Arctic Geophysics Inc.

Geophysical Surveys • Prospecting • Consulting

BC Geological Survey
Assessment Report
34522

Geophysical Survey with 2D Resistivity
Pine Creek, British Columbia

ON PLACER TENURES 1012181 and 1020918

ATLIN MINING DIVISON

MAPSHEET 104N12

Latitude 59° 35' 26''N, Longitude 133° 35' 43''W

WORK PERFORMED ON October 16th and October 18th – 19th 2013

OWNER: CASAVANT, TREVOR ORIN VICTOR – 5214 45 AVE; UEGREIULLE, AB; T9C 1A2

CONSULTANT: ARCTIC GEOPHYSICS INC. – BOX 747 DAWSON CITY YT, Y0B 1G0

AUTHORS: PHILIPP MOLL, STEFAN OSTERMAIER

DATE SUBMITTED: November 15th 2013

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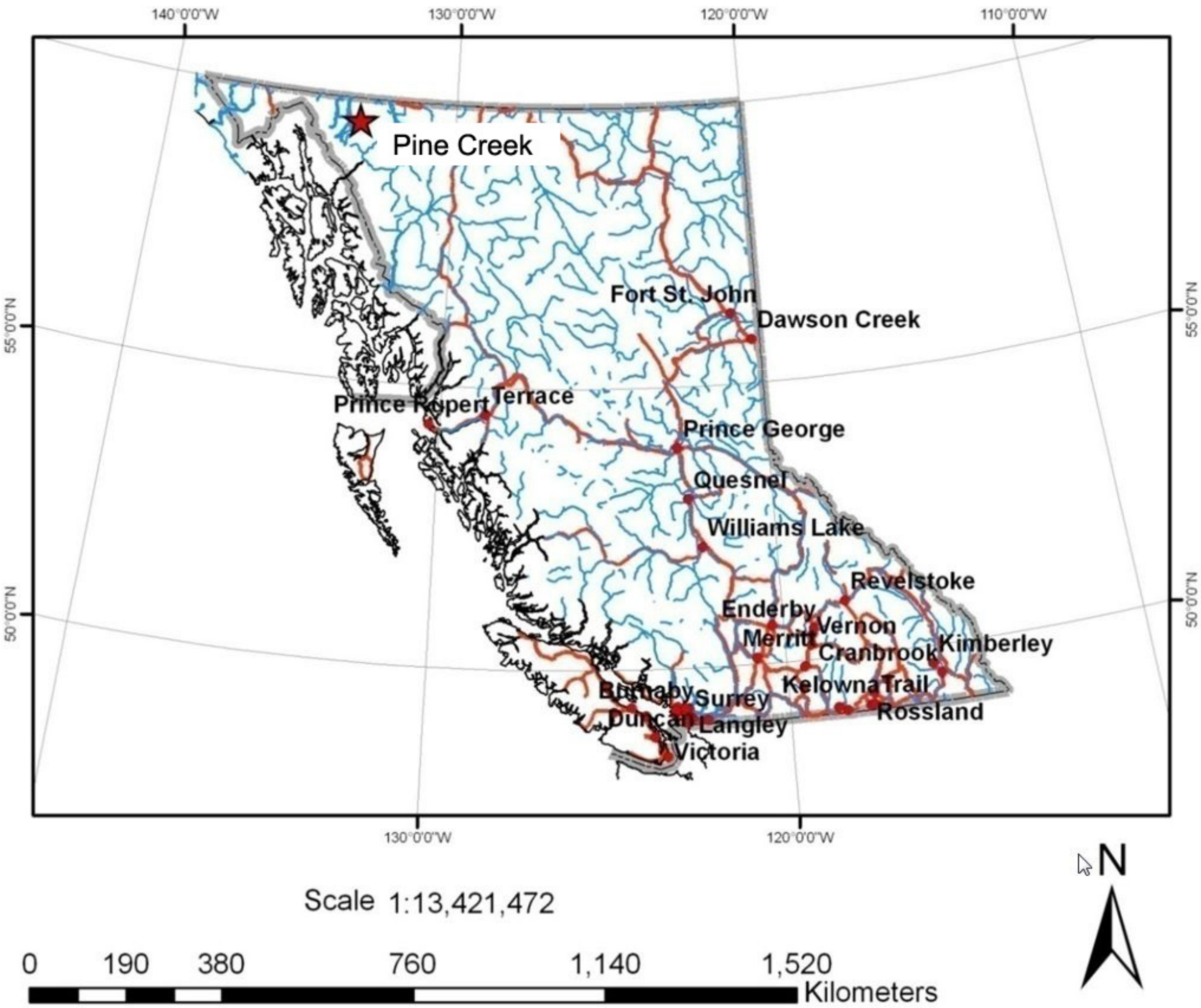
1. Introduction

The Atlin gold rush was an off shoot of the 1898 Klondike gold rush. Gold mining activities have continued in Atlin to the present day; and although some of the traditional creeks have been thoroughly mined out there are still potentially rich placer areas to be discovered.



The geology of the Atlin area shows extensive signs of glaciation. At Pine Creek (Atlin BC) commercial placer gold deposits are potentially sitting in glaciofluvial gravels, glaciolacustrine sediments, till on top of bedrock, and pre-glacial gravels which have been preserved.

This geophysical survey, using 2D Resistivity, was done on the placer tenures listed in the table below on Pine Creek (Latitude 59° 35’ 26’’N, Longitude 133° 35’ 43’’W) for CASAVANT, TREVOR ORIN VICTOR.

Tenure Number	Claim Name	Owner
1012181	UTOPIA	CASAVANT, TREVOR ORIN VICTOR 100.0%
1020918	-	CASAVANT, TREVOR ORIN VICTOR 100.0%

The claims are 6km east of Atlin and were accessed via the Surprise Lake Road.

A total of 945m of measuring line was produced during the survey.

The survey was focussed on measuring and interpreting following **subsurface characteristics**:

1. Depth and topography of bedrock
   - Paleochannels
2. Sedimentary stratification
3. Groundwater table
4. Mining/prospecting history

This geophysical survey using Resistivity is delivering subsurface information as the foundation for a systematic advanced prospection with technological means such as trenching, drilling, or shafting.

2. Crew

Survey Leader: Stefan Ostermaier
Assistance in the field: David Jennings
Support, Documentation: Philipp Moll, Stefan Ostermaier

3. Fieldwork - Schedule

Fieldwork: October 16th and October 18th – 19th 2013

4. Geophysical Method

Resistivity is not a time domain geophysical method such as Ground Penetrating Radar or Seismic. Resistivity measures a material property. In the Resistivity model the different underground zones are material-dependently differentiated according to their electrical conductivity. Thus, Resistivity promises good chances in respect of measuring the kind and character of the subsurface materials as well as the groundwater distribution, which would be of interest for placer mining. The equipment used (see below) allows for measuring of layer interfaces in depths from 1m to 100m by varying the electrode spacing. – Therefore, this prospecting concept is based on the use of 2D Resistivity.

Figure: 2D Resistivity measurement, Stefan Ostermaier, Arctic Geophysics Inc., Yukon 2009

5. Use of Geophysical Methods

5.1. Instrumentation

For this survey a lightweight, custom-built 2D RESISTIVITY and INDUCED POLARIZATION (IP) imaging system with rapid data acquisition was used. The system includes:

- "4 POINT LIGHT" EARTH RESISTIVITY METER[1]
- 64 ELECTRODE CONTROL MODULES[2]
- 64 STAINLESS STEEL ELECTRODES[3]
  315m MULTICORE CABLE: CONNECTOR SPACING: 5m[4]

[1] Constructed and produced by LGM (Germany)
[2] Ditto
[3] Constructed and produced by GEOANALYSIS.DE (Germany)
[4] Ditto

This system weighs approximately 120 kg which is about one third of regular standard equipment. It can be run with a 12V lead battery. The equipment facilitates high mobility and rapid data acquisition with a small crew.

5.2. Data Acquisition

Resistivity

The data acquisition is carried out by the automatic activation of 4-point-electrodes. Thus several thousand measurements are taken, one every 1-2 seconds. The AC transmitter current of 0.26 to 30 Hz is amplified by the electrode control modules, up to a maximum of 100mA and 400V peak to peak. The voltage measured at the receiver electrodes (M, N) is also amplified. In this geoelectrical survey the **Schlumberger-array** were used. The Schlumberger array is appropriate to image horizontal layers as is needed for placer prospecting.

The 2D Resistivity imaging system, used for this survey, allows measurements with a depth of up to 55m. With a depth to bedrock of more than 6m, an electrode spacing of 5m can be used for placer surveys. This allows the measuring of large profile lengths in short time with a horizontal measuring resolution of 2.5m. This quantification has proven itself to be reliable in the determination of the bedrock topography and sedimentary arrangement for placer investigation at the most environmental conditions.

5.3. Processing

Resistivity

The measured Resistivity data were processed with the **RES2DINV** inversion program[5].

The Wenner-Schlumberger array, used in this geoelectrical survey, is appropriate to measure subsurface conditions predominantly showing a horizontal zoning of the ground materials.

5.4. Interpretation

In this survey the interpretation of the Resistivity models is high likely since the data quality is very high and the data structure of the models is most plausible!
The resistivity profile is the basic source for the interpretation of placer-related subsurface aspects of overburden and bedrock.

[5] Produced by GEOTOMO SOFTWARE (Malaysia)

6. Mining History of Pine Creek[6]

The first discovery of gold in the camp was in surface gravel in Pine Creek in 1898 near what became the settlement of Discovery. By the next season 640 miners were working the surface gravels of the valley bottom and farther upstream at Gold Run were mining underground, and the total recorded production was 13,828 ounces which is more than was produced in any other season. Many of the miners left at the end of the 1899 season. Ditches to bring water for hydraulic mining were dug in 1900 and were put into use in 1902. A dredge was built at Gold Run in 1903 and was operated in 1904 and part of 1905, but could not successfully handle boulders encountered.

