A TETRA TECH COMPANY

March 31, 2011

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Attention: David Morrison, YEC, President and CEO
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Subject: Geology and Hydrogeochemistry of the Stinky Lake Warm Spring, Whitehorse, Yukon

1.0 INTRODUCTION

As part of the 2010 Yukon Geothermal Exploration Program, EBA, A Tetra Tech Company (EBA) conducted a geological desktop and site assessment in the area of the Stinky Lake Warm Spring located south of Porter Creek, Whitehorse, Yukon (Figure 1). The information collected will be used to enhance the understanding of the geological conditions in which the thermal spring occurs and the geothermal potential of the area of the Stinky Lake Warm Spring.

Stinky Lake is a 100 m-diameter circular lake located within the City of Whitehorse, about 1 km south of the Porter Creek subdivision in an undeveloped green space (Photo 1). The lake is fed by a warm spring located in a small, triangle-shaped wetland about 20 m to the west of the lake shore (Photo 2 and 3). It remains partly unfrozen throughout the winter. A slight sulfur odour (H_2S) originating from the lake is sometimes noticeable and accounts for the local name.

2.0 PURPOSE AND SCOPE

The key objectives of this Phase 105 of the 2010 Geothermal Exploration Program was to review existing information related to the geology in the area of the Stinky Lake Warm Spring and to conduct geological mapping in the area of the thermal spring, mainly to collect joint orientation data and observe lithology to aid in the understanding of the geological setting of the spring. The scope of work involved preparatory office activities and literature review, followed by fieldwork including geological observations and field measurements. The fieldwork was completed by two EBA geologists in one day. No intrusive fieldwork (e.g., drilling) was conducted as part of this phase of the geothermal exploration program.

EBA also directed staking of the Stinky Lake area on behalf of Yukon Energy Corp. (YEC) to secure subsurface rights in this area.

This report contains all of the findings, results, analysis, discussion, and recommendations for this assignment.

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3.0 METHODS

EBA conducted a review of existing information related to the geology in the Stinky Lake area, including geological maps, aerial photographs, and reports. The existing information was compiled and summarized in this report and attached maps.

Aurora Geosciences on behalf of YEC and under direction of EBA staked the area of the Stinky Lake Warm Spring to secure subsurface rights in this area. A total of nine YEC quartz claims named GREEN 1 to GREEN 9 were staked (Figure 2).

Two EBA representatives, Stephan Klump and Sarah Sternbergh, conducted the fieldwork to carry out geological mapping in the Stinky Lake area on November 10, 2010. During the geological investigation rock types at outcrops in the area of the thermal spring were mapped and sampled. Structural measurements such as joint, fault and bedding plane orientations were taken. Each structural measurement and observed rock type was recorded with corresponding GPS locations. Structural measurements were later plotted on a Stereonet to determine dominant orientations.

4.0 REGIONAL GEOLOGY OF THE WHITEHORSE AREA

4.1 Geology

The majority of the City of Whitehorse is underlain by Quaternary sediments. To the west of the City is the Whitehorse Plutonic Suite, mid Cretaceous in age, consisting of intrusive granodiorite, tonalite and diorite. This unit is associated with the formation of skarn copper deposits forming the Whitehorse Copper Belt. To the west, east and north of this unit is the Lewes River Group, Aksala Formation, Hancock member and Mandanna Member consisting of sedimentary rocks of the upper Triassic. To the east of the Whitehorse Plutonic Suite and at Miles Canyon, south of Whitehorse, the Miles Canyon Basalts unconformably overlie older rocks and are believed to be of Miocene age. The Miles Canyon Basalts are described as dark red to brown weathering, columnar jointed olivine basalt flows (Figure 3; Gordey, 2008).

It is believed that following the deposition of the Lewes River Group in the mid Cretaceous, the Whitehorse Plutonic Suite intruded through the previously existing sedimentary rocks. Such intrusion metamorphosed surrounding rock units and caused structural changes as well as creating the skarn copper deposits.

4.2 Structural Geology

Regional mapping of the Whitehorse area shows the bedded rocks are deformed into northwest-trending folds (Wheeler, 1961). Faults in the Whitehorse area are predominantly oriented southwest-northeast to east-west. Northwest of Whitehorse in the area of the Takhini Hot Spring the dominant fault trend is north-south. A distinct northeast-southwest trending fault is mapped through the linear depression where Stinky Lake is located (Figure 3).

Table 4.1-1: Regional Geology Units (Wheeler, 1961)

Unit	Age	Description
mKgW: Whitehorse Plutonic Suite	Mid-Cretaceous	Dark or medium grey weathering, medium-grained biotite-hornblende granodiorite, tonalite and diorite; local weak foliation, porphyritic biotite-granodiorite; mesocratic, strongly magnetic, hypersthere-hornblende diorite, quartz diorite and grabbro
uTrAK3: Mandanna member. of Aksala Group	Upper Triassic, Carnian to Norian	Red weathering, medium bedded, green and red greywacke and pebble conglomerate; red shale partings and minor interbedded, red, bioturbated siltstone; crystal-rich greywacke and shale; coarse-grained, tan to brown, massive, lithic arenite
uTrAK2: Hancock member of Aksala Group	Upper Triassic, Carnian to Norian	Massive to thick bedded limestone; minor thin bedded argillaceous to sooty limestone; coarsely crystalline, massive dolostone; minor laminated chert; massive to poorly bedded, limestone conglomerate debris flows and fanglomerate

5.0 GEOLOGY OF THE STINKY LAKE AREA

5.1 Stratigraphy

Stinky Lake is a small water body fed by a thermal spring with a water temperature of about 19°C at surface. The geology in the area of Stinky Lake is mapped as Lewes River Group, Aksala Formation, Mandanna Member and Hancock Member (Figure 3).

The arenites of the Lewes River group are poorly sorted with various grain sizes up to 3 mm. They contain approximately 30-40% matrix with angular to sub-angular crystals and rock fragments. The crystals and rock fragments generally have rounded corners with cracked or broken grains. Quartz rarely occurs and when it does it is unstrained and clear. There is a low amount of potash feldspar, predominant amount of plagioclase, with mafic minerals making up 5 to 6%. Rock fragments are generally volcanic and the matrix is generally composed of feldspar, chlorite, mica, carbonate and other minor constituents. The majority of arenites fall into the greywacke category. Some of the arenites associated with limestone have a carbonate content derived both diagenetically and from deposition. The two members of the Lewes River Group that are present at Stinky Lake area are Mandanna Member and the Hancock Member which are described further below (Wheeler, 1961).

The Mandanna Member is composed of red, purple, green and grey, medium bedded to massive, arkosic greywacke, mudstone and shale; finely laminated, thick-bedded arkosic sandstone; minor interbedded pebble conglomerate and red, bioturbated siltstone (Gordey, 2008). This unit is also mapped at the Takhini Hot Spring and Haeckel Hill (Hart, 1997).

The Hancock member of the same formation and group is also mapped in the area. This unit is described as a resistant, white to light grey weathering massive and thickly bedded limestone with sparsely to densely fossiliferous bioclastic horizons; sooty black limestone, sandy limestone, siltstone and sandstone; tan dolostone; massive to poorly bedded limestone conglomerate and breccia deposited as debris flows and fanglomerate (Gordey, 2008).

There are numerous mineral claims in the area and copper skarn showings have been mapped nearby. The MINFILE ID numbers of the copper skarn showings proximal to this location are 105D125, 105D200, and 105D124 (Gordey, 2008).

There are several intrusive igneous units that outcrop in the Stinky Lake area. The mid-Cretaceous Whitehorse Plutonic Suite outcrops less than 1 km to the south and west of Stinky Lake, described as a dark or medium grey weathering, medium grained biotite-hornblende granodiorite, tonalite and diorite; local weak foliation; porphyritic biotite-hornblende granodiorite; mesocratic, strongly magnetic, hypersthere-hornblende diorite, quartz diorite and gabbro (Gordey, 2008). Also identified nearby are Late Pliocene Nisling Range Plutonic Suite rocks (including the Haeckel Hill pluton within 4 km of Stinky Lake; Hart, 1997). This suite is characterized as orange weathering, locally miarolitic, coarse grained, leucocratic, biotite granite with smokey quartz; alaskite (Gordey, 2008).

5.2 Field Mapping Results

Two of the Lewes River Group members were observed in the Stinky Lake area; Hancock Member and Mandanna Member. The four rock types mapped as part of these two Members include limestone, sandstone, siltstone and greywacke (Photos 4, 5, and 6). All rock types observed appear to be slightly altered. The following is a brief description of the rocks mapped at the site. Locations of field stations are shown in Figure 4. A summary of the field stations with rock types observed is presented in Table 1.

