Yukon Geological Survey Miscellaneous Report 12

Geophysical and geological exploration for aggregate in the City of Whitehorse area

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EXECUTIVE SUMMARY

The objective of this investigation is to guide the exploration for and development of aggregate resources for the City of Whitehorse in accordance with its Official Community Plan. Four sites in the immediate Whitehorse vicinity were selected by the Yukon Geological Survey to be addressed within this study. Prospective exploration targets are evident in each site but additional ground-truthing is necessary to reliably confirm the presence or absence of aggregate material.

The investigation consisted of a staged approach utilizing the principle that coarse-grained material *(i.e.,* sand, gravel) is generally more electrically resistive than finer-grained soils (*i.e.,* clay, silt, till).

A desktop study and on-site visual inspection identified areas in which to focus electromagnetic (EM) surveys. The EM surveys provided a coarse assessment of the electrical properties of the shallow sub-surface. Electrical resistivity imaging (ERI) survey data were then collected in high resistivity regions identified by the EM survey to assess thickness and depth of occurrence of the potential aggregate material. Shallow test pitting was then undertaken to field verify geophysical anomalies with observed ground material.

Three ERI arrays were surveyed at three sites and two arrays at one site. In seven of the 11 ERI profiles a relative conductive horizon overlies a layer of higher resistivity. The conductive layer generally extends from surface to a maximum depth of approximately 5 metres. The thickness of the underlying resistive layer, possibly aggregate, varies from less than 5 m to greater than 10 m. ERI survey results are highly variable both within and between sites indicating significant variations in the shallow soil types.

The most likely targets for further aggregate exploration at each of the four sites are areas of elevated to high resistivity. All areas with high resistivity are not necessarily potential aggregate targets as some of those areas are coincident with exposed bedrock.

Project and environmental constraints precluded the use of heavy equipment for ground truthing which was limited to hand-dug test pits. The test pits revealed predominantly silty-sand extending to approximately 70 cm depth. Only traces of gravel or cobbles were observed within the shallow soil horizons exposed within the pits. Materials contributing to the high resistivity identified by the EM and ERI surveys likely occur at depths greater than the excavated test pit depths.

A more in-depth interpretation of the geophysical results would require ground-truthing to depths greater than were obtained for this project. In addition, a higher density of geophysical data would be required to further delineate high resistivity, possible aggregate-bearing areas that were identified in this investigation.

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APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has conducted an investigation for the Yukon Geological Survey (YGS) to assess the distribution of aggregate resources at four sites near Whitehorse, Yukon Territory. The staged process included the following processes:

- A terrain evaluation study;
- An electromagnetic (EM) terrain conductivity survey;
- An electrical resistivity imaging (ERI) survey;
- A test pit excavation; and
- An integrated interpretation of the data.

The field program was conducted from October 2 to 27, 2013. Surveys were performed by staff from Golder's Whitehorse, Victoria, and Calgary offices and by a local subcontractor.

2.0 SITE DESCRIPTION

Four sites were selected by the YGS for this exploration project:

- Kilometre 196 of the North Klondike Highway (Km 196) (Figure 1-1);
- Little Takhini (Figure 2-1);
- Long Lake (Figure 3-1); and
- McLean Lake (Figure 4-1).

As a preliminary review of the Long Lake site by YGS indicated the presence of limestone bedrock, the location of the selected investigation site was moved approximately two km to the south.

3.0 PRELIMINARY TERRAIN EVALUATION

To produce preliminary terrain maps of each of the four sites and to identify possible areas of granular materials for evaluation with geophysical techniques, the Golder team researched the existing available geological information and made a review of available air photographs.

A field visit was carried out subsequent to the development of the preliminary terrain maps to further identify target areas.

3.1 Background

For a description of the surficial geology of the four sites, the team used:

- Surficial Geology - Whitehorse (Morrison and Klassen 1991),
- Soil, Terrain and Wetland Surveys (Mougeot 1997) and
- Surficial Geology of Whitehorse (Bond, Morrison and McKenna 2005).

Additional information was obtained from a summary of the late Wisconsin glacial history of the Whitehorse area (Bond 2003). The team reviewed a number of site-specific documents from the Elijah Smith library, but none were applicable to the four sites.

3.2 Air Photo Interpretation

To identify possible granular areas for follow up with geophysical survey techniques, Golder interpreted the aerial photography covering the four sites together with the published surficial geology information. The 1:10,000 scale air photos, collected on August 9th, 2001, were obtained from the Yukon Energy Mines and Resources public library. The following photos were viewed for each site:

■ Km 196	A28473	100-102
	A28473	120-123
■ Little Takhini	A28473	236-239
	A28474	041-044
■ Long Lake	A28472	144-147
	A28473	020-023
■ McLean Lake	A28473	182-190
	A28473	257-264

The Km 196 site is roughly rectangular in area approximately 300 m long and 200 m wide adjacent to the North Klondike Highway approximately 5 km north of the intersection with the Alaska Highway. It is located immediately north of an existing active gravel pit. The topography is hummocky and there are a number of kettle–like depressions to the west of the site. East of the site, adjacent to the Yukon River is a level terrace. Published surficial geological mapping indicates that the area consists of gravelly hummocky moraine with some glacio-lacustrine material. The air photo interpretation and site reconnaissance suggested the site was silty hummocky ground with possibly gravel at depth.

The Little Takhini site is located south of Alaska Highway approximately 3 km west of the intersection with the North Klondike Highway. The approximately 2.5 km^2 area is located to the south and west of two gravel pits. Published surficial geological mapping indicates that the site is primarily morainal blanket or colluvial veneer over bedrock except for the eastern portion which is mapped as a sandy gravelly glaciofluvial deposit. Based on the mapping, air photo interpretation and the site reconnaissance the eastern portion of the site is a relatively level ridged area that is interpreted to be moraine and the western portion is an upland area that is interpreted to be a morainal veneer over bedrock. In the northeastern corner between the two gravel pits is a hill feature interpreted to be gravel or sand.

The McLean Lake site is a large area approximately 6.5 km long by 2 km wide located between Fish Lake Road in the north and Mount Sima Road in the south. It is west of the Alaska Highway south of the city. Published surficial geological mapping indicates that the area consists primarily of rolling moraine over bedrock with a zone of gravelly glaciofluvial material along the western portion of the area. Much of the site is the location of an old copper mine. To the north of the McLean Lake Site is an area of working gravel pits but the majority of the site area is interpreted to consist of a morainal veneer or blanket overlying bedrock. The western flank of the site was interpreted to consist of granular deposits based on the air photo interpretation and the site reconnaissance.

The initial Long Lake site was revised and moved approximately two km to the south. The relocated site, approximately 1 km^2 in area, is located on the Long Lake Road approximately 5 km north of the city of Whitehorse. This area, based on the published surficial geological mapping, consists of sandy gravelly glaciofluvial or morainal material. From the site reconnaissance the area consists of a relatively level plateau interpreted to consist of glacio-lacustrine silt with some potential for granular deposits to exist in the northern part of the site.

4.0 METHODS

Three complementary geophysical and geotechnical methods (EM and ERI surveys and test pit excavation) were undertaken in an iterative process to assess the presence and distribution of potential aggregate material.

The rationale used to choose areas for geophysical investigation was based on interpreted landforms from air photo analysis and on-site visual inspection by the senior geotechnical engineer. At the end of the initial site visit, portions of each survey area were excluded as being less favourable targets for possible aggregate. Exclusion criteria included observed presence of bedrock outcrops.

The preliminary terrain evaluation identified initial EM survey target areas at each of the four sites noted as the orange, cross-hatched regions.

- Kilometre 196 of the North Klondike Highway (Km 196) (Figure 1-1);
- Little Takhini (Figure 2-1);
- Long Lake (Figure 3-1); and
- McLean Lake (Figure 4-1).

The EM surveys provided a relatively quick reconnaissance method to identify areas of low conductivity (*i.e.* resistive terrain) that may be indicative of aggregate material. The localized regions of resistive soils identified locations for subsequent ERI surveys that will better delineate the electrically resistive soils.

Examination of the sediments exposed in hand-dug test pits enabled a limited correlation with the geophysical survey results (*i.e*., ground truthing).

4.1 Geophysical Methods

The primary factors that control resistivity are typically soil grain size, porosity, rock or soil type, temperature, ice content and water saturation. Variations in the electrical properties of different geological formations often enable effective geological mapping using electrical and/or electromagnetic geophysical survey methods. Some characteristics are as follows:

- Clays and silts are generally less resistive than sands and gravels.
- Fresh water saturation within clay-free soils reduces resistivity in accordance with Archie's Law, *i.e*. water-saturated sands have a lower resistivity than dry sands.
- Increasing the concentration of total dissolved solids, particularly salts and metals, in contained groundwater normally reduces resistivity significantly.
- The presence of organic materials tends to increase the matrix resistivity relative to coarse-grained material.

Table 1 illustrates typical resistivity values for various geological materials (Annan 1997).

Table 1: Resistivity and Conductivity Ranges

MATERIAL	RESISTIVITY (Ω-m)	CONDUCTIVITY (mS/m)
Fresh Water	2,000	0.5
Sea Water	0.033	30,000
Dry Sand	100,000	0.01
Saturated Sand	100 - 5,000	0.2 - 10
Gravel	100 - 10,000	0.1 - 10
Silts	10 - 1,000	1 - 100
Clays	1 - 500	2 - 1,000
Granite	<1,000 - 100,000	0.01 - 1
Limestone	500 - 2,000	0.5 - 2
Shale	10 - 1,000	1 - 100
Dry Salt	1,000 - 100,000	0.01 - 1
Ice	100,000	0.01

4.1.1 Electromagnetic Ground Conductivity Survey

The Geonics Ltd. EM31-MK2 Terrain Conductivity Meter measures soil conductivity to a depth of approximately 5.6 metres below ground surface [mbgs] by measuring the inductive response of the ground. An alternating current is supplied to a wire transmitter coil, producing a time-varying 9.8 KHz magnetic field that penetrates the ground and induces electrical eddy currents within the subsurface materials. The eddy currents give rise to a secondary magnetic field that is measured, together with the primary field, by the receiver coil (Figure A).

The ratio of the secondary to the primary magnetic field is linearly proportional to terrain conductivity under most survey conditions. Apparent conductivity, measured in milliSiemens per metre [mS/m], is this ratio multiplied by a constant that is dependent on frequency of operation, coil separation and permeability of free space.

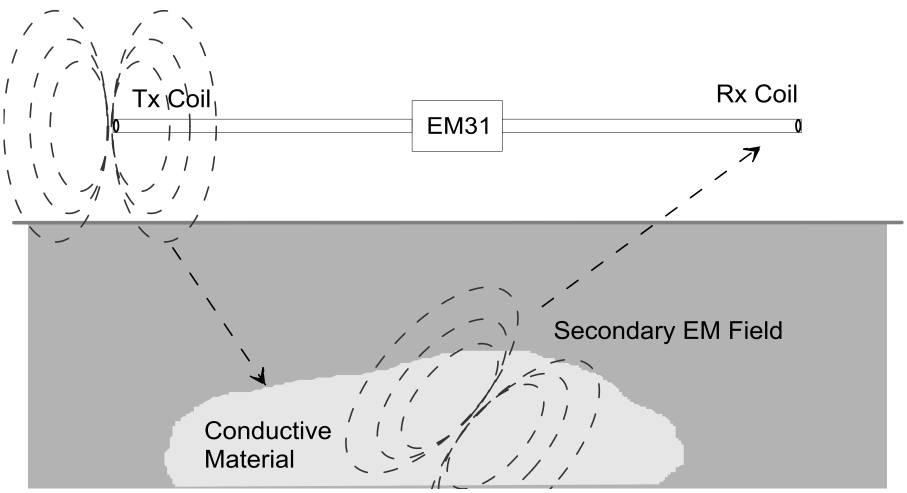

Figure A: Electromagnetic Induction

Figure B: EM31 Ground Conductivity Meter

For practical purposes, the EM31 response should be interpreted as a weighted average (apparent) conductivity for hemispherical subsurface volumes that have a radius approximately equivalent to the 5.6 m depth range.

EM31 survey data were collected and digitally recorded at one-second intervals as the EM31 was carried across the site (Figure B).

The positions of the survey stations were collected and digitally recorded using a Global Positioning System (GPS) receiver (Trimble GeoXH).

Conductivity values in mS/m were converted to resistivity values in Ohm-metres (Ω-m) to simplify the comparison with the subsequent ERI survey results (McNeill 1980).

$$\text{Resistivity } (\Omega\text{-m}) = 1000/\text{Conductivity (mS/m)}$$

The EM31 survey data were plotted and contoured using the Golden Surfer v10 mapping program. As survey data are commonly irregularly spaced, trends that are suggested in the data are generally best expressed using the kriging geostatistical gridding method.

4.1.2 Electrical Resistivity Imaging Survey

The ERI method measures the electrical resistivity of the subsurface, both laterally and vertically, to infer rock and soil types and stratigraphy. Ground resistivity is measured by applying a direct current to the ground using two current electrodes and measuring the potential difference, or voltage, between two potential electrodes (Figure C). The depth of investigation is largely a function of electrode separation, with larger electrode separations providing information to a greater depth.

Stainless steel electrodes are positioned along a survey line, or spread, and connected to the resistivity meter by a series of cables with multiple connection points (Figure D). Software controlling the resistivity meter uses multiple configurations of electrodes to collect measurements at various user-specified separations to provide high-density data along the entire length of the profile.

