# YUKON MINERAL EXPLORATION PROGRAM (YMEP No. 16-040) FINAL REPORT FOR A TARGET EVALUATION PROGRAM ON THE LIGHTNING/ MCNEIL PLACER PROPERTY, YUKON

NTS 105 M 14P

Longitude 135°09' W, Latitude 63°55'N

**Mayo Mining District** 

Claim Names: Creek Claim 1-11 and Creek Claim 1-22 Grant Numbers: P16789-99 and P16800-P16821

#### Prepared By:

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January 30, 2017

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#### INTRODUCTION

This report is the Final Target Evaluation Report for YMEP 16-040 on the Lightning/McNeil placer claims, submitted by H. Coyne & Sons.. The objectives of this program were to identify and evaluate two-types of placer targets by means of sampling excavator test pits and identifying possible older deeper pre-McConnell targets by means of a seismic refraction survey.

The Lightning/McNeil Placer property is an early stage placer gold project located on the Lightning creek road 7.5 km east of Keno City within the Keno Hill Map area (105M14). The area lies within the glaciated region of the Central Yukon and includes the placer-gold-producing basins of Duncan Creek, Thunder Gulch, Lightning Creek, and Granite Creek. Placer mining within these drainages has focused on buried interglacial deposits or outwash gravel that reworked interglacial deposits, and only recently on locally derived glacial till at Granite Creek. Surficial geological mapping carried out by Bond (1998) indicates that the ground covered by the Lightning/McNeil placer claims is composed of Late Pleistocene till complexes including the McConnell alpine glacier terminal moraine complex at the mouth of McNeil Gulch, colluvium veneer, and undivided Holocene alluvial deposits.

The potential for discovery of placer deposits within this part of the Keno Hill map area is high for three reasons:

- 1) proximity of gold bearing vein showings in and around the Gustavus Ranges (Yukon Minfile 105M-011, 012, 052, 070, and 073),
- anomalous stream sediment geochemical values (NGR 105M-87-1077 210.5 ppb Au, 105M-87-1124 – 41 ppb Au. 105M-87-1119 – 254 ppb, 105M-87-1073 – 106 ppb); and,
- that with the exception of a few alpine glaciers originating in the Gustavus Ranges the area was largely free from the erosive forces of the Cordilleran ice sheet during the McConnell Glaciation.

Placer gold is widespread and easily panned from old workings, test pits and road cuts on lower McNeil and Lightning creeks from a variety of materials including glacial moraine, glaciofluvial, and post-glacial sediments. The terminal moraine materials are gold bearing apparently being derived from pre-existing placers in McNeil creek and gold bearing veins in the Gustavus Range to the south. Lower McNeil was test mined by Kim Klippert and family from 1998-2001 resulting in 4 cuts from 25-55 feet deep. Gold values were said to be occur from top to bottom in material described as glacial moraine. In a 2012 e-mail Kim Klippert wrote *"I had done a test when gold was \$257.00 an oz and recovery values were \$4.00 per yard average from the surface down to 55 ft depth (no bedrock encountered at this depth). I washed 5000-6000 yards in this test."* Material of this grade would be of interest at current gold price around \$ US 1200 per ounce, and there are other types of placer targets on the claims that could potentially be of economic significance.

There are three distinctly different placer exploration Target Types (1-3) that could be present and need to be explored and evaluated using a variety of techniques, including:

TYPE 1. These are deposits within the large moraine complex resulting from destruction of pre-existing placer deposits by the McNeil alpine/valley glacier. They could be primary and somewhat linear deposits within the moraine controlled by the direction of ice flow, or secondary deposits formed by reconcentration of gold from moraine by glaciofluvial processes. These deposits could be identified by a pattern of shallow excavator test pits given the high degree of degree of erosion of the terminal moraine by post –McConnell meltwater flows in Lightning and McNeil providing slices through the moraine complex

TYPE 2. These are placer deposits in Lightning and McNeil Creeks formed by concentration of gold in meltwater and seasonal channels since the end of the McConnell glaciation. They could be deep channels which cut all the way to bedrock or much shallower channels perched on bouldery, pavement or till layers which lined the bottoms of active channels from time to time. Such deposits could be in or near present day channels and these shallower targets could be explored by carefully sampling a pattern of excavator test pits. These old channels are full of boulders and a larger size excavator is needed to be effective.

TYPE 3. These are much older pre-McConnell placers formed in ancestral incised streams during the pre or post-Reid interglacial periods that were not destroyed by subsequent glaciations because the ice over-rode the older deposits burying them under moraine and glaciofluvial materials. There is a very large area on Lower McNeil and Lightning Creek where Type 3 deposits could be preserved beneath the terminal moraine complex. Depth to bedrock in this area was thought to be 55 feet or more but the seismic survey has shown that there may well be up to 150 m of glacial related overburden.

Summary of the work completed in 2016.

- 1. Repaired road to property such that trucks can haul to site
- 2. Cut 4 km of 1,5 m wide line for survey (6 lines)
- 3. Completed 4 km of explosive source seismic survey
- 4. Excavated, sampled and reclaimed 40 test pits and trenches using PC 60 and PC 400 excavators.

## LOCATION – ACCESS - PHYSIOGRAPHY

The Lightning/McNeil placer property consists of 33 placer claims that are located on the Lightning creek road approximately 7.5 km east of Keno City, Yukon. Keno City is accessed from Mayo by 40 km of gravel road known as the Silver Trail Highway (Figure 1). The Project area is covered by the Keno Hill Map area (105M-14).

The Keno Hill Map area lies within the glaciated region of the Mayo Placer Watershed, Central Yukon (Figure 2 and 3). At the center of the map area is the Gustavus Range. Mount Hinton forms the core of the range and has many summits above 6500 feet. Two plateau uplands, Keno and Galena Hills, are separated from the Gustavus Range by Duncan Creek and Lightning Creek. The placer-gold-producing basins in the Keno Hill map area include: Duncan Creek, Thunder Gulch, Lightning Creek, and Granite Creek. Placer mining within these drainages has focused on either buried interglacial deposits or outwash gravel that reworked interglacial deposits. The area shows remnant geomorphological features from several periods of Cordilleran and Alpine glaciation, including glacial deposits (lateral and terminal moraines), cirques and U-shaped valleys, outwash channels, deltas and gravel plains. The Mayo Placer watershed is characterized by rolling hills and mountains with peaks up to 2000 meters. The area is sometimes referred to as the Keno Hill Silver District, as there has been extensive silver mining of polymetalic veins (Ag-Pb-Zn).

The property is centered at the confluence of Lightning Creek and McNeil Gulch near 63.92° N Latitude; 135.152° W Longitude (Figure 4).

McNeil gulch is a north trending valley with a large west and north facing cirque at the headwaters and a large terminal moraine complex in the lower 3000 ft of the valley. Upstream of the terminal moraine, the valley has the classic glacial formed U-shape. There are small glaciers in the cirque at the headwaters. McNeil creek was obviously dammed and diverted by the terminal moraine deposits and has cut a steep sinuous channel along the west side of the terminal moraine and enters the top of Kim Klippert's test mining area. The treed rolling hills(Figure 9) are the moraine with the u-shaped upper valley in the distance.

Lightning Creek is an east- west trending valley (almost perpendicular to McNeil) that served as a major meltwater channel draining the melting Cordilleran Ice sheet in Laude River Area at the end of the last (McConnell) glaciation. Below McNeil it becomes noticeably incised downstream. This down-cutting in Lightning Creek is attributed to lowering of the base level of Mayo River in post-McConnell time.