A dam was built at the mouth of Surprise Lake in 1905 to increase its storage capacity and provide more water for hydraulicking. A steam shovel was operated in 1906 and 1907 to handle gravel east of Discovery, and then in 1908 and major hydraulic operation was started. This continued until 1922, and at the end of that period the main pit had almost the extent it has now.

After suspension of the large scale hydraulic operation in most years only a few underground operations and some sniping was carried on and production generally was much less. A hydraulic operation at the southeast limit of the pit was successful in 1932-1935 and another along the southern limit was successful in 1938 and 1939. In 1940 a company was formed that used a dragline and bulldozers to move gravel along the northern part of the pit to a mobile washing plant. This operation was continued until 1942. Since then production has been low.

A company was formed in 1925 to hydraulic gravel west of the main hydraulic cut and presumed to be in an old channel of Pine Creek. The operation was continued until 1930 and in that period about two million yards of gravel was handled and a 1,500 foot length of bedrock was cleaned but no pay gravel was found.

The grade of bedrock in parts of the pit was too low for sluicing efficiently, and during operations it was necessary to cut ditches into bedrock and sluices were laid in these. Much of the bedrock is soft decomposed serpentinized rock and easily eroded. Intruding this are hard

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[6] Black, J. M.: Report in the Atlin Placer Camp, 1953

dark green dykes and these project as ribs above the general rock surface. Preglacial gravel occurs or did occur in some areas, but much of it has been worked [...]. Yellow gravel is exposed in the banks of the pit and continues for an unknown distance north and south of the pit. Some of it has been drift-mined but the remaining gravel is not being worked. East and west of the main area except at Gold Run till rests on bedrock, some of which is glaciated and much of the remainder presumably is. Parts of Gold Run have been drift-mined but this section has not been hydraulicked and some sections presumably are of economic interest.

7. General Geology[7]

The survey area at Pine Creek is located in the Cache Creek Terrain west of Surprise Lake.

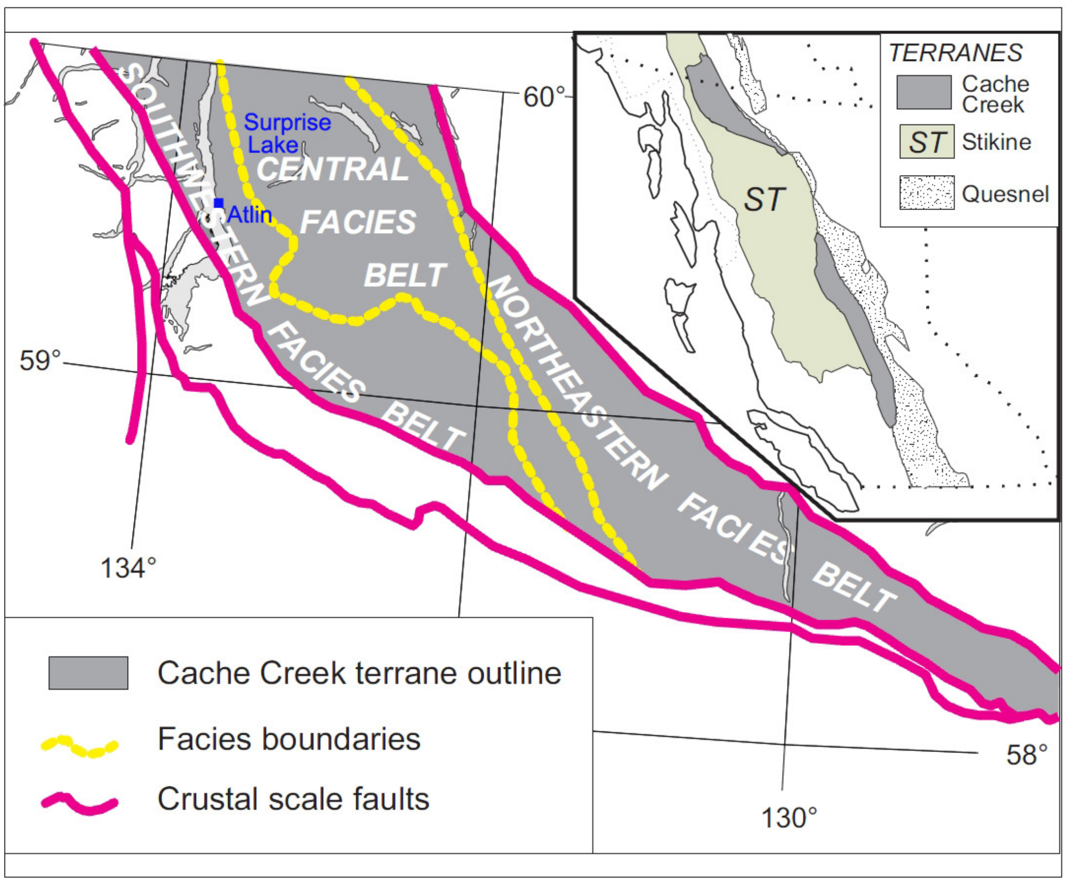

Figure: Cache Creek Terrain[8]

[7] W. Gruenwald, B. Sc.: Geological, Geochemical and Geophysical Report on the Eagle, Margarita and Butterfly Claims, Atlin Mining Division, BC, 1984
Black, J. M.: Report in the Atlin Placer Camp, 1953
Asg, C. H.: Origin and Tectonic Setting of Rocks in the Atlin Area, BC (NTS104N), Ophiolitic, Ultramafic and Related, Geological Survey Branch, Bulletin 94, 1994
[8] British Columbia Geological Survey Branch, Bulletin 105v25C05, Chapter 5

7.1. Bedrock

During the upper Paleozoic (Permo-carboniferous 360 - 250 million years ago) common components of the contemporary Cache Creek bedrock complex were created: Quarzite, argillite, greenstone[9], and marble.

In the Mesozoic (250 - 65 million years ago) numerous irregular bodies of ultrabasic rocks have intruded into host rock dominated by the above mentioned rock types (Atlin Intrusions). The majority of these bodies were altered to masses of quartz-carbonate with variable amounts of greenish nickel-chromium micas.

During the Jurassic period (200 - 145 million years ago) granitic intrusions occurred in the Cache Creek area: for example the granodiorite body at Mt. Carter north of Atlin, and the alaskite[10] quartz monzonite masses of the Surprise Lake Batholith east of Atlin.

The youngest rocks mapped in the Atlin area are the olivine basalt flows and scoria near the headwaters of Volcanic and Ruby Creeks.

Today the host rocks for the above mentioned intrusions are the sedimentary, metamorphic, and volcanic rocks of the Cache Creek Group seen in the Bedrock Geology Map below.

Lode gold occurrences, which are thought to be the source of the Atlin placer gold deposits, are found in quartz veins, veinlets and/or stockworks associated with structural features such as faults or shear zones within, along, or near intrusive bodies.

[9] Term for green schist including chlorite, actinolite, epidote
[10] American term for alcali feldspare granite

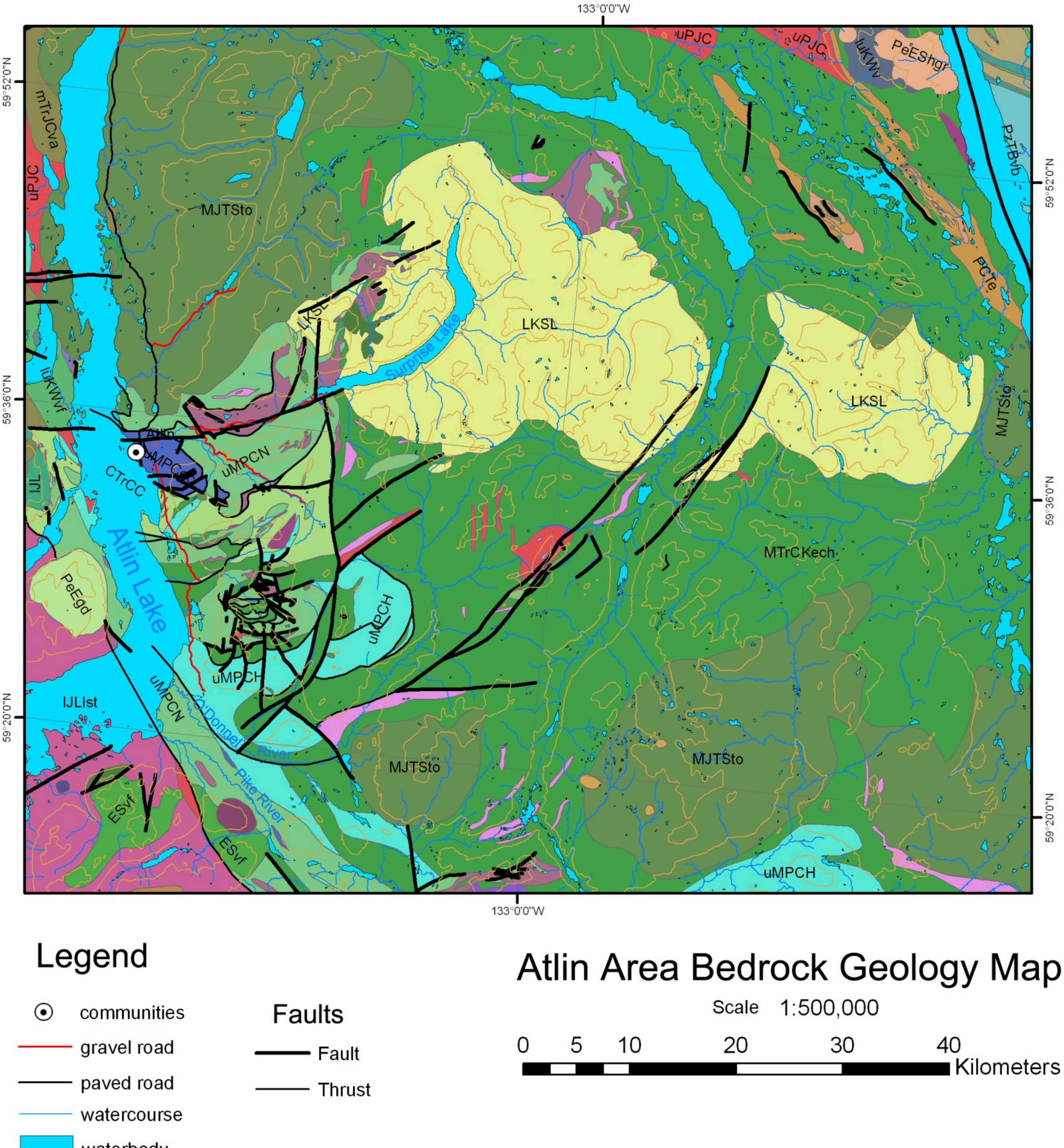

Figure: Bedrock Geology Map – Atlin Area[11]