The Wenner-Schlumberger array type maintains constant potential electrode spacing at a fixed midpoint, while iteratively increasing the current electrode spacing on either side of the potential electrode midpoint (Figures C and D). This process is repeated for all user-specified combinations of potential electrode midpoints and current electrode separations. The Wenner-Schlumberger array generally provides deep penetration relative to electrode spacing and results in a good compromise between delineating horizontal structures and steeply dipping structures in the subsurface.

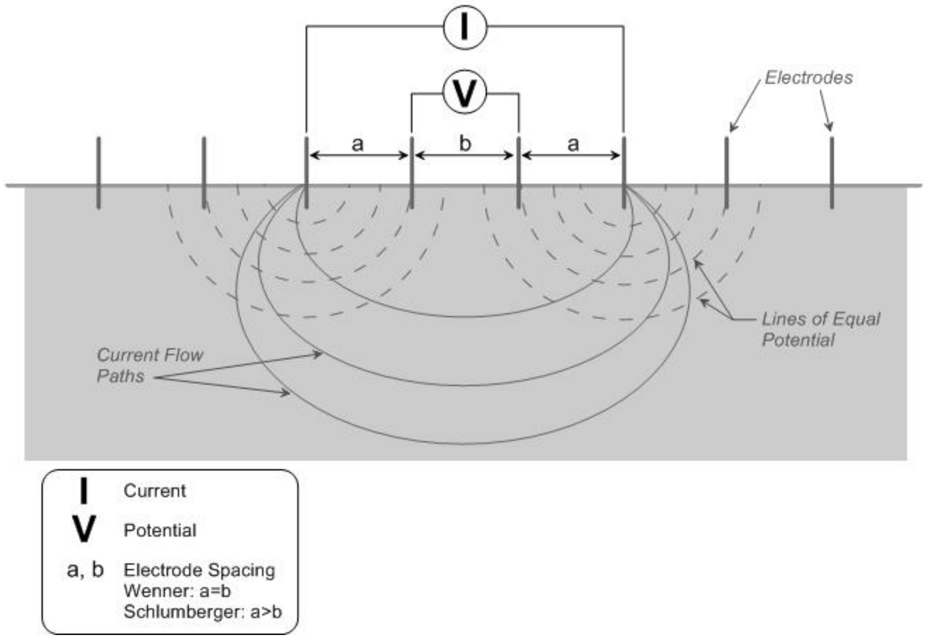

Figure C: ERI Wenner-Schlumberger Array

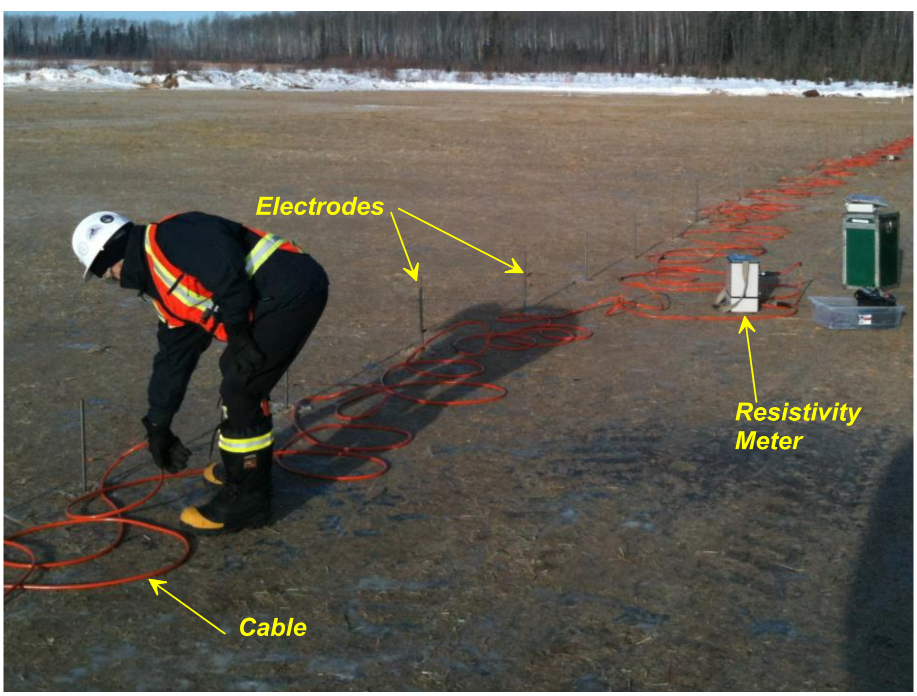

Figure D: ERI Survey Configuration

4.2 Test Pit Excavation

A preliminary inspection of the EM and ERI results identified areas of anomalous response (*i.e.*, localized regions of elevated ground resistivity). Geotechnical site investigation of the four designated areas was conducted to compare geophysical anomalies with observed ground conditions. Test pit locations were primarily centred on geophysical targets that were interpreted to indicate aggregate material. Interpreted non-aggregate material was also targeted for comparison. Shallow test pits were dug by hand to confirm and characterize the soil materials at shallow depths.

5.0 RESULTS

Results of the investigation are presented on Figures 1-1 to 4-3.

- Figures 1-1, 2-1, 3-1 and 4-1 illustrate the results of the geotechnical investigation in addition to the locations of the geophysical surveys.
- Figures 1-2, 2-2, 3-2 and 4-2 illustrate the results of the EM31 surveys. The contour scale range is 0 to 500 Ω-m.
- Figures 1-3, 2-3, 3-3 and 4-3 present the modelled resistivity depth profiles. The contour scale range used to display the ERI data is 0 to 9000 Ω-m.

Initial processing involved converting EM31 conductivity values to resistivity (Section 4.1.1). The subsequent EM31 resistivity contour plan maps illustrate the weighted average of the bulk measurement across the upper 5.6 m of the subsurface. Areas of high resistivity (>200 Ω-m) were selected as being indicative of aggregate material or shallow granite bedrock, and is illustrated by the dashed cross hatching on EM plan maps. These areas were selected as targets for the ERI profiling survey and for subsequent test pit locations. The final positioning of the ERI lines was adjusted by the field crew according to access, topography, presence of visible bedrock, and density of vegetation.

The ERI survey method is more sensitive to variations in resistivity than the EM31 method. The selection criterion for the interpretation of the ERI data is based on Table 1. The threshold value possibly indicative of aggregate or bedrock is 1000 Ω-m (upper resistivity range for silts). Regions with ground resistivity greater than 1000 Ω-m are identified by the cross hatching in the depth sections.

Comparable colours in the survey methods are not representative of equivalent resistivity values. The resistivity contour range for the EM31 contour plans is from 0 to 500 Ω-m. For the ERI profiles the resistivity range is 0-9000 Ω-m.

A direct comparison of the colour range between the EM and the ERI results is not valid and should only be considered relative.

Results of the ERI surveys at three of the sites showed high resistivity (>1000 Ω-m) particularly between 3 and 15 mbgs. Values were predominantly in the range of 1000 to 4000 Ω-m range but substantial horizons >5000 Ω-m are present. The MacLean Lake sections differed in that they revealed extensive regions <2000 Ω-m.

Ground truthing was limited to hand-dug test pits due to the constraints of budget and the exclusion of line cutting for heavy equipment access within this project.

To maximize the number of locations that could be examined, the depths of the pits were confined to less than 1 m. The average depth of the pits was approximately 70 cm. The shallow soils exposed in the test pits were predominately silty sand. Most showed at least some trace of gravel and/or cobbles. General descriptions of the subsurface conditions encountered during the 2012 test pitting in these four areas are provided in the respective descriptions for each site. Test pit logs for each pit are summarized in Appendix A.

The shallow limit of the hand-dug pits precluded the positive identification of the source materials resulting in the resistivity anomalies that were detected at depths greater than 1 mbgs.

The interpretation of the ERI profiles is indeterminate, due to the absence of ground truthing information below 1 m. Ground truthing to greater depths is required to provide a discrete interpretation of the source material.

5.1 Results from Km 196

The EM survey results for the Km 196 site indicate that resistive terrain is present in the area immediately surrounding the existing gravel pit and extends further to the northeast. Two ERI spreads were positioned at this site (Figure 1-2) and the results were as follows:

- ERI Spreads 1 and 2 identify a resistive zone of 1000 to 5000 Ω-m from the surface to a depth up to 5 mbgs.
- Spread 2 displays a less uniform resistivity profile with a more discontinuous zone of resistivity in excess of 5000 Ω-m (Figure 1-3).
- Both ERI depth profiles exhibit high resistivity zones (>5000 Ω-m) between approximately 4 and 15 mbgs.

Eight test pits were excavated in this area. Typical soil types and conditions include a thin layer (up to 3 cm thick) of frozen topsoil underlain by up to 80 cm of silty sand (SM) with some gravels and cobbles indicated throughout. The sand is moist and compact and light brown in colour. There is a thin layer of volcanic ash identified in at least one (TPK3) test pit at approximately 10 cm depth

(Appendix A, Test Pit Data Summary) Seven of the test pits were located in high resistivity areas identified in the EM survey. One pit (TP K3) was positioned in an area of lower resistivity (identified in the EM31 results) for comparison. Except for the ash layer, TP K3 was not definitively distinct from all the test pits in the higher resistivity areas. TP K3 and TP K5 shared similar stratigraphic characteristics of a thin peat layer underlain by sandy silt.

5.2 Results from Little Takhini

This site displayed the lowest mean ground resistivity in the EM results of all the sites addressed in this investigation (Figure 2-2).

Three ERI spreads were positioned in the northern part of the EM surveyed area (Figure 2-3) and the results are as follows:

- ERI Spread 1 results indicate modelled resistivity ranging from 1000 to 5000 Ω-m occurring from ground surface to approximately 5 mbgs. At depths greater than 5 mbgs, a discontinuous distribution of resistivity in excess of 5000 Ω-m is identified.

- The modelled results of ERI Spread 2 exhibit a layered boundary of 1000 to 4000 Ω-m from surface to approximately 5 mbgs. This is underlain by a higher resistivity layer of 5000 Ω-m from 5 to 15 mbgs.
- ERI Spread 3 displays relatively low resistivity across most of the profile with only small, asymmetric regions of modelled resistivity greater than 1000 Ω-m. This is the only spread in the investigation where bedrock was encountered within the test pit excavation.
- ERI profiles for Spreads 1 and 2 exhibit high resistivity regions (>5000 Ω-m), either in a uniform horizon or an irregular distribution, between 4.5 mbgs and 15 mbgs.

Eight test pits were excavated at this site. Soil types and conditions identified include a thin layer (up to 10 cm thick) of frozen topsoil, underlain, in most cases, by up to 80 cm of fine silty sand (SM) with some gravels and cobbles throughout. The sand is moist and compact and light brown in colour.

5.3 Results from Long Lake

Two localized regions of elevated resistivity are identified in the EM results (Figure 3-2). One is located north of the power line on the north side of the road. The other is located south of the power line on the west side of the road. A description of the ERI survey results are as follows.

- The modelled ERI Spread 1 results (Figure 3-3) identify a similar trend to that noted at other sites within this investigation. A shallow band of high resistivity (1000 Ω-m to 5000 Ω-m) occurring between ground surface and 3.5 mbgs overlies a region where modelled resistivity is greater than 5000 Ω-m extending to approximately 15 m depth.
- ERI Spread 2 results identify high resistivity across the profile mostly in excess of 4000 Ω-m. The highest resistivity noted in this section occurs in the vicinity of TP-L2.
- Spread 3 identifies resistivity from 1000 to 3500 Ω-m between the surface and 3mbgs. This is underlain by a region of 4000 to 6000 Ω-m down to 12 mbgs.

Seven test pits were excavated in this area. Typical soil types and conditions identified include a thin layer (up to 5 cm thick) of frozen topsoil underlain, in most cases, by up to 25 cm of fine silty sand (SM). The sand is light brown in colour and is moist and compact. The sand overlies a finer to coarser sand (SW to GW) with some gravels and cobbles, ranging in depth from approximately 30 to 70 cm. The underlying sand layer is moist and compact and grey in colour and ranges in depth from 20 to 80 cm.

5.4 Results from McLean Lake

McLean Lake was the largest area surveyed in the current investigation. The EM31 results indicate the presence of aggregate material and/or shallow bedrock across most of the site with the highest resistivity occurring in the centre and northern portions of the survey area (Figure 4-2). In comparison with the associated ERI section profiles, it is stressed that a direct association of the colour scales should not be made.

Modelled ERI resistivity along the three ERI survey lines surveyed within the McLean Lake site was generally less than indicated at all other sites surveyed in this investigation.

- ERI Spread 1, located in the southern region of the site, identifies a near-surface (from ground surface to a maximum of 5mbgs) low resistivity region within the northern portion of the spread. This is underlain by a layer where resistivity is generally less than 6000 Ω-m. High resistivity is evident across the southern half of the spread from surface to the bottom of the profile.

- ERI Spread 2 position was located in the centre portion of the site, immediately east of an existing aggregate pit. The original target for this spread was the high resistivity zone immediately to the northeast as identified by the EM31 results. That site was discounted in the field because of observed bedrock outcrops. The line was moved southwest to its illustrated position because of the difficulty in inserting electrodes into shallow bedrock. The ERI profile identifies a resistive zone (up to 6000 Ω-m) that extends from ground surface to approximately 5m depth across the length of the line. This relatively shallow, flat-lying resistive zone is interpreted as aggregate material which is corroborated by the presence of the adjacent aggregate operation.
- ERI Spread 3 was located in the northern region of the site. This spread was originally targeted for the high resistivity zone immediately to the southeast. The position was adjusted in the field because of the presence of bedrock outcrops. The high resistivity zone approximately 600 m south of the spread was not targeted as it is the site of an existing pit with bedrock outcrops at the southeastern periphery of the pit.
- Spread 3 exhibited ERI data primarily <1000 Ω-m. Any aggregate encountered along the line is expected to be of limited volume.
- The field crew excavated seven test pits by hand at the McLean Lake site. Typical soil types and conditions include a thin layer (up to 5 cm thick) of frozen topsoil underlain by up to 70 cm of fine silty sand (SM) with a trace of cobbles. The sand is moist and compact and light brown in colour.