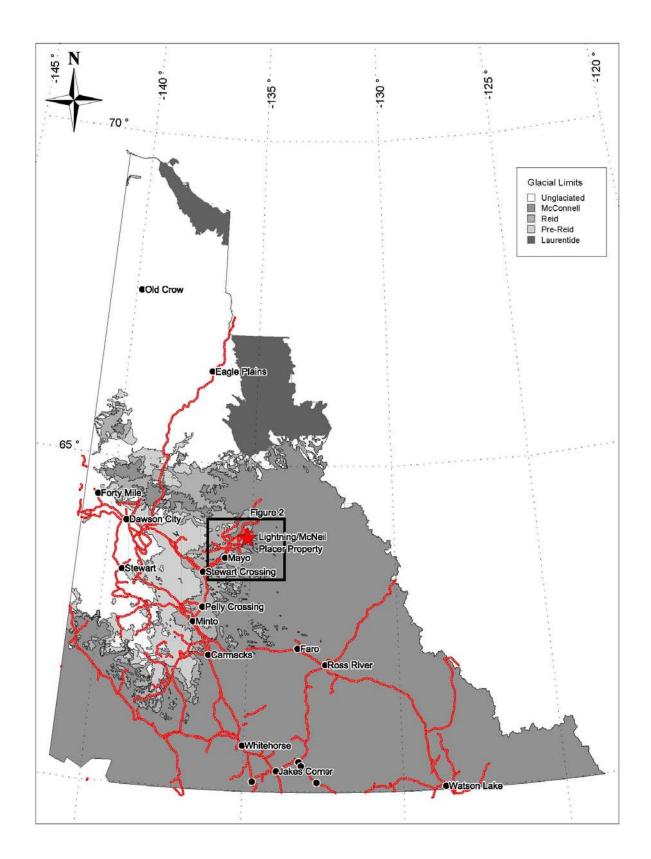


Figure 1. Project Location (Red Star) showing boundaries of glacial limits

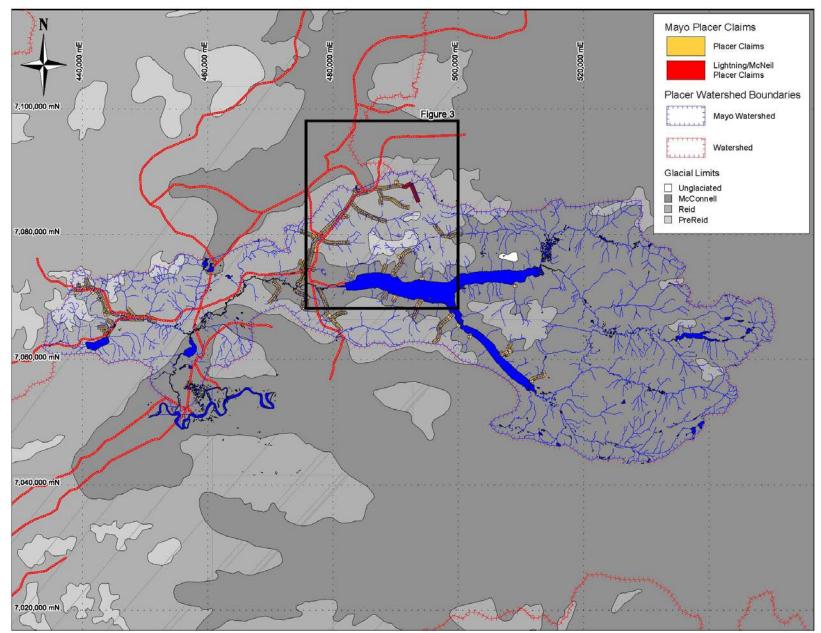


Figure 2. Project location (Red Claim Cells) showing Mayo watershed boundary, boundaries of glacial limits and Mayo Placer Claims

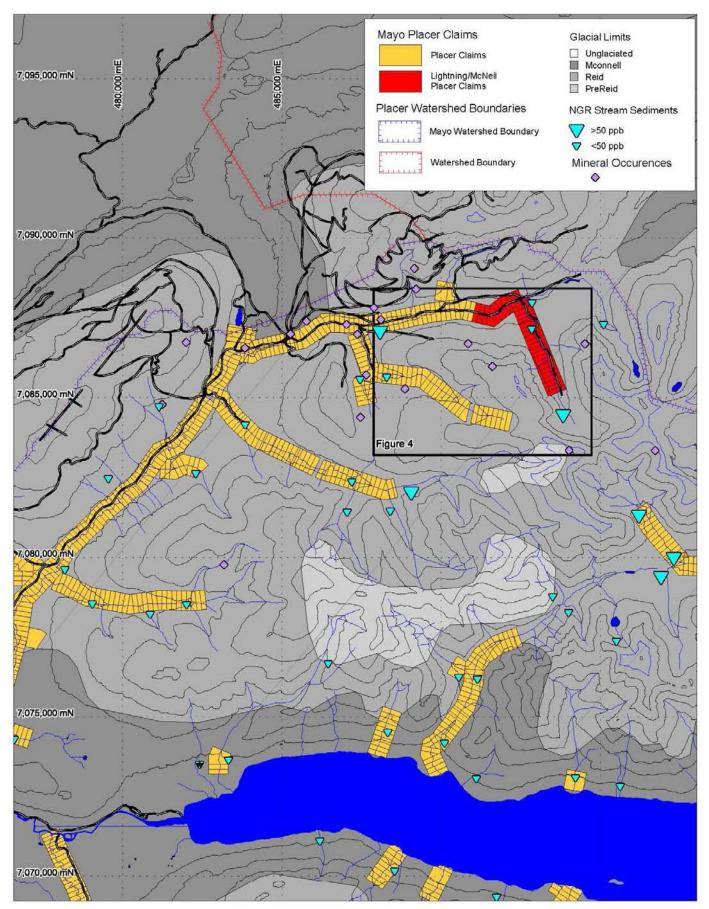


Figure 3. Keno Hill Map area showing Mayo placer claims boundaries of glacial limits, mineral occurrences, and NGR stream sediments

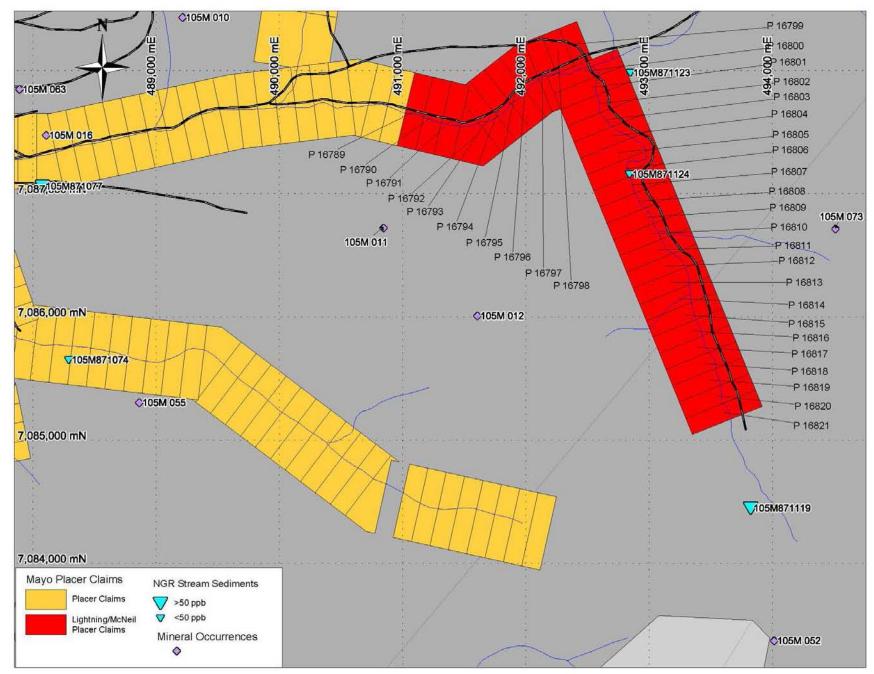


Figure 4. Project claim grant numbers (Red Cells), other Mayo placer claims, mineral occurrences, and NGR stream sediments

Grant				Recording	Claim
Number	Claim Name	Claim Nbr	Claim Owner	Date	Expiry Date
P 16789	Creek Claim	1	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16790	Creek Claim	2	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16791	Creek Claim	3	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16792	Creek Claim	4	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16793	Creek Claim	5	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16794	Creek Claim	6	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16795	Creek Claim	7	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16796	Creek Claim	8	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16797	Creek Claim	9	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16798	Creek Claim	10	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16799	Creek Claim	11	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16800	Creek Claim	1	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16801	Creek Claim	2	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16802	Creek Claim	3	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16803	Creek Claim	4	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16804	Creek Claim	5	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16805	Creek Claim	6	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16806	Creek Claim	7	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16807	Creek Claim	8	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16808	Creek Claim	9	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16809	Creek Claim	10	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16810	Creek Claim	11	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16811	Creek Claim	12	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16812	Creek Claim	13	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16813	Creek Claim	14	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16814	Creek Claim	15	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16815	Creek Claim	16	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16816	Creek Claim	17	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16817	Creek Claim	18	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16818	Creek Claim	19	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16819	Creek Claim	20	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16820	Creek Claim	21	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08
P 16821	Creek Claim	22	Gimlex Enterprises Ltd 100%	1993-11-10	2017-09-08

Table 1: McNeil and Lightning Creek Placer Claims included in this YMEP.

#### **REGIONAL GEOLOGY**

#### **Bedrock Geology and Mineralization**

The Keno Hill map area is located in the northwestern part of the Selwyn Basin. This area of the basin is underlain by Upper Proterozoic meta-sediments (Hyland Group), Devono-Mississippian meta-volcanic and meta-sedimentary rocks (Earn Group), Mississippian quartzites (Keno Hill Formation) that were deposited in a shelf environment during the formation of the northern Cordilleran continental margin (Figure 5). Middle Triassic gabbro and diorite sills are dispersed within the Keno Hill quartzites. At some point in the Late Jurassic, the region transitioned from an extension or transtension and rifting tectonic regime to a compressive or transpression tectonic regime (Murphy, 1997). This change in tectonic regime is recorded by the regional deformation, metamorphism and displacement on large thrust faults, such as the Robert Service and Tombstone thrusts. This tectonic regime ended sometime before the emplacement of the 90-94Ma felsic plutons (Tombstone intrusions). The Tombstone plutonic suite includes the large Roop Lakes pluton, dated at 92.8 Ma (Roots, 1997), which intrudes the Keno Hill Quartzite approximately 12 km east of the Lightning/McNeil placer claims.