- Limestone: Lewes River Group, Alaska Formation, Hancock member
  - Limestone, light to dark grey, fine to medium grained, thinly bedded, moderately weathered, white to beige weathering, calcite veins and calcite crystals, slight alternation.
- Sandstone: Lewes River Group, Alaska Formation, Mandanna Member
  - Silicified sandstone, red and beige, fine grained, massive, weathered dark reddish brown to black.
  - Silicified sandstone, fine to medium to light grey, medium grained, massive, moderately weathered, weathered medium to dark brown, quartz and biotite crystals.
- Siltstone: Lewes River Group, Alaska Formation, Mandanna Member
  - Siliceous siltstone, fine grained, light grey, massive, moderately weathered, weathered brown to iron colored, slightly altered crystals.
- Greywacke: Lewes River Group, Alaska Formation, Mandanna Member
  - Greywacke, medium to coarse grained, brown, massive, moderately weathered, iron to brown weathering, altered crystals.

As the rocks of the Lewes River Group located in the Stinky Lake area are situated near the contact of the Whitehorse Plutonic Suite, they have been subject to heat and pressure during the intrusion of the plutonic rocks. This may account for the alteration and slight metamorphosis of the rocks in this area that was observed in local bedrock outcrops. Alterations of the rocks of the Lewes River Group mapped resulted in silicification and the formation of diagenetic crystals. Red coloring and black weathering typical of manganese oxidation suggests siliceous fluids rich in manganese most likely infiltrated parts of the Mandanna Member of the Alaska Formation, Lewes River Group.

5.3 Structural Geology

Structural data collected in the field (Table 2) was plotted on a stereographic projection to illustrate dominant jointing, bedding and fault orientations in the study area (Figure 5). A summary of the predominant structural features orientations is illustrated in Table 2 below. There are four predominant joint orientations at the site, with two main dip directions of varying dips. The dip direction orientations are north and northeast, dipping moderately to steeply. One fault was identified in the area with a western dip direction, moderately dipping. Two major bedding plane orientations were identified in the area with a southeast and northeast dip direction and moderate dip slope.

Table 2: Summary of Predominant Structural Features

Structural Feature	Dip	Dip Direction
Joint	50	309
Joint	82	310
Joint	84	043
Joint	50	041
Bedding	44	114
Bedding	35	041
Fault	66	175

Stereographic air photograph interpretation indicates three possible fault trends in the immediate area of the warm springs (Figure 4).

6.0 HYDROGEOCHEMISTRY OF THE STINKY LAKE WARM SPRING

EBA assessed the hydrogeochemistry of the Stinky Lake Warm Spring in 2009. The following provides a summary of the main findings and interpretation presented in EBA (2009).

The thermal water can be characterized as calcium-magnesium-bicarbonate (Ca-Mg-HCO_3) type water that reflects a typical chemical composition of shallow groundwater and does not necessarily indicate deep water circulation and a significant residence time of the thermal water in the subsurface. The Ca-Mg-HCO_3 water type suggests an origin of the thermal water in sedimentary, carbonate-rich rocks.

The stable isotopic composition is also typical for local meteoric water indicated by the sample plotting close to the Local Meteoric Water Line for Whitehorse. Stable isotopic fractionation, which can be typical for high-temperature geothermal waters with high residence times, was not observed. The tritium concentration is about 6 TU in the sample from the Stinky Lake Spring. The tritium isotopes found in all water samples suggest either a relatively short residence time of the water in the subsurface of less than about 50 years or a mixture of young, shallow and likely cold groundwater with an older thermal water component. The mixing ratio cannot be estimated with any reasonable level of confidence based on the data available. Nonetheless, assuming a modern tritium concentration of 5-10 TU for the shallow, cold groundwater component and tritium-free thermal water, the percentage of the thermal water in the samples collected could be considerably less than 50%. In this case, the temperature of the thermal water would be much higher than the water temperatures observed. However, no further quantification of mixing ratios or temperature of the thermal water component is possible based on the information available at this stage of the project.

EBA used geothermometer methods to estimate subsurface geothermal reservoir temperatures. Based on current information and the use of the silica-based geothermometer, the hottest temperature that the spring water was exposed to along its subsurface flow path has been estimated to be about 85°C for the Stinky Lake Warm Spring. It is important to note that geothermometers do not provide any information on the depth and location of these temperature conditions. Furthermore, the silica geothermometer calculations do not take into account any mixing between the geothermal water and cold, shallow groundwater, and therefore present a lower estimate of the reservoir temperature.

7.0 COMPARISON OF TAKHINI HOT SPRING AND STINKY LAKE WARM SPRING

7.1 Geological Setting

Takhini Hot Spring is located about 19 km to the northwest of the Stinky Lake Warm Spring within the Takhini River Valley (EBA, 2009). Interestingly, the geological setting of both thermal springs appears to be fairly similar. Both springs emanate from overburden deposits, which are likely very shallow at the location of the Stinky Lake spring as bedrock outcrops are within about 20 m. The overburden thickness at the location of the Takhini Hot Spring is unknown; however, bedrock outcrops are within about 100 m. Geological mapping at both locations revealed that both springs are likely associated with the same lithological unit. Both springs appear to occur in sedimentary rocks mapped as part of the Mandanna member of the Aksala Formation, Lewes River Group. Limestone outcrops of the Hancock Member of the same formation and group are in close proximity to both springs0. Many Cordilleran hot springs are associated with carbonate rock formations that provide deep and rapid fluid circulation systems. This might also be the case for the Takhini Hot Spring and Stinky Lake Warm Spring that both occur close to limestone of the Hancock Member.

Both thermal springs are also located in relatively close proximity to granitic intrusions of Mid-Cretaceous and Tertiary age. The Stinky Lake Warm Spring is located about 1 km north of the contact of the Lewes River Group sedimentary rocks and a granodiorite intrusion which forms part of the Mid-Cretaceous Whitehorse Plutonic Suite (~111 Ma). Another granitic intrusion outcrops about 4 km to the west of the Stinky Lake spring and forms part of the Tertiary Nisling Range Plutonic Suite(~55 Ma). Similar granites of the same Tertiary intrusion complex also outcrop about 2.5 km to the northwest of the Takhini Hot Spring. Further exploration work would be necessary to identify a potential relationship between these granitic intrusions and the occurrence of the thermal springs.

Remnant heat from these intrusions is unlikely the heat source for the present day thermal springs because of their relatively old age. Nonetheless, radioactive heat production due to elevated concentrations of radioactive isotopes (mainly isotopes of uranium, thorium, and potassium) that are often found in granitoid igneous rocks could be a possible source of heat. However, this remains purely speculative without further geological evidence and geochemical analysis of the granitic intrusions located close to the Takhini and Stinky Lake springs.

7.2 Hydrogeochemistry

The surface temperature of the Takhini Hot Spring is about 47°C, i.e., significantly higher than that of Stinky Lake Warm Spring. The flow rate at Takhini Hot Spring (measured at 6.6 L/s) is also considerably higher than at Stinky Lake Warm Spring (estimated at about 1 L/s).

The chemical composition of the Stinky Lake Warm Spring water has been described in detail in Section 6. The Takhini Hot Spring thermal water can be characterized as a calcium-sulphate (Ca-SO_4) type and shows a high mineralization with total dissolved solids (TDS) exceeding 1,000 mg/L and is very hard with a hardness of about 1,800 to 1,900 mg/L $CaCO_3$. Especially the very high sulphate concentration of 1,740 mg/L is characteristic for the Hot Spring water. In contrast, the chemical composition of the Stinky Lake Warm Spring is significantly different and can be characterized as Ca-Mg-HCO_3 type water. The tri-linear Piper Plot presented in Figure 6 also demonstrates the different chemical composition of the Takhini Hot Spring and Stinky Lake Warm Spring water samples. The mineralization of the Stinky Lake Warm Spring water is much lower than that of the Takhini Hot Spring. The chemical composition of the Stinky Lake Warm Spring water is more similar to local shallow groundwater and does not directly indicate deep fluid circulation. The highly mineralized thermal water from Takhini Hot Spring is more indicative of groundwater that chemically evolved along a deep flow path with a considerable subsurface residence time.

The dissolved silicon concentration was slightly higher in samples from the Takhini Hot Spring (~20 mg/L) than in a sample from Stinky Lake Warm Spring (~16 mg/L). The silica geothermometer temperature is therefore slightly higher for Takhini Hot Spring (~95°C) than for Stinky Lake Warm Spring (~87°C). Na-K-Ca geothermometer methods yield similar temperature estimates in the range of about 160-170°C.

The stable isotopic composition of the Takhini Hot Spring water and Stinky Lake Warm Spring water are similar and both waters plot close to the LMWL for Whitehorse which indicates meteoric origin of the thermal fluids.

The tritium concentration in the Takhini Hot Spring was very low and close to detection limit. This indicates that there is likely limited mixing with shallow young groundwater. The detectable tritium concentration in the sample collected from the Stinky Lake Warm Spring, however, suggests that there is significant mixing with young shallow groundwater.

8.0 SUBSURFACE TEMPERATURE DATA IN THE STINKY LAKE AREA

Subsurface temperature data measured in boreholes can be used to infer the local geothermal gradient at the borehole location and provide important information on the geothermal potential of the respective area. Table 3 summarizes temperature information collected from existing boreholes in the general area of the Stinky Lake Warm Spring. The borehole locations are shown on Figure 1.