6.0 SUMMARY

The geophysical and geotechnical survey has provided a representation of the shallow subsurface electrical properties and soil characteristics within the inherent limitations of the instrumentation and methods used.

Golder's interpretations of results of the geophysical and geotechnical investigation suggest that aggregate material is most likely to occur within the following regions:

- Km 196 – Immediately to the south and northeast of the existing pit (Figure 1-2).
- Little Takhini – Three regions within the northern portion of the survey area (Figure 2-2).
- Long Lake – Two small regions within the north and south regions of the survey area (Figure 3-2).
- McLean Lake – Two regions in the southern portion of the survey area in the vicinity of Spread 1 and Spread 2 (Figure 4-2).

Each of these regions exhibits high resistivity in the EM31 survey results. They also exhibit elevated resistivity in the ERI profiles distributed in comparatively uniform horizons

The ERI depth sections generally exhibit high resistivity horizons between depths of approximately 3 mbgs and 15 mbgs. However, the modelled resistivity value at McLean Lake is, instead, generally low with a shallow, high resistivity horizon apparent along Spread 2.

This investigation has identified that the terrain at these four sites is generally comprised of electrically resistive soils underlain by electrically resistive bedrock. There is a high degree of variability of the terrain and the measured electrical properties, both within and between the sites that were addressed. A detailed interpretation of the ERI results would be indeterminate without coincident ground-truthing data from equivalent depths of exploration.

Subsequent investigations are recommended to confirm and enhance the results of the geophysical interpretation. Locating ERI arrays along the tops of exposed cutbanks or pit walls with visible soil horizons may permit calibration of resistivity results, but only with localized conditions due to the high variability of electrical properties within and between the sites. To conclusively identify and quantify aggregate resources, geotechnical information obtained at greater depths, and grain size analysis will be indispensable.

Extensive areas were surveyed within a relatively brief period during this study's field program. Greater understanding of the disposition of aggregate resources within the study areas will be achieved by increasing the resolution the of the field methods (i.e. filling in data gaps with the EM31, longer ERI arrays, more test pits, or boreholes).

Unless vegetation can be cleared, many areas within the four surveyed sites will remain inaccessible to excavators and/or other heavy equipment. Therefore, the depth of additional test pits will be limited to what can reasonably be dug by hand (typically less than one metre).

It is, therefore, recommended that regions of high ground resistivity be further investigated using complementary geophysical methods such as ground penetrating radar (GPR) and/or seismic refraction in order to differentiate between shallow aggregate material and bedrock.

7.0 LIMITATIONS OF GEOPHYSICAL METHODS

Golder has prepared this report in a manner consistent with the level of care and skill ordinarily exercised by members of the engineering and geoscience professions currently practicing in Canada, subject to the time limits and physical constraints applicable to the work described in this report. No other warranty, express or implied, is made. The work completed, as documented in this report, is subject to the Terms and Conditions submitted to the Client.

This report has been prepared for the specific site, objective, development and/or purpose described to Golder by the Client, and is subject to the scope of work, financial and scheduling constraints of the assignment and the agreement entered into with the Client. The factual data, interpretations and recommendations pertain to this specific project, as described in this report, are based on the information obtained during the assessment by Golder on the dates cited in the report, and are not applicable to any other project or site location. The validity of this report is affected by any change of site conditions, purpose, development plans or significant delay from the date of this report to initiating or completing the project. If changes or delays occur, Golder cannot be responsible for the use of this report, or portions thereof, unless Golder is asked to review and, if necessary, revise the report.

The inferences concerning the site conditions contained in this report are based on information obtained during the assessment conducted by Golder personnel, and are based solely on the condition at the time of the assessment, supplemented by historical and/or other information obtained by Golder, as described in this report. The conclusions presented in this report represent the judgment of the assessor, and are based on observations and measurements made, and on site conditions observed on the date(s) cited in this report. Due to the nature of the investigation, and the limited data available, the assessor cannot warrant against undiscovered features that may impact the project, nor variations in subsurface conditions between measuring points.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express, written consent. The report, all plans, data, drawings and other documents, as well as all electronic media prepared by Golder, are considered its professional work product and shall remain the copyright property of Golder.

It is a fundamental assumption for geophysical survey techniques that there will be sufficient physical property contrast between the media being investigated. However, physical properties can vary in the field such that media and subsurface bodies may not be sufficiently in contrast with their surroundings, and result in uncertainty with respect to data interpretation. It is recommended that subsurface conditions interpreted through geophysical survey techniques be verified by physical sampling and/or inspection, to confirm and calibrate the data interpretation. Once verification data are available through future work, including excavations, borings, or other studies, Golder Associates Ltd. should be asked to re-evaluate the interpretations, conclusions and recommendations of this report, and to provide amendments, as required.

Report Signature Page

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8.0 REFERENCES

Annan, A.P. 1997. *Ground-penetrating Radar: Workshop Notes, Sensors and Software Inc*., Mississauga, Ontario, p. 42.

Bond, J., Morrison S. and Mckenna K. 2005 *Surficial Geology of Whitehorse*, Yukon Geological Survey Geoscience Map 2005-7, 1:50,000 scale.

Bond, J. 2004. *Late Wisconsinan McConnell Glaciation Of The Whitehorse Map Area (105D) Yukon In: Yukon Exploration and Geology* 2003, D.S.Esmond and L.L. Lewis (eds.) Yukon Geological Survey, p. 73-88.

McNeill J.D. 1980. *Electromagnetic Terrain Conductivity Measurement at Low Induction Numbers*. Geonics Limited Technical Note TN-6. Geonics Ltd. Mississauga, Ontario, Canada.

Morrison S.R. and Klassen R.W., 1991, *Surficial Geology – Whitehorse, Yukon Territory*, Geological Survey of Canada Map 12 – 1990, 1:250,000 scale.

Mougeot C.M. 1997 *Soil, Terrain and Wetland Surveys*, City of Whitehorse, Mougeot GeoAnalysis, Whitehorse, Yukon.

FIGURES

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- KM 196 AREA BOUNDARY
- EM SURVEY LOCATION

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

0 100 200 300 m

SCALE (APPROX.)

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

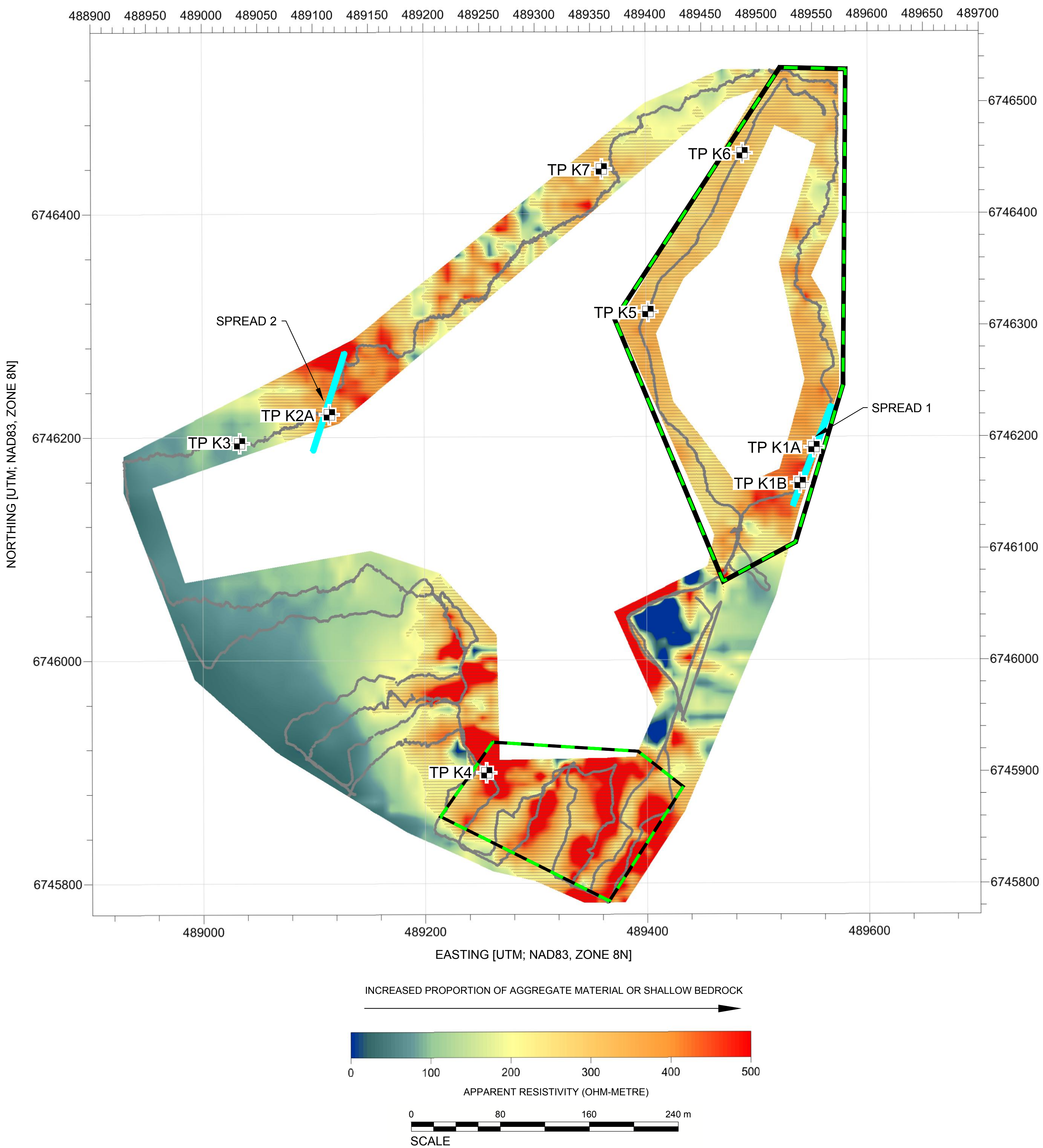
TITLE

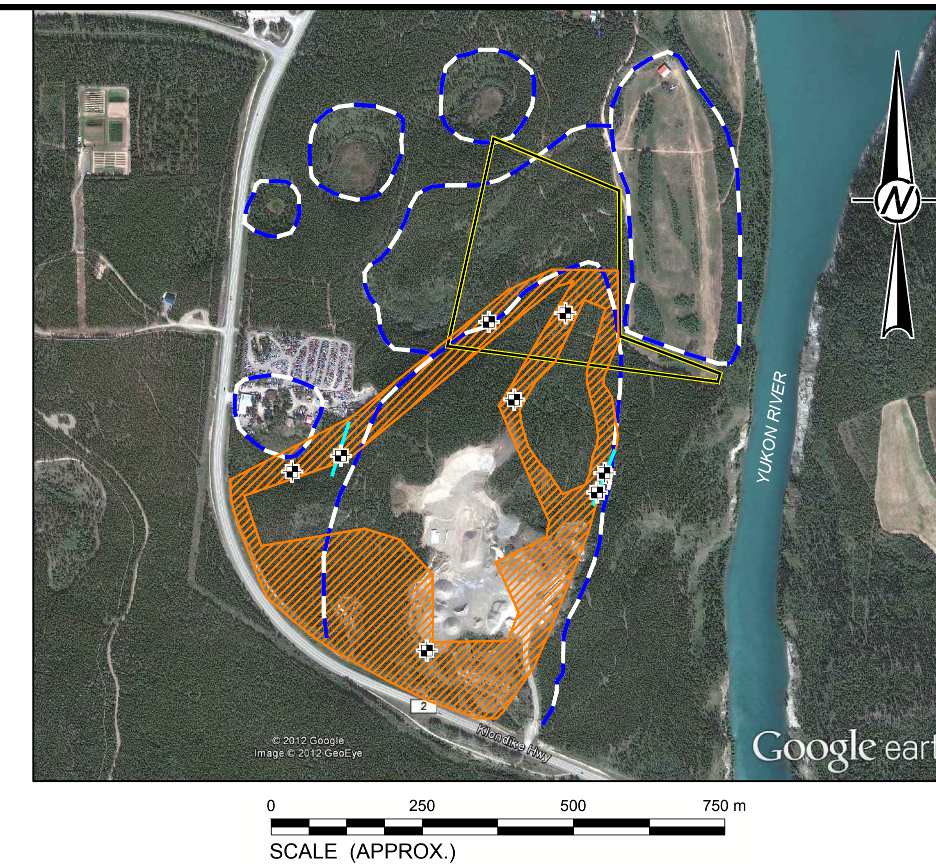
KM 196 AREA SURVEY LOCATIONS

Golder Associates

PROJECT No.	12.1348.0040.3000		FILE No.	12134800401000A001
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-11	FIGURE 1-1	
CHECK	MH	2013-04-11		
REVIEW	MB	2013-04-11		

\\golder.gds\CAL\MCAD\2012\1348\12-1348-0040\3000\Report_A\Fig1-1_12134800401000A001_KM196.dwg | Layout: Layout | Modified: TVu 04/11/2013 3:37 PM | Plotted: TVu 04/11/2013





LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- EM SURVEY PATH
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- KM 196 AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