A contact metamorphic halo within the Keno Hill Quartzite extends as much as 4km away from exposures of the Roop Lakes pluton (Lynch, 1989a, b). Fault- and fracturecontrolled hydrothermal veins within the quartzite extend from the margin of the metamorphic halo toward the west into the Keno Hill mining district. From east to west, veining is zoned away from the pluton (Lynch, 2005). Quartz-feldspar-tourmaline veins occur immediately west of Roop Lakes pluton. Outward from the quartz-feldspartourmaline veins are vuggy quartz-calcite veins. The vuggy quartz-calcite veins transition into the sulphide-rich, quartz-siderite veins of the Keno Hill silver-lead-zinc mining district. The regional zoning pattern suggests that gold may be found between Roop Lakes pluton and the Keno Hill district (Lynch, 1986).

Gold bearing veins in the Gustavus Range, like those associated with Minfiles 105M-011, 012, 052, 070, and 073, are thought to be the gold sources for placer gold in Lightning/McNeil Creek (Figure 5).

#### **Surficial Geology**

The current landscape of central Yukon is primarily a result of the multiple glacial and interglacial events that took place during the Quaternary period (Figure 6). Ice from both the Cordilleran ice sheet and local alpine glaciers from the Gustavus Range covered the valleys in the Keno Hill map area. From oldest to youngest these were the pre-Reid (early Pleistocene), Reid (middle Pleistocene) and the McConnell (late Pleistocene) glaciations.

Landforms resulting from the pre-Reid glaciations have undergone considerable erosion and are difficult to identify. Pre-Reid interglacial deposits are sometimes preserved under Reid glacial sediment, as is the case in Duncan and Upper Duncan Creeks.

The Reid glaciation occurred at least 200,000 years ago (Berger, 1994). Reid ice advanced into the map area from the east following the regional drainage. The main conduits for the passage of ice were the Keno-Ladue River, Granite Creek, Mayo Lake and South McQuestern River valleys. The Corilleran ice from Keno-Ladue River flowed up Faith Creek and combined with glacial ice emanating from Allen Creek, McMillan Gulch, and McNeil Gulch. The combined ice flowed westward down Lightning Creek and merged with the Keno-Ladue River ice advancing up Christal Creek. This combined ice flowed south into the Duncan Creek drainage. Glacial till and glacial fluvial deposits of this glaciation can be found along the Duncan Creek drainage. Till fabrics from upper Duncan Creek indicate that during the waning stages of the Reid glaciation alpine ice retreated prior to the Cordilleran ice and as a result Cordilleran ice advanced up upper Duncan Creek. The interglacial period between the Reid and the McConnell glaciations resulted in a number of alluvial deposits that are pre-served at surface and underneath McConnell glacial deposits.

The McConnell glaciation advanced into the map area between 17,000 and 20,000 years ago (Bond, 1997). The advance of the alpine glaciers originating in the Gustavus Range reached their maximum immediately preceding the Cordilleran ice. A lobe of Cordilleran ice advanced up Faith Creek from the Keno-Ladue River. The Cordilleran ice merged with the alpine ice but did not advance down Lightning Creek more than 1km west of the mouth of McNeil Gulch. Significant glacial till, glacial fluvial and alluvial deposits were formed in the map area with receding of the McConnell ice.

Placer deposit potential within the Keno Hill map area is prospective for three main reason: 1) gold bearing vein showings in and around the Gustavus Ranges (Yukon Minfile 105M-011, 012, 052, 070, and 073), 2) favorable stream sediment geochemical values (NGR – 105M-87-1077 – 210.5 ppb Au, 105M-87-1124 – 41 ppb Au. 105M-87-1119 – 254 ppb, 105M-87-1073 – 106 ppb), and 3) that with the exception of a few alpine glaciers originating in the Gustavus Ranges the area was largely free from the erosive forces of the Cordilleran ice sheet during the McConnell Glaciation.

Surficial geological mapping carried out by Bond (1998) indicates that the ground covered by the Lightning/McNeil placer claims is composed of Late Pleistocene McConnell glaciation till complexes including the McConnell valley glacier moraine at the mouth of McNeil Gulch, undivided Pleistocene and Holocene colluvium veneer, and undivided Holocene alluvial deposits (Figure 7).

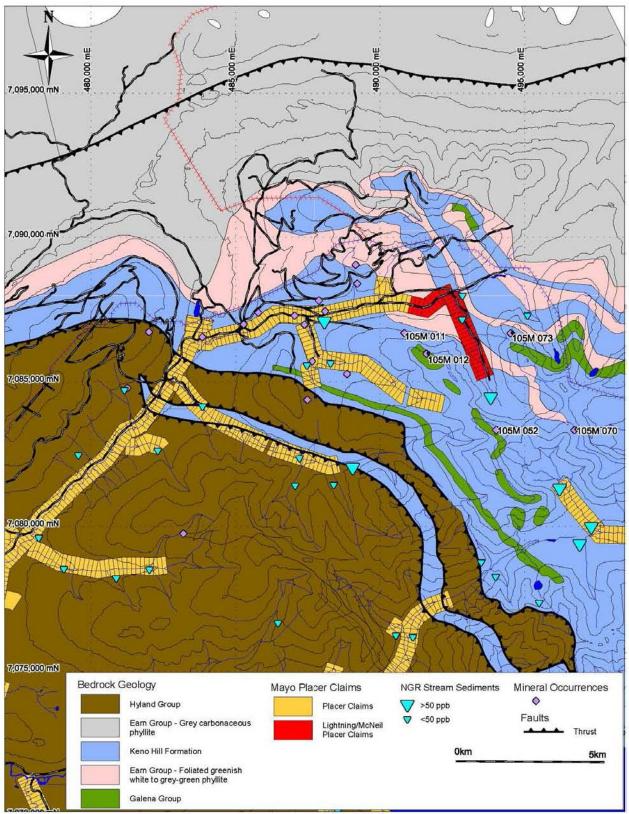


Figure 5. Keno Hill map area showing bedrock geology, minfile occurrences and Mayo placer claims

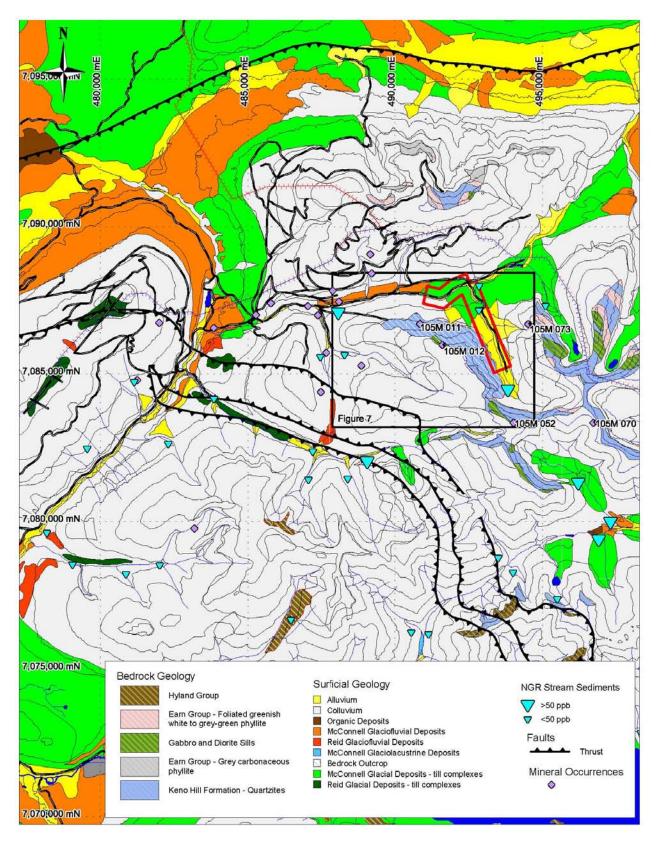


Figure 6. Keno Hill map area showing surficial geology and Lightning/McNeil placer claims outline