EBA conducted a groundwater temperature survey for Yukon Energy Corp. and the City of Whitehorse in the Whitehorse area (EBA, 2008). Two of the groundwater wells where a temperature profile was measured as part of the 2008 project are located in Porter Creek about 4 km north of the Stinky Lake Warm Spring. The well water temperature in well “14 MacDonald Rd” could only be measured from about 38 m below top of casing (static water level) to the top of the installed pump at about 40 m which was insufficient to infer a temperature gradient. Well “4-76”, however, showed the largest temperature gradient of about 60°C/km measured in the Whitehorse area. It should be noted that the well was only accessible for temperature profiling to a depth of about 36 m and that temperature gradients in shallow wells cannot necessarily be linearly extrapolated to determine the local geothermal gradient. A geothermal gradient of 60°C/km would be considerably higher than the average crustal gradient, which is typically in the order of 20 to 30°C/km, and may indicate potential for geothermal development.

However, other borehole temperature data collected as part of Phase 114 of the 2010 Geothermal Exploration Program suggest much lower geothermal gradients for the Whitehorse area (EBA, 2011). Two of the boreholes presented in the Phase 114 report (EBA 2011) are located in close proximity to the Stinky Lake Warm Spring in Porter Creek. Both boreholes were likely drilled for exploration purpose in the Whitehorse Copper Belt and are referenced in Jessop et al. (2005). Borehole 122002 is located about 200 m southwest of the Stinky Lake Warm Spring and borehole 122003 is located about 3 km west of Stinky Lake.

These boreholes are about 210 m and 335 m in depth and show inferred geothermal gradients in the order of only 20 to 22°C/km. These geothermal gradients are in the range of average crustal values and do not indicate any increased geothermal potential for this area.

Table 8.0-1: Borehole Temperature Information in the Stinky Lake Area

Borehole ID	Latitude	Longitude	UTM (NAD 83, Zone 8)		Location Accuracy (m)	Depth (m)	Geothermal Gradient (°C/km)
			E	N			
4-76	60°47.42’N	135°8.39’W	492389	6739450	100	73.2†	61
122002	60°45.1’N	135°7.9’W	492823	6735135	100	212.9	22
122003	60°45.0’N	135°11.0’W	490006	6734956	100	335.8	20

†Maximum accessible depth of 36 m for temperature measurements.

9.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The following summary and conclusions are based on the results of the desktop and field geological assessment of the Stinky Lake Warm Spring:

- EBA directed the staking of a total of nine quartz claims in the area of the Stinky Lake Warm Spring to secure subsurface rights in this area. The claims are owned by YEC and named GREEN 1 to GREEN 9 (Figure 2).
- The Stinky Lake Warm Spring is situated in sedimentary rocks of the Triassic Mandanna and Hancock Members, of the Aksala Formation, Lewes River Group. The main rock types mapped in the vicinity of the warm spring are limestone, siltstone, sandstone, and greywacke. All rocks appear to be slightly altered and siliceous, probably a result of the intrusion of granitic rocks, which are part of the Whitehorse Plutonic Suite, to the south and west of the site.
- Geological field mapping confirmed the geology in the area of the Stinky Lake Warm Spring as shown in Gordey (2008). Dominant bedding planes dip moderately toward northeast and southeast, whereas dominant joints dip moderately to steeply toward northeast and northwest.
- The Stinky Lake Spring water can be characterized as Ca-Mg-HCO3 type water which is a typical chemical composition of local shallow groundwater. The chemistry of the thermal water does not directly indicate deep fluid circulation.
- Silica geothermometer methods indicate a subsurface temperature of about 85°C. The spring water seems to be a mixture of deep thermal water and shallow groundwater based on tritium concentration. The geothermometer temperature is therefore a minimum estimate of subsurface reservoir temperature.
- The Takhini Hot Spring is located in a similar geological setting and appears to be associated with the same stratigraphic units. It is also located in close proximity to a granitic intrusion similar to the Stinky Lake Warm Spring.
- The chemical composition of the Takhini Hot Spring is significantly different from Stinky Lake Warm Spring. The Takhini Hot Spring water can be characterized as Ca-SO4 type water and has much greater mineralization compared to Stinky Lake Warm Spring.
- The geothermometer temperatures for both the Takhini and Stinky Lake thermal springs are similar with the Takhini geothermometer temperature being slightly higher (95°C and 85°C, respectively).
- Temperature data from existing boreholes in the general area of the Stinky Lake Warm Spring yield inconclusive and contradictory geothermal gradients between 20 and 60°C/km.

Geology indicates that the Stinky Lake warm springs is likely related to faulting in sedimentary rocks, with limestone as a primary rock unit. This conforms to the geology models at most Cordilleran Hot Springs. The results of geothermometry do not discount favourable water temperatures at depth.

To pursue this site as a geothermal prospect, EBA recommends advancing to the next stage of exploration by planning a greater than 1000-foot-deep borehole to record sub-surface temperatures and geology.

10.0 REFERENCES

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11.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Yukon Energy Corp. and their agents. EBA, A Tetra Tech Company, does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Yukon Energy Corp. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's General Conditions which are provided in Appendix A of this report.

12.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

Sincerely,
EBA, A Tetra Tech Company

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TABLES

Table 1: Geological Field Stations, Stinky Lake

Field Station	GPS Coordinates (UTM, NAD 83, Zone 8)		Geology description
	Easting	Northing	
SL-S-1	493108	6735374	Limestone medium-fine grained, light grey
SL-S-2	493002	6735216	Limestone medium-fine grained, light grey
SL-S-3	492996	6735216	Limestone, medium grained, pale grey
SL-S-4	492988	6735241	Limestone, well bedded, calcite veining
SL-S-5	492967	6735221	Limestone, well bedded medium grained, medium grey
SL-S-6	492974	6735264	Limestone, fine grained, very altered (rusty alteration), calcite veins
SL-S-7	493006	6735278	Limestone, very fine grained, some occurrences of calcite veins, light to medium grey
SL-S-8	493007	6735306	Limestone, medium grained, massive, medium grey
SL-S-9	493000	6735316	Limestone, fine to very fine grained, light grey to beige
SL-S-10	493126	6735316	Limestone, medium to fine grained, medium grey
SL-S-11	493126	6735338	Limestone, medium to fine grained, medium grained
SL-S-12	493137	6735278	Shale, limestone, interbedded, fine grained
SL-S-13	493155	6735247	Shale, limestone, interbedded, fine grained
SL-S-14	493171	6735227	Shale, limestone, interbedded, fine grained
SL-S-15	492964	6735439	Shale, dark grey/black, fine grained, interbedded with limestone, fine grained, light grey to beige
SL-K-1	493070	6735666	Limestone, fine grained, thin bedded, dark grey
SL-K-2	493115	6735425	Limestone, coarse grained, crystalline, massive, grey
SL-K-3	493112	6735378	Sandstone/Greywacke, fine grained, massive, grey
SL-K-4	493009	6735192	Shale, calcareous, fine grained, dark grey
SL-K-5	493005	6735184	Shale, calcareous, light grey, red
SL-K-6	493002	6735179	Limestone, grey, calcareous, interbedded with shale
SL-K-7	493046	6735102	Limestone, strongly weathered, red, fresh color grey
SL-K-8	493095	6735074	Limestone, strongly weathered, red, fresh color grey
SL-K-9	492979	6735267	Sandstone/Greywacke, medium grained, light to dark grey
SL-K-10	492961	6735278	Greywacke, fine grained, sample
SL-K-11	492961	6735295	Greywacke, coarse grained, lithic, massive, greenish grey
SL-K-12	492953	6735306	Greywacke, coarse grained, lithic, massive, greenish grey
SL-K-13	492952	6735320	Limestone, fine grained, light grey
SL-K-14	493085	6735326	Sandstone/Greywacke, fine grained, massive, dark grey
SL-K-15	493103	6735334	Sandstone/Greywacke, fine grained, massive, dark grey
SL-K-16	493136	6735290	Shale, limestone, interbedded, heavily jointed, cleavage perpendicular to bedding
SL-K-17	493159	6735277	Sandstone/Greywacke, fine grained, massive, grey
SL-K-18	493157	6735286	Shale, dark grey
SL-K-19	493210	6735222	Shale, greywacke, interbedded, fine grained, massive, greenish grey
SL-K-20	492916	6735470	Limestone, light grey, interbedded with shale, dark grey