TITLE

KM 196 AREA EM31 GROUND RESISTIVITY SURVEY

Golder Associates

PROJECT No.	12.1348.0040.3000		FILE No. 12134800401000A002
DESIGN	MH	2013-01-25	SCALE AS SHOWN
CADD	TV	2013-03-11	
CHECK	MH	2013-04-11	**FIGURE 1-2**
REVIEW	MB	2013-04-11	

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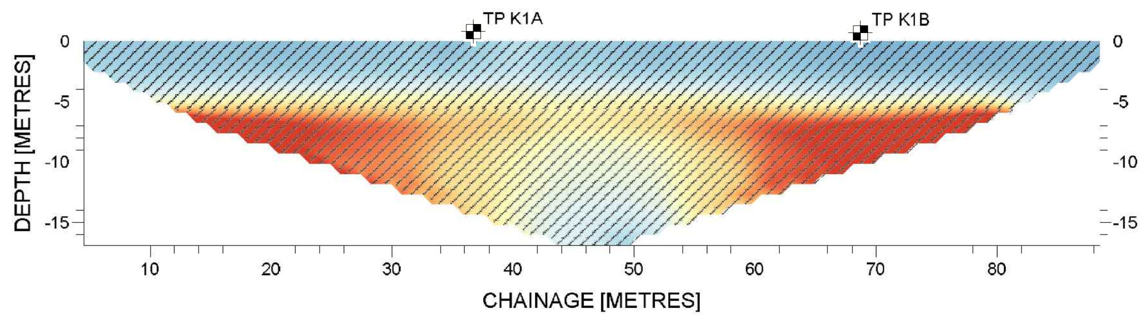
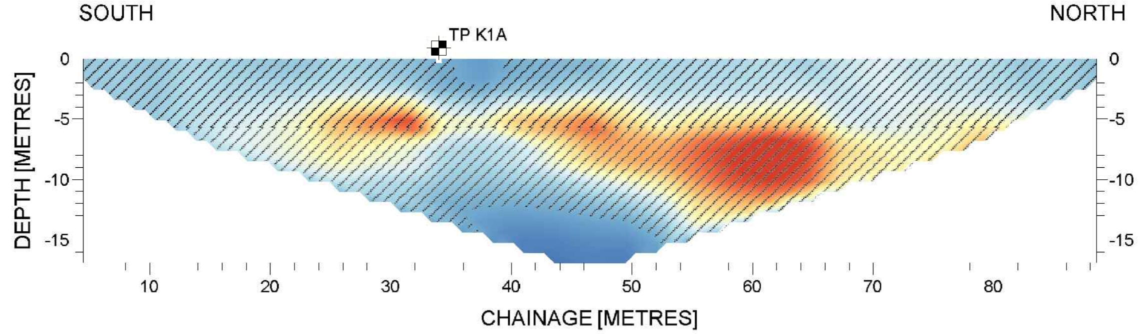
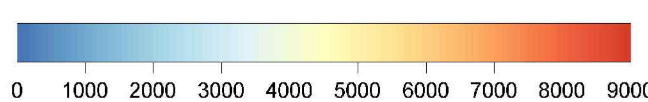


SPREAD 2 - MODELLED RESISTIVITY SECTION:

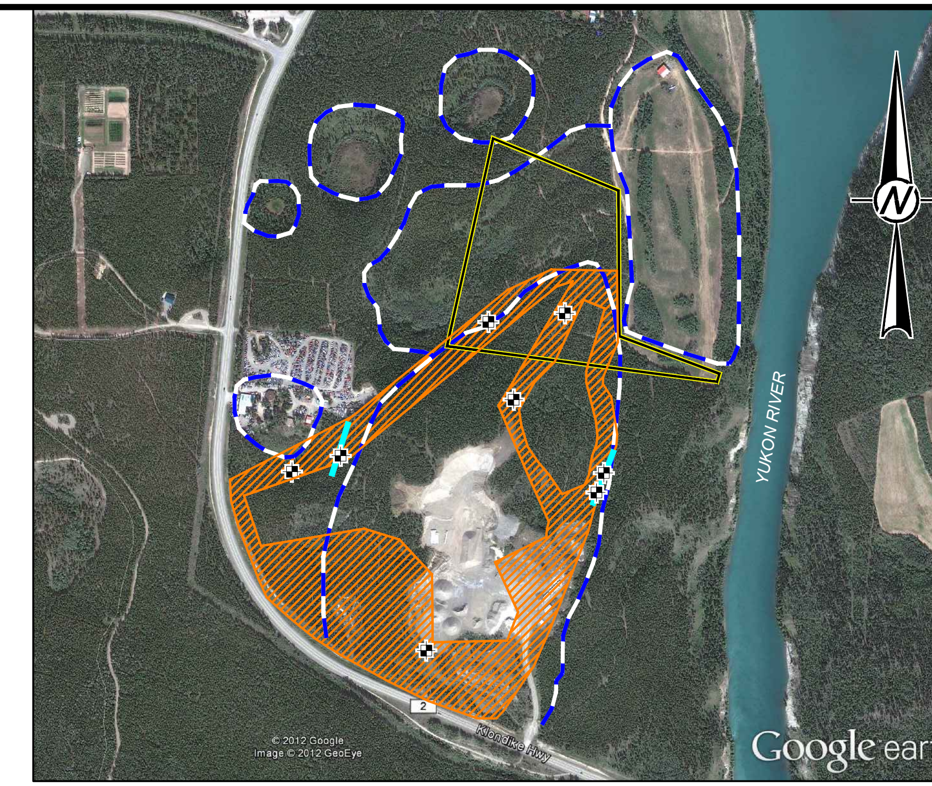




MODELLED RESISTIVITY (OHM-METRE)

0 25 50 75 m

SCALE



0 250 500 750 m

SCALE

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- KM 196 AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

TITLE

KM 196 AREA ERI SURVEY

Golder Associates

PROJECT No.	12.1348.0040.3000		FILE No.	12134800401000A003
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-11	**FIGURE 1-3**	
CHECK	MH	2013-04-11		
REVIEW	MB	2013-04-11		

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LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- LITTLE TAKHINI AREA BOUNDARY
- EM SURVEY LOCATION

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

0 200 400 600 m
SCALE (APPROX.)

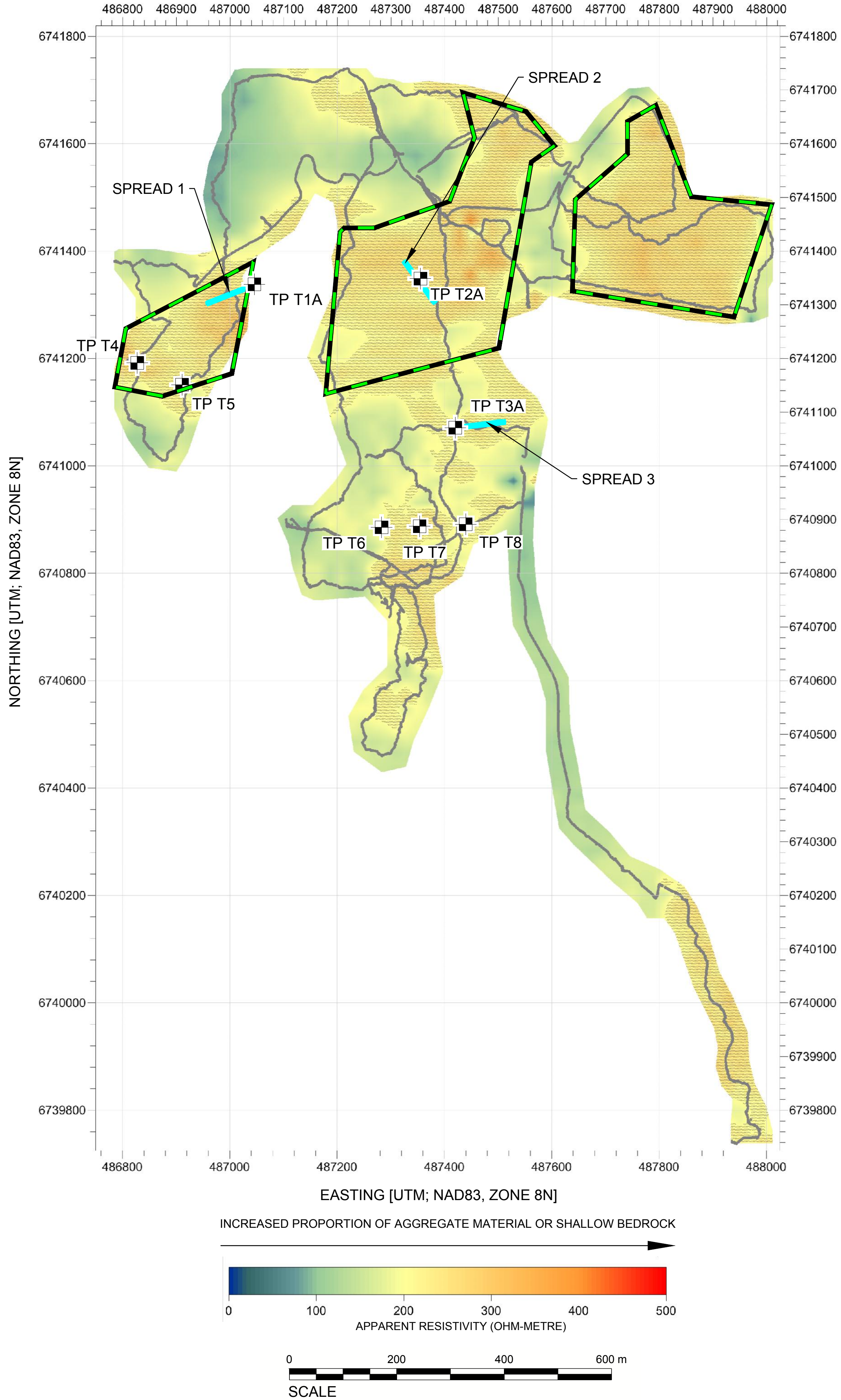
PROJECT
YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

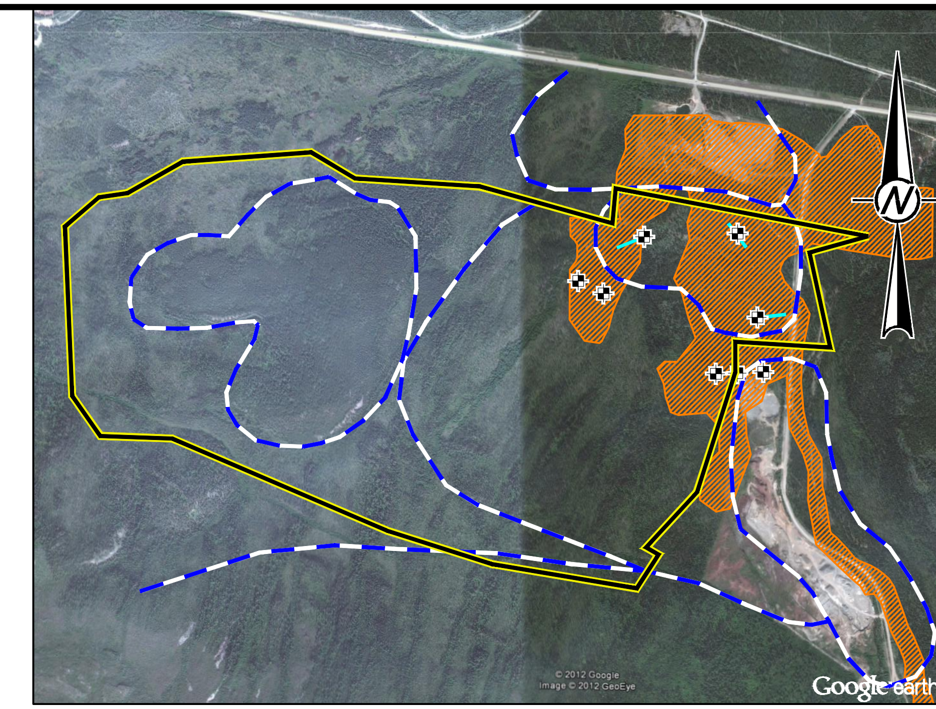
TITLE
LITTLE TAKHINI AREA SURVEY LOCATIONS

Golder Associates

PROJECT No.		12.1348.0040.3000	FILE No.	12134800403000B001
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13		
CHECK	MH	2013-04-11	**FIGURE 2-1**	
REVIEW	MB	2013-04-11		

\\golder.gds\CAL\M\CAD\2012\1348\12-1348-0040\3000\Report_B\Fig2-1_12134800403000B001_Takhini.dwg | Layout: 2-1 Little Takhini Area | Modified: TVu 04/11/2013 3:07 PM | Plotted: TVu 04/11/2013





0 500 1,000 1,500 m

SCALE (APPROX.)