[11] Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NO8 Northwest B.C., B.C. Ministry of Energy and Mines, Geofile, 2005-8, scale 1:250,000

Bedrock Geology

STRAT_UNIT

- CTrCC - Paleozoic to Mesozoic - Cache Creek Complex undivided sedimentary rocks
- DCog - Paleozoic - Unnamed orthogneiss metamorphic rocks
- ESv - Cenozoic - Sloko Group undivided volcanic rocks
- ESvf - Cenozoic - Sloko Group rhyolite, felsic volcanic rocks
- ESvl - Cenozoic - Sloko Group coarse volcaniclastic and pyroclastic volcanic rocks
- LKSL - Mesozoic - Surprise Lake Plutonic Suite granite, alkali feldspar granite intrusive rocks
- LKWfp - Mesozoic - Windy Table Complex feldspar porphyritic intrusive rocks
- LMPCN - Paleozoic - Cache Creek Complex - Nakina Formation gabbroic to dioritic intrusive rocks
- MJTSdr - Mesozoic - Three Sisters Plutonic Suite dioritic intrusive rocks
- MJTSto - Mesozoic - Three Sisters Plutonic Suite tonalite intrusive rocks
- MTrCKech - Paleozoic to Mesozoic - Cache Creek Complex - Kedahda Formation chert, siliceous argillite, siliciclastic rocks
- MTrCKelm - Paleozoic to Mesozoic - Cache Creek Complex - Kedahda Formation limestone, marble, calcareous sedimentary rocks
- MiPiTvk - Cenozoic - Tuya Formation alkaline volcanic rocks
- PCFv - Paleozoic - Cache Creek Complex - French Range Formation undivided volcanic rocks
- PCTe - Paleozoic - Cache Creek Complex - Teslin Formation limestone, marble, calcareous sedimentary rocks
- PeEShgr - Cenozoic - Sloko-Hyder Plutonic Suite granite, alkali feldspar granite intrusive rocks
- PeEShqd - Cenozoic - Sloko-Hyder Plutonic Suite quartz dioritic intrusive rocks
- PeEgd - Cenozoic - Unnamed granodioritic intrusive rocks
- PzTBlm - Paleozoic - Big Salmon Complex limestone, marble, calcareous sedimentary rocks
- PzTBqz - Paleozoic - Big Salmon Complex quartzite, quartz arenite sedimentary rocks
- PzTBs - Paleozoic - Big Salmon Complex undivided sedimentary rocks
- PzTBvb - Paleozoic - Big Salmon Complex basaltic volcanic rocks
- PzTBvd - Paleozoic - Big Salmon Complex dacitic volcanic rocks
- QM - Cenozoic - Mount Edziza Complex alkaline volcanic rocks
- Qs - Cenozoic - Unnamed undivided sedimentary rocks
- Qvb - Cenozoic - Unnamed basaltic volcanic rocks
- lJL - Mesozoic - Laberge Group undivided sedimentary rocks
- lJLIst - Mesozoic - Laberge Group - Inklin Formation argillite, greywacke, wacke, conglomerate turbidites
- luKWcg - Mesozoic - Windy Table Complex conglomerate, coarse clastic sedimentary rocks
- luKWv - Mesozoic - Windy Table Complex undivided volcanic rocks
- luKWvf - Mesozoic - Windy Table Complex rhyolite, felsic volcanic rocks
- mTrJCcg - Mesozoic - Cache Creek Complex conglomerate, coarse clastic sedimentary rocks
- mTrJCst - Mesozoic - Cache Creek Complex argillite, greywacke, wacke, conglomerate turbidites
- mTrJCva - Mesozoic - Cache Creek Complex andesitic volcanic rocks
- uMPCH - Paleozoic - Cache Creek Complex - Horsefeed Formation limestone, marble, calcareous sedimentary rocks
- uMPCN - Paleozoic - Cache Creek Complex - Nakina Formation basaltic volcanic rocks
- uMPCec - Paleozoic - Cache Creek Complex eclogite/mantle tectonite
- uMPCum - Paleozoic - Cache Creek Complex ultramafic rocks
- uPJC - Paleozoic to Mesozoic - Cache Creek Complex mudstone/laminite fine clastic sedimentary rocks

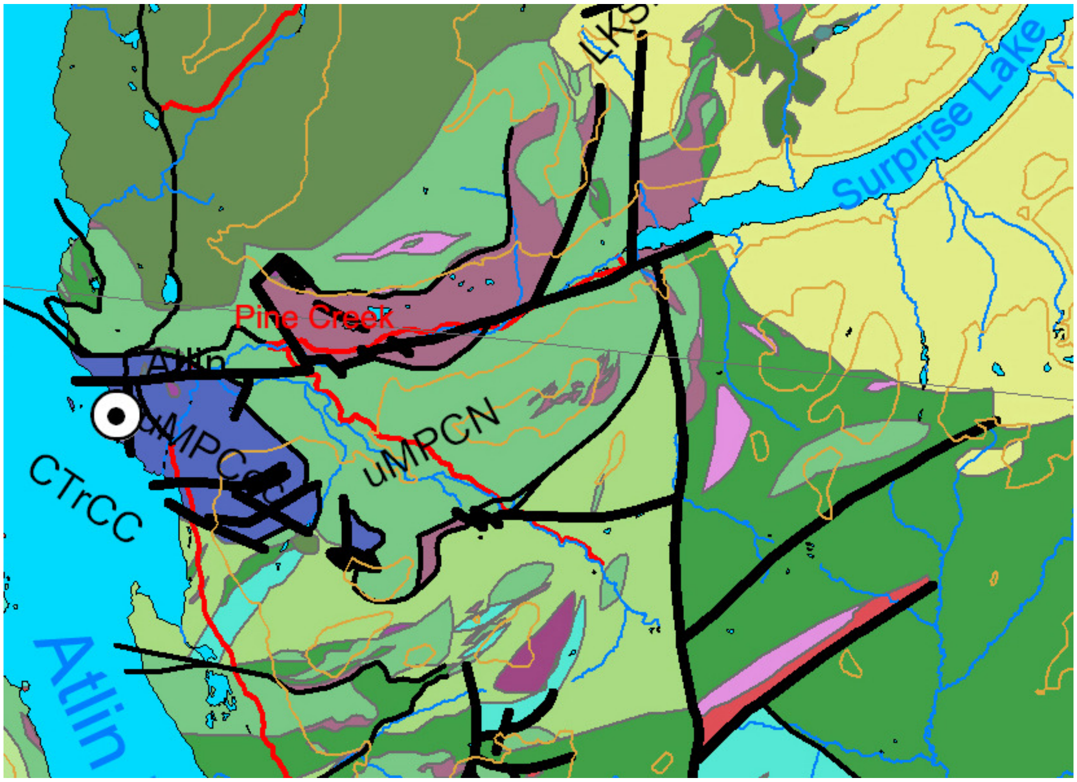

Figure: Bedrock Geology Map – Atlin Area – Pine Creek[12]

7.2. Physiography, Glaciation, Placer Deposits at Pine Creek[13]

As Atlin glacier thickened and advanced a lobe or tongue from it moved up Pine Valley, the lowest outlet to the east. In an ice marginal lake east of the advancing lobe detritus was deposited and then, as the lake advanced, was dispersed and the valley bottom was glaciated. Bedrock in a hydraulic cut south of Halfway is glaciated. The surface of the bedrock slopes indicating that possibly the old channel of Pine Creek at this point is south of the hydraulic cut.

Bedrock near the west limits of a large hydraulic cut on the central part of Pine Valley has also been glaciated. This suggests that most of the floor of the valley west of the cut is probably glaciated and

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[12] Massey, N.W.D., MacIntyre, D.G., Desjardins, P.J. and Cooney, R.T., 2005: Digital Geology Map of British Columbia: Tile NO8 Northwest B.C., B.C. Ministry of Energy and Mines, Geofile, 2005-8, scale 1:250,000

[13] Black, J. M.: Report in the Atlin Placer Camp, 1953

Asg, C. H.: Origin and Tectonic Setting of Rocks in the Atlin Area, BC (NTS104N), Ophiolitic, Ultramafic and Related, Geological Survey Branch, Bulletin 94, 1994 that any placer deposits on it have been dispersed. However, the bedrock of the hydraulic cut has not been glaciated and the writer believes that because of the great load of detritus picked up to the west the erosive power of the lake was decreased and it did not erode to bedrock but moved over pre-glacial gravels. These gravels in the western part of the cut are only a few feet thick but towards the east become as much as 40 feet thick.