Table 2: Structural Geology Data, Stinky Lake

Field Station	GPS Coordinates (UTM, NAD 83, Zone 8)		Feature	Dip	Dip Direction
	Easting	Northing			
SL-S-1	493108	6735374	Joint	70	212
			Joint	60	290
			Joint	60	36
SL-S-2	493002	6735216	Joint	47	41
SL-S-3	492996	6735216	Joint	72	118
			Joint	74	226
SL-S-4	492988	6735241	Joint	72	82
SL-S-5	492967	6735221	Bedding	35	15
			Joint	76	296
			Joint	50	231
			Joint	83	310
SL-S-6	492974	6735264	Joint	70	142
			Joint	42	310
SL-S-7	493006	6735278	Joint	84	316
			Joint	36	46
			Joint	87	130
SL-S-8	493007	6735306	Joint	48	289
			Joint	90	226
			Joint	60	308
			Joint	29	22
			Joint	30	240
SL-S-9	493000	6735316	Joint	50	304
SL-S-10	493126	6735316	Joint	79	30
			Joint	40	96
SL-S-11	493126	6735338	Joint	70	110
			Joint	81	38
			Joint	56	318
SL-S-12	493137	6735278	Bedding	44	110
			Joint	54	252
			Joint	50	290
			Joint	58	270
			Joint	86	157
			Joint	44	19
SL-S-13	493155	6735247	Bedding	42	112
			Joint	78	24
			Joint	40	324
SL-S-14	493171	6735227	Bedding	45	98
			Joint	49	299
			Joint	44	356
			Fault	66	175

Table 2: Structural Geology Data, Stinky Lake

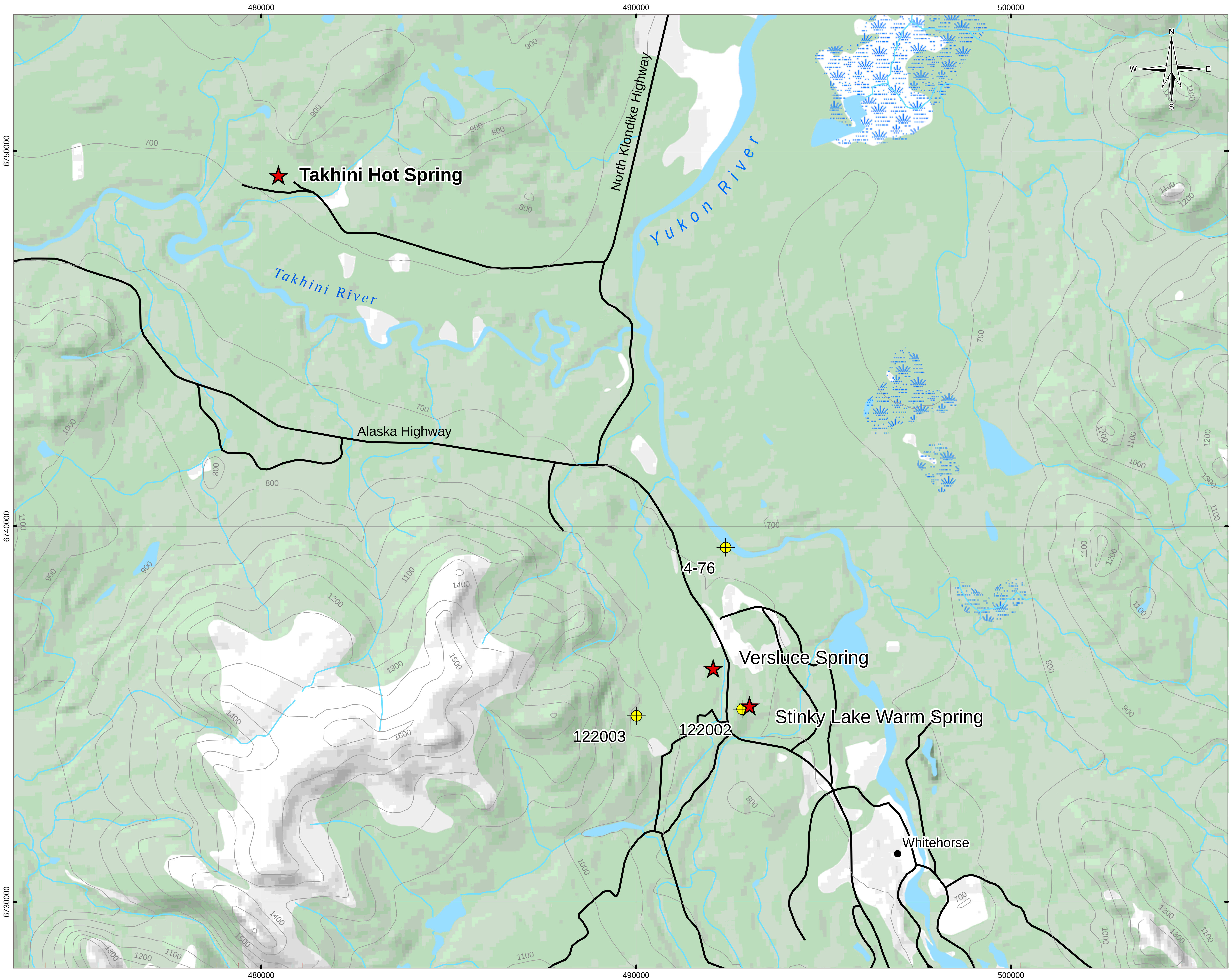
Field Station	GPS Coordinates (UTM, NAD 83, Zone 8)		Feature	Dip	Dip Direction
	Easting	Northing			
			Joint	34	48
			Joint	86	221
SL-S-15	492964	6735439	Joint	52	36
SL-K-1	493070	6735666	Bedding	46	53
			Bedding	32	29
SL-K-2	493115	6735425	Bedding	34	34
			Bedding	25	31
			Joint	79	306
			Joint	88	336
			Joint	86	98
			Joint	85	109
SL-K-3	493112	6735378	Joint	60	306
SL-K-4	493009	6735192	Bedding	44	63
			Bedding	35	48
			Joint	68	316
			Joint	85	319
			Joint	72	318
SL-K-5	493005	6735184	Bedding (folded)	55	68
			Joint	80	306
			Joint	72	327
			Joint	65	166
SL-K-6	493002	6735179	Joint	81	102
			Bedding	57	333
SL-K-7	493046	6735102	Joint	85	310
SL-K-8	493095	6735074	Joint	85	310
SL-K-9	492979	6735267	-	-	-
SL-K-10	492961	6735278	Joint	51	129
			Joint	47	125
			Joint	46	321
SL-K-11	492961	6735295	-	-	-
SL-K-12	492953	6735306	Bedding	58	320
			Joint	74	164
SL-K-13	492952	6735320	-	-	-
SL-K-14	493085	6735326	Joint	88	30
SL-K-15	493103	6735334	Joint	88	30
SL-K-16	493136	6735290	Bedding	46	120
			Joint	34	58
			Joint	75	56
			Joint	54	47
			Joint	65	269

Table 2: Structural Geology Data, Stinky Lake

Field Station	GPS Coordinates (UTM, NAD 83, Zone 8)		Feature	Dip	Dip Direction
	Easting	Northing			
			Joint	40	318
			Joint	42	290
			Joint	82	47
SL-K-17	493159	6735277	Joint	57	327
			Joint	84	47
			Joint	81	45
SL-K-18	493157	6735286	Joint	53	28
			Joint	60	25
			Joint	64	263
			Bedding	40	118
SL-K-19	493210	6735222	Joint	70	254
			Joint	70	250
			Bedding	59	117
			Joint	84	39
			Joint	84	40
Sl-K-20	492916	6735470	-	-	-

(-) no data collected

FIGURES



LEGEND

- Spring Location
- Borehole
- Community
- Road
- Elevation Contour (m)
- Vegetation
- Watercourse
- Waterbody
- Wetland

