BC Geological Survey
Assessment Report
39744

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Ministry of Energy, Mines & Petroleum Resources
Mining & Minerals Division
BC Geological Survey

Assessment Report
Title Page and Summary

TYPE OF REPORT [type of survey(s)]: Geochemical Assessment **TOTAL COST:** $ 8,000.00

AUTHOR(S): J. T. Shearer, M.Sc., P.Geo. **SIGNATURE(S):** J Shearer

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S): **YEAR OF WORK:** 2021

STATEMENT OF WORK - CASH PAYMENTS EVENT NUMBER(S)/DATE(S): 5855946

PROPERTY NAME: Barnes Property MX-5-813

CLAIM NAME(S) (on which the work was done): 1011319 1020873 1055454
Barnes Lake Barnes 2 Barnes LK West

COMMODITIES SOUGHT: Phosphate

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN:

MINING DIVISION: Fort Steele Mining Division **NTS/BCGS:** 82G/07E

LATITUDE: 49 ° 27 ' 10 " **LONGITUDE:** 114 ° 44 ' 54 " **(at centre of work)**

OWNER(S):
1) J. T. Shearer 2)

MAILING ADDRESS:
Unit 5 - 2330 Tyner Street
Port Coquitlam, BC V3B 2Z7

OPERATOR(S) [who paid for the work]:
1) Same 2)

MAILING ADDRESS:
Same

PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):
The target is a phosphatic horizon in the basal Jurassic Fernie Group
The zone is 1m to 2m thick grading around 33.5% P_2O_5

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS:
Assessment Reports 6859, 5556, 9142, 25644, 25079, 6365, 8989

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TYPE OF WORK IN THIS REPORT	EXTENT OF WORK (IN METRIC UNITS)	ON WHICH CLAIMS	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)			
Ground, mapping			
Photo interpretation			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Induced Polarization			
Radiometric			
Seismic			
Other			
Airborne			
GEOCHEMICAL (number of samples analysed for...)			
Soil			
Silt			
Rock	6	1011319	3000
Other	Water	1011319	5000
DRILLING (total metres; number of holes, size)			
Core			
Non-core			
RELATED TECHNICAL			
Sampling/assaying			
Petrographic			
Mineralographic			
Metallurgic			
PROSPECTING (scale, area)			
PREPARATORY / PHYSICAL			
Line/grid (kilometres)			
Topographic/Photogrammetric (scale, area)			
Legal surveys (scale, area)			
Road, local access (kilometres)/trail			
Trench (metres)			
Underground dev. (metres)			
Other			
		TOTAL COST:	$ 8,000.00

GEOCHEMICAL ASSESSMENT REPORT
ON THE
BARNES PROPERTY

49°27’10”N LATITUDE/114°44’54”W LONGITUDE
NTS: 82G/7E (82G.047)
FORT STEELE MINING DIVISION
SOUTHEASTERN BRITISH COLUMBIA
Event # 5855946
Permit MX-5-813

For

FERTOZ INTERNATIONAL ORGANIC INC.
Suite 2100 – 1055 West Georgia St.
PO Box 111
Vancouver, BC
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By