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- EM SURVEY PATH
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- LITTLE TAKHINI AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

TITLE

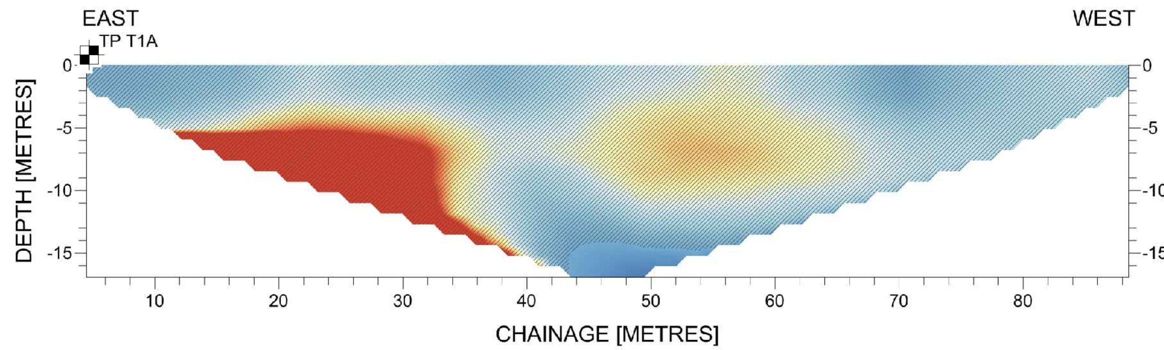
LITTLE TAKHINI AREA EM31 GROUND RESISTIVITY SURVEY

Golder Associates

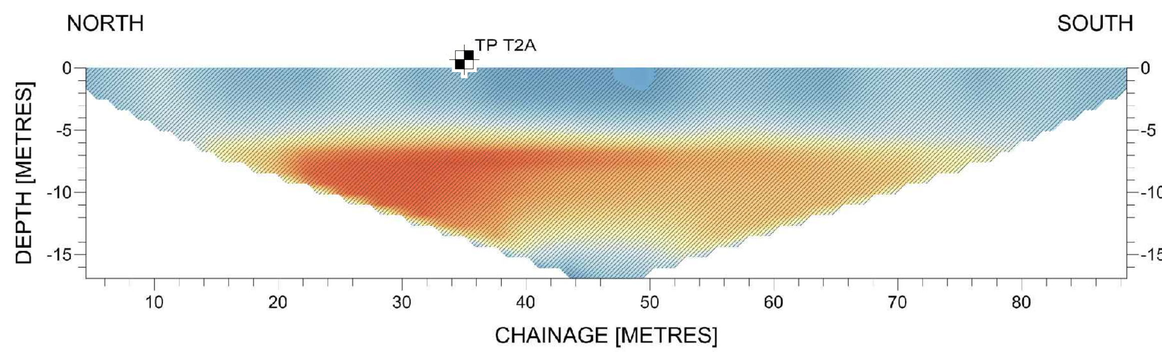
PROJECT No.	12.1348.0040.3000		FILE No.	121348004030000B002
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13		
CHECK	MH	2013-04-11		
REVIEW	MB	2013-04-11		

FIGURE 2-2

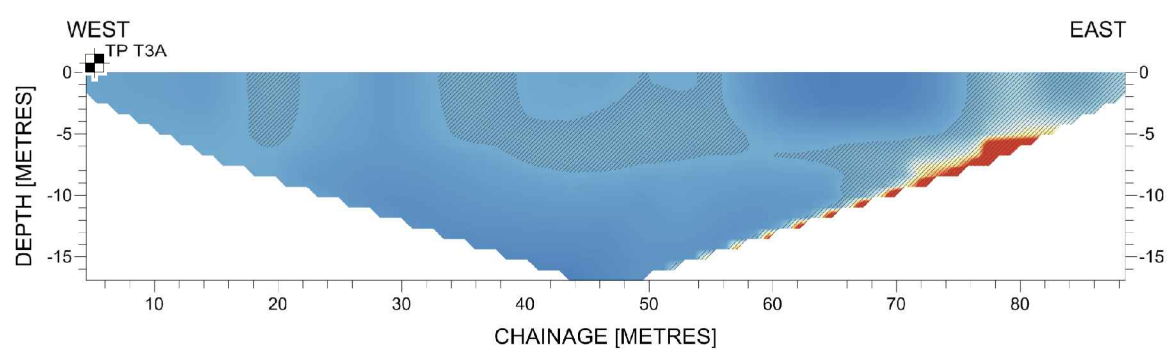
SPREAD 1 - MODELLED RESISTIVITY SECTION:

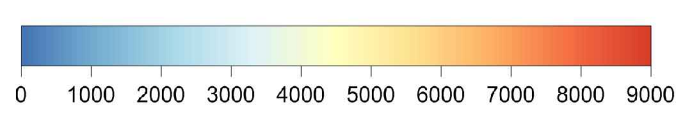


SPREAD 2 - MODELLED RESISTIVITY SECTION:



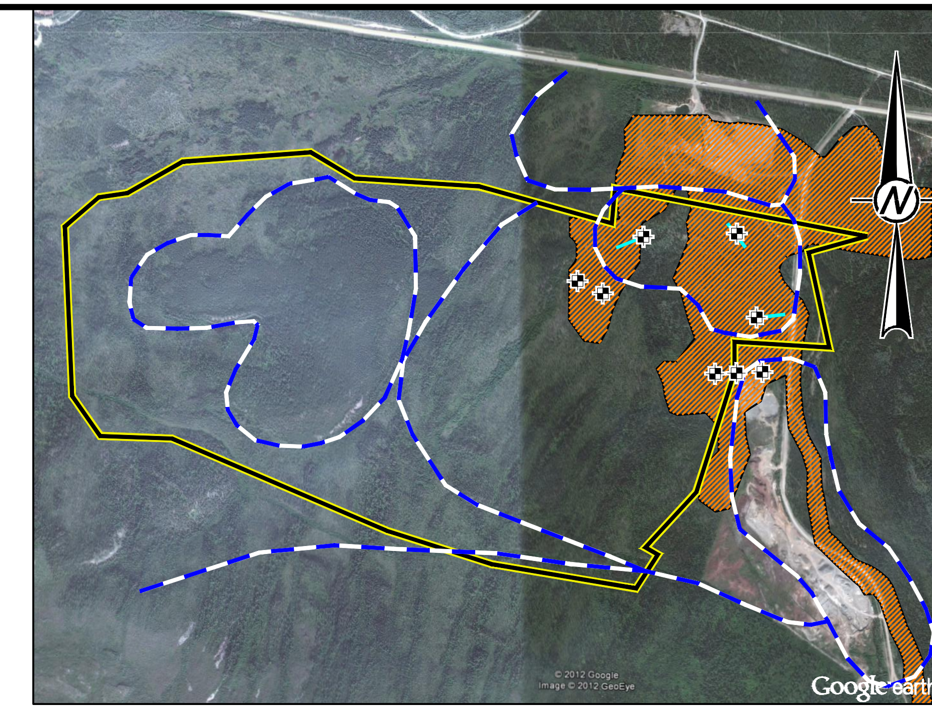
SPREAD 3 - MODELLED RESISTIVITY SECTION:





0 20 40 60 m

SCALE



0 500 1,000 1,500 m

SCALE (APPROX.)

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- LITTLE TAKHINI AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

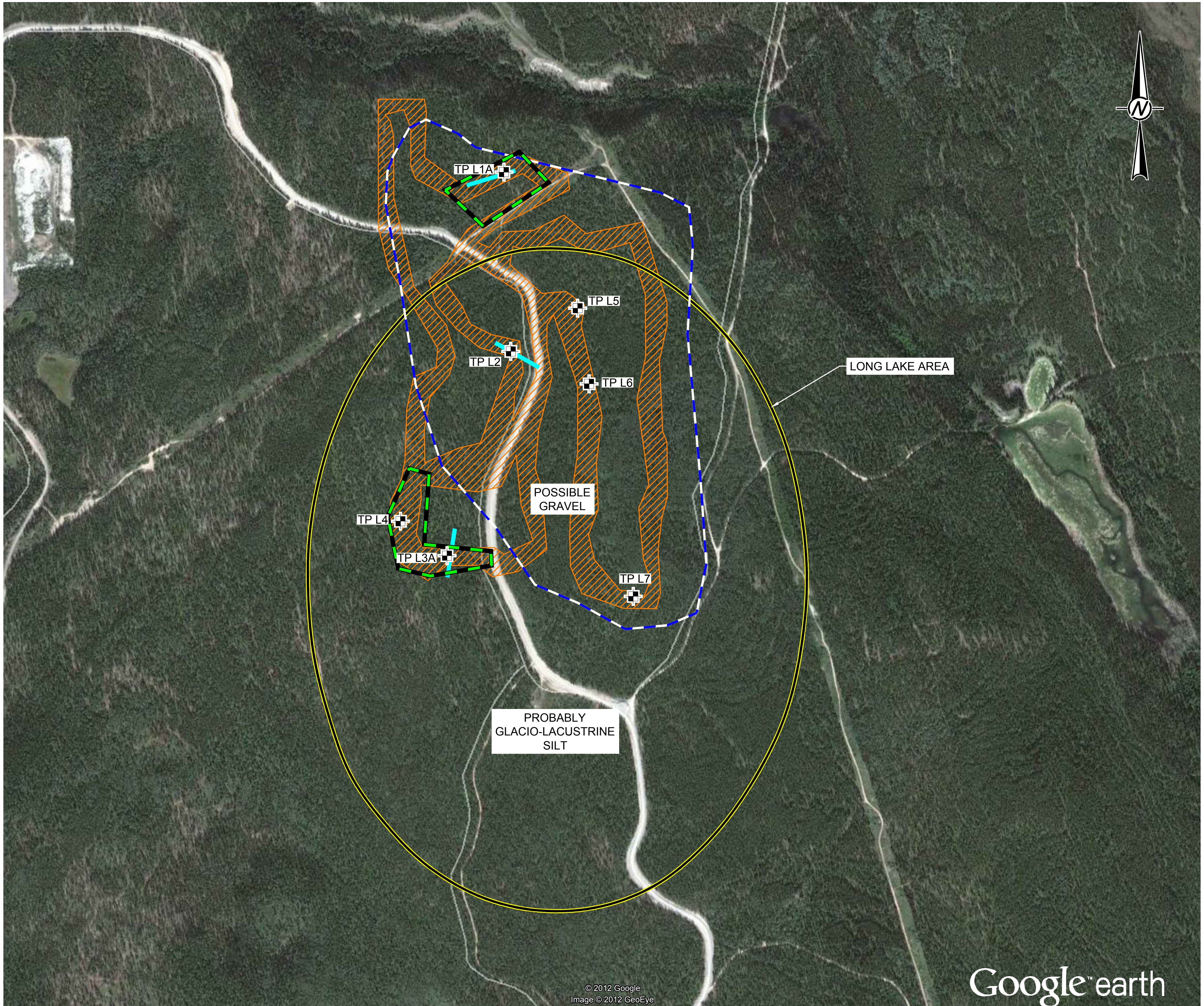
YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

TITLE

LITTLE TAKHINI AREA ERI SURVEY

Golder Associates

PROJECT No.	12.1348.0040.3000		FILE No.	12134800403000B003
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13	FIGURE 2-3	
CHECK	MH	2013-04-11		
REVIEW	MB	2013-04-11		



LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- LONG LAKE AREA BOUNDARY
- EM SURVEY LOCATION

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

0 150 300 450 m
SCALE (APPROX.)

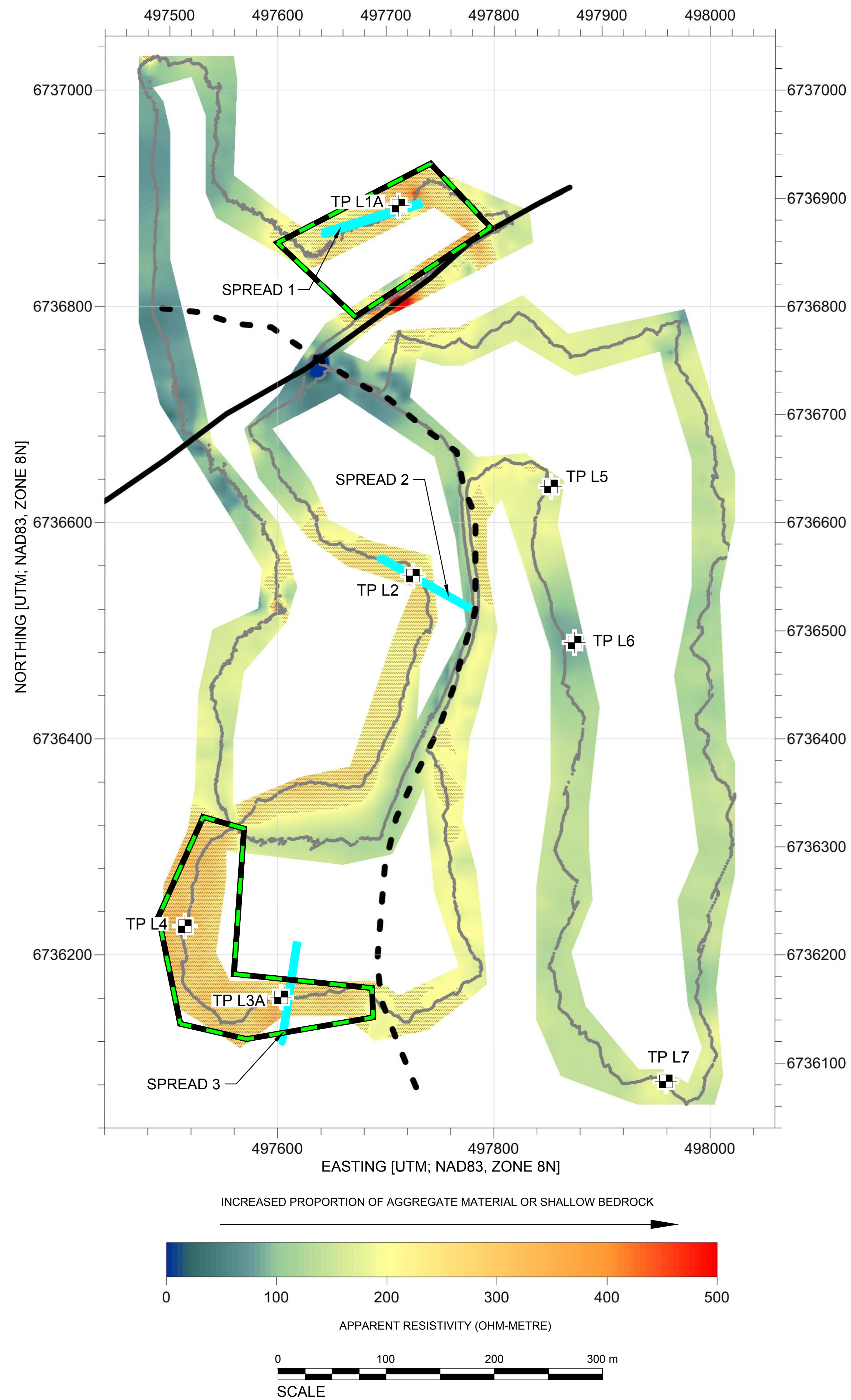
PROJECT
YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