NOTES
Base data source: Geomatics Yukon

STATUS
ISSUED FOR USE

YUKON GEOTHERMAL EXPLORATION PROJECT

Topographic Map
Stinky Lake and Takhini Hotspring

PROJECTION	DATUM	CLIENT
Canadian Lambert Conf. Conic	NAD83	YUKON ENERGY

Scale: 1:100,000
2 1 0 2
Kilometres

FILE NO.
W23101159.105_Figure_1_Topography.mxd

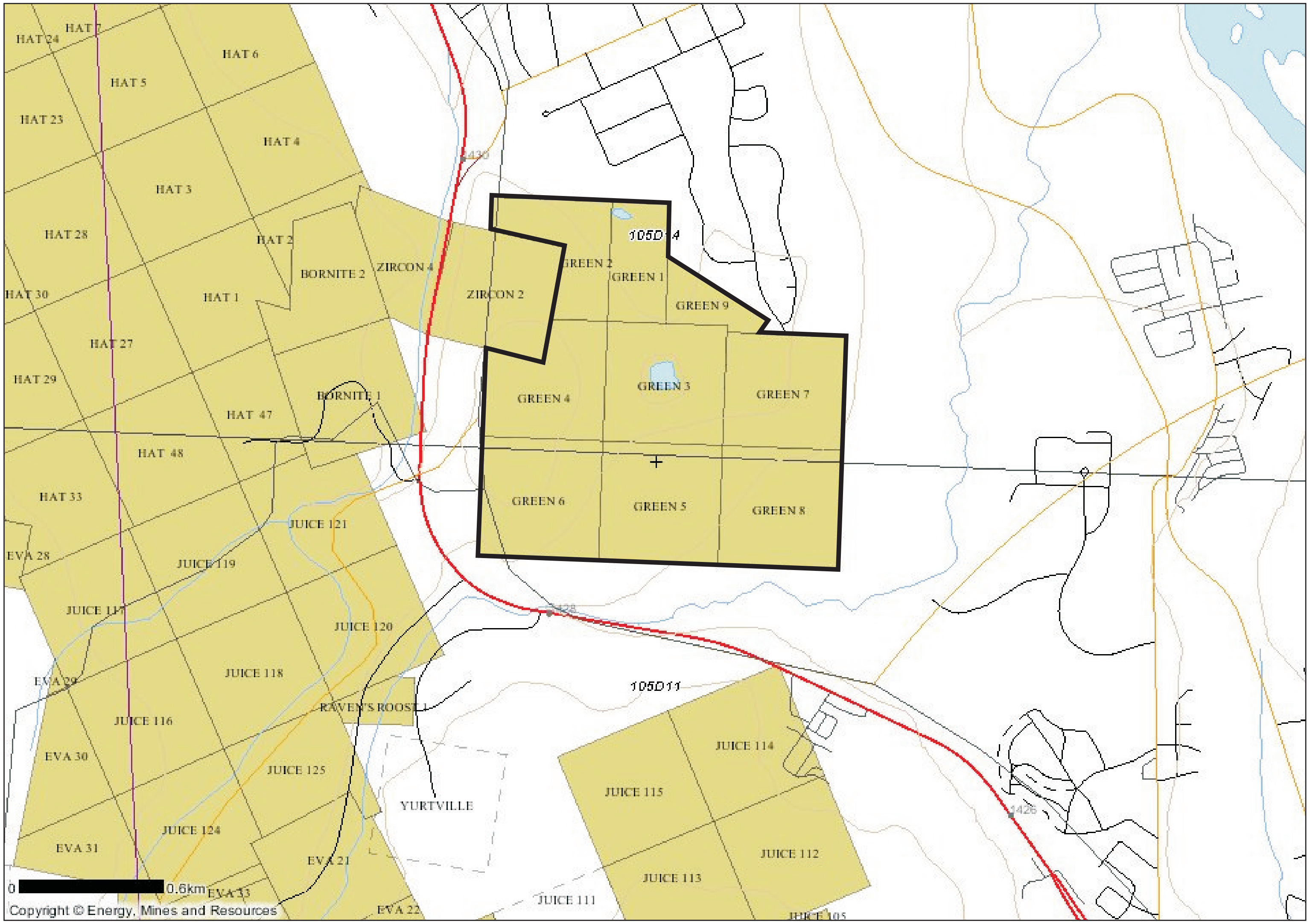
EBA A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	APVD	REV
W23101159.105	KRR	SK		0

OFFICE	DATE
EBA-WHSE	March 24, 2011

Figure 1

Q:\Whitehorse\Data\GIS_DATA\Projects\1159_YEC_Geothermal\W23101159.105\W23101159.105_Figure_1_Topography.mxd modified 4/1/2011 by krange



LEGEND

GREEN	Claims owned by Yukon Energy Corp. (GREEN 1-9)

NOTES

Base data: Yukon Mining Lands Viewer

STATUS

Issued for Use

CLIENT

YUKON ENERGY

A TETRA TECH COMPANY

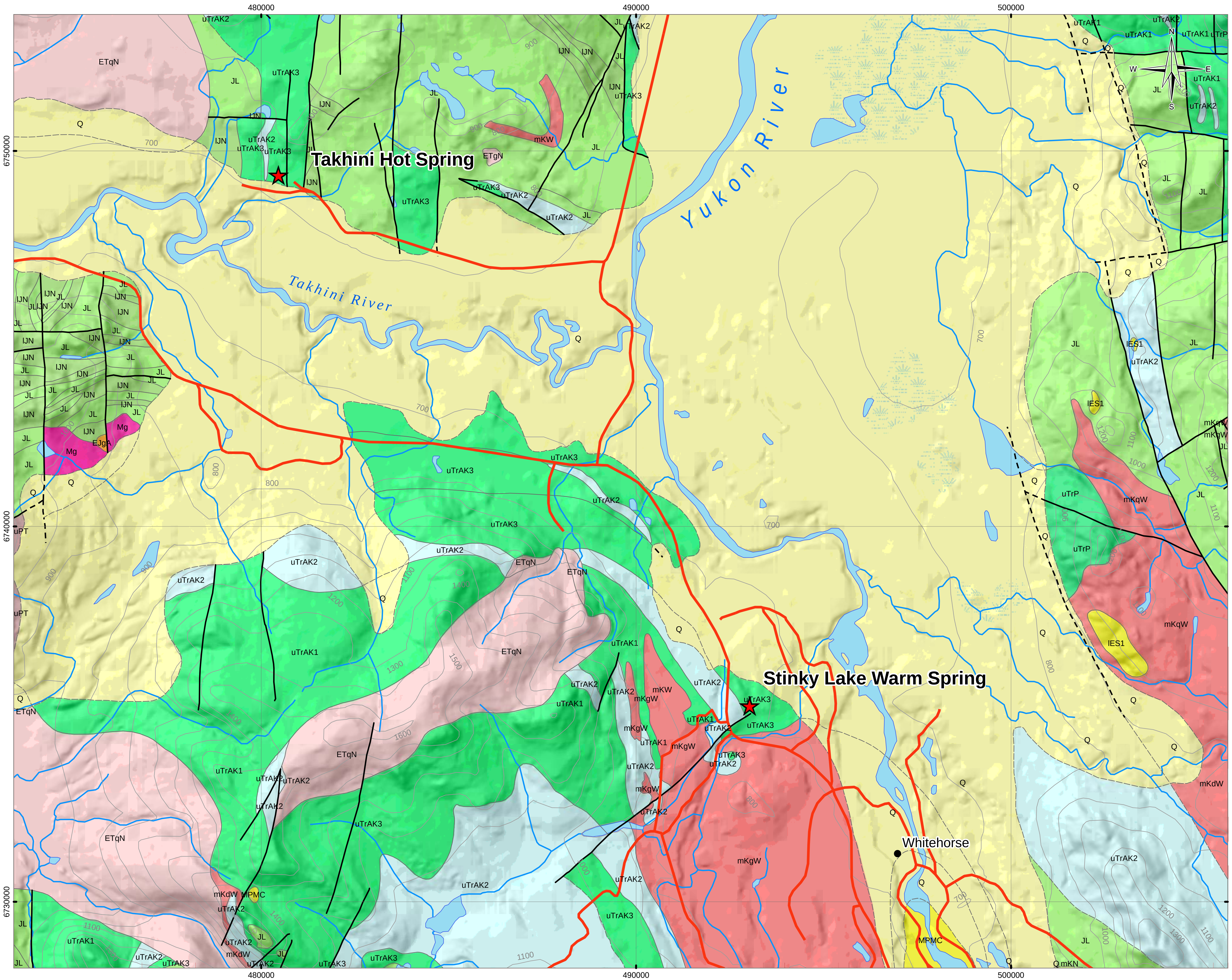
YUKON GEOTHERMAL EXPLORATION PROGRAM

Quartz Claims Map

PROJECT NO.	DWN	CKD	APVD	REV
W23101159.105	SK	JTD		0

OFFICE	DATE
EBA-WHSE	March 29, 2011

Figure 2



LEGEND

- Community
- Spring location
- Road
- Elevation Contour (m)
- Watercourse
- Waterbody
- Wetland

Contact
- Defined
- Undefined

Fault
- Defined
- Undefined

NOTES
Base data source: Geomatics Yukon

STATUS
ISSUED FOR USE

YUKON GEOTHERMAL EXPLORATION PROJECT

Bedrock Geology Map

PROJECTION	DATUM	CLIENT
UTM Zone 8	NAD83	YUKON ENERGY

Scale: 1:100,000
2 1 0 2
Kilometres

EBA A TETRA TECH COMPANY

FILE NO.
W23101159.105_Figure_3_Bedrock_Geology.mxd

PROJECT NO.	DWN	CKD	APVD	REV
W23101159.105	KRR	SK		0

OFFICE	DATE
EBA-WHSE	March 24, 2011

Figure 3

BEDROCK GEOLOGY LEGEND

UNIT **DESCRIPTION**

QUATERNARY

Q

Q: QUATERNARY
unconsolidated glacial, glaciofluvial and glaciolacustrine deposits; fluviatile silt, sand, and gravel, and local volcanic ash, in part with cover of soil and organic deposits

MIOCENE TO PLIOCENE

MPMC

MPMC: MILES CANYON
dark red to brown weathering, columnar jointed olivine basalt flows, commonly amygdaloidal and vesicular; ultramafic xenoliths **(Miles Canyon Basalt)**

LOWER EOCENE

lES

lES: SKUKUM
various felsic volcanic dykes, plugs, domes, laccoliths and flows (1) and (2)