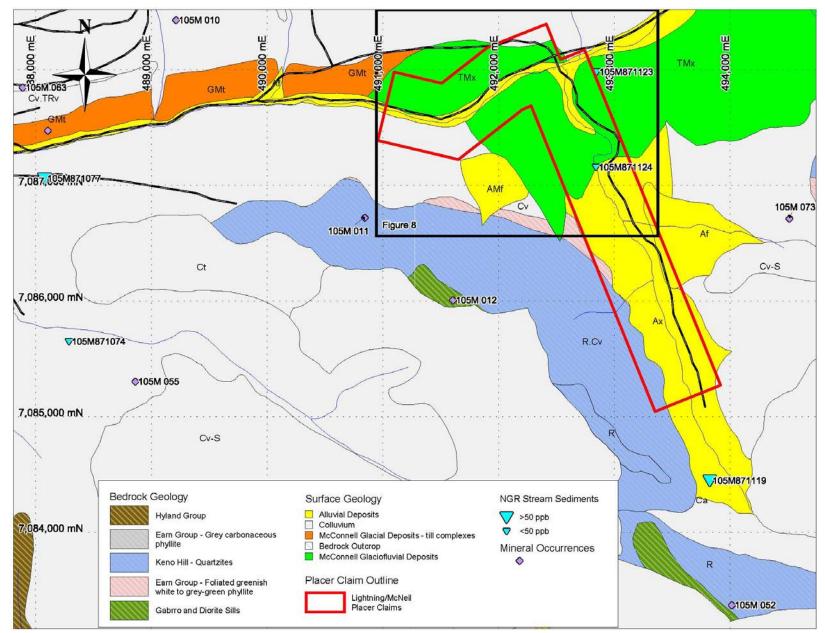


Figure 7. Surface geology covered by Lightning/McNeil placer claims and locations of mineral occurrences and NGR stream sediment samples

#### **PROPERTY HISTORY**

The placer claims included in this YMEP were staked by Kim Klippert in 1993 and from 1998 to 2001 Klippert carried out small scale mining and testing on the property. After the death of Kim the claims were offered for sale and Gimlex Enterprises Ltd. purchased 100% of the claims from Cheryl Klippert in the fall of 2014. Cheryl Klippert maintains a small royalty on any future gold production. Gimlex has not worked on the claims since that time.

Apparently, Kim Klippert was not into paper work or record keeping. Very little technical information, maps or production records were found describing the work done from 1998-2001. He received funding from YMIP # 2000-6 and worked on both the placer and quartz claims but the report does not give any useful details about the placer work completed. There are some short write ups in the Yukon Placer Mining Industry reports (1998-2002) which are summarized below, on the work done by Klippert on Lower McNeil and from adjoining properties Lightning Creek and tributary Thunder Gulch, mined by Bardusan Placers (Claus Barchan). We have had several discussions with Claus Barchen about his experience and knowledge from many years of mining on Lighting Creek a few miles downstream of this claim block.

From 1998 to 2001 Kim Klippert opened a mining cut in the bottom end of McNeil Gulch in glacial moraine material (Figure 8). Gold values were said to occur from surface to the bottom of the cut at depths of 7.6 metres to 15.2 metres (25ft. to 50ft.). In an email to another miner offering some of the claims for lease Kim Klippert claimed to have tested between 3,800 to 4,600 m<sup>3</sup> (5,000 to 6,000 cubic yards) of glacial material averaging \$4.00 USD per cubic yard when the gold price was \$ US 257USD/oz ( equivalent to~485mg of Au per cubic yard at \$257USD/oz). He also stated that Hans and Claus Barchan had drilled their claims below his claim block and reached bedrock at depths of 19.8 metres (65 feet) . Kim further stated, that while the values were interesting, without the resources and equipment to test or mine deep ground, Kim was not able to advance exploration on Lightning Creek.

Some of the work funded by YMIP #2000-6 included 3 trenches shown on Figure 8. A cubic yard sample collected from the bottoms of each trench and was concentrated with a sluice box and returned gold values from \$1.25USD to \$3.05USD per cubic yard (~150mg to ~370mg per cubic yard assuming a gold price of \$257USD/oz). Unfortunately the report does not include the specific gold values for the individual trenches. The locations of these three trenches are all within areas where the creeks have eroded significantly through the moraine (meltwater channels). The gold bearing moraine materials are plausibly being derived from glacial erosion of much older interglacial placer deposits in McNeil creek and/or gold bearing veins in the Gustavus Range to the south.

Downstream, Bardusan Placers mined on Lightning above Thunder Gulch from 2003-2009. At the mouth of Thunder the ground was 18.3 metres (60 feet) deep and went to

70 feet and greater upstream, and also the gold was finer and flatter (90% minus 12 mesh) above Thunder Gulch.

In a personal communication, Claus Barchan explained that they had difficulty stabilizing their pit walls in cuts on Lightning and in 2010 elected to move and focus their efforts on mining Thunder Gulch, where they continue to mine today. He also stated that he recalled and had seen records of a mid -980s drilling program done by Joris Brinkerhoff in which a couple of holes encountered bedrock at depths of 50-55 feet from surface near the junction of Lightning and McNeil. Records of these drill holes have not yet been located.

In summer of 2014, Jim Christie visited the site and hand panned 15 samples of material from cut walls of previous mining areas. There was no difficulty finding gold in sediments on the property and all pans contained gold, however, it was not weighable for individual pans and is only an indication that there is the potential for a placer concentration of gold on the property. Figures 9 to 12 show photographs of Lightning Creek and McNeil Gulch.

Gimlex has been researching and considering exploration methods on Lightning Creek and McNeil Gulch since 2014. The challenges associated with the three target types of deposits (depth, boulders, complex stratigraphy and potential for multiple gold horizons, etc.) make the traditional auger drill used in the Klondike ineffective. The costs to bring in an alternate drill, potentially dual rotary, sonic or reverse circulation, is very high due to high mobilization costs and per foot costs. A future drill program would be more likely to be successful with some initial target evaluation work done by excavator test pits and seismic survey.

Gimlex estimated that the total exploration required prior to making a mining decision on this property would likely exceeded \$500k and will take 3 or more exploration seasons. As there is significant risk that the exploration work might not yield a positive mining decision, Gimlex was uncertain that they wanted to proceed with extensive exploration on the property. While in discussions with Kluane Drilling about various drilling techniques, including dual rotary, Gimlex explained the challenges with exploration in glacial terrains with boulderly overburden and the exploration risk. Exploration in these areas is one of the main areas of exploration potential for new placer deposits in the Yukon. As Kluane drilling is an expert in drilling and based in the Yukon this may be an opportunity for them to expand into a new drilling niche.

Also, H. Coyne expressed a willingness to share the risk of exploration, willingness to test drilling techniques in this environment and entered into an option agreement to earn an interest in the Lightning Claims over a 3 year period. (A letter of confirmation of option agreement between Gimlex and H. Coyne is located in Appendix II). As part of the earn into the Lightning Claims, H. Coyne is required to fund (or contribute in-kind) a specific amount of exploration over a 3 years period, including the 2017 exploration program. Dr. J.S. Christie will continue to provide geological oversight and assist with running the exploration program using Gimlex or H. Coyne equipment.

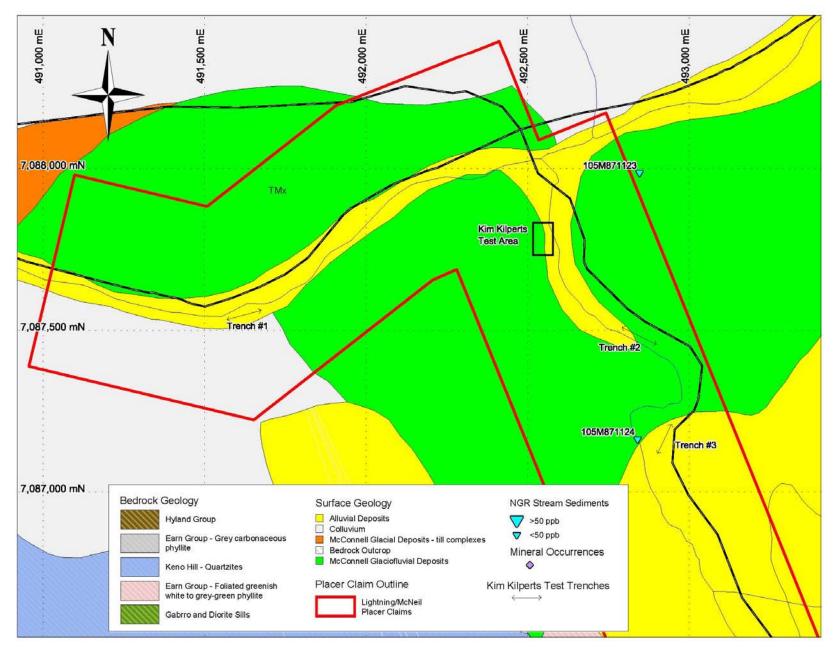


Figure 8. Location of Kim Klipperts test trenches and open cut test area



Figure 9: McNeil Creek looking upstream (SE) from north side of Lightning Creek.



Figure 10: Lightning Creek valley below McNeil.



Figure 11: McNeil Creek looking downstream to Lightning Creek with loader and pump in Kim Klipperts' test mining area.