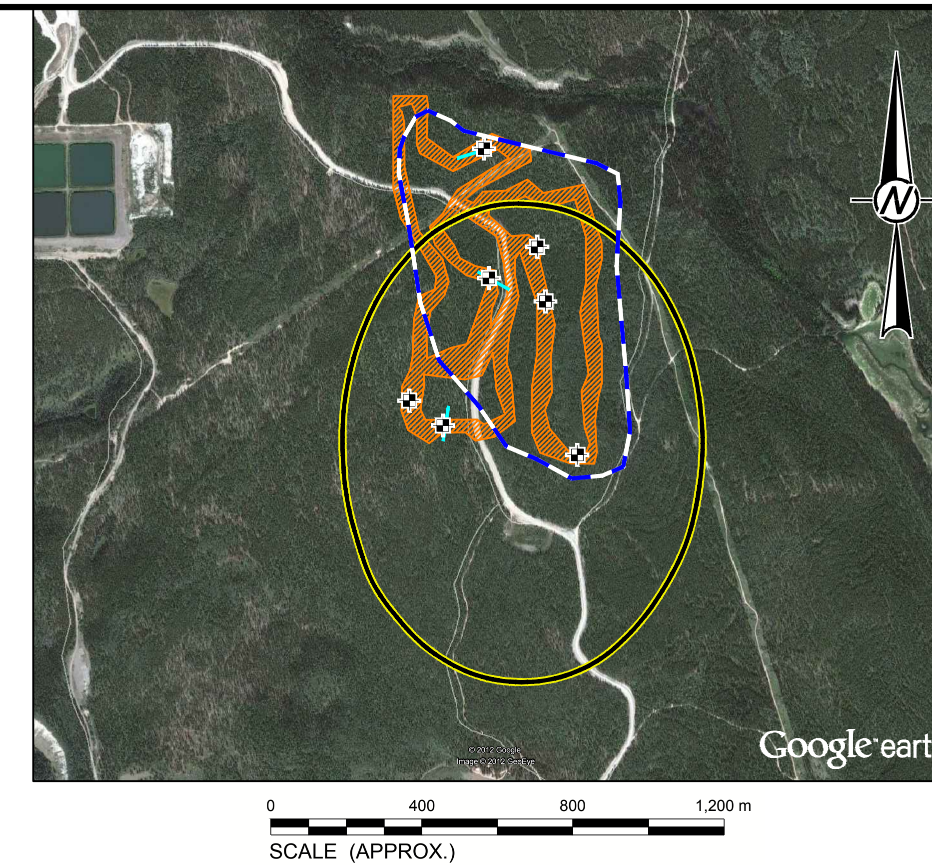
TITLE
LONG LAKE AREA SURVEY LOCATIONS

Golder Associates

PROJECT No.		12.1348.0040.3000	FILE No.	12134800403000C001
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13	**FIGURE 3-1**	
CHECK	MH	2013-04-11		
REVIEW	MB	2013-04-11		

\\golder.gds\CAL\MCAD\2012\1348\12-1348-0040\3000\Report_C\Fig3-1_12134800403000C001_LongLake_Locs.dwg | Layout: 2-1 Little Takhini Area | Modified: TVu 04/11/2013 3:14 PM | Plotted: TVu 04/11/2013





LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- EM SURVEY PATH
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- LONG LAKE AREA BOUNDARY
- POWER LINE
- ROAD
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

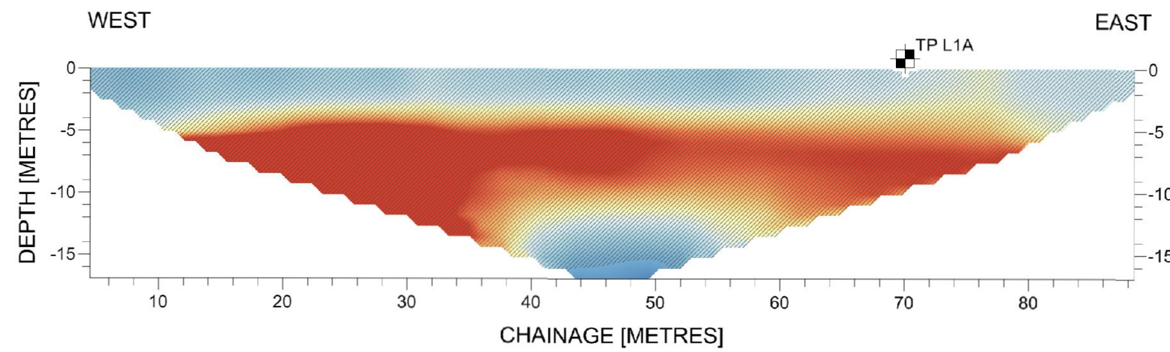
TITLE

LONG LAKE AREA EM31 GROUND RESISTIVITY SURVEY

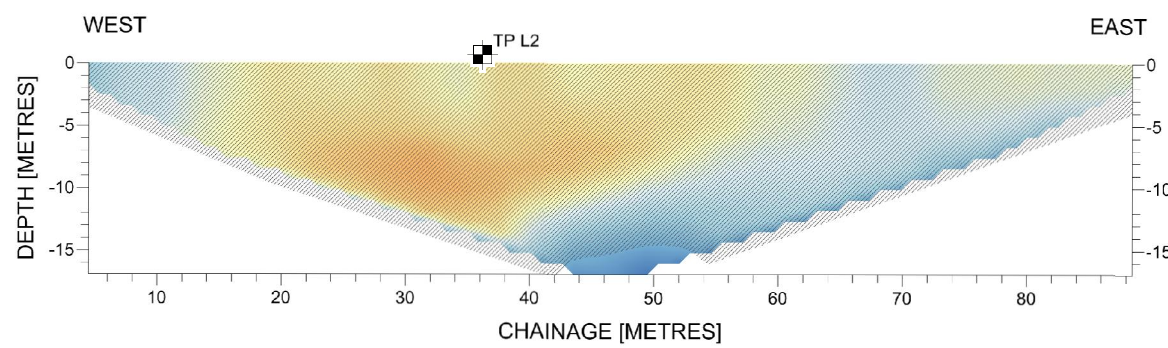
Golder Associates

PROJECT No.	12.1348.0040.3000		FILE No.	12134800403000C002
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13		
CHECK	MH	2013-04-11	FIGURE 3-2	
REVIEW	MB	2013-04-11		

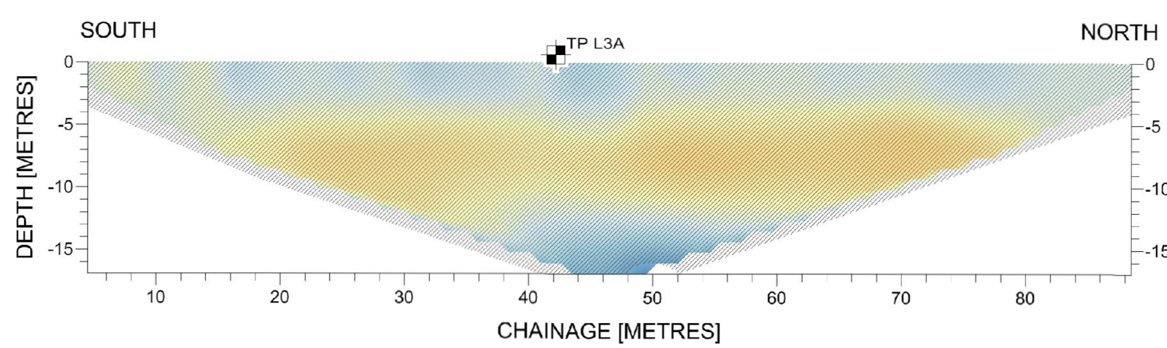
SPREAD 1 - MODELLED RESISTIVITY SECTION:

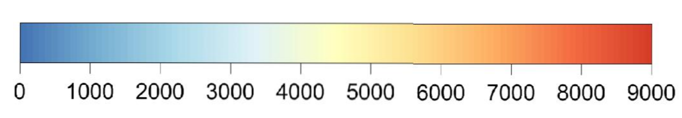


SPREAD 2 - MODELLED RESISTIVITY SECTION:



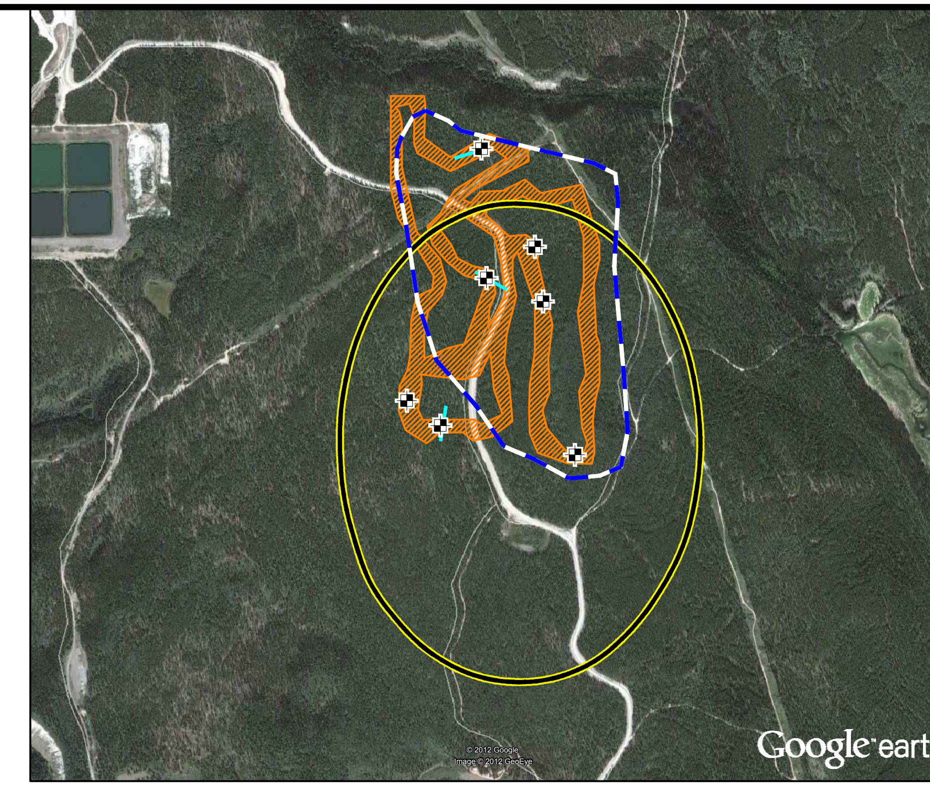
SPREAD 3 - MODELLED RESISTIVITY SECTION:





0 20 40 60 m

SCALE



0 400 800 1,200 m

SCALE (APPROX.)

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- LONG LAKE AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

TITLE

LONG LAKE AREA ERI SURVEY

Golder Associates

PROJECT No.	12.1348.0040.3000		FILE No.	12134800403000C003
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13		
CHECK	MH	2013-04-11	**FIGURE 3-3**	
REVIEW	MB	2013-04-11		

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- McLEAN LAKE AREA BOUNDARY
- EM SURVEY LOCATION

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

0 600 1,200 1,800 m
SCALE (APPROX.)