1 flow banded rhyolite flows and breccia, andesite flows and breccia, tuff, pyroclastic and epiclastic rocks, granite conglomerate; rhyolite feldspar porphyry domes, plugs and laccoliths; feldspar +/- hornblende +/- quartz-phyric felsite dykes and plugs **(Skukum Gp. including Boudette Creek, Butte Creek, Cleft Mountain, Crozier Breccia, Crozier Tuff and Lava, Gault, Jones Creek, Lemieux Creek, MacCauley Creek, Mount Reid, Partridge Lake, Vesuvius and Watson River)**

MID-CRETACEOUS

mKN

mKN: MOUNT NANSEN
massive aphyric or feldspar-phyric andesite to dacite flows, breccia and tuff; massive, heterolithic, quartz- and feldspar-phyric, felsic lapilli tuff; flow-banded quartz-phyric rhyolite and quartz-feldspar porphyry plugs, dykes, sills and breccia **(Mount Nansen Gp., Byng Creek Volcanics, Hutshi Gp.)**

mKW

mKW: WHITEHORSE SUITE
grey, medium to coarse grained, generally equigranular granitic rocks of felsic (q), intermediate (g), locally mafic (d) and rarely syenitic (y) composition

d hornblende diorite, biotite-hornblende quartz diorite and mesocratic, often strongly magnetic, hypersthene-hornblende diorite, quartz diorite and gabbro **(Whitehorse Suite, Coast Intrusions)**

g biotite-hornblende granodiorite, hornblende quartz diorite and hornblende diorite; leucocratic, biotite hornblende granodiorite locally with sparse grey and pink potassium feldspar phenocrysts **(Whitehorse Suite, Casino granodiorite, McClintock granodiodrite, Nisling Range granodiorite)**

q biotite quartz-monzonite, biotite granite and leucogranite, pink granophyric quartz monzonite, porphyritic biotite leucogranite, locally porphyritic (K-feldspar) hornblende monzonite to syenite, and locally porphyritic leucocratic quartz monzonite **(Mt. McIntyre Suite, Whitehorse Suite, Casino Intrusions, Mt. Ward Granite, Coffee Creek Granite)**

1 yellow to ochre-buff calcareous mudstone-siltstone, grey silty limestone and platy to thick bedded, cryptocrystalline limestone; local well-bedded, limestone; thick to massive-bedded limestone in upper parts of unit probably equivalent to SDB1 **(Goatherd Mtn. assem.)**

EARLY TERTIARY

ETN

ETN: NISLING RANGE SUITE
medium to coarse grained equigranular to porphyritic rocks of intermediate composition (g), fine to coarse grained, equigranular and porphyritic granitic rocks of felsic composition (q) and felsic dyke rocks (f)

f orange and buff weathering light-coloured feldspar porphyry dyke and flow rocks of intermediate to acid composition

g biotite-hornblende granodiorite (locally K-feldspar megacrysts), quartz monzonite, quartz diorite; minor granodiorite-gneiss; hornblende and biotite hornblende diorite; biotite quartz feldspar porphyry and porphyritic biotite quartz monzonite **(Ruby Range Suite)**

EARLY JURASSIC

EJgA

EJgA: AISHIHIK SUITE
medium- to coarse- grained, foliated biotite-hornblende granodiorite; biotite rich screens and gneiss schlieren; foliated hornblende diorite to monzodiorite with local K-feldspar megacrysts; may include unfoliated monzonite of the Long Lake Suite **(Aishihik Suite)**

LOWER AND MIDDLE JURASSIC, HETTANGIAN TO BAJOCIAN

JL

JL: LA BERGE
poorly sorted, medium bedded to massive arkosic sandstone and minor shale with interbeds and thick members of resistant heterolithic pebble and boulder conglomerate; recessive, dark brown weathering, thin bedded, dark brown to greenish, silty shale **(Laberge Gp.)**

LOWER JURASSIC, PLEINSBACHIAN TO TOARCIAN

lJN

lJN: NORDENSKIOLD
resistant, reddish brown weathering, massive, khaki-green dacite tuff with fresh plagioclase, hornblende and biotite; grades locally to pale green, punky weathering, salt and pepper textured, massive sandstone; interbedded conglomerate **(Nordenskiold Dacite)**

MESOZOIC

Mg

Mg: MESOZOIC GRANITIC ROCKS UNDIVIDED
poorly described granitic rocks of uncertain age including diorite, quartz monzonite, and monzonite

UPPER TRIASSIC, CARNIAN TO NORIAN

uTrAK1

uTrAK: AKSALA
mixed clastic-carbonate assemblage divisible into three dominant facies including calcareous greywacke (1), locally thick carbonate (2) and red-coloured clastics (3) **(Aksala)**

1 brown shale, black and minor red siltstone, greenish, calcareous greywacke and interbedded bioclastic, argillaceous limestone; igneous- or limestone-clast pebble and cobble conglomerate; lahaaric debris flows; rare feldspar-augite porphyry flows **(Casca mb. of Aksala)**

uTrAK2

2 massive to thick bedded limestone; minor thin bedded argillaceous to sooty limestone; coarsely crystalline, massive dolostone; minor laminated chert; massive to poorly bedded, limestone conglomerate debris flows and fanglomerate **(Hancock mb. of Aksala)**

uTrAK3

3 red weathering, medium bedded, green and red greywacke and pebble conglomerate; red shale partings and minor interbedded, red, bioturbated siltstone; crystal-rich greywacke and shale; coarse-grained, tan to brown, massive, lithic arenite **(Mandanna mb. of Aksala)**

UPPER TRIASSIC, CARNIAN AND OLDER (?)

uTrP

uTrP: POVOAS

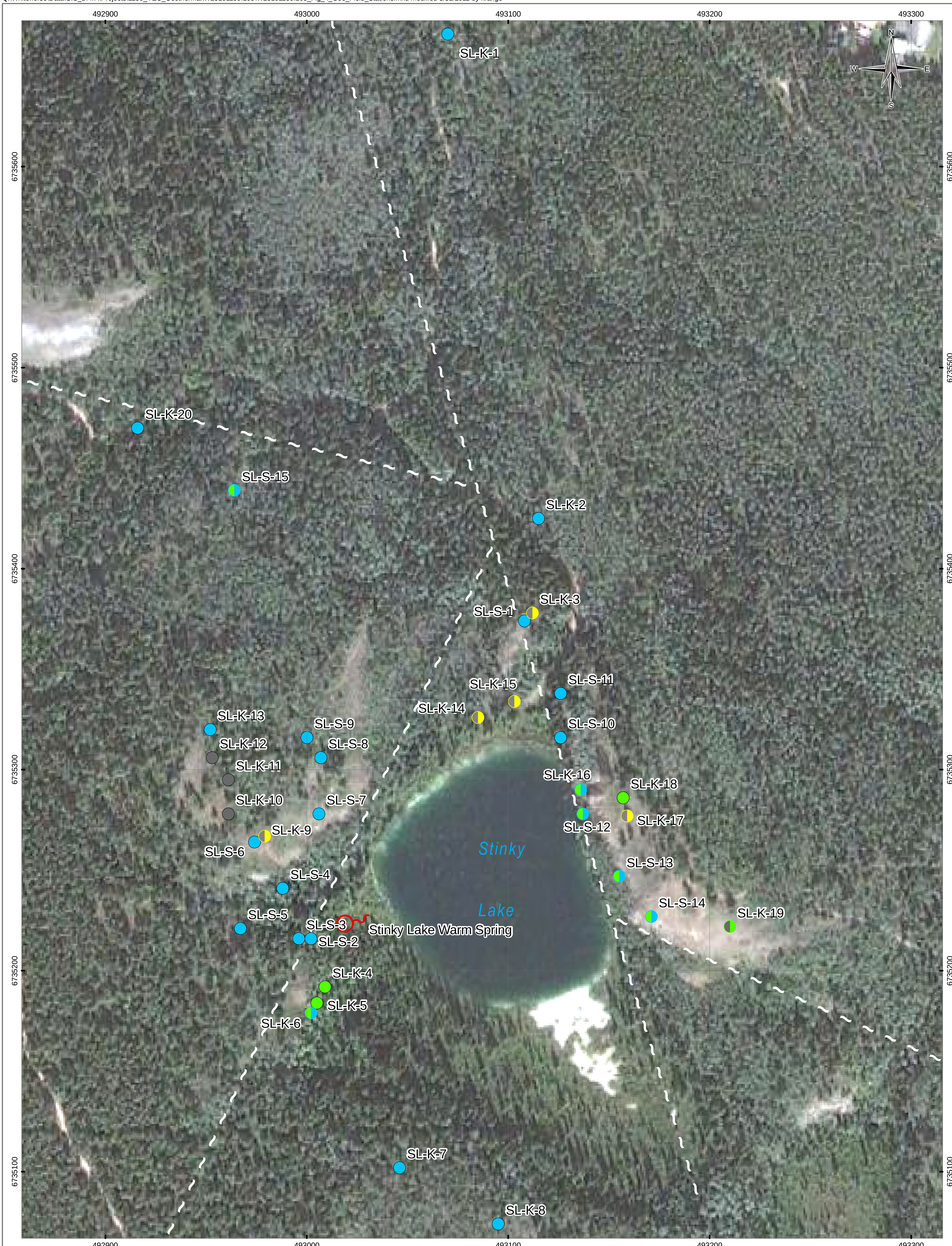
1 augite or feldspar phyric, locally pillowed andesitic basalt flows, breccia, tuff, sandstone and argillite; local dacitic breccia and tuff with minor limestone; greenschist, chlorite schist, chlorite-augite-feldspar gneiss, amphibolite **(Povoas)**