Figure 12: Lightning Creek above McNeil looking downstream (southeast). Tree covered slopes across creek are part of the terminal moraine complex

## TARGET RATIONALE

Placer gold is widespread and easily panned from old workings, test pits and road cuts on lower McNeil and Lightning creeks from a variety of materials including glacial moraine, glaciofluvial, and post-glacial sediments. The moraine materials are gold bearing apparently being derived from pre-existing placers in McNeil creek and gold bearing veins in the Gustavus Range to the south. Lower McNeil was test mined by Kim Klippert and family from 1998-2001 resulting in 4 cuts from 25-55 feet deep. Gold values were said to be occur from top to bottom in material described as glacial moraine. In a 2012 e-mail Kim Klippert wrote "I had done a test when gold was \$257.00 an oz and recovery values were \$4.00 per vard average from the surface down to 55 ft depth (no bedrock encountered at this depth). I washed 5000-6000 yards in this test." Material of this grade would be of interest at current gold price around \$ US 1200 per ounce, and there are other types of placer targets on the claims that could potentially be of economic significance. Knowledge of the placer geology at the site is limited by poor exposure, lack of meaningful records from previous work and the dominant overprint of a large terminal moraine complex from the McNeil valley glacier (McConnell age) covering the area around the McNeil/Lightning confluence.

There are three distinctly different placer exploration Target Types (1-3) that could be present and need to be explored and evaluated using a variety of techniques

TYPE 1. These are deposits within the large moraine complex resulting from destruction of pre-existing placer deposits by the McNeil alpine/valley glacier. They could be primary and somewhat linear deposits in the moraine controlled by the direction of ice flow, or secondary deposits formed by reconcentration of gold from moraine by glaciofluvial processes. These deposits could be identified by a pattern of shallow excavator test pits given the high degree of degree of erosion of the terminal moraine by post –McConnell meltwater flows in Lightning and McNeil providing a slice through the moraine complex. Description and mapping of the materials encountered would aid in understanding the geology and careful sampling would give an indication of the gold content of the moraine and the economic potential for placer mining.

TYPE 2 These are placer deposits in Lightning and McNeil Creeks formed by concentration of gold in meltwater and seasonal channels since the end of the McConnell glaciation. They could be deep channels which cut all the way to bedrock or much shallower channels perched on bouldery, pavement or till layers which lined the bottoms of active channels from time to time. Both creeks have cut deeply into the moraine complex and Lightning probably reworked a lot more material along the McNeil terminus during a period when it was a significant meltwater channel draining the large cordilleran ice sheet which terminated just west of Lightning at the end of the McConnell. Lightning is therefore thought to be a better target for near surface placer deposits than McNeil but has received little if any recent exploration Klipperts test mining area was of this Type or possibly a combination of Type 1 and 2. Such deposits could be in or near present day channels and shallower targets could be explored by carefully sampling a pattern of excavator test pits. These old channels are full of boulders and a larger size excavator is needed to be effective. Sampling much below the water table is seldom worthwhile with an excavator because of caving and contamination.

TYPE 3. These are much older pre-McConnell placers formed in ancestral incised streams during the pre or post-Reid interglacial period that were not destroyed by the McConnell valley glacier because the ice over-rode the older deposits burying them under moraine and glaciofluvial materials. There is a very large area on Lower McNeil and Lightning Creek where Type 3 deposits could be preserved beneath the terminal moraine in an area where in glacial times conditions near the edge of the ice were more likely to have been depositional than erosive. A few km downstream on Lightning Bardusan Placers Ltd. (Claus Barchen) mined on Lightning above Thunder Gulch during the period 2005-10. The stratigraphy is described as boulder gravel 60-70 feet thick and the lower 20 feet of this material on bedrock was sluiced, and this material was not frozen. This deep pay may be an example of the older Type 3 deposit formed during pre-McConnell interglacial periods.

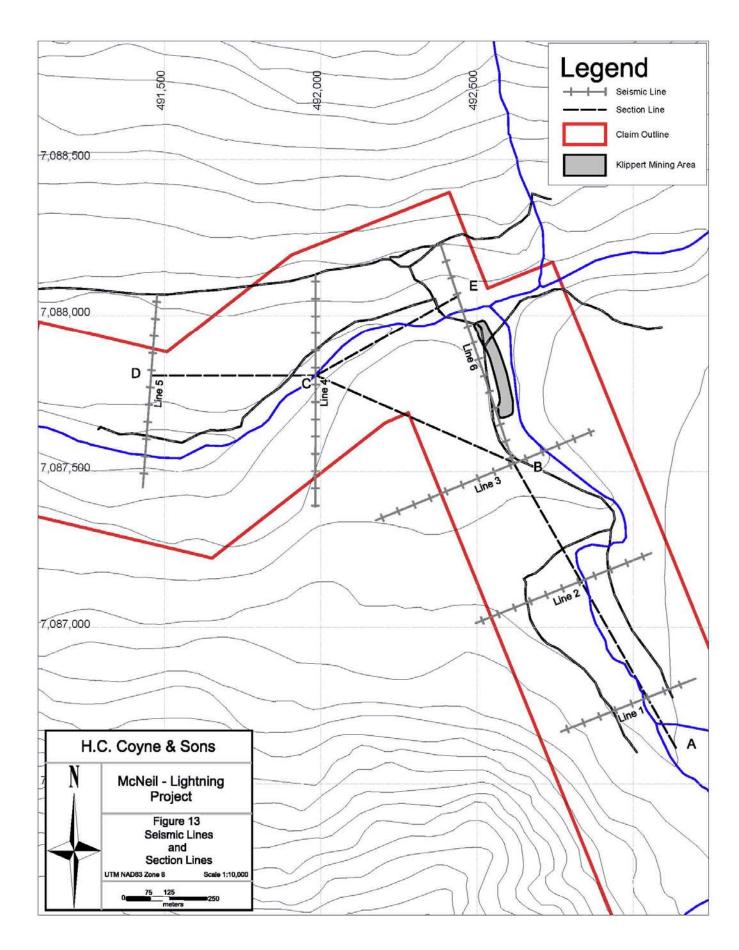
## 2017 EXPLORATION PROGRAM

The 2017 exploration program was focused on the McNeil Lightning confluence area and was planned to be executed in a specific sequence starting with line cutting followed by seismic surveys on Lines 1 - 6 in that order and then trenching and test pitting after the seismic work was complete (Figure 13). As it turned out the work could not be completed as planned on account of delays and other complications but in the end the seismic survey was complete and less than half of the proposed test pitting was done.

## ACTUAL PROGRAM

Recent changes in regulations about overnight storage of explosives threatened to derail the seismic work altogether because the required type of storage container was not available to Aurora Geophysics. Eventually, just in time, Alexco Resources was able to allow Aurora to use the powder magazine located at their minesite in Keno for overnight storage of powder and caps, and the program got off to a late start. Line cutting was completed by Coureur Des Bois of Whitehorse and the Aurora Crew arrived in Keno on August 23 and was ready to work onsite the next morning. Upon arrival they found the Lightning Creek crossing to be flooded by a large beaver dam and unpassable, and the road up McNeil Creek washed out and un-driveable, and the excavator was not expected onsite before the 26<sup>th</sup>. There was no choice but to start the seismic work on the accessible Lines 5 & 4, backwards from the plan and negating the original trenching/test pitting sequence. This was made worse when the 400 excavator broke a track in large boulders and could not be repaired until the PC 60 excavator arrived on the 31<sup>st</sup> and Gimlex lost the help of a much needed geologist/ technician because of a prior commitment. Initially the pc 400 excavator had to be walked in from Sigh Post road and it fixed all of the worst problem areas on the way in. Later the road was brushed derocked, and graded using a small dozer and an old loader that was onsite at McNeil (Figure 25) and the road was then suitable for hauling equipment on trucks.

The Seismic field work was completed on September 4<sup>th</sup> after13.5 days of field work '50 % more time than estimated for completion of the work. This was due in part to difficult terrain and deeper than expected overburden requiring re-dos to get better data, and time was lost transporting explosives to and from the site each day until a second pickup



arrived for the blaster. The extra time did result in higher costs for all components of the survey leaving less budget for trenching and test pits. The six seismic Lines are shown on Figure 13, and photos of some lines are on Figures 14 - 19. The seismic report and profiles for the 6 lines are in Appendix 1 & 2.

## **BETWEEN LINE (LONG) SECTIONS**

Sections A-B, B-C, C-D, C-E are shown in plan view on Figure 13 and Figures 20 - 22 and were made to examine the slope of the bedrock surface based on the seismic interpretation. The point B is at the intersection of Lines 3 & 6 where there is about 50m difference in the interpreted depth to bedrock, Line 3 being the deeper. The difference in the interpreted slopes may be seen on Figures 20 & 21. On Figures 21 & 22 the interpreted slope of bedrock under Lightning Creek is seen to be very gentle upstream on Sections C –B & C –E suggesting that the divide may have been further downstream in the past.

### SEISMIC LINE END TRENCHES

Deeper trenches were excavated at the east end of Line 2 and the north end of Line 6 attempting to find bedrock but neither succeeded. Line 2 trench ended in very hard rocky till at 6m while Line 6 trench was also in rocky till or colluvium to 7m but change to weathered looking slightly rusty clay decomposed colluvium at the bottom that may be paleo soil (Figures 32 - 33). After visiting the ends of other lines on foot it was deemed pointless to try to dig to bedrock given the nature of the slopes and the angular rocky surface material.