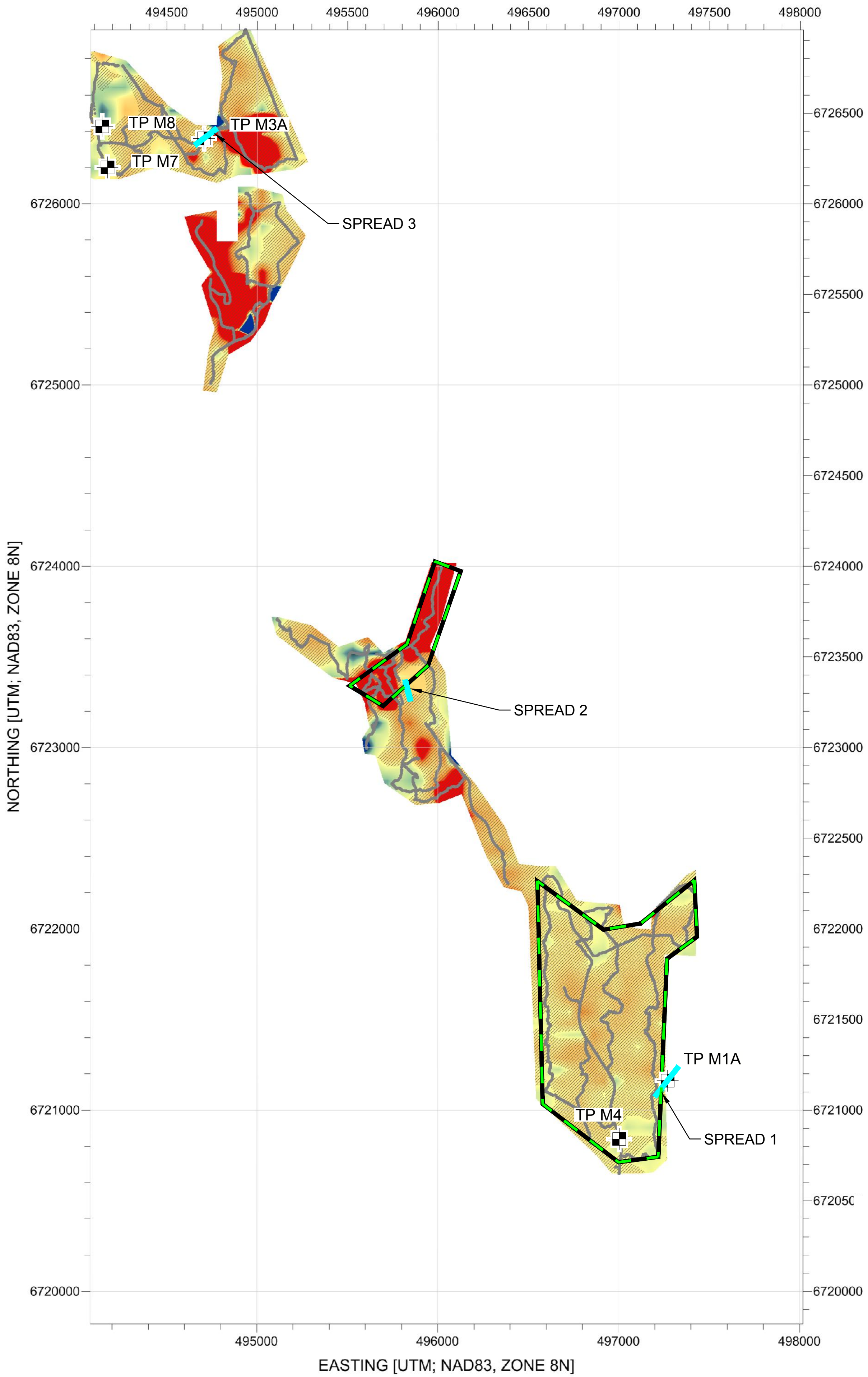
PROJECT
YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

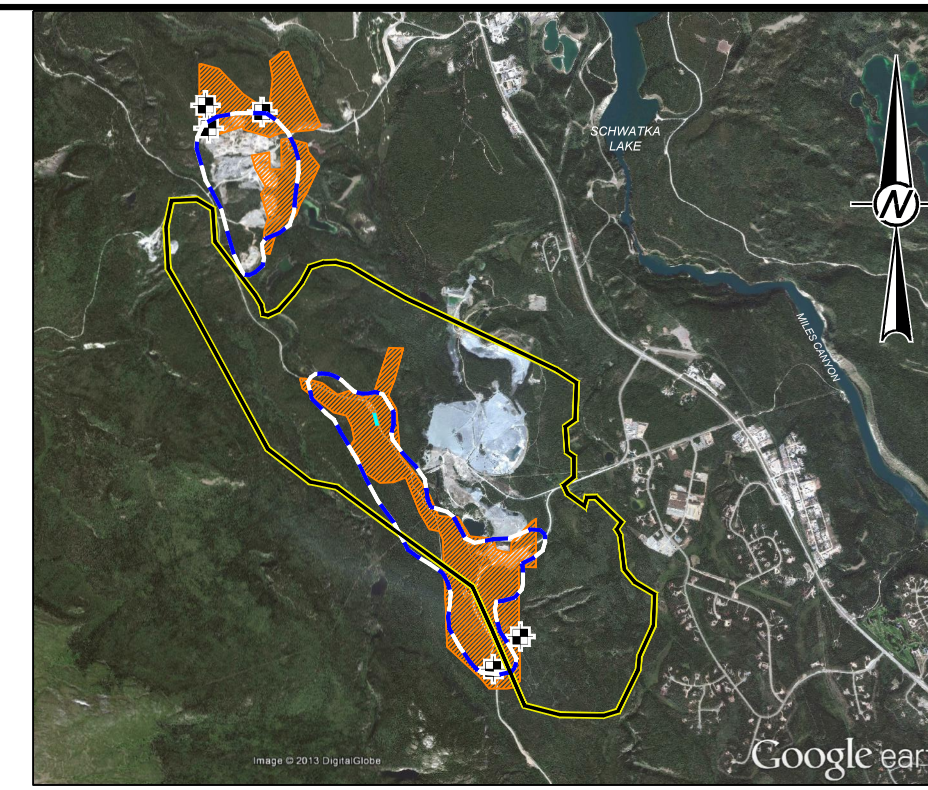
TITLE
McLEAN LAKE AREA SURVEY LOCATIONS

PROJECT No.	12.1348.0040.3000		FILE No.	12134800403000D001
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13		
CHECK	MH	2013-04-11	**FIGURE 4-1**	
REVIEW	MB	2013-04-11		

Golder Associates

L:\2012\1348\12-1348-0040\3000\Report_D\Fig4-2_12134800403000D002_McLeanLake_EM.dwg | Layout: 4-2 McLean Lake | Modified: TVu 04/11/2013 4:56 PM | Plotted: TVu 04/11/2013





0 1,500 3,000 4,500 m

SCALE (APPROX.)

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- EM SURVEY PATH
- ERI SURVEY LINE
- INCREASED LIKELIHOOD OF AGGREGATE DEPOSITS
- McLEAN LAKE AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

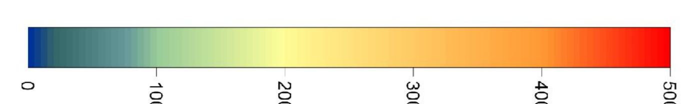
NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

INCREASED PROPORTION OF AGGREGATE MATERIAL OR SHALLOW BEDROCK



APPARENT RESISTIVITY (OHM-METRE)

0 600 1,200 1,800 m

SCALE

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

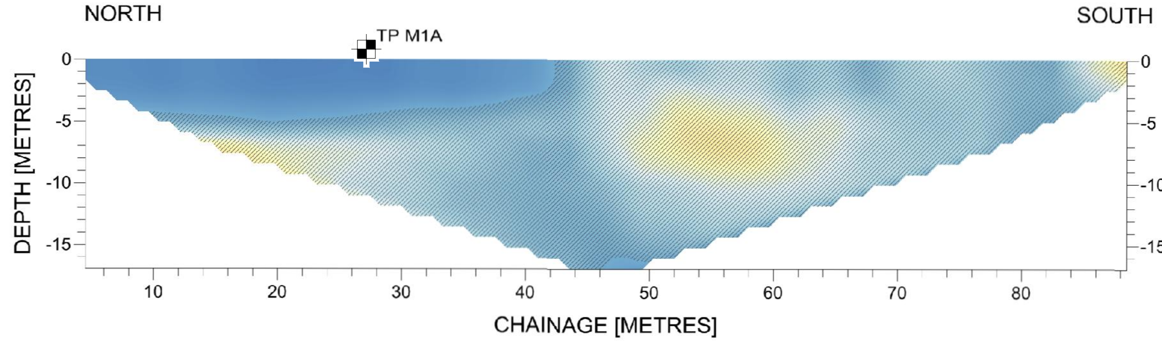
TITLE

McLEAN LAKE AREA EM31 GROUND RESISTIVITY SURVEY

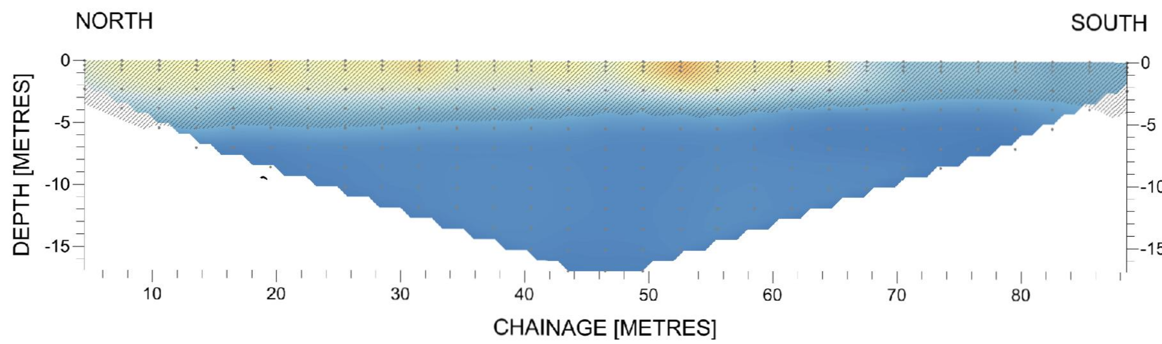
Golder Associates

PROJECT No.	12.1348.0040.3000	FILE No.	12134800403000D002
DESIGN	MH	2013-01-25	SCALE: AS SHOWN
CADD	TV	2013-03-13	
CHECK	MH	2013-04-11	**FIGURE 4-2**
REVIEW	MB	2013-04-11	

SPREAD 1 - MODELLED RESISTIVITY SECTION:



SPREAD 2 - MODELLED RESISTIVITY SECTION:



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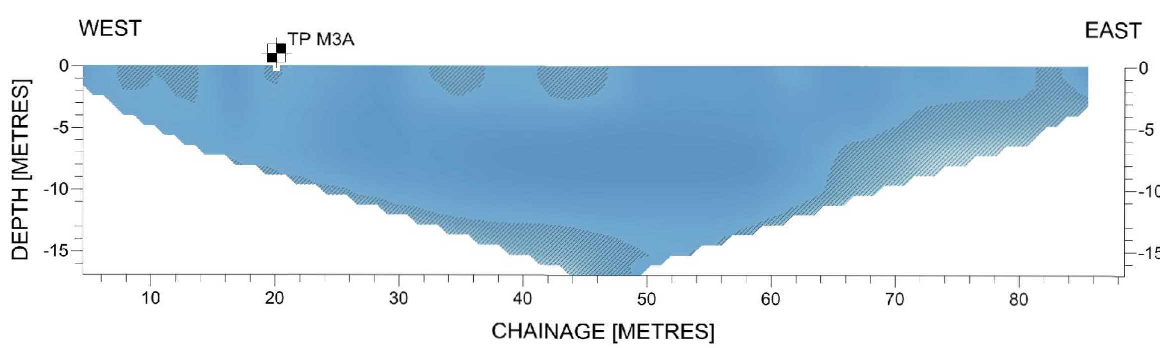
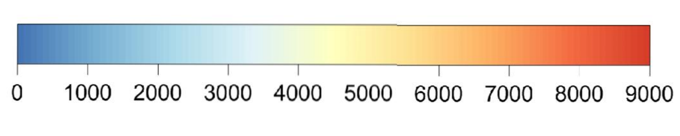
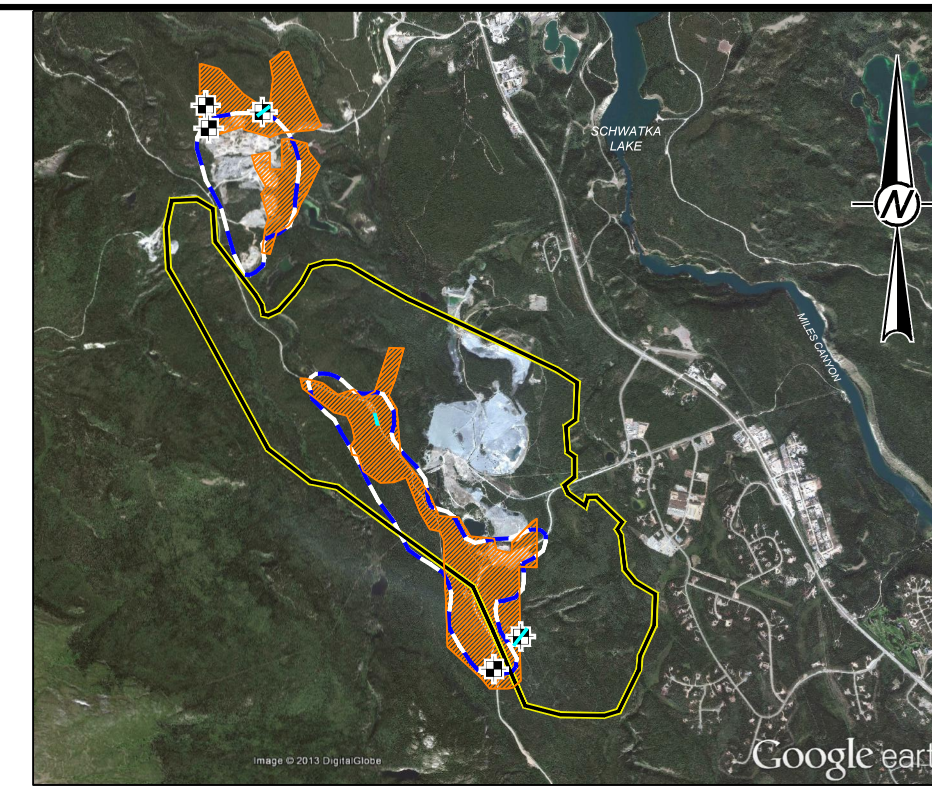




0 20 40 60 m

SCALE



0 1,500 3,000 4,500 m

SCALE (APPROX.)

LEGEND

- TEST PIT LOCATION
- APPROXIMATE GEOLOGICAL BOUNDARY
- EM SURVEY PATH
- ERI SURVEY LINE
- McLEAN LAKE AREA BOUNDARY
- EM SURVEY LOCATION
- INTERPRETED DISTRIBUTION OF AGGREGATE

NOTE

EM - ELECTROMAGNETIC
ERI - ELECTRICAL RESISTIVITY IMAGING

REFERENCE

IMAGE OBTAINED FROM GOOGLE EARTH PRO. USED UNDER LICENSE.
IMAGERY DATE: JULY 29, 2010. GOOGLE EARTH IMAGE IS NOT TO SCALE.
DATUM: NAD83 PROJECTION UTM ZONE 8N.

