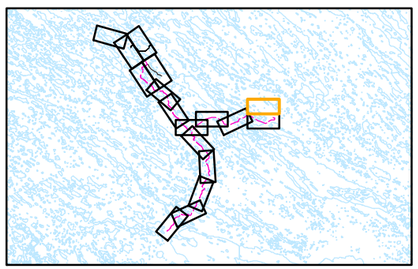
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

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MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING MAP 11 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009	F. 11	
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

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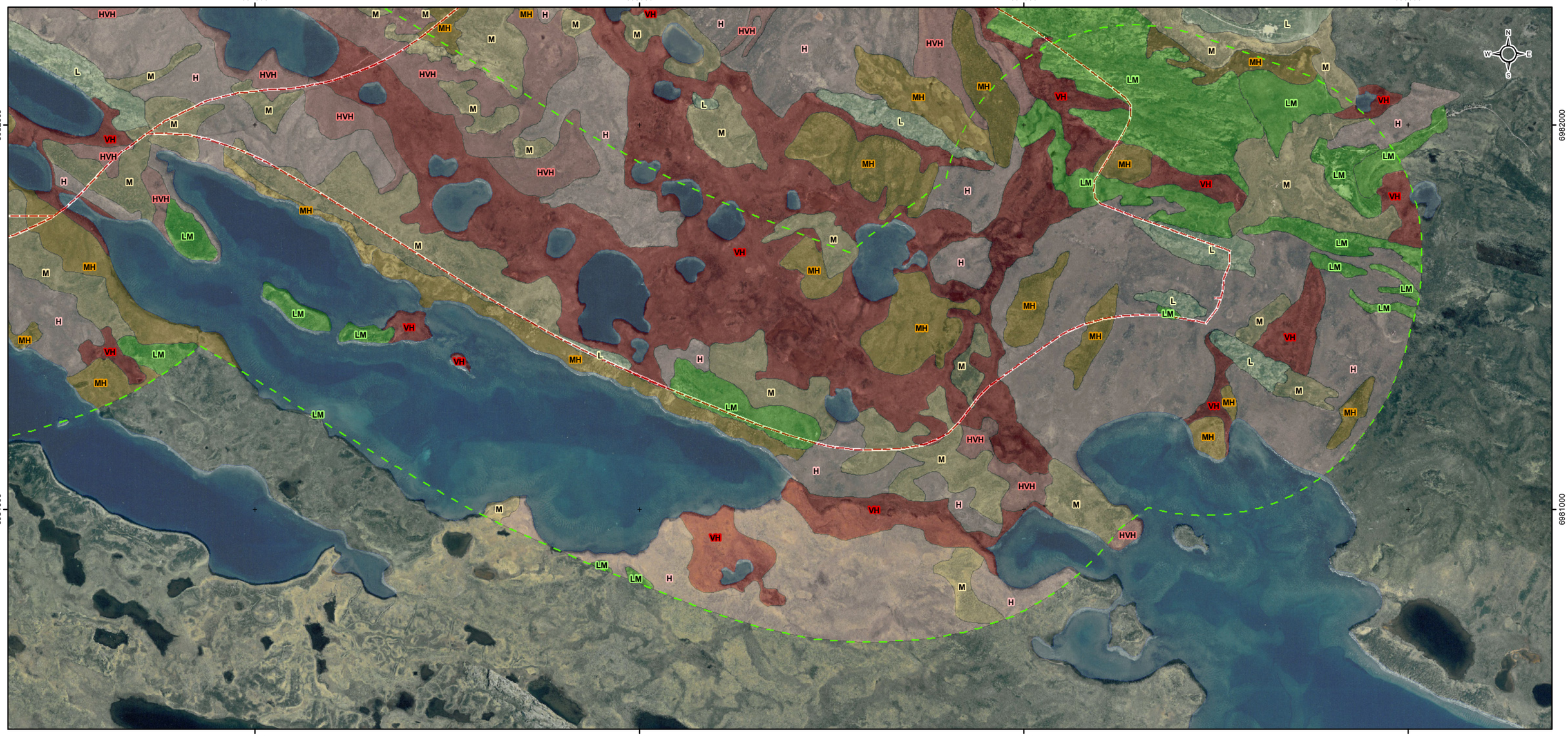
6982000

6981000

N W E S



250 0 250

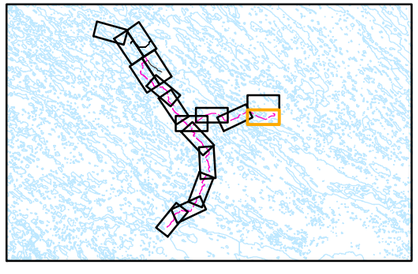
SCALE 1:10,000 METRES

LEGEND

- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake



REFERENCE

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

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 12 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	F. 12	
REVIEW	CC	01 Feb. 2010		