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December 13, 2021

Fieldwork Completed Between June 1, 2021 and December 13, 2021

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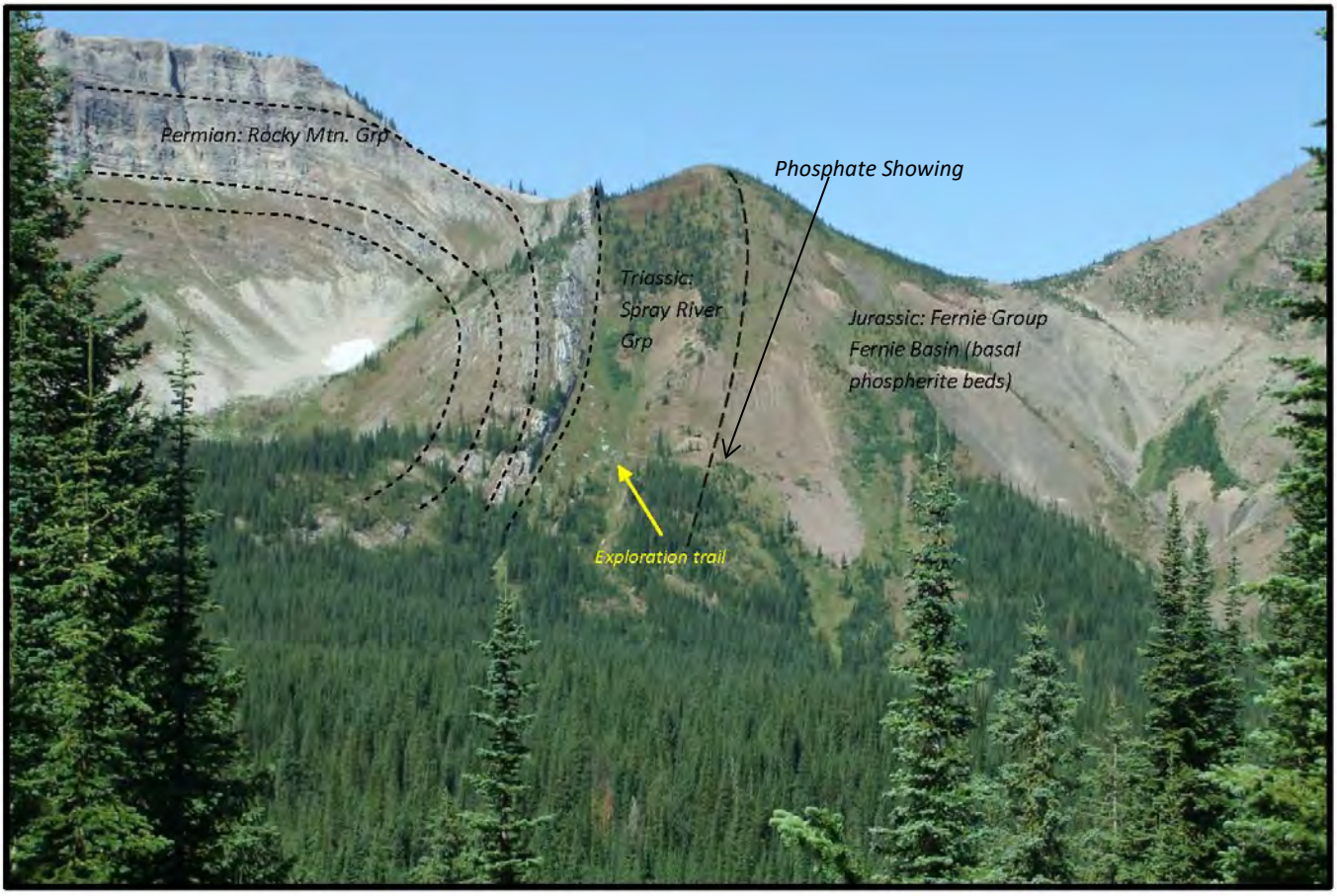


Photo looking northwesterly Barnes Lake property: folded overturned sequence of Permian – Rocky Mountain and Triassic Spray River groups with overlying Fernie Basin black shale with basal phosphate horizon characteristically occurring immediately next to the Spray River.

SUMMARY

The Barnes Lake property consists of 7 MTO claims encompassing 2,492.77 hectares. The claims are located in the Barnes Lake/Michel Creek area of the Rocky Mountains, Fort Steele Mining Division, southeastern British Columbia, approximately 40 kilometres by road south of the town of Sparwood and 27 kilometres due east of Fernie, B.C. The property is accessed via an extensive network of logging and exploration roads.