This difference in thickness indicates that the ice eroded less deeply as it moved eastward. Along this section of the valley the glacier straightened and smoothed the slope of Munroe Mountain. Probably it dammed Spruce Creek. The area in which there are undisturbed gravel deposits extends east of the hydraulic cut for an unknown but comparatively short distance and to the east bedrock is glaciated and till rests on it. The limit of unglaciated bedrock is not known. […] The reason that the glacier here eroded to bedrock east of Discovery is attributed to an influx of ice from Spruce Creek Valley, which could enter Pine Valley through a pass on the northwest slope of Spruce Mountain. Movement of ice on this slope apparently straightened and steepened the slope of Spruce Mountain.

One other section of Tertiary gravel deposits has been found in Pine Valley east of the main section. It is about at the point where a lobe of ice from Spruce Creek presumable flowed into the valley and occurs where a ridge of rock on the southern part of an old rim protected the channel from glaciation by a glacier moving northeastwards. This section, known as Gold Run, is covered with about 30 feet of gravel and till.

Pine glacier as it moved up the valley, straightened the walls and made the valley more nearly U-shaped. Probably a glacier flowed down Otter Creek valley to join it and thereby increased its effectiveness as an erosive agent and it eroded more deeply to form the basin occupied by Surprise Lake.

As the glacier moved through the part of Pine Valley now occupied by the lake, it probably glaciated the lower parts of the valleys of the tributary streams and dispersed gravel deposits and dammed the streams causing them to form ice marginal lakes. At the maximum extent of the ice, glaciers probably advanced down these tributary valleys and increased the erosive power of the main glacier. The valley towards the northeast is narrower , and here where the glacier was constricted the effects of glaciation are most marked.

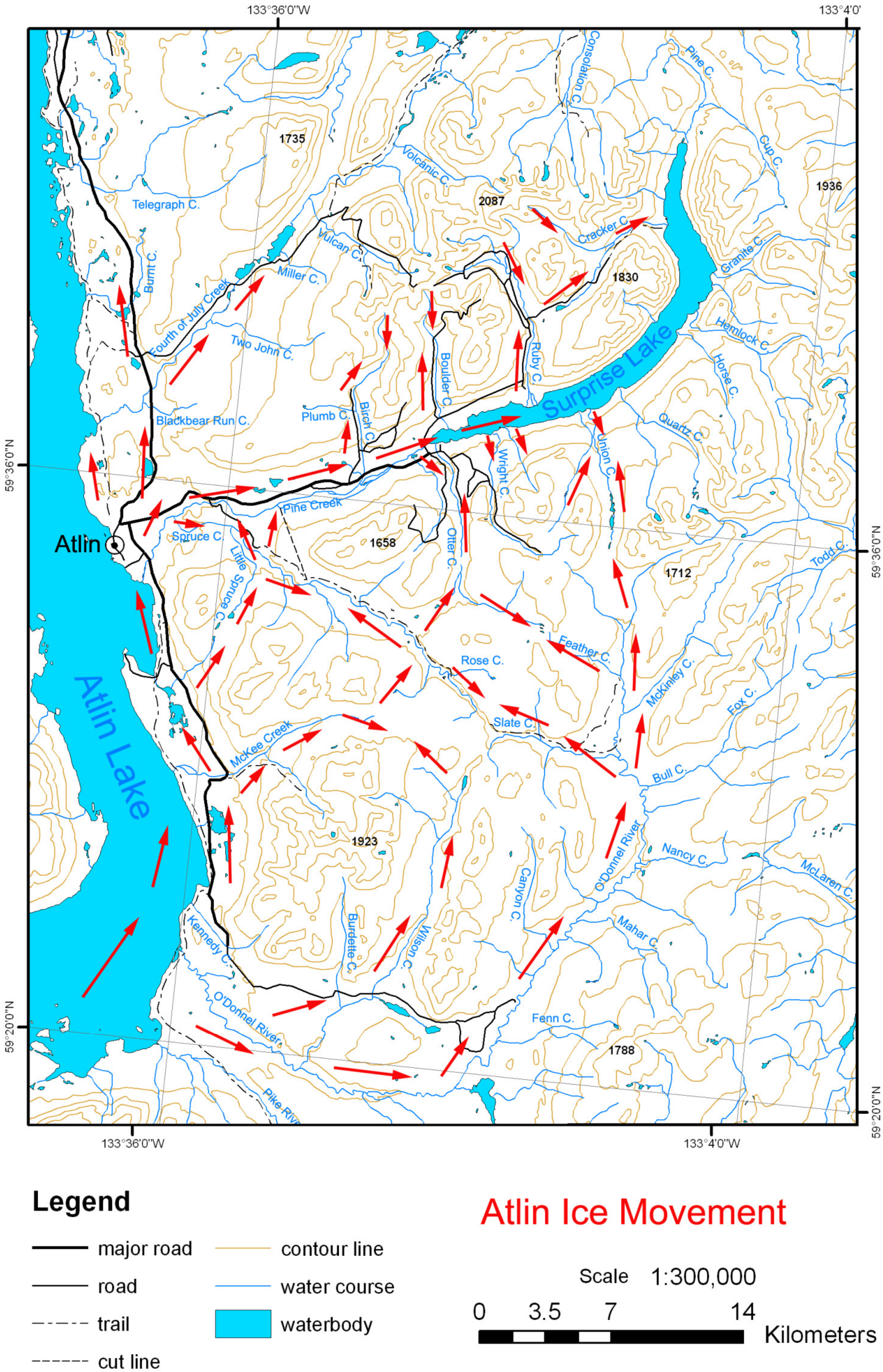
The valley occupied by a main tributary of Cracker Creek from the southwest is glaciated and U-shaped but it does not head in high ground where ice could have accumulated and therefore ice must have moved into it. From the configuration of the ground it appears probably that a lobe from Pine glacier moved up Ruby Valley and through the valley tributary to Cracker into Cracker Valley.
With continued expansion the glacier in Pine Valley thickened and glaciated the upper parts of the valley slopes and subsidiary lobes moved up the valleys of tributary streams. Lobes in the tributary streams also widened and the entire area may have been covered for a comparatively short time by ice.

When wastage of ice exceeded accumulation much till was deposited and then Pine Creek, swollen by meltwater, started to cut through the till and removed much of it from the valley. In some parts of the valley there is more than 70 feet of overburden, of which much is till but over considerable areas the depth of overburden is much less and in places bedrock is exposed. At Gold Run there is about 32 feet of overburden, of which eight feet is till; in the vicinity of the main hydraulic cut, till was largely removed and Tertiary gravels were exposed and some were removed. Some sections of the new course nearly coincided with the old, as at Discovery. Other sections of the new channel are incised in a rim of the old channel and have formed rock canyons. A narrow canyon west of Discovery and north of the present course, suggests that Pine Creek for a time was diverted through it and probably at that time flowed into Trend Gulch and, on into Fourth of July Creek.

A terrace of stratified sands and gravels more than 50 feet thick extends for about two miles across the valley, at an altitude of 2,500 feet. The upper beds dip gently downstream but the lower beds are covered with debris from above and their attitude is now known. The beds probably formed in a lake dammed behind ice that remained in the lower part of the valley at a late stage in the disappearance of the ice.
Several terraces lo-15 feet high which slope gently downstream north of Halfway, probably are remnants of flood plains left as the creek cut down to its present grade.

Figure below: Atlin Ice Movement[14]

[14] Black, J. M.: Report in the Atlin Placer Camp, 1953 and Ph. Moll, Arctic Geophysics Inc



Atlin Ice Movement

8. Profile image

In the Resistivity profile the interpreted layer interfaces are marked with a black line. The **graphical markings** showing the interpreted layer interfaces in the profiles (using a black line) are done according to the data structure in the profile itself.

9. Line Arrangement

The **line locations** were discussed and decided upon by Philipp Moll and Stefan Ostermaier from Arctic Geophysics Inc. according to the communicated intentions of the claim owner. The goal of the survey was to establish the depth to bedrock and other mining relevant subsurface information, such as groundwater.

10. Geophysical Implications

The different components of the overburden (till, glaciofluvial/-lacustrine sediments, and non-glacial alluvium) can hardly be differentiated in the Resistivity profiles, because they show quite similar resistivity data and are sometimes too thin to be measured. The reason for the similar resistivity of the overburden materials is the relatively high amount of ground water in the sediments. The rock components of the gravels, clasts, or boulders show low resistivity itself and support the similarity of the resistivity.

However, interfaces between different overburden materials can sometimes be detected anyway. At data interfaces where high conducting overburden layers are sitting on top of low conducting overburden layers, a clay-rich layer could start downwards acting as a seal layer for groundwater.

The interface between overburden and bedrock was clearly measured and realistically interpreted in resistivity models.

11. Placer Targets in Profiles[15]

Seal-layers (consisting of clay) described in the "Geophysical Implications, could act as "false bedrock": The upper part of the clay-layer itself and the material closely on top of it could contain concentrations of placer gold. The interpreted "false bedrock" layers in the profiles are not too likely - but the data structures in the resistivity models indicate its possible existence - so it seems to be reasonable to check the existence of the "false bedrock" since it would be a promising prospecting target for placer gold, laying shallower than bedrock sources.