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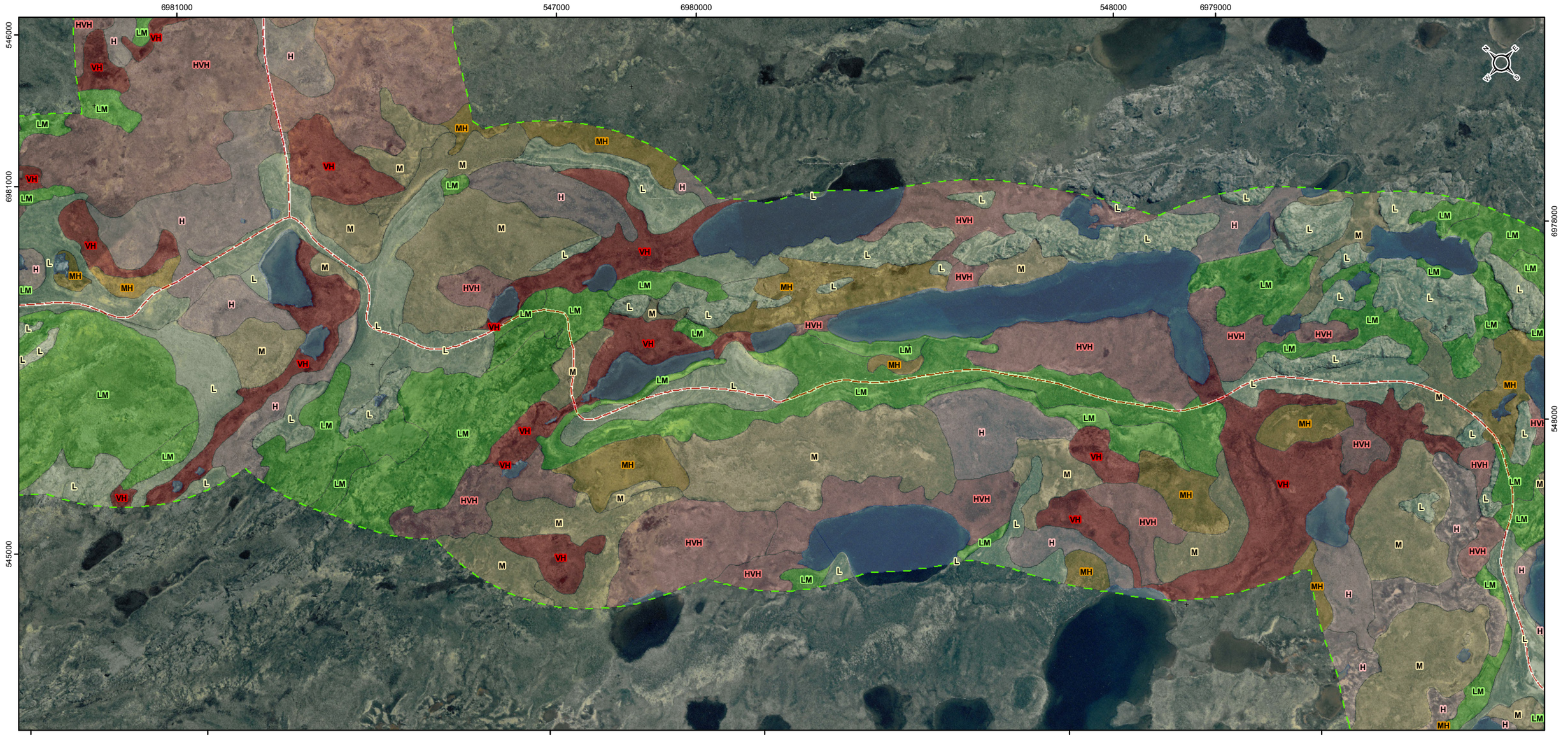


LEGEND

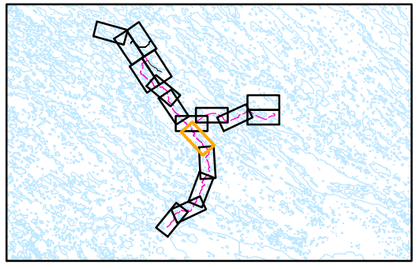
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 13 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	F. 13	
REVIEW	CC	01 Feb. 2010		