#### TEST PITS TO SAMPLE TERMINAL MORAINE COMPLEX

A series of 42 test pits up to 5m deep were excavated, sampled, weighed, and processed by hand through a small longtom to estimate grades in the moraine /till complex. These are shown on Figures 23 & 24 and the results are given in Table II. Most of the samples are approximately 1 cu ft in size equivalent to 2- 20l pails about <sup>3</sup>/<sub>4</sub> full and all rocks over 6 inches were excluded from the samples and the estimated % of rocks for each sample is given on Table II. The longtom concentrate from each was carefully panned to a small size and then finished on a Miller table where the individual gold grains are collected and then dried and weighed if there is enough gold to weigh or the colours counted if too small to weigh.Test pit Logs are in Appendix 4 and GPS data is in Appendix 5.

Of the 42 samples 20 contained weighable gold and 10 more had visible colours and 12 were blank. Only 2 of the 20 with weighable gold were similar in grade to that reported from Kim Klipperts test mining cut estimated to have averaged about 18 mg/cu ft and one of these (TP 37) was from the end wall of the last Klippert cut.. The second (TP15) at 44 mg was in theterminal moraine just above the elevation of the road between the 2 cabins from material that contained a lot of sand and stream washed pebbles. Most of the samples with weighable gold also had rocks with some degree of rounding and or sandy matrix and it was clear that some of the gravel was alluvial but it was not always easy to

# Table 2 : McNeil Sampling 2016 - TEST PITS

Sample	Au (mg)	Colours	Weight Kg	Pails	Depth Sample (m)	WxLxD	% Rock/ Boulder	Material
						HAND		
S1	6	3	55.4	2	1-2	SHOVEL	50	boulder diamict
						HAND		
S2	8	20	58.1	2	5	SHOVEL HAND	50	boulder diamict
<b>S</b> 3	2	4	56.3	2	1	SHOVEL	50	boulder diamict
			50.0		-	0110122		brown grey
S4		2 T	60.1	2	2	ROAD CUT	50	rocky colluvium
TP1			57.5	2	4	2X4X5	60+	rocky grey till
TP2		8 T	55	2	3-4	1.5X4X5	60+	rocky grey till
3		2	56.5	2	3	1.5X3X4	50+	very hard brownish grey till
4A		1 S 6 T	62	2	1.5-2.5	1.5X4X4	10	brown sandy gravel
4B			80	2	3-4	1.5X4X4	50+	hard rocky grey brown till
5		3 T	46	2	3-4	1.5X3X4	50+	dark grey rocky till
C		nla			N/C	22422	501	large slabby slide
6		n/s			N/S	2X4X3	50+	rock/colluvium sandy rocky
7		4 T	53	2	2-3	1X3X3	50+	grey till
8			50.5	2	2-3	1X3X3	50+	sandy rocky grey till
9			47.5	2	2-3	1X3X3	50+	grey rocky till
10	2	10 T	50	2	2-3	1X3X3	50+	grey rocky till
11			61	2	2	1X3X2.5	50+	grey rocky till
12	8	MANY	57	2	2	1X3X2.5	50+	grey sandy/gravel? Rocky till
13	4	MANY	65	2	2	1X3X2.5	50	grey sandy/gravel? Rocky till
14	2	1	47	2	2	1X3X2.5	50-	grey sandy/gravel rocky till
15	44	MANY	54.5	2	2	1X3X2.5	30	sandy/pebbly till? Colluvium?
16		3	51.5	2	2	1X3X2.5	30	sandy/pebbly till? Colluvium?
17		2	51.5	2	2	1X3X2.5	50	grey moraine/till complex
18			48	2	2	1X3X2.5	60+	grey rocky till

19			46.5	2	2	1X3X2.5	60+	grey rocky till
								grey till/alluvial
20	8		64.9	2	2	1X3X2.5	70+	complex
								brown sandy
21	10		51.7	2	2	1X3X2.5	30	gravel alluvium
								brown sandy
22	6		55.8	2	2	1X3X2.5	30	gravel alluvium
								colluvium from
								morain
23			52.6	2	2	1X3X2.5	50	Complex
								outwash aluvial
24		3 T	57.1	2	2	1X3X2.5	50	complex
								colluvium from
25		5 T	52.2	2	2	1X3X2.5	50	morain complex
26			48.5	2	2	1X3X2.5	50	older rocky till
27	4	3 S	46.3	2	2	1X3X2.5	50	older rocky till
								brown to grey
28		n/s	47.2	2	N/S	1.5X4X5	50	till wet sticky
								brown to grey
29	4	2 S+T	45.8	2	2	1.5X3X3	40	rocky till
								sticky to grey
								rocky
30	10.000	1 L 2 S+T	53.1	2	2	1.5X3X3	40	till?/aluvium
								rusty rocky
31	6	1 L 1 S+T	51.6	2	2	1.5X3X3	30	till?/gravel?
		. –						brown rocky
32	2	2 T	47.2	2	3.5	1.5X4X4	20	gravel
22	2	<u>а</u> т	52.4	2		4 51/21/2	20	brown rocky
33	2	2 T	52.4	2	2	1.5X3X3	30	gravel
34	2	2 T	57.6	2	2	1.5X3X3	20	brown rocky
54	2	21	57.0	Z	2	1.57572	20	gravel brown rocky
35			60.3	2	2	1.5X3X3	50+	till?/colluvium
			00.5	2	2	1.57,57,5	501	brown rocky
36		Т	56.2	2	2	1.5X3X3	50+	till?/colluvium
			50.2	2	2	1.5/(5/(5	50.	wet boulder
37	86	MANY S	211	7	2	2X4X3	50+	clay diamict
				-				boulder sandy
38	18	MANY S	196.7	7	2	2X4X3	50+	diamict
		Trench -						
		east end						
Seismic	N/S	line 2			N/S	2X5X6	60+	grey boulder till
		Trench -						
		North end						grey boulder
Seismic	N/S	Line 6			N/S	2X5X7	60+	till?/collumium?

T= TINY

S=SMALL L =

LARGER n/s= no

sample



Figure 14: Seismic Line #4: looking north from road: img 8040

Figure15: Seismic Line #4: Crossing Lightning creek looking south from road: img 8042





Figure 16: Seismic Line #5: Looking north from road: img 8038 Figure 17: Seismic Line #5: Looking south from road: img 8041