[15] Discussion between William LeBarge and Philipp Moll

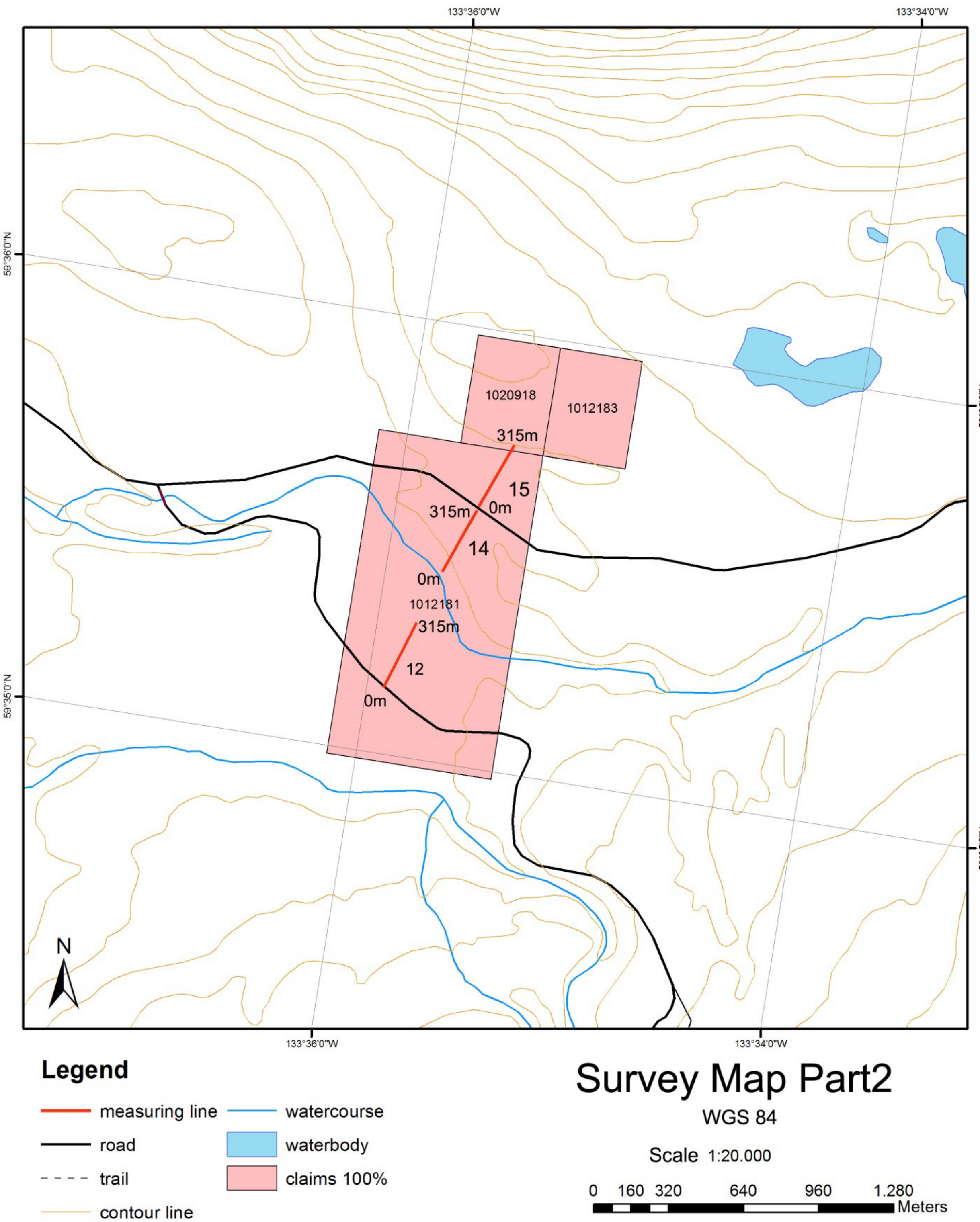
Clay layers can also protect the deposits underneath from glacial erosion. So, the material below a clay-rich layer could have preserved older placers.

Normally, glaciofluvial gravels have much higher potential for placer gold deposits than till, especially if they reworked pre-existing placers or eroded and re-depositing gold-bearing bedrock.

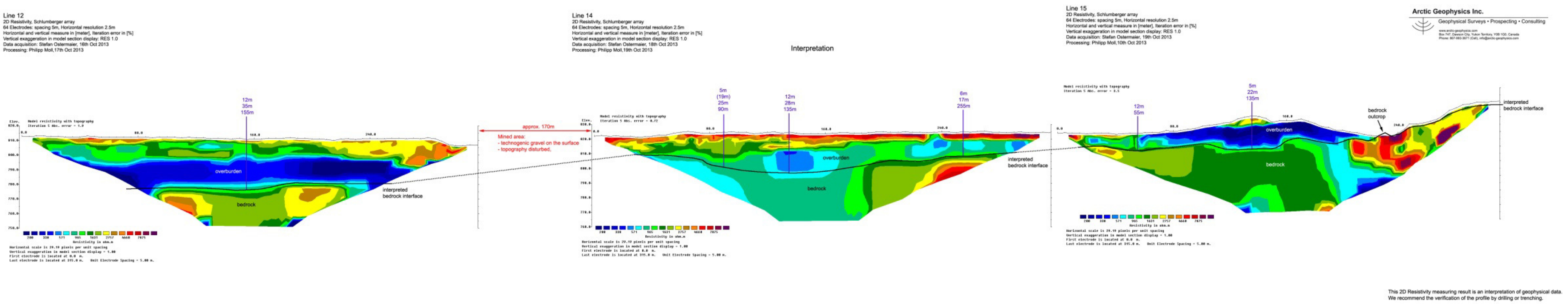
The general case is that glacial till will incorporate placer gold into it and dilute rich paystreaks into a larger volume lower grade deposit which may be uneconomic. So placer gold in till is actually fairly rare in most settings, and usually only occurs when the glacial activity is right on top of a bedrock gold source. But this actually may be the case in the survey area .

All of the sandy, gravelly, silty, and clay-containing sediments at Pine valley can potentially contain placer gold. Each new sediment discovered when doing physical prospecting would be worth sampling.

12. Survey Map



13. Profiles: Interpretation and Recommendation



Profile_12

Line 12
2D Resistivity, Schlumberger array
64 Electrodes: spacing 5m, Horizontal resolution 2.5m
Horizontal and vertical measure in [meter], Iteration error in [%]
Vertical exaggeration in model section display: RES 1.0
Data acquisition: Stefan Ostermaier, 16th Oct 2013
Processing: Philipp Moll,17th Oct 2013

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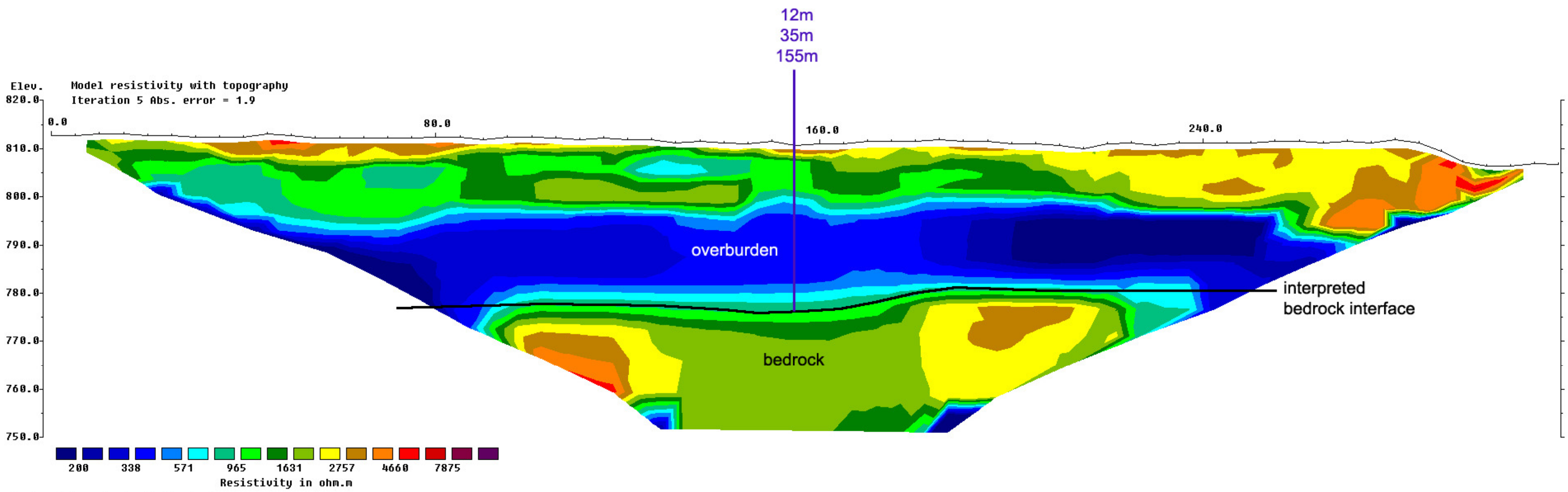
Interpretation



Horizontal scale is 29.19 pixels per unit spacing
Vertical exaggeration in model section display = 1.00
First electrode is located at 0.0 m.
Last electrode is located at 315.0 m. Unit Electrode Spacing = 5.00 m.

This 2D Resistivity measuring result is an interpretation of geophysical data.
We recommend the verification of the profile by drilling or trenching.

Interpretation

Resistivity profile_12 suggests 30-35m of overburden on top of bedrock.

The topmost resistivity layer, 12-15m thick, shows a heterogeneous data pattern (turquoise/green/yellow/brown/orange/red). This interpreted **overburden** layer seems to be dominated by glacial till. Likely glaciofluvial gravel or glaciolacustrine clay-/silt-rich sediments are embedded in the till. The layer might contain moderate amounts of water.
At 120-140m the lens-shaped turquoise data zone, seen at 3-7m depth, could indicate a layer containing more water than the material around. This layer could sit on a clay-rich layer acting as a seal layer ("false bedrock").
The yellow/brown/orange/red data zone seems to be relatively dry, porous deposits most likely glacial till

The resistivity layer below shows significantly lower, relatively continuous resistivity (blue). This layer seems to represent the groundwater horizon. This water-saturated material could be till potentially associated with lenses of glaciofluvial or glaciolacustrine deposits. Because of the higher concentration of groundwater, different ground-materials can hardly be differentiated. - Alternatively this layer could be a clay-rich layer of glaciolacustrine origin.