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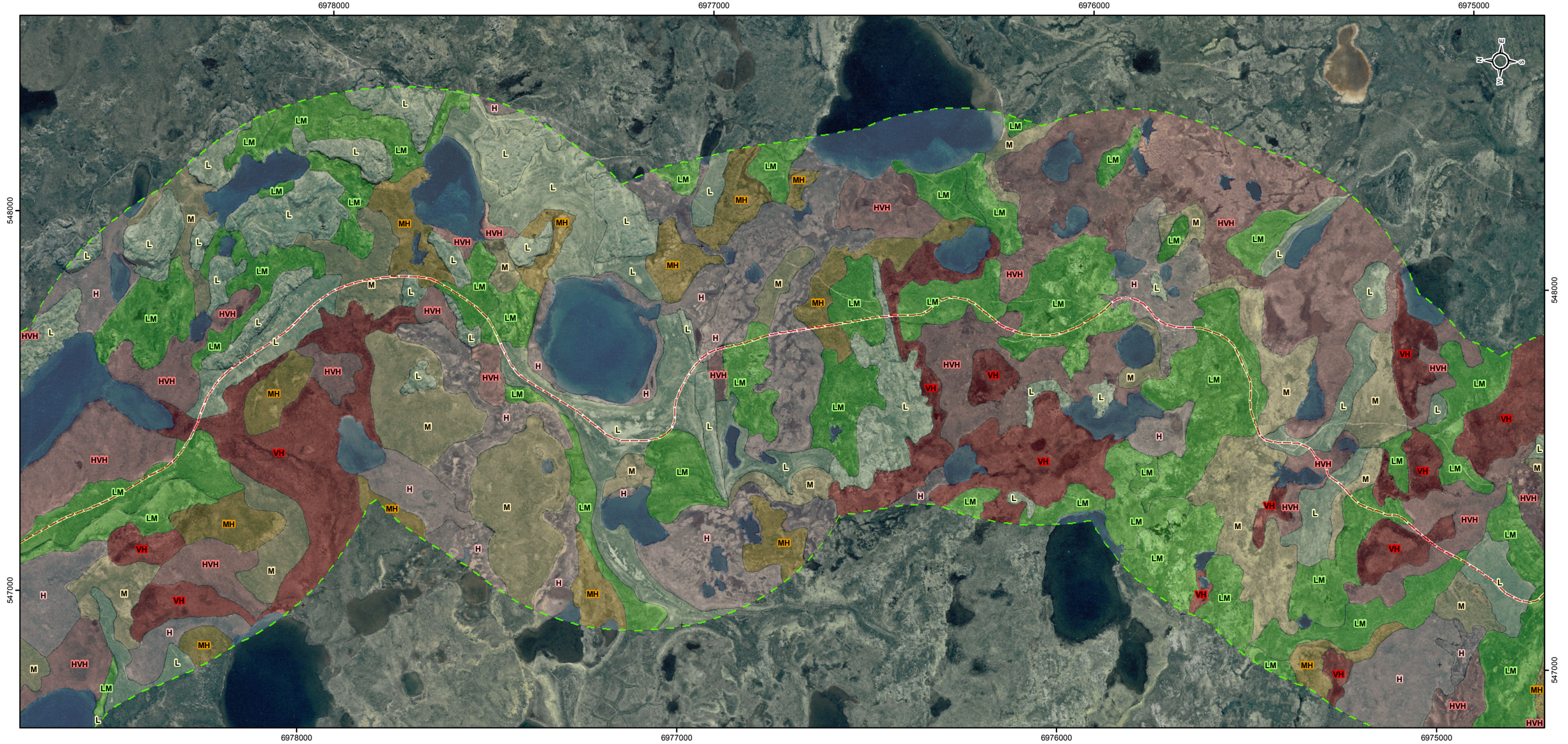


LEGEND

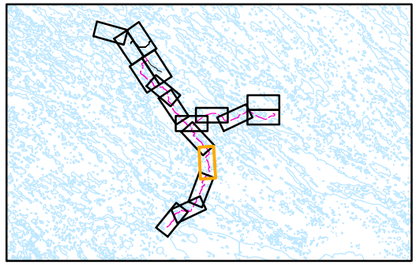
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



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SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

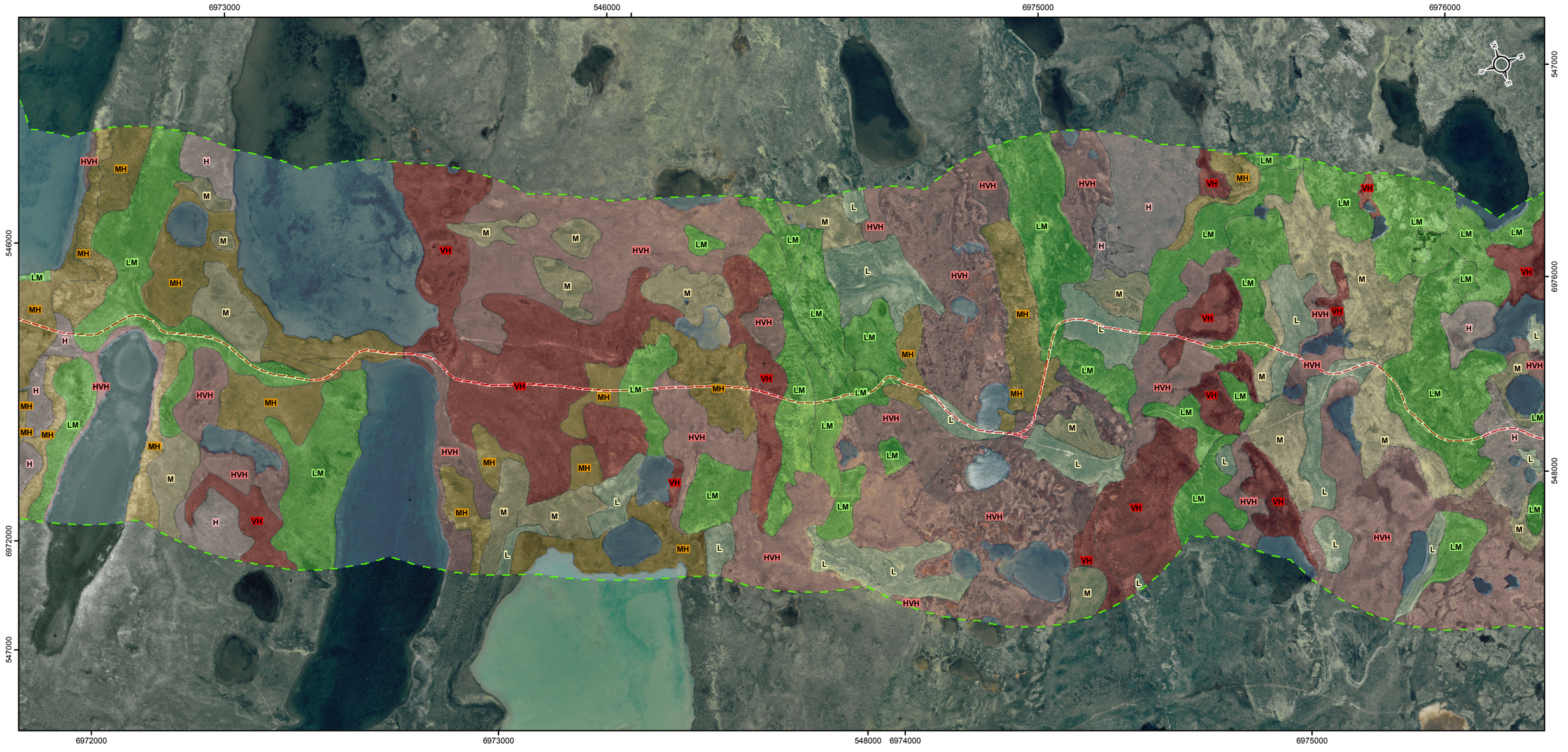
DISPLACEMENT HAZARD MAPPING
MAP 14 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