The Barnes Lake claim was staked as part of the Crowsnest Project, whose primary objective was to evaluate the grade and continuity of the basal Fernie phosphate horizon in terms of establishing its potential as a large tonnage P_2O_5 resource. Previously, in 1990 reconnaissance and detailed geologic mapping, hand trenching, sampling, backhoe trenching and assaying was completed on the Barnes Claim. In 1990, fifty-seven rock samples were collected from *2* hand trenches and 9 backhoe trenches. The samples were analyzed for P_2O_5 (by gravimetric assay), yttrium (by XRF) and gold plus 33 trace elements (by INAA).

The Barnes Lake property is predominantly underlain by a sequence of Late Paleozoic to Mesozoic strata (Permian to Jurassic) that were deposited in the Alberta Trough under marine conditions and Late Jurassic to Cretaceous fluvio-deltaeic sediments that were subsequently deformed during the Late Cretaceous. Phosphatic rocks occur in a number of stratigraphic intervals within this sequence; however, the thickest and most continuous phosphate horizon was developed at the base of the Jurassic Fernie Group which is the focus of this project. The basal Fernie phosphatic strata are generally one to two metres thick and also contain unusually high concentrations of yttrium.

Previous work on the Barnes Lake Property suggests average grades of the basal phosphorite horizon on the property are around 22.5 per cent P_2O_5 and 610 ppm Y across 1.4 metres. In one trench, an incomplete section was measured which ran 30.5 per cent P_2O_5 and 777 ppm yttrium across 0.98 metres.

The 2017 program consisted of reconnaissance prospecting, rock sampling and establishing further access. This 2017 work shows anomalous soil samples approximately 150m to 200m east of the main road at an elevation of approximately 1725m to 1767m. Close spaced follow-up soil samples were completed perpendicular to the road system (E-W) at 10m intervals.

In 2018, the work program included bridge installation, road rehab and trenching.

Follow-up sampling and geological mapping was completed east of the main access road and also west of Michel Creek and north of Barnes Lake which confirmed the high grade (>30% P_2O_5) nature of the phosphate zone at surface.

Assay results indicate a folded and faulted phosphate horizon. In places the phosphate horizon has been duplicated as shown in Trench 3 and 4 where the lower part of Trench 4 exhibits a thickened phosphate zone.

In 2019, a series of 19 drillholes were completed using a Shaw backpack drill. This drill proved to be very effective in outlining the phosphate zone.

The 2019 program completed 19 separate drillholes. The Assay results are contained in Appendix IV and shown on figure 19 to 38.

Drill logs are contained in Appendix V. Hole B-19-01 intersected some silty black shale boulders, Spray River Formation fragments and poker chip shale. Fernie Phosphorite at 2m assayed 12.59% P_2O_5. The very top of Hole DDH B-19-02 assayed 4.5% P_2O_5, and 14.62% P_2O_5 but the rest of the hole returned Spray River Siltstone chips.

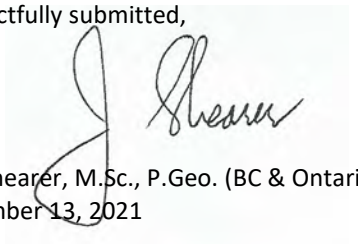
Drillholes DDH B-19-03 to B-19-06 were collared in good phosphorite with values up to 27.72% P_2O_5. Phosphate values in Holes 7 to 19 contained low P_2O_5 values due to being higher up in the stratigraphy.

This zone 2 is an excellent exploration target and future bulk sample test site. More detail mapping is required and structural interpretation in order to constrain the enriched phosphate horizon.

The program in 2021 consisted of continued water samples and phosphorite samples.

Careful mapping is needed to outline the >20% P_2O_5 zones using additional trenching and sampling.