PROJECT

YUKON GEOLOGICAL SURVEY
GEOPHYSICAL AND GEOLOGICAL EXPLORATION
WHITEHORSE, YUKON

TITLE

McLEAN LAKE AREA ERI SURVEY

PROJECT No.	12.1348.0040.3000		FILE No.	12134800403000D003
DESIGN	MH	2013-01-25	SCALE	AS SHOWN
CADD	TV	2013-03-13	**FIGURE 4-3**	
CHECK	MH	2013-04-11		
REVIEW	MB	2013-04-11		

Golder Associates

APPENDIX A

Test Pit Summary and Field Logs

Km 196 Field Logs

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 24 OCT 12 / 10:20
TEST PIT NUMBER TP K1A TEST PIT SIZE 30 X 60 CM ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE 5°C °F WEATHER CALM, CLEAR

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	fibrous PEAT					
3		(SM) SILTY SAND, fine,					
		light brown, moist					
		compact					
	30	trace gravel					
	40	some gravel					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1349-0040 JOB NAME YUKON GEOPHYSICS DATE 25-OCT-12 / 15:35
TEST PIT NUMBER TP K1B TEST PIT SIZE 50x60 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	2	fibrous PEAT, frozen					
2		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
	60	some gravel					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME Yukon Geophysics DATE 24-OCT-12 / 11:00
TEST PIT NUMBER TP K2A TEST PIT SIZE 30 x 30 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR JA'AN KLUACHON DATUM
TEMPERATURE -10°C °F WEATHER CLEAR, CALM

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	fibrous PEAT, Frozen					
3		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
	10	some gravel, trace cobbles					
	20	gravelly					
75		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 24-OCT-12 / 11:25
TEST PIT NUMBER TP K3 TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER CLEAR, CALM

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	10	fibrous PEAT, frozen					
10	12	ASH					
12		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
	75	EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

JOB No.
TEST PIT No.
ENGINEER

Golder Associates

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 24-OCT-12/11:40
TEST PIT NUMBER TPK4 TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	2	fibrous PEAT, frozen					
2		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
60		trace cobbles					
	70	EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

JOB No.
TEST PIT No.

Golder Associates

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 25-OCT-12 / 15:55

TEST PIT NUMBER TP K5 TEST PIT SIZE 50x60 CM ELEVATION

MACHINE TYPE CONTRACTOR TA'AN KWACH'AN DATUM

TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	2	fibrous PEAT, frozen					
2		(SM) SILTY SAND, fine,					
	80	light brown, moist,					
		compact					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.

TEST PIT No.

FORM G.A. – F – Ia

FIELD TEST PIT LOG

--- NUMBER 12·1348·0040 JOB NAME YUKON GEOPHYSICS DATE 25·OCT·12 / 16:15
TEST PIT NUMBER TP K6 TEST PIT SIZE 50x60 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	2	fibrous PEAT, Frozen					
2		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
30	60	trace gravel					
60		(SP) SAND, fine, grey,					
	80	moist, compact					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 25OCT-12 / 16:30
TEST PIT NUMBER TP-K7 TEST PIT SIZE 50x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°c °F WEATHER OVERCAST

DEPTH		SOIL DESCRIPTION	SAMPLES		IN SITU DENSITY TEST		REMARKS
FROM	TO		No.	DEPTH	No.	DEPTH	
0		(SM) SILTY SAND, fine,					
		light brown, moist,					
	80	compact.					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

Long Lake Field Logs

FORM G.A. – F – Ia

FIELD TEST PIT LOG

... NUMBER 12.1348.0040 JOB NAME YUKON GEOPHYSICS DATE 24 OCT 12/13:50
TEST PIT NUMBER TP 11A TEST PIT SIZE 50x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -9°C °F WEATHER SNOWING

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	fibrous PEAT, frozen					
3		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
30		some gravel, trace					
	60	cobbles					
60		(SW-GW) SAND and GRAVEL					
		fine to coarse, some					
		cobbles, grey, moist,					
	80	compact.					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12·1348·0040 JOB NAME YUKON GEOPHYSICS DATE 24·OCT·12 / 14:15

TEST PIT NUMBER TP12 TEST PIT SIZE 50 x 60 cm ELEVATION

MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM

TEMPERATURE -10°C °F WEATHER SNOWING

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	fibrous PEAT, frozen					
5		(SM) SILTY SAND, trace					
		cobbles, fine, light brown,					
	30	moist, compact					
30		(SM) SILTY SAND, fine, some					
		gravel, some cobbles,					
	60	light brown, moist, compact.					
60		(SW-GW) SAND and GRAVEL,					
		fine to coarse, some cobbles,					
	80	light grey, moist, compact.					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.

TEST PIT No.

ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-348-0040 JOB NAME YUKON GEOPHYSICS DATE 24-OCT-12 / 14:45
TEST PIT NUMBER TP L3A TEST PIT SIZE 40 x 50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -9°C °F WEATHER SNOWING

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	fibrous PEAT, frozen					
5		(SM) SILTY SAND, fine,					
		dark brown red, moist,					
	20	compact.					
20		(SW) SAND, fine to coarse,					
		some gravel, trace cobbles,					
		grey brown, moist, compact					
	80	EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12.1348.0040 JOB NAME YUKON GEOPHYSICS DATE 24.OCT.12/ 15:10
TEST PIT NUMBER TP64 TEST PIT SIZE 40x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -9°C °F WEATHER SNOWING

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	fibrous PEAT, frozen					
5		(SM) SILTY SAND, fine, some					
		cobbles, light brown,					
	20	moist, compact					
20		(SW-GW) SAND and GRAVEL,					
		fine to coarse, some					
	60	cobbles, moist, compact					
60		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

... NUMBER 12·1348·0040 JOB NAME YUKON GEOPHYSICS DATE 26·OCT·12/15:00
TEST PIT NUMBER TP L5 TEST PIT SIZE 50x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR M'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	fibrous PEAT, frozen					
3		(SM) SILTY SAND, fine,					
		light brown, moist,					
	50	compact.					
50	70	some gravel					
70		(SW) SAND, fine to					
		coarse, some gravel,					
	80	grey, moist, compact					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 15:15
TEST PIT NUMBER TP 66 TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	4	fibrous PEAT, frozen					
4		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
40		some gravel, some					
	70	cobbles					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 15:40
TEST PIT NUMBER TPL7 TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	fibrous PEAT, frozen					
5		(SM) SILTY SAND, fine,					
		light brown, moist, compact					
30		trace cobbles					
50		some gravel					
	60	EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

Little Takhini Field Logs

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME Yukon Geophysics DATE 25-OCT-12/11:10
TEST PIT NUMBER TP T1A TEST PIT SIZE 50x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	10	Fibrous PEAT, frozen					
10	50	(SM) SILTY SAND, fine,					
		light brown, moist, compact					
50		(SP) SAND, fine, dark grey,					
	80	moist, compact					
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

... NUMBER 12.1348.0040 JOB NAME YUKON GEOPHYSICS DATE 25 OCT 12 / 11:25
TEST PIT NUMBER TP T2A TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	fibrous PEAT, frozen					
5		(SM) SILTY SAND, fine,					
		light brown, moist, compact					
20		some gravel, some cobbles					
	80						
80		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 25-OCT-12/ 11:50
TEST PIT NUMBER TP T3 TEST PIT SIZE 50x50 CM ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	Fibrous PEAT, Frozen					
5		(SM) SILTY SAND, Fine,					
	80	red brown, moist, compact					
80		ROCK, granite					
		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME Yukon Geophysics DATE 25 OCT 12 / 12:25
TEST PIT NUMBER TP TY TEST PIT SIZE 50x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR Ta'an Kwach'an DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	Fibrous PEAT, frozen					
3		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact					
4	6	ASH					
	15	trace gravel and cobbles					
	50						
50		(SW-GW) SAND and GRAVEL					
	70	some silt					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

... NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 25-OCT-12 / 12:45
TEST PIT NUMBER TP T5 TEST PIT SIZE 60 x 50 CM ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	2	fibrous PEAT, frozen					
2	4	volcanic ASH					
4		(SM) SILTY SAND, fine,					
		light brown, moist,					
		compact.					
	20	trace cobbles and					
	70	gravel					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

JOB No.
TEST PIT No.
ENGINEER

Golder Associates

FORM G.A. – F – 1a

FIELD TEST PIT LOG

___ NUMBER 12-1348-0040 JOB NAME Yukon Geophysics DATE 25-Oct-12 / 13:10
TEST PIT NUMBER TP T6 TEST PIT SIZE 60x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR Ta'an Kwach'an DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	10	fibrous PEAT, frozen					
10		(SM) SILTY SAND, fine,					
		light brown, moist,					
	70	compact					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 25-OCT-12 / 13:25
TEST PIT NUMBER TP-17 TEST PIT SIZE 50x60 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR DA'AN KWACH'AN DATUM
TEMPERATURE -10°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	10	Fibrous PEAT, frozen					
10		(SM) SILTY SAND, Fine,					
	20	light brown, moist, compact					
20		(ML) SILT, grey, moist,					
		dense					
	80	EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.

FORM G.A. — F — 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME Yukon Geophysics DATE 25-OCT-12/13:45
TEST PIT NUMBER TP18 TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR Ta'an Kwach'an DATUM
TEMPERATURE -10°C °F WEATHER Overcast

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	10	Fibrous PEAT, frozen					
10		(SM) SILTY SAND, fine,					
		light brown, moist,					
	70	compact					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.

McLean Lake Field Logs

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME Yukon Geophysics DATE 26-OCT-12/09:00

TEST PIT NUMBER TP M1A TEST PIT SIZE 50x5 cm ELEVATION

MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM

TEMPERATURE -13°C °F WEATHER OVERCAST

DEPTH		SOIL DESCRIPTION	SAMPLES		IN SITU DENSITY TEST		REMARKS
FROM	TO		No.	DEPTH	No.	DEPTH	
0	40	Fibrous PEAT, Frozen					
		(SM) SILTY SAND, fine					
40		trace cobbles, some					
		gravel, light brown,					
	70	moist, compact.					
70		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.

TEST PIT No.

ENGINEER

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1548-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12/ 11:15
TEST PIT NUMBER TPM2A TEST PIT SIZE 50X50 CM ELEVATION
MACHINE TYPE CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
		NO PIT COMPLETED, FACE OF EXISTING EXCAVATION EXPOSED					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 11:40
TEST PIT NUMBER TP M3A TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	Fibrous PEAT, frozen					
3		(SM) SILTY SAND, some					
		gravel, trace cobbles,					
		light brown, moist,					
	50	compact.					
50		EOH					
		large boulder					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

JOB No.
TEST PIT No.
ENGINEER

Golder Associates

FORM G.A. – F – 1a

FIELD TEST PIT LOG

JOB NUMBER 12-1349-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 10:20
TEST PIT NUMBER TP M4 TEST PIT SIZE 50x50cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	5	Fibrous PEAT, frozen					
5		(SM) SILTY SAND, Fine,					
		trace gravel and cobbles,					
5		light brown, moist,					
	70	compact					
70		EOH					
		EOH BEDROCK?					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

FIELD TEST PIT LOG

... NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 10:50
TEST PIT NUMBER TP M5 TEST PIT SIZE 50X50 cm ELEVATION
MACHINE TYPE H CONTRACTOR DA-BN KWACH'AN DATUM
TEMPERATURE 15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
		NO TEST PIT COMPLETED, CLEAN FACE DUG INTO EXISTING PIT.					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

FORM G.A. – F – 1a

FIELD TEST PIT LOG

... NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 12:45

TEST PIT NUMBER TPM7 TEST PIT SIZE 50X50 CM ELEVATION

MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM

TEMPERATURE -15°C °F WEATHER OVERCAST

DEPTH FROM	DEPTH TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	3	Fibrous PEAT, frozen					
3		(SM) SILTY SAND, some					
		gravel, some cobbles,					
		fine, light brown,					
	60	moist, compact.					
60		EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.

TEST PIT No.

ENGINEER

FORM G.A. – F – Ia

FIELD TEST PIT LOG

JOB NUMBER 12-1348-0040 JOB NAME YUKON GEOPHYSICS DATE 26-OCT-12 / 13:15
TEST PIT NUMBER TP M8 TEST PIT SIZE 50x50 cm ELEVATION
MACHINE TYPE HAND CONTRACTOR TA'AN KWACH'AN DATUM
TEMPERATURE -15°C °F WEATHER OVERCAST, LIGHT SNOW

DEPTH cmBGS FROM	TO	SOIL DESCRIPTION	SAMPLES No.	SAMPLES DEPTH	IN SITU DENSITY TEST No.	IN SITU DENSITY TEST DEPTH	REMARKS
0	2	Fibrous PEAT, frozen					
2		(SM) SILTY SAND, fine					
		some gravel, trace					
		cobbles, light brown, moist,					
	60	compact					
	60	EOH					

LOCATION SKETCH

Water conditions in Test Pit.

☐ Test Pit dry.

Golder Associates

JOB No.
TEST PIT No.
ENGINEER

As a global, employee-owned organisation with over 50 years of experience, Golder Associates is driven by our purpose to engineer earth's development while preserving earth's integrity. We deliver solutions that help our clients achieve their sustainable development goals by providing a wide range of independent consulting, design and construction services in our specialist areas of earth, environment and energy.

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