F. 14

N:\Bur-Graphics\Projects\2009\1426\09-1426-0015\GIS\projects\3700\Appendix-F_displacement_hazard.mxd



LEGEND

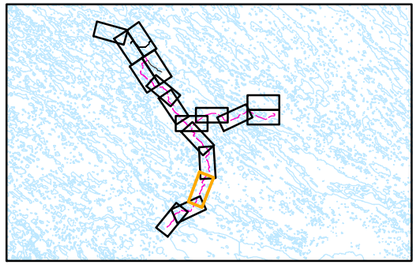
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 15 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009	F. 15	
CHECK	TR	01 Feb. 2010		
REVIEW	CC	01 Feb. 2010		

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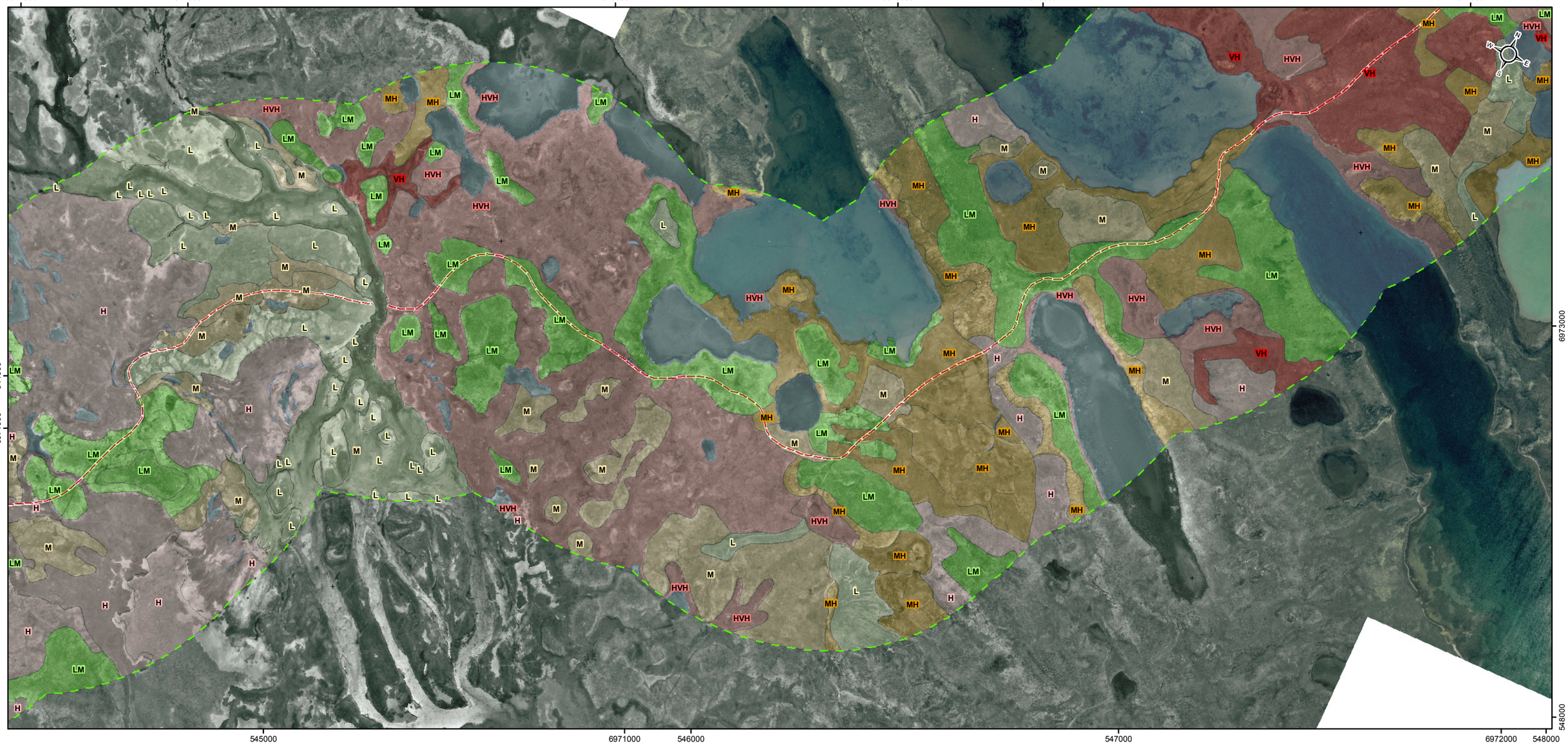
544000 6971000 6973000