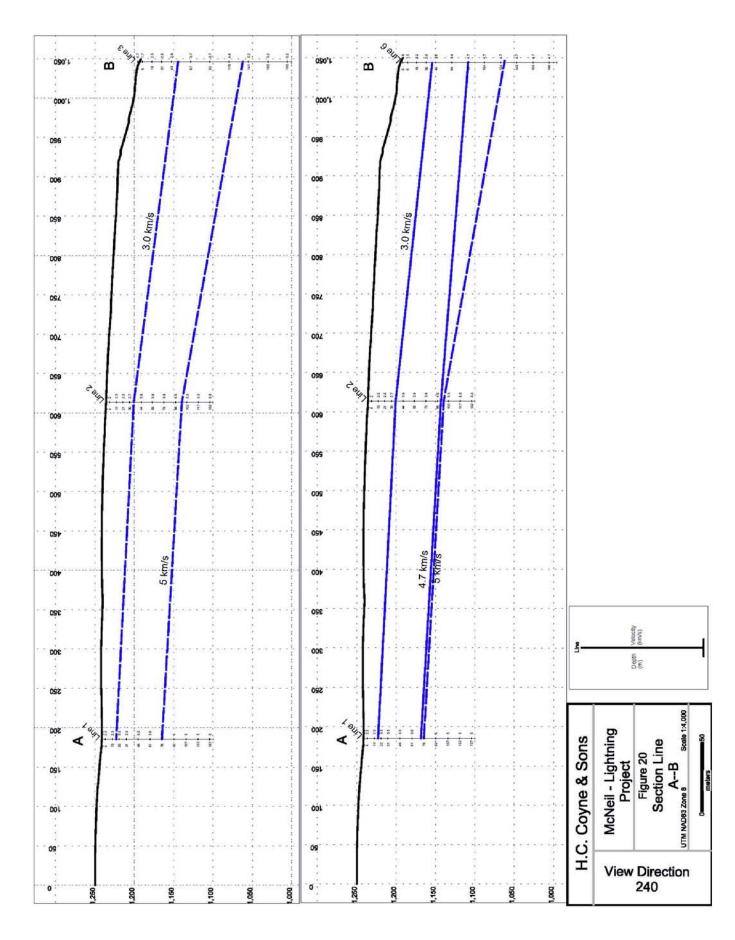


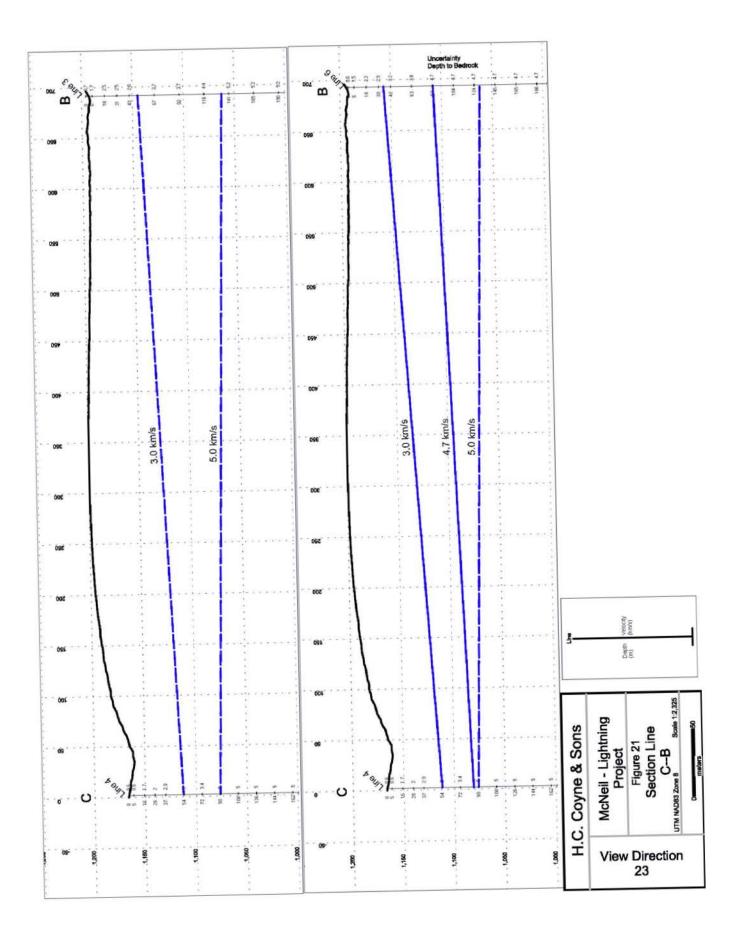


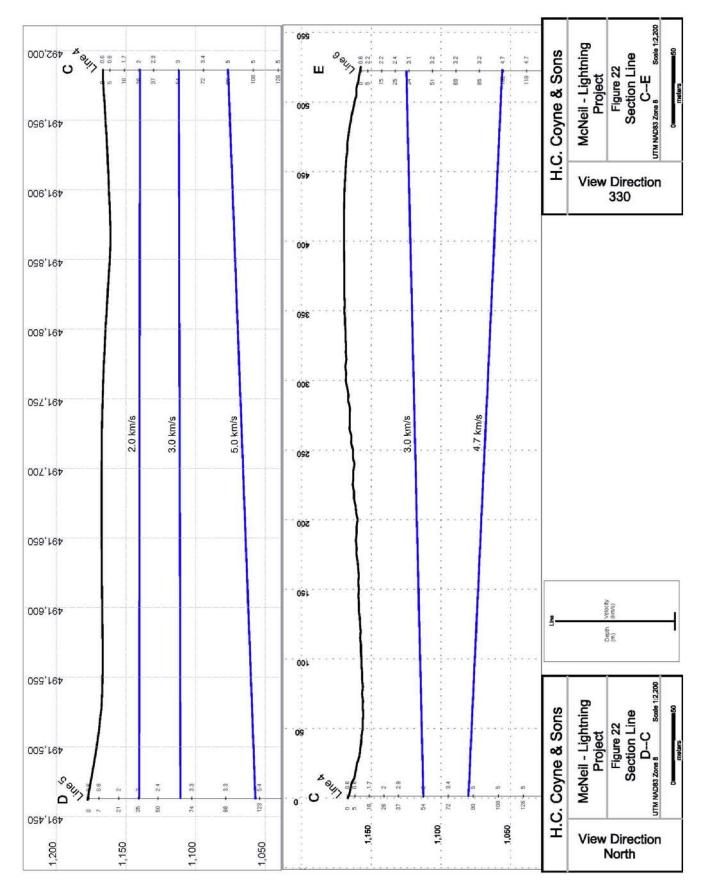
Figure 18: Line 6: Looking south to Lightning Crossing from Line 3: img 8054

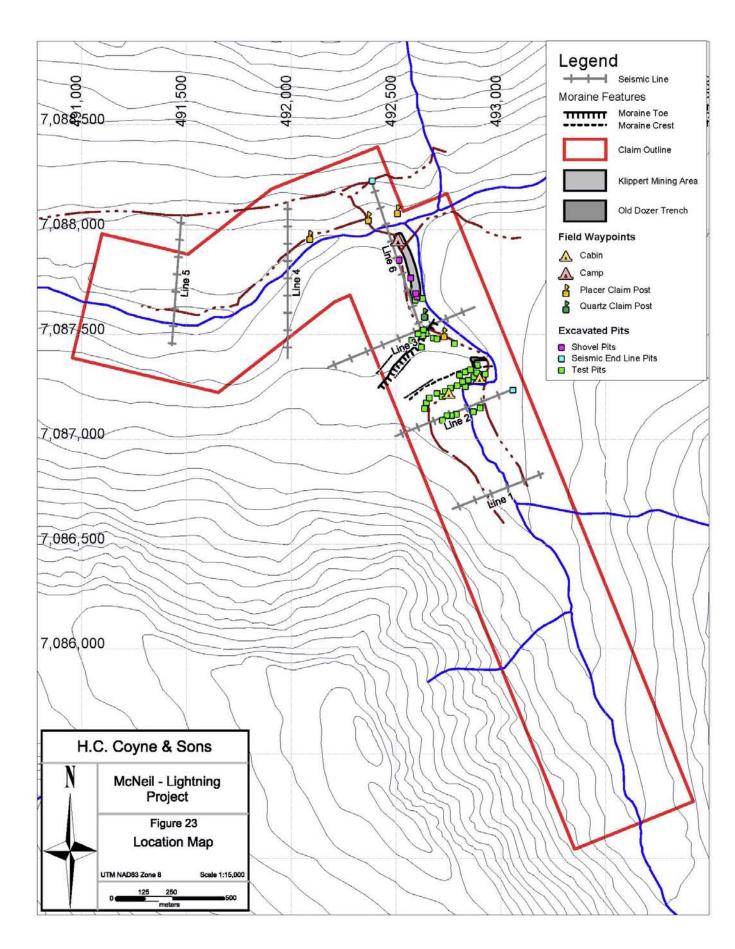
Figure 19: Line 6 crossing McNeil Creek Rd (on left) looking downstream (north) img8047

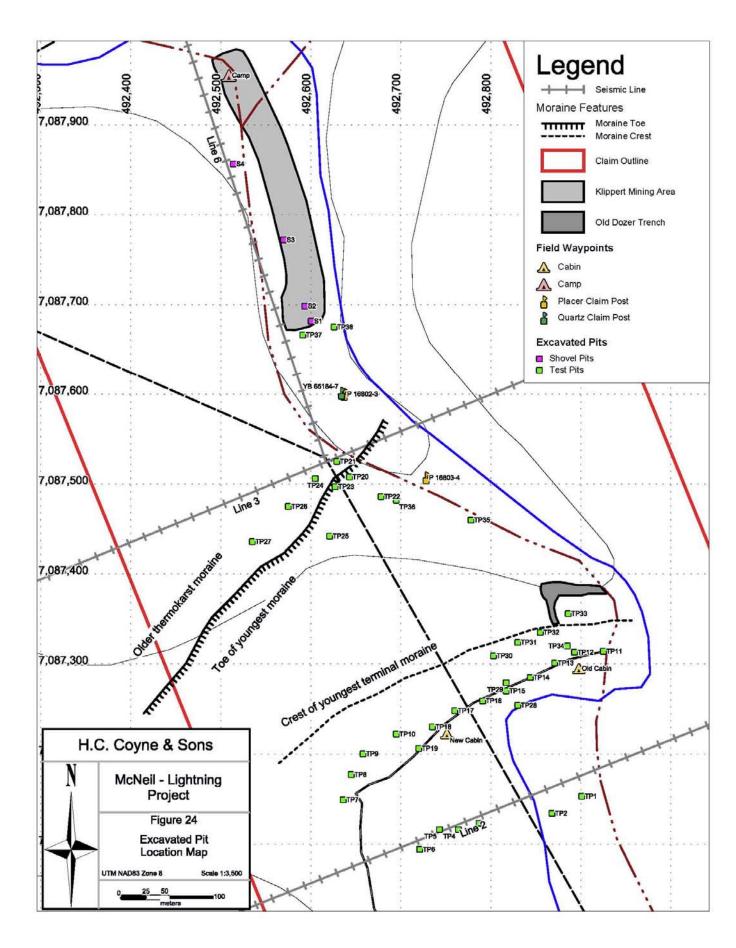












distinguish till from alluvial material. Samples from other pits adjacent to the 2 higher grade ones were much lower in grade suggesting that they are probably spot highs. The results suggest that there is not likely to be a mineable gold resource in the terminal moraine.