At 155m in the profile there could be a slight depression in the bedrock possibly indicating a paleochannel.

The **bedrock** shows various resistivity data: the lower data in the middle of the profile could represent another bedrock type than the high data at the edges.

Recommendation

We recommend to drill at 155m in the profile - bedrock is expected at approx. 35m depth. If the interpreted channel exists, higher concentrations of placer gold are likely.
The possible existence of a "false bedrock" layer at 120-140m, about 7m deep, could be investigated with drilling or digging at 130m in the profile. Gold sample of the material above the possible "false bedrock" could be richer.

Profile_14

Line 14
2D Resistivity, Schlumberger array
64 Electrodes: spacing 5m, Horizontal resolution 2.5m
Horizontal and vertical measure in [meter], Iteration error in [%]
Vertical exaggeration in model section display: RES 1.0
Data acquisition: Stefan Ostermaier, 18th Oct 2013
Processing: Philipp Moll,19th Oct 2013

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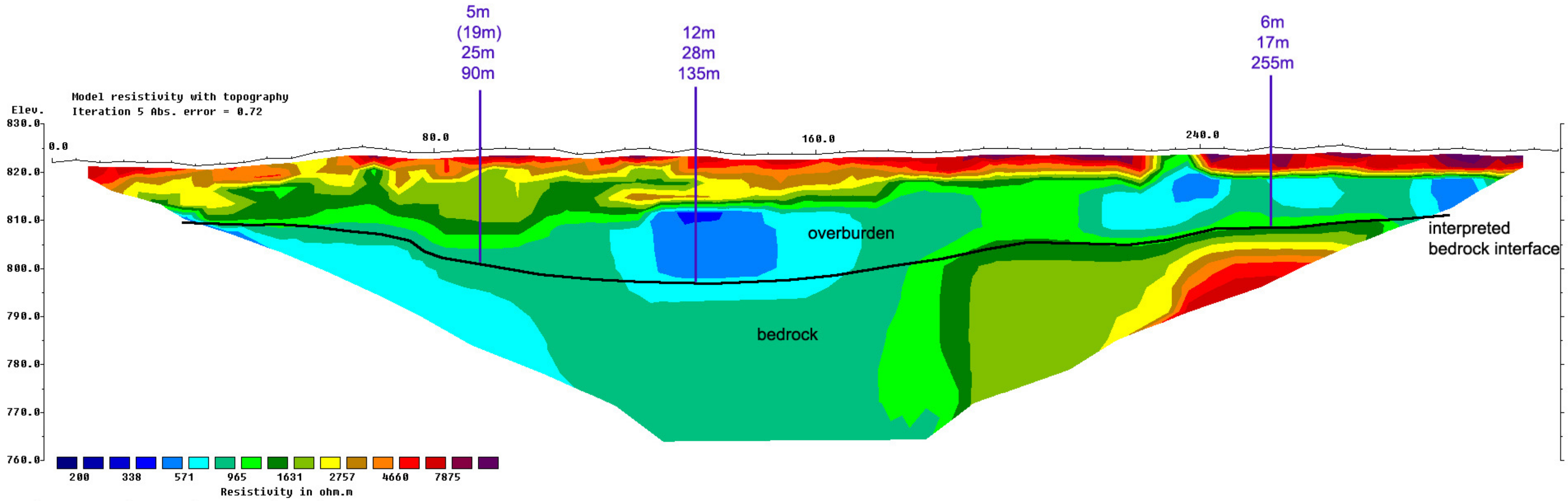
Interpretation



Horizontal scale is 29.19 pixels per unit spacing
Vertical exaggeration in model section display = 1.00
First electrode is located at 0.0 m.
Last electrode is located at 315.0 m. Unit Electrode Spacing = 5.00 m.

This 2D Resistivity measuring result is an interpretation of geophysical data.
We recommend the verification of the profile by drilling or trenching.

Interpretation
Resistivity profile_14 suggests 15-28m of overburden on top of bedrock.

Same as the previous profile, profile_14 represents two **overburden** layers having significantly different resistivity: The upper layer has more homogeneous and higher resistivity than the topmost layer in the previous profile. Likely this topmost overburden layer had lower influence by post-glacial (glaciofluvial) processes. It might be just till. This upper low-resistivity layer is thinner than the one in the previous profile since the sedimentary erosion could have been higher at this location further up the hill. - Or the groundwater level could be higher at this line location.

The second layer has resistivity data being similar to the second layer in profile_12. This layer could again mark the groundwater level. Alternatively this layer could be a clay-rich deposit with a glaciolacustrine origin.

The interpreted bedrock interface is less contrasting than in the previous profile, likely because of similar low resistivity in overburden and bedrock.

At 135m there could be a paleochannel, 28m deep.
At 255m there could be a bedrock bench, 17m deep, filled with 6m of dry overburden on top of 17m of moist overburden.

In the **bedrock** a horizontal data transition (alteration zone) becomes evident: The lower data on the left side of the profile do change into significantly higher data on the right side of the profile. This change in the data might indicate a change of the bedrock type.

Recommendation
We recommend to drill at 135m in the profile - here the bedrock is expected at approx 28m depth. If the interpreted channel exists, higher concentrations of placer gold are likely.

The possible bedrock bench at around 255m, could be verified by drilling. There the bedrock is expected at 17m depth.

Profile_15

Line 15
2D Resistivity, Schlumberger array
64 Electrodes: spacing 5m, Horizontal resolution 2.5m
Horizontal and vertical measure in [meter], Iteration error in [%]
Vertical exaggeration in model section display: RES 1.0
Data acquisition: Stefan Ostermaier, 19th Oct 2013
Processing: Philipp Moll,10th Oct 2013

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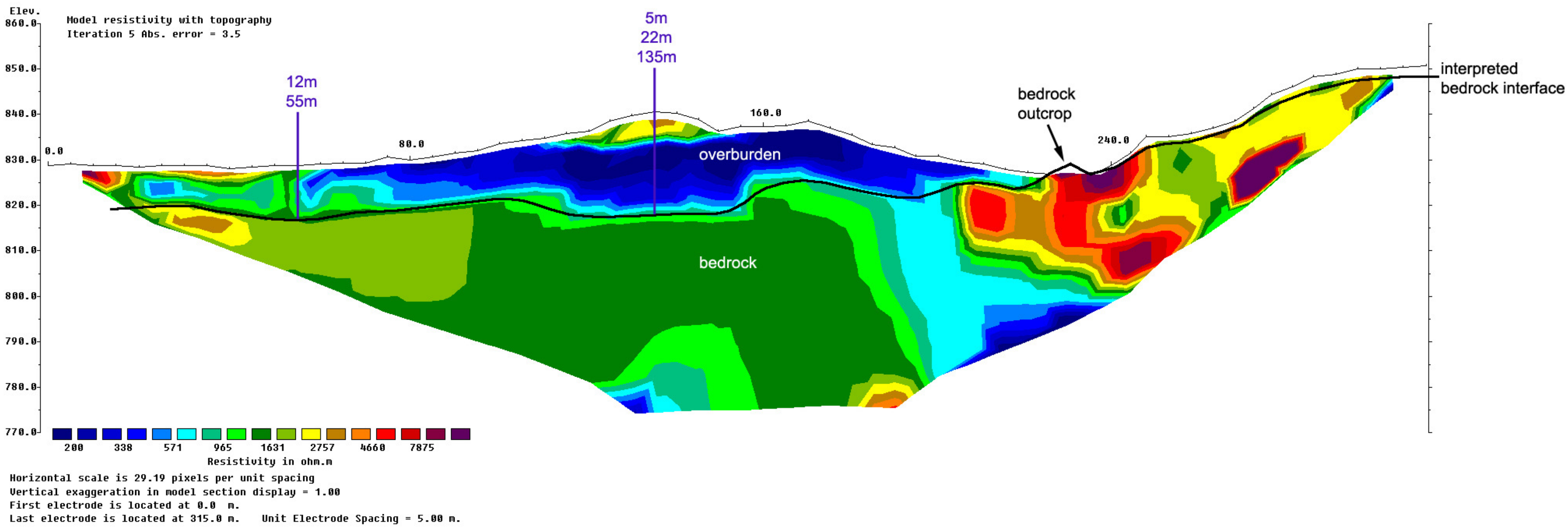
Interpretation



This 2D Resistivity measuring result is an interpretation of geophysical data.
We recommend the verification of the profile by drilling or trenching.

Interpretation

Resistivity profile_15 suggests 0-22m of overburden on top of bedrock. At 230m in the profile a bedrock outcrop has been observed.

At around 135m a small dome-shaped **overburden** layer, approx. 5m thick, was detected. This high-resistivity-material is most likely glacial till with a lower amount of fine sediment components because finer materials have been washed out.

The resistivity layer below, 5-22m thick, shows relatively homogenous data. It is interpreted to be an indefinable mosaic of the location-typical overburden types: glacial till with possible lenses of glaciofluvial gravel or glaciolacustrine fine sediments (sand, silt, clay).

At 135m a distinctive depression seems to be detected in the bedrock. This data structure seems to represent a paleochannel in the bedrock, approx. 22m deep and 40m wide, most likely filled with glaciofluvial gravel near bedrock.