545000 6971000 546000 547000 6972000 548000 548000



LEGEND

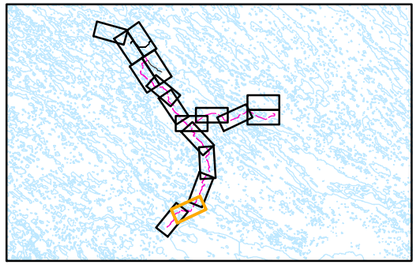
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250

SCALE 1:10,000 METRES

PROJ

COMAPLEX MINERALS CORP

COMAPLEX MINERALS CORPORATION
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

DISPLACEMENT HAZARD MAPPING
MAP 16 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700	
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN	REV. 0
GIS	JW	24 Nov. 2009		
CHECK	TR	01 Feb. 2010	**F. 16**	
REVIEW	CC	01 Feb. 2010		

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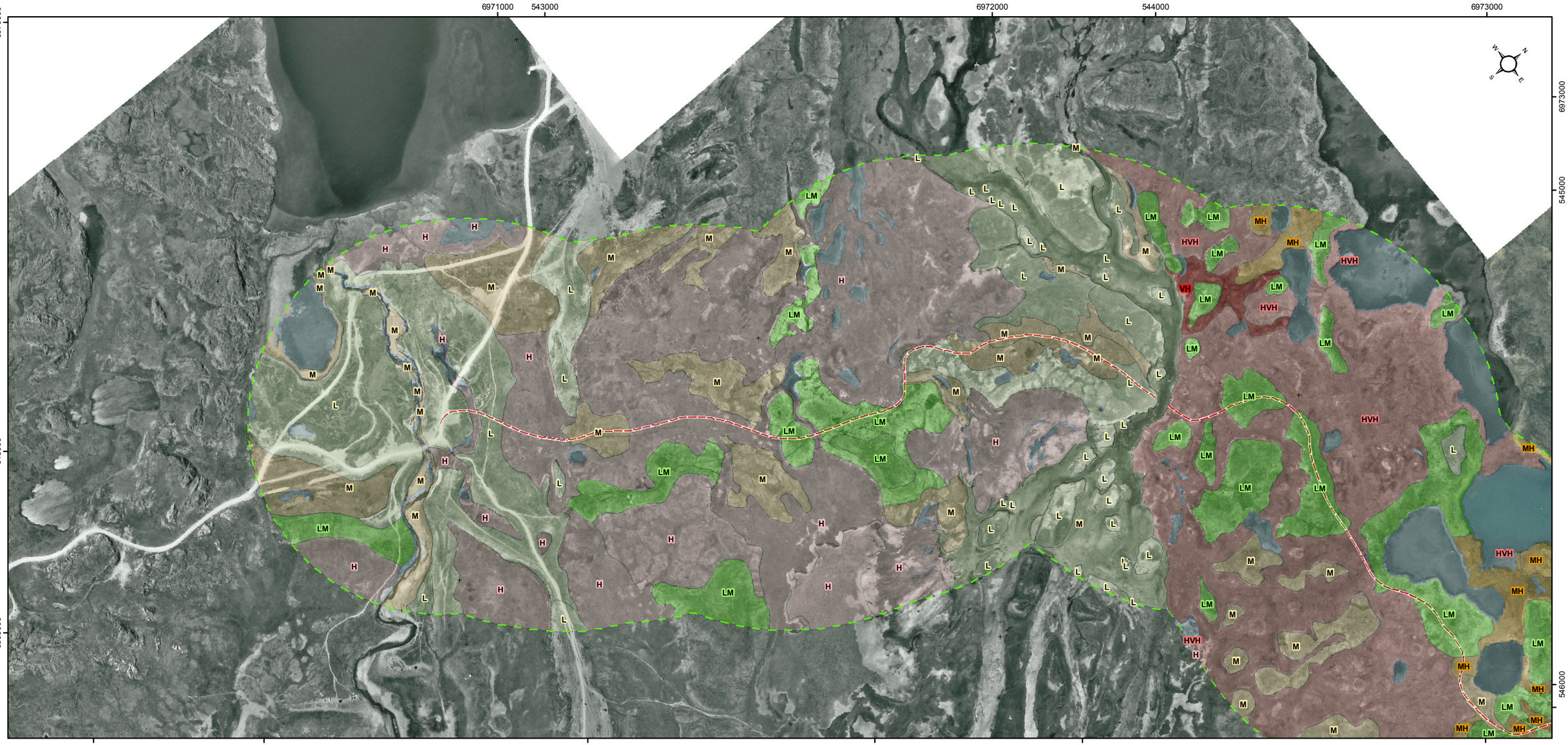


LEGEND

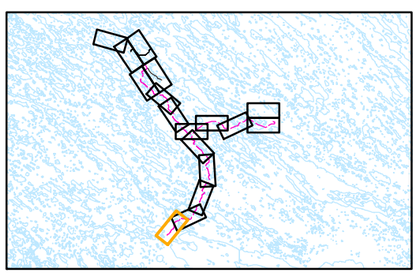
- Proposed Service Road
- As Built Road (April 2007)
- 500m Study Buffer

Freeze and Thaw Induced Displacement Hazard Mapping

- Low
- Low - Medium
- Medium
- Medium - High
- High
- High - Very High
- Very High
- Lake

REFERENCE

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



250 0 250
SCALE 1:10,000 METRES

PROJ
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MELIADINE GOLD PROJECT
NUNAVUT