UPPER PALEOZOIC

uPT

uPT: TAKHINI
variably sheared and metamorphosed metabasite, amphibolite gneiss, tuff, wacke and marble with minor quartz mica schist and orthogneiss

Q:\Whitehorse\Data\GIS_DATA\Projects\1159_YEC_Geothermal\W23101159.105\W23101159.105_Fig_4_Geo_Field_Stations.mxd modified 3/31/2011 by krange



LEGEND

Stinky Lake Warm Spring

Geological Field Station

- Greywacke
- Limestone
- Interbedded Shale and Limestone
- Sandstone/Greywacke
- Shale
- Interbedded Shale and Greywacke

~ ~ ~ Possible Fault Trend (interpreted from airphotograph)

NOTES

Base data source: Google Earth

STATUS

ISSUED FOR USE

YUKON GEOTHERMAL EXPLORATION PROGRAM

Geological Field Stations Stinky Lake Area Whitehorse, Yukon

PROJECTION	DATUM	CLIENT
UTM Zone 8	NAD83	YUKON ENERGY

Scale: 1:1,800

20 10 0 20

Meters

FILE NO.
W23101159.105_Fig_4_Geo_Field_Stations.mxd

PROJECT NO.	DWN	CKD	APVD	REV
W23101159.105	KRR	SK		0

OFFICE	DATE
EBA-WHSE	March 31, 2011

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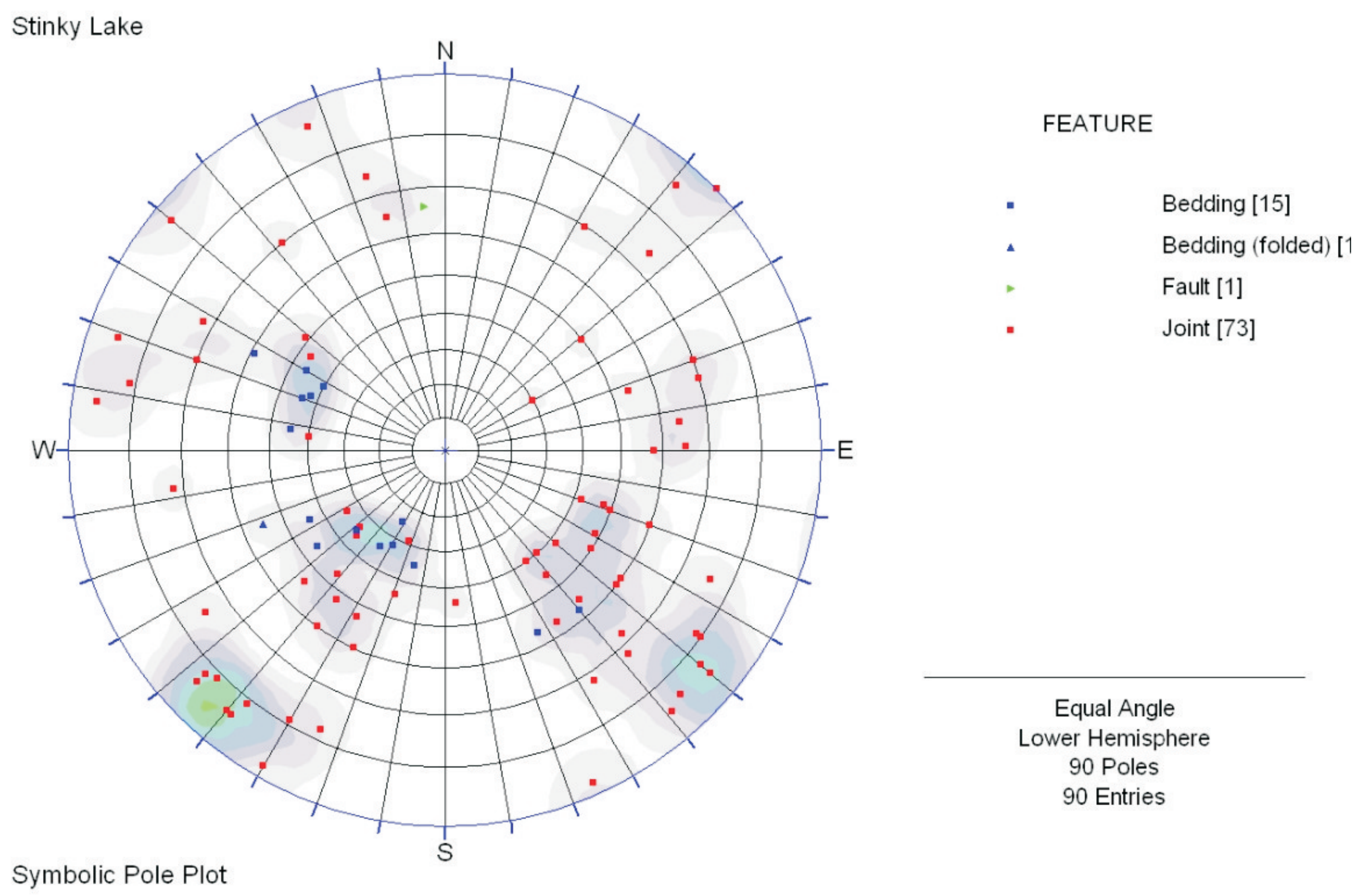
Figure 4



LEGEND

NOTES

STATUS
ISSUED FOR USE

CLIENT
Yukon Energy Corporation

A TETRA TECH COMPANY

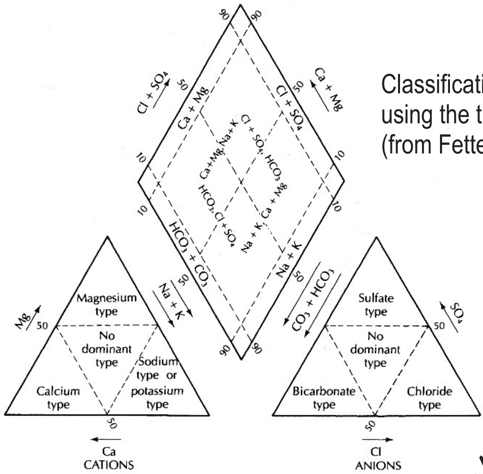
YUKON-WIDE GEOTHERMAL EXPLORATION PROGRAM

Stereographic Projection of Structural Data

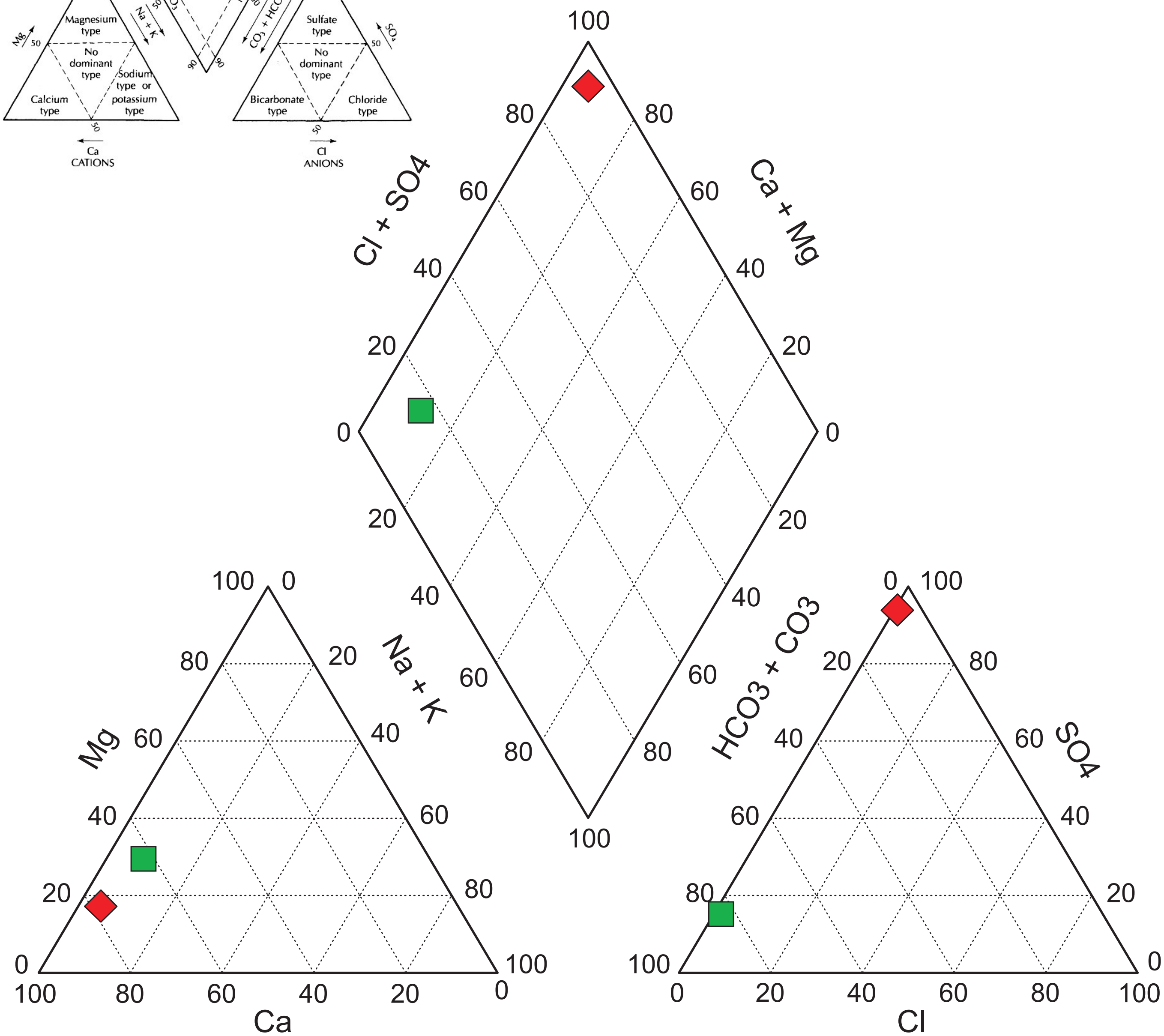
PROJECT NO.	DWN	CKD	APVD	REV
W23101159.105	BCW	SK		0