The **bedrock** shows homogeneous resistivity (green) at the left side of the profile and variously higher resistivity (yellow/red/violet) at the right side. There seems to be a bedrock change at around 200m. The bedrock to the left could be another bedrock type than the one on the right side.

Recommendation

We recommend to drill at 135m in the profile - bedrock is expected at approx. 22m depth. If the interpreted channel exists, higher concentrations of placer gold are likely.

14. Conclusion

The following table shows and **estimation** of the value of the interpreted placer targets such as paleochannels and "false bedrock". This estimation includes two parameters: First, the **Likeliness of the Interpretation**, this means an estimation of the likeliness if the profile interpretation formulated above is true or not. Second, the **Gold Potential,** this describes an estimation of the placer gold value, which can be expected at the interpreted placer targets prospected in this survey. Both parameters are developed by the Arctic Geophysics team based on the following aspects: shape and dimensions of the feature based on the data structure in the resistivity profile, soil sampling survey (from Linda Dandy 2007), geological background, and historical/current mining.

Resistivity Line	Channel Depth / Location	Likeliness of Interpretation	Gold Potential
12	35m / 155m	high	moderate-high

Resistivity Line	Channel Depth / Location	Likeliness of Interpretation	Placer Potential
14	28m /135m	moderate-high	high
	"False Bedrock" Depth / Location	Likeliness of Interpretation	Placer Potential
	7m / 120-140m	low-moderate	moderate

Resistivity Line	Channel Depth / Location	Likeliness of Interpretation	Gold Potential
15	12m / 55m 22m / 135m	high high	moderate-high high-very high

15. Gallery

2D Resistivity Line_15

16. Qualifications

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Certificate of Qualifications

I, Philipp Moll, currently residing at “Am Buchenrain 9, 77746 Schutterwald, Germany, do hereby certify that:

1. I have studied Geology at the University of Freiburg, Germany.
2. I have visited of geophysical field courses at the University of Karlsruhe in Germany.
3. I have been working for Arctic Geophysics Inc. since June 2007 (foundation). For this company I have carried out geophysical field surveys using 2D Resistivity, Induced Polarization, and Magnetics: Data acquisition, processing, interpretation, documentation.
4. I have done geophysical surveying for mining exploration in the Yukon since 2005, and geological prospecting for precious metals and minerals in the Yukon, NWTs, and Alaska since 1989
5. I have written the following publications/reports:

   A) Numerous Assessment Reports about geophysical surveys done for Yukon mining companies, filed at Yukon Mining Recorder, Dawson City and Whitehorse, Yukon.

   B) Publication about a geophysical survey (45 field days) for the Yukon Government: Yukon Geological Survey:
   http://www.geology.gov.yk.ca/recent.html Open Files:
   Moll, P., & Ostermaier, S., 2010. 2D Resistivity/IP Data Release for Placer Mining and shallow Quartz Mining - Yukon 2010. Yukon Geological Survey Miscellaneous Report MR-4. PDF Report [10.3 MB] & Data Profiles, 45.4 MB]]

17. Confirmation

I have prepared this report entitled 2D Resistivity Survey on the Pine Creek Property for assessment credit, and reviewed the data contained in the report titled: “Geophysical Survey with 2D Resistivity Pine Creek, British Columbia”. The survey was carried out by Arctic Geophysics Inc.

Schutterwald, Germany, 15th November 2013
“Signed and Sealed” Philipp Moll

Ph. Moll

Philipp Moll

Appendix
Literature
Location-specific

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Geophysical Data Table

Rock type	Resistivity range (Ωm)
Granite porphyry	4.5×10^3 (wet) $- 1.3 \times 10^6$ (dry)
Feldspar porphyry	4×10^3 (wet)
Syenite	$10^2 - 10^6$
Diorite porphyry	1.9×10^3 (wet) $- 2.8 \times 10^4$ (dry)
Porphyrite	$10 - 5 \times 10^4$ (wet) $- 3.3 \times 10^3$ (dry)
Carbonatized porphyry	2.5×10^3 (wet) $- 6 \times 10^4$ (dry)
Quartz diorite	$2 \times 10^4 - 2 \times 10^6$ (wet) -1.8×10^5 (dry)
Porphyry (various)	$60 - 10^4$
Dacite	2×10^4 (wet)
Andesite	4.5×10^4 (wet) $- 1.7 \times 10^2$ (dry)
Diabase (various)	$20 - 5 \times 10^7$
Lavas	$10^2 - 5 \times 10^4$
Gabbro	$10^3 - 10^6$
Basalt	$10 - 1.3 \times 10^7$ (dry)
Olivine norite	$10^3 - 6 \times 10^4$ (wet)
Peridotite	3×10^3 (wet) $- 6.5 \times 10^3$ (dry)
Hornfels	8×10^3 (wet) $- 6 \times 10^7$ (dry)
Schists (calcareous and mica)	$20 - 10^4$
Tuffs	2×10^3 (wet) $- 10^5$ (dry)
Graphite schist	$10 - 10^2$
Slates (various)	$6 \times 10^2 - 4 \times 10^7$
Gneiss (various)	6.8×10^4 (wet) $- 3 \times 10^6$ (dry)
Marble	$10^2 - 2.5 \times 10^8$ (dry)
Skarn	2.5×10^2 (wet) $- 2.5 \times 10^8$ (dry)
Quartzites (various)	$10 - 2 \times 10^8$
Consolidated shales	$20 - 2 \times 10^3$
Argillites	$10 - 8 \times 10^2$
Conglomerates	$2 \times 10^3 - 10^4$
Sandstones	$1 - 6.4 \times 10^8$
Limestones	$50 - 10^7$
Dolomite	$3.5 \times 10^2 - 5 \times 10^3$
Unconsolidated wet clay	20
Marls	3 – 70
Clays	1 – 100
Oil sands	4 – 800

List of Costs

2013 Statement of Costs

Pine Creek Geophysical Program

Project Conducted from October 16th to October 19th 2013

Date	Item	Contractor	Description	Days	Km	Item Cost	Total
16, 18-19.10.2013	Geophysical Lines	Arctic Geophysics Inc.	Field Crew (2 people)	3.0		$1 130.00	$3 390.00
	Transportation	Arctic Geophysics Inc.	Vehicle	3.0		$70.00	$210.00
			Kilometers		51	$0.55	$28.05
16, 18-19.10.2013	Accommodation/meals			3		$119.70	$359.10
Sub-Total							**$3.987.15**

Report			
Data	Arctic Geophysics Inc.	Data processing, interpretation	$125.00
Report	Arctic Geophysics Inc.	Report Preparation	$350.00
Sub-Total			**$475.00**

Total Value of Work	$4 462.15

Total Person Days = 6

GPS-Data

Line12

Electrode No.	Location in Profile [m]	GPS-Coordinates ddd° mm' ss.s'' WGS 1984	GPS-Accuracy [m]	Post [*]
1	0	N59 35 09.0 W133 35 54.1	3	*
2	5	N59 35 09.2 W133 35 54.0	3	
3	10	N59 35 09.4 W133 35 53.9	3	
4	15	N59 35 09.5 W133 35 53.8	3	
5	20	N59 35 09.7 W133 35 53.7	3	
6	25	N59 35 09.8 W133 35 53.6	3	
7	30	N59 35 10.0 W133 35 53.5	3	
8	35	N59 35 10.1 W133 35 53.4	3	
9	40	N59 35 10.3 W133 35 53.3	3	
10	45	N59 35 10.4 W133 35 53.2	3	
11	50	N59 35 10.5 W133 35 53.1	3	
12	55	N59 35 10.7 W133 35 53.0	3	
13	60	N59 35 10.8 W133 35 52.9	3	
14	65	N59 35 11.0 W133 35 52.9	3	
15	70	N59 35 11.2 W133 35 52.8	3	
16	75	N59 35 11.3 W133 35 52.7	3	
17	80	N59 35 11.5 W133 35 52.7	3	
18	85	N59 35 11.7 W133 35 52.6	3	
19	90	N59 35 11.8 W133 35 52.6	3	
20	95	N59 35 11.9 W133 35 52.5	3	
21	100	N59 35 12.1 W133 35 52.4	3	
22	105	N59 35 12.3 W133 35 52.3	3	
23	110	N59 35 12.4 W133 35 52.1	3	
24	115	N59 35 12.6 W133 35 52.0	3	
25	120	N59 35 12.7 W133 35 51.9	3	
26	125	N59 35 12.9 W133 35 51.8	3	
27	130	N59 35 13.0 W133 35 51.7	3	
28	135	N59 35 13.1 W133 35 51.6	3	
29	140	N59 35 13.2 W133 35 51.5	3	
30	145	N59 35 13.5 W133 35 51.4	3	
31	150	N59 35 13.6 W133 35 51.3	3	
32	155	N59 35 13.8 W133 35 51.2	3	
33	160	N59 35 13.9 W133 35 51.1	3	
34	165	N59 35 14.0 W133 35 50.9	3	
35	170	N59 35 14.2 W133 35 50.9	3	
36	175	N59 35 14.4 W133 35 50.8	3	
37	180	N59 35 14.6 W133 35 50.8	3	
38	185	N59 35 14.7 W133 35 50.6	3	
39	190	N59 35 14.9 W133 35 50.3	3	
40	195	N59 35 15.0 W133 35 50.3	3	
41	200	N59 35 15.1 W133 35 50.2	3	
42	205	N59 35 15.3 W133 35 50.0	3	
43	210	N59 35 15.5 W133 35 50.0	3	
44	215	N59 35 15.6 W133 35 49.8	3	