TITLE
DISPLACEMENT HAZARD MAPPING
MAP 17 OF 17

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 09-1426-0015			PHASE No. 3700		
DESIGN	TR	17 Jul. 2009	SCALE AS SHOWN		REV. 0
GIS	JW	24 Nov. 2009	F. 17		
CHECK	TR	01 Feb. 2010			
REVIEW	CC	01 Feb. 2010			

APPENDIX G

Description of Orthorectification Process and Air Photo Accuracy

February 1, 2010
Doc. No. 046 Ver. 0
Project No. 09-1426-0015/3700

TECHNICAL MEMORANDUM

DATE	February 1, 2010	**PROJECT No.**	09-1426-0015/3700
TO	Comaplex Minerals Corporation	**DOC. No.**	046-G Ver. 0
CC			
FROM	Julie Werner and Cameron Clayton	**EMAIL**	jwerner@golder.com; cclayton@golder.com

DESCRIPTION OF AIR PHOTO ORTHORECTIFICATION PROCESS AND ORTHOPHOTO ACCURACY

1.0 DESCRIPTION OF ORTHORECTIFICATION PROCESS

The Meliadine Gold Project area is covered by National Topographic System (NTS) map sheets 055K16, 055J13, 055N01, and 055O04 (see Figure 1). Air photos were provided to Golder by Comaplex. The air photos were scanned at a high resolution, and orthorectified to develop an orthophoto image for the project area, specifically the proposed road alignment. The orthophoto was used as part of the terrain mapping and freeze and thaw induced displacement hazard assessment for the proposed all-weather access road.

During the orthorectification process, two issues were identified. These were:

- photo resolution of the orthophoto; and
- inaccuracy in the locations of the water features used to orthorectify the air photos.

These are described below.

1.1 Air Photo Resolution

The first iteration of the orthophoto was created with a pixel size of 1 m. This is usually a sufficient resolution for most purposes and is used to maintain a manageable orthophoto file size. However, due to the lack of topographic relief in the project area and subtle photo tone changes, the terrain, soil drainage and permafrost features were difficult to distinguish at this resolution. Consequently, the orthophoto was recreated with a pixel size of 0.5 m, which made it easier to identify and map the terrain features.

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1.2 Inaccuracy in the Locations of Water Features used to Orthorectify the Air Photos

The orthorectification process requires multiple input data sets. These are:

- digital elevation models (DEM);
- ground control points;
- camera information; and
- the scanned air photos with fiducial measurements.

Errors in any of these input data sets will introduce error to the final orthophoto product. While processing the air photos for the Meliadine Gold Project to generate the original orthophotos, an error was introduced resulting from inaccurate water feature locations obtained from the National Topographic System (NTS) map sheet 055K16. The lake edges and other topographic features on this map sheet were used as ground control points for the air photo rectification process. The horizontal accuracy of the lake edges and topographic features from this map sheet varied from actual by 10 metres to 60 metres in some areas. This variance introduced a significant error in the processed orthophotos. A portion of the 055K16 map sheet had been surveyed previously and with greater accuracy than the government issued NTS map sheet. These data are referred to as the Schlenker data and were provided to Golder by Comaplex. The extent of the Schlenker data coverage is shown in Figure 2.

The Schlenker survey data consists of digitized and surveyed lake boundaries covering the western portion of the project area, including part of the 055K16 map sheet. A combined data set of Government NTS data, where accurate, and the Schlenker data was developed. Additional ground control points were located in the field by Comaplex personnel, and these data were provided to Golder. The additional ground control points improved the orthophoto accuracy in areas not covered by the Schlenker survey data on map sheet 055K16 and along the eastern extent of the air photos that include the Discovery Mine area. The ground control points were provided in a table with x,y,z values and as points on individual air photos showing the approximate location of the ground control point on the ground. The ground control points were collected by Comaplex using a GPS survey instrument. The combination of the Schlenker water base layer and the new ground control points greatly increased the accuracy of the final orthophotos.

1.3 Estimation of Error between Control Points and Orthophoto Image

An estimate was made of the relative magnitude of error between the orthorectified images and the ground control point locations. This was accomplished by measuring the distance from the plotted ground control point, to the position of the control point as viewed on the orthophoto. The relative error between the control points and the orthophoto images is shown in Table 1.

Table 1: Approximate Error in Survey Control Points

Point_ID	SurveyPt	UTM_N	UTM_E	EL_m	Approximate Error (m)
P1	p1_tru	6974146.13	547309.97	47.28	4
P1A	p1a_tru	6974266.72	547158.44	51.94	5
P2	p2_tru	6974670.96	549088.30	51.77	2.5
P2A	p2a_tru	6974481.51	549007.72	46.99	3.5
P3	p3_tru	6975888.55	547808.79	66.31	4
P4	p4_tru	6976065.31	549144.59	62.17	4
P5	p5_tru	6976936.48	550250.71	77.60	4.5
P6	p6_tru	6977544.13	549324.10	79.96	3
P7	p7_tru	6977389.91	547409.65	72.98	3
P8	p8_tru	6977695.04	548253.33	80.48	2.5
P8A	p8a_tru	6977724.50	548150.69	80.64	2
P9	p9_tru	6979360.65	547063.45	88.47	8
P10	p10_tru	6979351.83	548308.64	74.02	4
P11	p11_tru	6979484.91	549757.24	65.37	4.5
P11A	p11a_tru	6979648.83	549397.44	65.33	5.5
P12	p12_tru	6980058.38	550410.23	62.85	9
P12A	p12a_tru	6980080.43	550439.18	62.79	10
P13	p13_tru	6980837.57	550898.92	62.88	6
P14	p14_tru	6981183.72	549305.80	73.46	3
P15	p15a_tru	6981979.17	551549.58	57.83	2.5
P16	p16_tru	6981876.53	550098.35	54.69	3
P17	p17_tru	6980746.06	547840.10	72.78	3.5
P17A	p17a_tru	6980840.06	547678.10	72.81	3
P18	p18_tru	6982219.96	547606.68	72.16	2
P19	p19a_tru	6982696.79	546502.00	77.94	4
P19A	p19b_tru	6982440.40	546605.93	77.93	6.5
P20	p20_tru	6980973.51	546623.36	82.11	6.5
P21	p21a_tru	6982584.98	550423.83	54.92	1.5
P22	p22_tru	6980837.00	551881.28	58.87	7
P22A	p22a_tru	6980907.46	552202.98	58.77	5
P23	p23_tru	6981424.57	552941.64	62.50	3
P23A	p23a_tru	6981535.83	552856.03	62.58	4.5
P24	p24_tru	6981006.32	554023.20	63.64	4.5
P24A	p24a_tru	6980845.97	554112.75	63.70	2
P25	p25_tru	6982533.50	554690.33	83.65	2.5
P25A	p25a_tru	6982670.06	554676.43	83.54	4