OFFICE	DATE
EBA-WHS	March 2011

Figure 5



Classification of hydrogeochemical water types using the trilinear Piper diagram (from Fetter, 2001)



LEGEND

Stinky Lake Warm Spring

Takhini Hot Spring

STATUS
DRAFT

CLIENT
YUKON ENERGY

A TETRA TECH COMPANY

HYDROGEOCHEMISTRY OF STINKY LAKE WARM SPRING, YUKON

Piper Plot

PROJECT NO.	DWN	CKD	APVD	REV
W23101159.105	SK	RMM		0

OFFICE	DATE
EBA-WHSE	March 28, 2011

Figure 6

PHOTOGRAPHS

Photo 1	Stinky Lake. Looking west.
Photo 2	Stinky Lake with triangle-shaped wetland at east shore of lake. The Stinky Lake Warm Spring is located at the right edge of this wetland. Looking west.
Photo 3	Stinky Lake Warm Spring feeding small stream that flows into Stinky Lake. Looking west.
Photo 4	Prominent bedrock outcrop on east side of Stinky Lake. Looking east.
Photo 5	Calcareous shale outcrop (SL-K-5) southwest of the warm spring. Looking north.
Photo 6	Interbedded shale and limestone outcrop (SL-K-16) on east side of Stinky Lake (cf. Photo 4). Looking east.

Photo 1: Stinky Lake. Looking west.

Photo 2: Stinky Lake with triangle-shaped wetland at the west shore of lake. The Stinky Lake Warm Spring is located at the right edge of this wetland. Looking west.

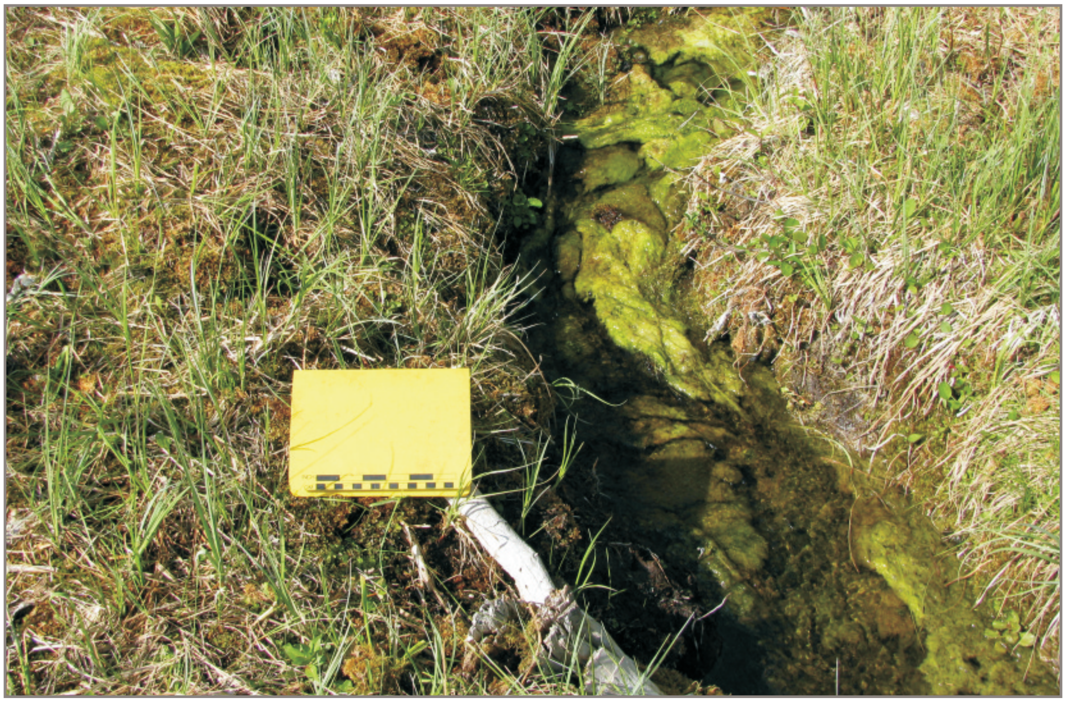


Photo 3: Stinky Lake Warm Spring feeding small stream that flows into Stinky Lake. Looking west.

Photo 4: Prominent bedrock outcrop on east side of Stinky Lake. Looking east.

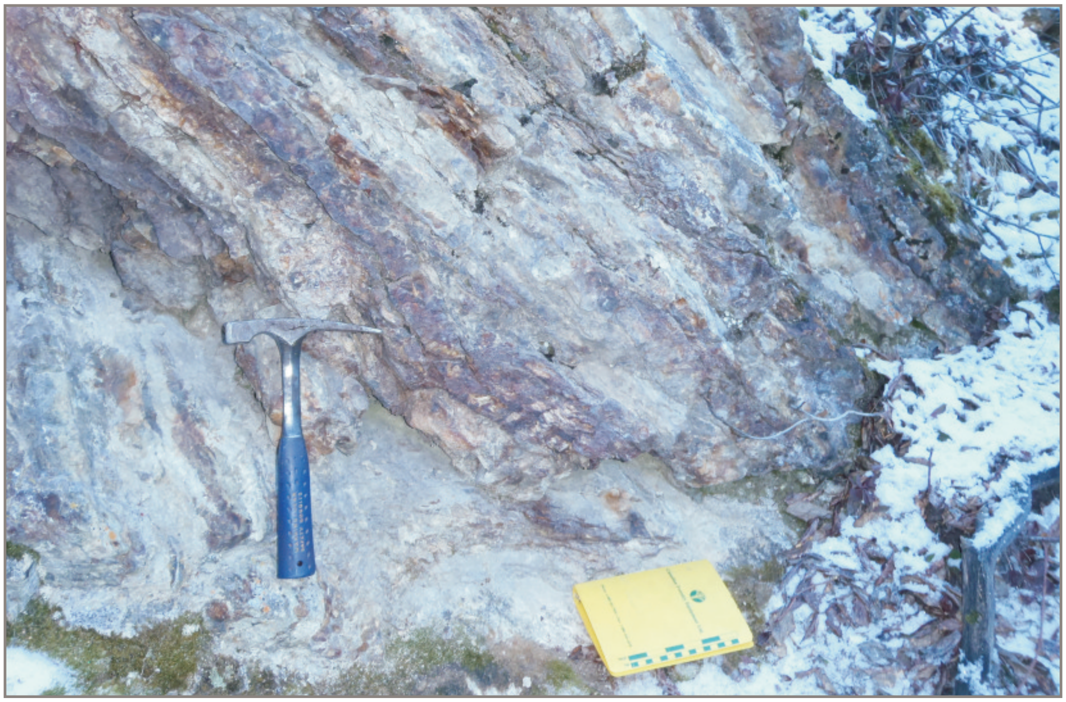


Photo 5: Calcareous shale outcrop (SL-K-5) southwest of the warm spring. Looking north.

Photo 6: Interbedded shale and limestone outcrop (SL-K-16) on east side of Stinky Lake (cf. Photo 4). Looking east.

APPENDIX A

APPENDIX A EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA’s client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

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Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.