An old dozer trench shown on Figure 24 is on the ridge and hillside above the big bend on McNeil Creek near the old cabin and has quite a bit of sloughed gravelly material and looks interesting, but nearby samples were low. Claus Barchan, the miner downstream on Thunder Gulch told me that he was told that there was interesting gold near surface in the trench but it quickly dropped off with depth and warned me to be cautious about possible surface enrichment in the terminal moraine. We took note of this warning and collected all samples well below the surface layers.

Some photographs of the test pits have been included to illustrate the nature of the excavated materials. Figures 26 -28 (TP - 1) show very angular rocky dense grey till just off Line 2 near the centre of McNeil Valley. Figure 29 shows TP -32 till?/alluvium? with a washed sandy matrix and some rounded cobbles and pebbles and Figure 30 is a nearby old dozer trench also shown on Figure 24, with angular and rounded rocks just below the crest of the youngest terminal moraine. Test pit TP-27 shown on Figure 31 is thought to be part of an older thermokarst moraine/till complex underlying the youngest terminal moraine which forms the ridge in the back of the photo. The material is brown grading downward to grey rocky till with a few rounded and subrounded cobbles and pebbles. There is a noteable concentration of larger angular rocks in the surface layer in this area.

## **RELATED OBSERVATIONS AND SPECULATION**

It seemed apparent to me while walking the lines and digging test pits that the prominent terminal moraine above the cabins is the youngest major glacial artifact and is also limited in size and extent and a very mapable feature. On Figure24 there are 2 lines that I believe are the approximate positions of the crest and toe of that youngest terminal moraine complex and test pits TP 20, 22, 23, 25, 35,36 probably sampled the toe or upslope derived material from that youngest moraine. TP 21, 24, 26, 27 on the other side of the line appear to be part of an older thermokarst terrain that is likely related to an older phase of alpine glaciation in McNeil Gulch. Based on present topography there is a definite possibility that there was an older meltwater channel connecting the west side of McNeil Valley with the Klippert mining area but now partly buried by the younger terminal moraine.



Figure 25: Upper Lightning Road upgrading on claims. Derocking, brushing and grading to accommodate trucks. img 8069

Figure 26: Test Pit 1: Looking SE. Excavated Rocky Till. img 4094





Figure 27: TP-1 Looking SW, sample pile under excavator arm 4097 Figure 28: TP-1 Rocky Till at bottom of pit. img 4093





Figure 29: TP 32. img 8061

Figure 30: Older Dozer Trench on McNeil Terminal Moraine and Pc400 on TP 33. img.8062





Figure 31: TP27 looking south at backside of McNeil Terminal Moraine. img. 8048 Figure 32: Seimic Line 6 End pit. img 8067



Figure 33: Decomposed colluvium end of Seismic Line 6. img8064



### **DISCUSSION OF RESULTS**

Aurora's interpretation of the seismic data created a surprising picture of interesting although very deep depressions in the bedrocks surface underlying Lightning and McNeil Creeks. These depressions appear to be deeply buried but otherwise intact ancient stream channels that potentially could host significant placer gold concentrations. If so in order to be viable mining situations they would need to be of exceptional high grade to support higher exploration and unconventional deep mining costs because open pit placer mining might not be a feasible option. Target depth on bedrock is about 75m on the upper Line 1 on McNeil and depth to bedrock appears to increases downstream and on Lightning Creek.

One problem with the interpreted models is that there has been no bedrock found in outcrop or excavator trenches to correlate with the seismic data. The travel velocity used for interpretation of the bedrock surface (red line on profiles) is about 5 km/s, a value known to be consistent with typical values for quartzite.. There are however phyllite layers within the Keno Hill quartzite and the underlying Earn Group is predominately phyllite and does appear to project through the property based on regional mapping on nearby hillsides. Phyllites would be expected to be characterized by slower travel velocities around 4.5 km/s and would be near the blue/green transition area on the profiles. Use of the slower velocity to interpret bedrock depth would decrease depth by 10-20 m but would not otherwise significantly change the profiles , and the targets are still very deep.

Four layers have been interpreted in each of the profiles and marked with black lines. The top of the next layer above bedrock at about 3 km/s where the green transitions through yellow to orange on the profiles appears to be a surface characterized by numerous depressions that could be of interest. This feature could be an interglacial erosion surface ( pre or post Reid ) where placer gold accumulations might have formed in streams that occupied the depressions. These are shallower more conventional placer targets 10-15 m deep on McNeil Line 1 but deeper downstream and on Lightning.

An interesting 10-15 m deep target is indicated on Line 6 under Lightning Creek. This is a higher velocity panel about 100 m wide extending across the valley. It was in this general area in the mid 1980's that a fingernail sized nugget was recovered from a reverse circulation drill hole. Mel Zeiler, now a miner on lower Duncan, was at the drill site and actually saw the nugget come up and said that the drillers had just arrived from Alberta "oil patch" and were not very knowledgeable about placer drilling or sampling. They thought the hole was in bedrock at around 18 m contrasting with seismic interpreted depth of about 100 m.

At McNeil on Lines 1 & 2 narrow troughs A & B were identified at depths of 20 and 50 m near the west end of the profiles near the existing road. The shallow trench A on Line 1 would be easy to test should a drill be onsite.

#### RECOMMENDATIONS

The seismic results are intriguing and warrant validation by drill testing some of the shallower targets to determine depth to bedrock and rock type. Line 1 on McNeil has the shallowest targets and would be a good place to start, followed by Line 2 and then Line 6 on Lightning if acceptable drilling and sampling techniques have been developed.

Drilling through the hard rocky glacial overburden and obtaining meaningful samples of underlying gravels is a challenge which will probably be best achieved by some form of reverse circulation drilling utilizing a down the hole hammer. The exploration drill rig needs to be powerfull enough to drill to depths of 150 m while light enough to be mounted on a tracked carrier capable of travel on the bouldery sometimes steep terrain. It needs to be able to move from site to site without the need for building elaborate access roads and drill sites and requiring trucks to haul fill. If and when results warrant a heavier truck mounted rig such as a Foremost Dual Rotary rig could be used to obtain larger and better samples.

Respectfully submitted January 30, 2017.

James S Christie, Ph.D, Geologist

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#### **Statement of Qualifications**

I, James Stanley Christie, of Dawson City, in Yukon Territory, Canada

Hereby certify:

- 1. That my address is P.O. Box 660, Dawson City, YT, Y0B 1G0;
- 2. That I am a graduate of the University of British Columbia:
  - a) Ph.D., Geology. 1973,
  - b) B.Sc., Honors, Geology, 1965;
- 3. That I have been practicing my profession in geology, placer mining and mining exploration continuously since 1965 and since 1984 in the Yukon;
- 4. That I have over 20 years experience with placer exploration, evaluation of placer deposits and placer mining;
- 5. That this proposal is based on my knowledge of the district and the applicable techniques for placer exploration.

Dated this 30<sup>th</sup> day of January, 2017 at Vancouver, B.C.,

James Christie

Item	No. items	Rate	Unit	No. Units	Cost
Field Crew					
Project Manager / Senior Geologist - J.S Christie, Ph.D.	1	\$ 500.0	day	28	\$14,000.0
Alex Gunn, Technician /FA 3	1	\$ 300.0	day	15	\$4,500.0
Dagmar Christie, Technician	2	\$ 350.0	day	2	\$700.0
WCB - 5% Estimate					\$925.0
Equipment					
Vehicles - Crew and equipment -4wd ccab	2	\$ 50.0	day	28	\$2,800.0
Service truck with tools and welder	1	\$ 100.0		28	\$2,800.0
Horse trailer + Equipment Trailer	1	\$ 64.0		14	\$896.0
Flat bed trailer	1	\$ 40.0		28	\$1,120.0
12 kVa generator	1	\$ 40.0	day	28	\$1,120.0
ATV	1	\$ 40.0		28	\$1,120.0
Sampling equipment/long ton/ miller table etc.	1	\$ 50.0		28	\$1,400.0
Heavy equipment and Support					
Pc400 Excavator	1	\$ 300.0	pre hr.	30	\$9,000.0
Pc 60 Excavator	1	\$ 120.0	pre hr.	37	\$4,440.0
Bombardier Carrier - sample and supply transport	1	\$ 75.0	day	28	\$2,100.0
Hauling - Kenworth T800 and Lowboy for PC400	1	\$ 210.0	hour	32	\$6,720.0
Courer De Bois (line cutters- 2 invoices)					\$10,997.8
Seismic Survey (Aurora Geoscience))					\$46,693.5
Keno Hotel (for Aurora Geoscience)					\$5,116.0
Total camp person days					
Daily Field Expenses	1	\$ 100.0	day	43	\$4,300.0
Report					
GIS Support (James Thom)					\$600.0
Preparation and writing					\$2,000.0
Total					\$120,748.3

# Statement of Expenditures Lightning Creek Placer Exploration Program 2016