A summary of the descriptive statistics for the data is presented in Table 2. The average error is on the order of 4.3 m.

Table 2: Statistical Summary of Estimated Error between Plotted Control Point Location and Orthophoto Location

Paramater	Approximate Error (m)
Mean	4.25
Median	4
Mode	4
Range	8.5
Minimum	1.5
Maximum	10

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Attachments: Figures G.1 and G.2

CJC/JW/mrb

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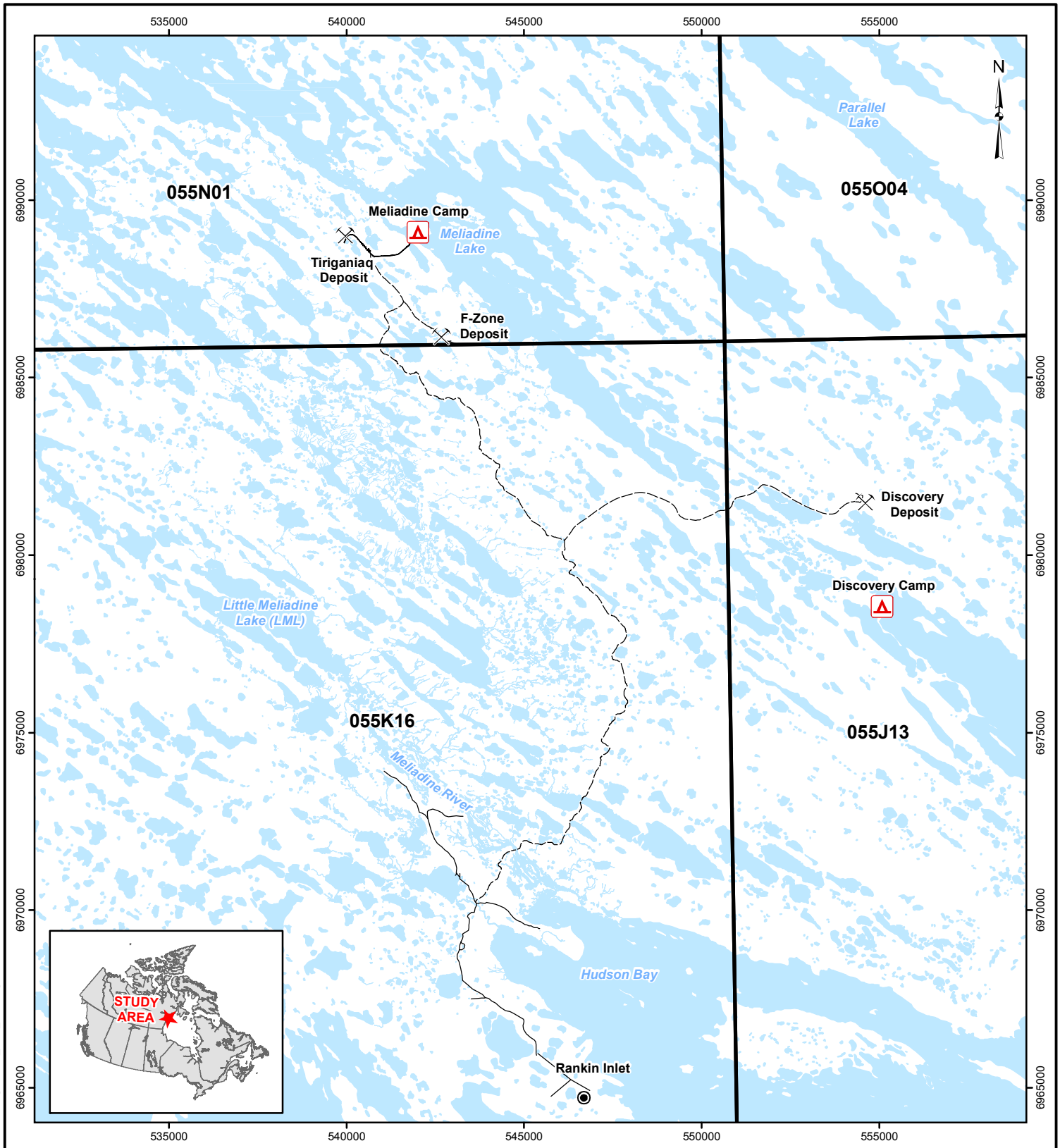