Electrode No.	Location in Profile [m]	GPS-Coordinates ddd° mm' ss.s'' WGS 1984	GPS-Accuracy [m]	Post [*]
45	220	N59 35 15.7 W133 35 49.7	3	
46	225	N59 35 15.9 W133 35 49.6	3	
47	230	N59 35 16.0 W133 35 49.5	3	
48	235	N59 35 16.2 W133 35 49.5	3	
49	240	N59 35 16.4 W133 35 49.3	3	
50	245	N59 35 16.5 W133 35 49.2	3	
51	250	N59 35 16.7 W133 35 49.1	3	
52	255	N59 35 16.8 W133 35 49.0	3	
53	260	N59 35 17.0 W133 35 48.8	3	
54	265	N59 35 17.1 W133 35 48.7	3	
55	270	N59 35 17.3 W133 35 48.6	3	
56	275	N59 35 17.4 W133 35 48.6	3	
57	280	N59 35 17.6 W133 35 48.5	3	
58	285	N59 35 17.7 W133 35 48.4	3	
59	290	N59 35 17.8 W133 35 48.4	3	
60	295	N59 35 17.9 W133 35 48.2	3	
61	300	N59 35 18.1 W133 35 48.3	3	
62	305	N59 35 18.3 W133 35 48.2	3	
63	310	N59 35 18.5 W133 35 48.2	3	
64	315	N59 35 18.6 W133 35 48.1	3	*

Line14

Electrode No.	Location in Profile [m]	GPS-Coordinates ddd° mm' ss.s'' WGS 1984	GPS-Accuracy [m]	Post [*]
1	0	N59 35 26.1 W133 35 43.4	3	*
2	5	N59 35 26.1 W133 35 43.4	3	
3	10	N59 35 26.2 W133 35 43.4	3	
4	15	N59 35 26.4 W133 35 43.3	3	
5	20	N59 35 26.5 W133 35 43.2	3	
6	25	N59 35 26.6 W133 35 43.1	3	
7	30	N59 35 26.7 W133 35 43.0	3	
8	35	N59 35 26.9 W133 35 42.8	3	
9	40	N59 35 27.1 W133 35 42.7	3	
10	45	N59 35 27.3 W133 35 42.6	3	
11	50	N59 35 27.4 W133 35 42.5	3	
12	55	N59 35 27.5 W133 35 42.4	3	
13	60	N59 35 27.6 W133 35 42.3	3	
14	65	N59 35 27.7 W133 35 42.2	3	
15	70	N59 35 27.8 W133 35 42.1	3	
16	75	N59 35 27.9 W133 35 42.0	3	
17	80	N59 35 28.1 W133 35 42.0	3	
18	85	N59 35 28.1 W133 35 41.9	3	
19	90	N59 35 28.3 W133 35 41.7	3	
20	95	N59 35 28.6 W133 35 41.6	3	
21	100	N59 35 28.8 W133 35 41.4	3	
22	105	N59 35 28.9 W133 35 41.2	3	
23	110	N59 35 29.0 W133 35 41.1	3	
24	115	N59 35 29.2 W133 35 40.9	3	
25	120	N59 35 29.4 W133 35 40.9	3	
26	125	N59 35 29.5 W133 35 40.8	3	
27	130	N59 35 29.7 W133 35 40.7	3	
28	135	N59 35 29.9 W133 35 40.6	3	
29	140	N59 35 30.1 W133 35 40.5	3	
30	145	N59 35 30.1 W133 35 40.3	3	
31	150	N59 35 30.4 W133 35 40.2	3	
32	155	N59 35 30.5 W133 35 40.1	3	
33	160	N59 35 30.6 W133 35 40.1	3	
34	165	N59 35 30.7 W133 35 40.0	3	
35	170	N59 35 30.8 W133 35 39.9	3	
36	175	N59 35 30.9 W133 35 39.8	3	
37	180	N59 35 31.1 W133 35 39.7	3	
38	185	N59 35 31.3 W133 35 39.6	3	
39	190	N59 35 31.5 W133 35 39.5	3	
40	195	N59 35 31.7 W133 35 39.4	3	
41	200	N59 35 31.7 W133 35 39.3	3	
42	205	N59 35 31.8 W133 35 39.2	3	
43	210	N59 35 31.9 W133 35 39.1	3	
44	215	N59 35 32.0 W133 35 39.0	3	
45	220	N59 35 32.2 W133 35 38.9	3	
46	225	N59 35 32.3 W133 35 38.9	3	
47	230	N59 35 32.3 W133 35 38.7	3	

Electrode No.	Location in Profile [m]	GPS-Coordinates ddd° mm' ss.s'' WGS 1984	GPS-Accuracy [m]	Post [*]
48	235	N59 35 33.1 W133 35 38.5	3	
49	240	N59 35 33.2 W133 35 38.4	3	
50	245	N59 35 33.3 W133 35 38.3	3	
51	250	N59 35 33.4 W133 35 38.1	3	
52	255	N59 35 33.6 W133 35 38.1	3	
53	260	N59 35 33.7 W133 35 38.0	3	
54	265	N59 35 33.8 W133 35 37.9	3	
55	270	N59 35 34.0 W133 35 37.8	3	
56	275	N59 35 34.1 W133 35 37.7	3	
57	280	N59 35 34.2 W133 35 37.5	3	
58	285	N59 35 34.4 W133 35 37.4	3	
59	290	N59 35 34.5 W133 35 37.3	3	
60	295	N59 35 34.6 W133 35 37.2	3	
61	300	N59 35 34.7 W133 35 37.1	3	
62	305	N59 35 35.0 W133 35 37.0	3	
63	310	N59 35 35.1 W133 35 36.8	3	
64	315	N59 35 35.2 W133 35 36.8	3	*

Line15

Electrode No.	Location in Profile [m]	GPS-Coordinates ddd° mm' ss.s'' WGS 1984	GPS-Accuracy [m]	Post [*]
1	0	N59 35 35.6 W133 35 36.5	3	*
2	5	N59 35 35.8 W133 35 36.4	3	
3	10	N59 35 36.0 W133 35 36.2	3	
4	15	N59 35 36.1 W133 35 36.0	3	
5	20	N59 35 36.3 W133 35 35.8	3	
6	25	N59 35 36.4 W133 35 35.7	3	
7	30	N59 35 36.5 W133 35 35.6	3	
8	35	N59 35 36.7 W133 35 35.5	3	
9	40	N59 35 36.8 W133 35 35.4	3	
10	45	N59 35 37.0 W133 35 35.3	3	
11	50	N59 35 37.1 W133 35 35.2	3	
12	55	N59 35 37.2 W133 35 35.1	3	
13	60	N59 35 37.4 W133 35 35.0	3	
14	65	N59 35 37.6 W133 35 34.7	3	
15	70	N59 35 37.8 W133 35 34.6	3	
16	75	N59 35 37.9 W133 35 34.6	3	
17	80	N59 35 38.0 W133 35 34.5	3	
18	85	N59 35 38.2 W133 35 34.3	3	
19	90	N59 35 38.3 W133 35 34.3	3	
20	95	N59 35 38.5 W133 35 34.2	3	
21	100	N59 35 38.6 W133 35 34.0	3	
22	105	N59 35 38.8 W133 35 33.8	3	
23	110	N59 35 38.9 W133 35 33.8	3	
24	115	N59 35 39.1 W133 35 33.7	3	
25	120	N59 35 39.2 W133 35 33.7	3	
26	125	N59 35 39.3 W133 35 33.5	3	
27	130	N59 35 39.4 W133 35 33.3	3	
28	135	N59 35 39.6 W133 35 33.2	3	
29	140	N59 35 39.8 W133 35 33.1	3	
30	145	N59 35 39.9 W133 35 33.0	3	
31	150	N59 35 40.1 W133 35 33.0	3	
32	155	N59 35 40.2 W133 35 32.9	3	
33	160	N59 35 40.3 W133 35 32.8	3	
34	165	N59 35 40.5 W133 35 32.7	3	
35	170	N59 35 40.6 W133 35 32.5	3	
36	175	N59 35 40.9 W133 35 32.4	3	
37	180	N59 35 41.0 W133 35 32.3	3	
38	185	N59 35 41.2 W133 35 32.0	3	
39	190	N59 35 41.5 W133 35 31.9	3	
40	195	N59 35 41.7 W133 35 31.6	3	
41	200	N59 35 41.8 W133 35 31.5	3	
42	205	N59 35 41.9 W133 35 31.3	3	
43	210	N59 35 42.2 W133 35 31.3	3	
44	215	N59 35 42.2 W133 35 31.2	3	
45	220	N59 35 42.3 W133 35 31.2	3	
46	225	N59 35 42.4 W133 35 31.1	3	
47	230	N59 35 42.5 W133 35 31.2	3	

Electrode No.	Location in Profile [m]	GPS-Coordinates ddd° mm' ss.s'' WGS 1984	GPS-Accuracy [m]	Post [*]
48	235	N59 35 42.7 W133 35 31.1	3	
49	240	N59 35 42.8 W133 35 31.1	3	
50	245	N59 35 42.8 W133 35 31.0	3	
51	250	N59 35 42.9 W133 35 30.9	3	
52	255	N59 35 43.1 W133 35 30.8	3	
53	260	N59 35 43.3 W133 35 30.7	3	
54	265	N59 35 43.4 W133 35 30.6	3	
55	270	N59 35 43.5 W133 35 30.5	3	
56	275	N59 35 43.6 W133 35 30.5	3	
57	280	N59 35 43.8 W133 35 30.3	3	
58	285	N59 35 43.8 W133 35 30.3	3	
59	290	N59 35 44.0 W133 35 30.1	3	
60	295	N59 35 44.2 W133 35 30.0	3	
61	300	N59 35 44.3 W133 35 29.8	3	
62	305	N59 35 44.5 W133 35 29.8	3	
63	310	N59 35 44.6 W133 35 29.7	3	
64	315	N59 35 44.8 W133 35 29.6	3	*