LEGEND

- Camp
- Proposed Mine Site
- Road - Existing
- Proposed Road
- Watercourse
- NTS Map Sheet Boundary
- Waterbody

REFERENCE

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

2,500 0 2,500

SCALE 1:150,000 METRES

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TITLE

NTS MAP SHEET COVERAGE
PROPOSED ALL-WEATHER ACCESS ROAD

Golder Associates
Greater Vancouver Office, BC

PROJECT NO. 09-1426-0015			PHASE No. 3700	
DESIGN	CC	21 Jan. 2010	SCALE AS SHOWN	REV. 0
GIS	JW	28 Jan. 2010	G.1	
CHECK	CC	28 Jan. 2010		
REVIEW	CC	28 Jan. 2010		

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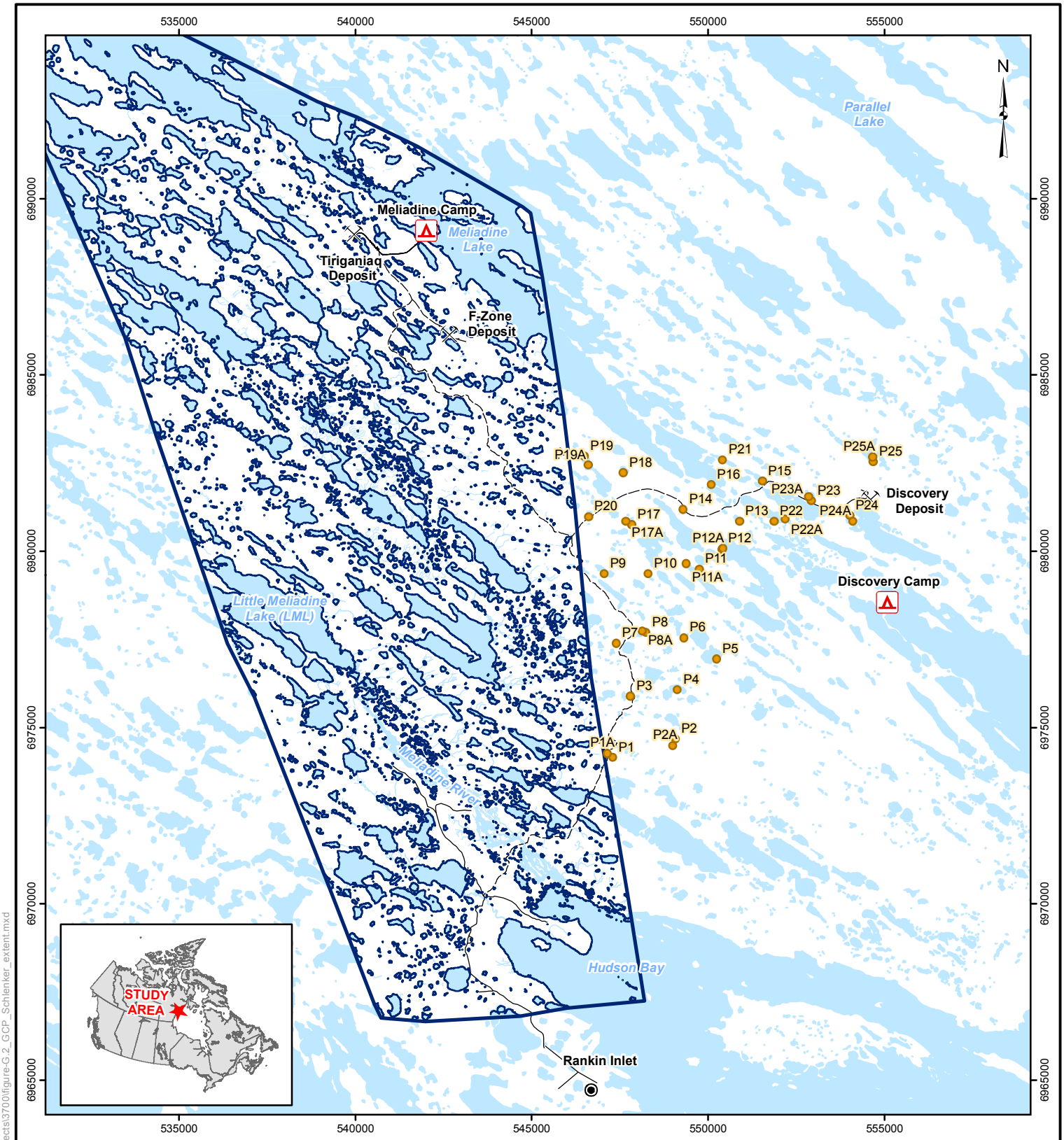

LEGEND

- Camp
- Ground Control Point
- Proposed Mine Site
- Proposed Road
- Road - Existing
- Waterbody - Schlenker Data
- Watercourse
- Extent of Schlenker Data Coverage
- Waterbody

REFERENCE

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

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GROUND CONTROL POINTS AND EXTENT OF SCHLENKER DATA COVERAGE

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PROJECT NO. 09-1426-0015			PHASE No. 3700	
DESIGN	CC	21 Jan. 2010	SCALE AS SHOWN	REV. 0
GIS	JW	28 Jan. 2010	G.2	
CHECK	CC	28 Jan. 2010		
REVIEW	CC	28 Jan. 2010		

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