Respectfully submitted,



J. T. Shearer, M.Sc., P.Geo. (BC & Ontario)
December 13, 2021

INTRODUCTION

Pell (1990) makes the following observations: Canada imported 2.39 million tonnes of phosphorite in 1986, approximately 80 per cent of which was used in the fertilizer industry. Other products which require the use of phosphorus include organic and inorganic chemicals, soaps and detergents, pesticides, insecticides, alloys, animal-food supplements, ceramics, beverages, catalysts, motor lubricants, dental and silicate cements (Barry, 1987). Approximately 55 million tonnes per annum are produced in the United States (Stowasser, 1989). Approximately 50 per cent of the phosphate rock imported into western Canada previously comes from Florida, the remainder being supplied from the Western U.S. (Barry, 1987) but currently the majority is imported from North Africa. Resources in Florida are rapidly being depleted (Stowasser, 1988): some experts feel that the western U.S. sources will not be able to meet the demand when Florida becomes exhausted, which suggests a possible niche for a new producer.

Phosphate rock produced in the U.S. is classified as acid or fertilizer grade, more than 31 per cent P_2O_5; furnace grade, 24 to 31 per cent P_2O_5; and beneficiation grade, 18 to 24 per cent P_2O_5. Acid grade rock is used directly in fertilizer plants, furnace grade rock is charged to electric furnaces and beneficiation grade rock is upgraded to acid or furnace feed (Stowasser, 1985).

Most commercial phosphate rock is used in fertilizer plants: feed for these plants must meet the following specifications:

P_2O_5 content: 27 to 42%
CaO/P_2O_5 ratio: 1.32 to 1.6
R_2O_3/P_2O_5:<0.1; $R_2O_3=A1_2O_3+Fe_2O_3+MgO$
MgO content<l.0%

The phosphate rock mined in the western United States (Idaho, Montana, Wyoming, Utah) is from the Retort and Meade Peak members of the Permian Phosphoria Formation. The majority of mines are strip mining operations with ore zones ranging from 9 to 18 metres thick, with an average grade of 21.3 per cent P_2O_5. Overburden thickness is commonly 5 to 10 metres (Fantel et. al., 1984). Cominco American operated an underground phosphate mine in Montana. The phosphate horizon is 1 to 1.2 metres thick and has an average grade of >31 per cent P_2O_5. Most western U.S. phosphate ore is beneficiated by crushing, washing, classifying and drying (Stowasser, 1985). Phosphates mined in Florida and South Carolina are from the Miocene Hawthorne Formation and the younger, reworked deposits of the Bone Valley Formation. Ore thickness range from 3 to 8 metres, with overburden of 3 to 10 metres. Average grade is 7 per cent P_2O_5. Flotation processes are used to beneficiate the ores. Phosphates mined in Tennessee have a minimum cut-off grade of 16 to 17.2 per cent P_2O_5 and a minimum thickness of 0.6 to 1.2 metres (Fantel et. al., 1984). Currently, there is no by-product recovery of yttrium from any of the U. S. operations. Phosphoria formation phosphorites from the western phosphate field contain an average of 300 ppm Y; phosphorites from North Carolina and Florida contain an average of 235-300 ppm Y; and, phosphorites from Tennessee contain an average of 63 ppm Y (Altschuler, 1980). The worldwide average yttrium value in phosphorites is 260 ppm (Altschuler, 1980).

The phosphorite beds in the Jurassic Fernie Group are thin (usually 1 to 2 metres, Butrenchuk, 1987a) relative to most phosphorites mined in the United States. The Fernie phosphorites have anomalous yttrium concentrations with respect to most other sedimentary phosphate deposits. If it proves feasible to recover yttrium during the production of phosphoric acid, as has been suggested by some researchers (Altschuler, et. al:, 1967), the economics of exploiting the Fernie Group basal phosphorite horizon will become significantly more attractive.

However, the strategy employed by Fertoz in the present program is to investigate the direct application of Organic Certified Rock Phosphate to the organic farm market. Numerous contacts have been made to farmers already producing organic products.

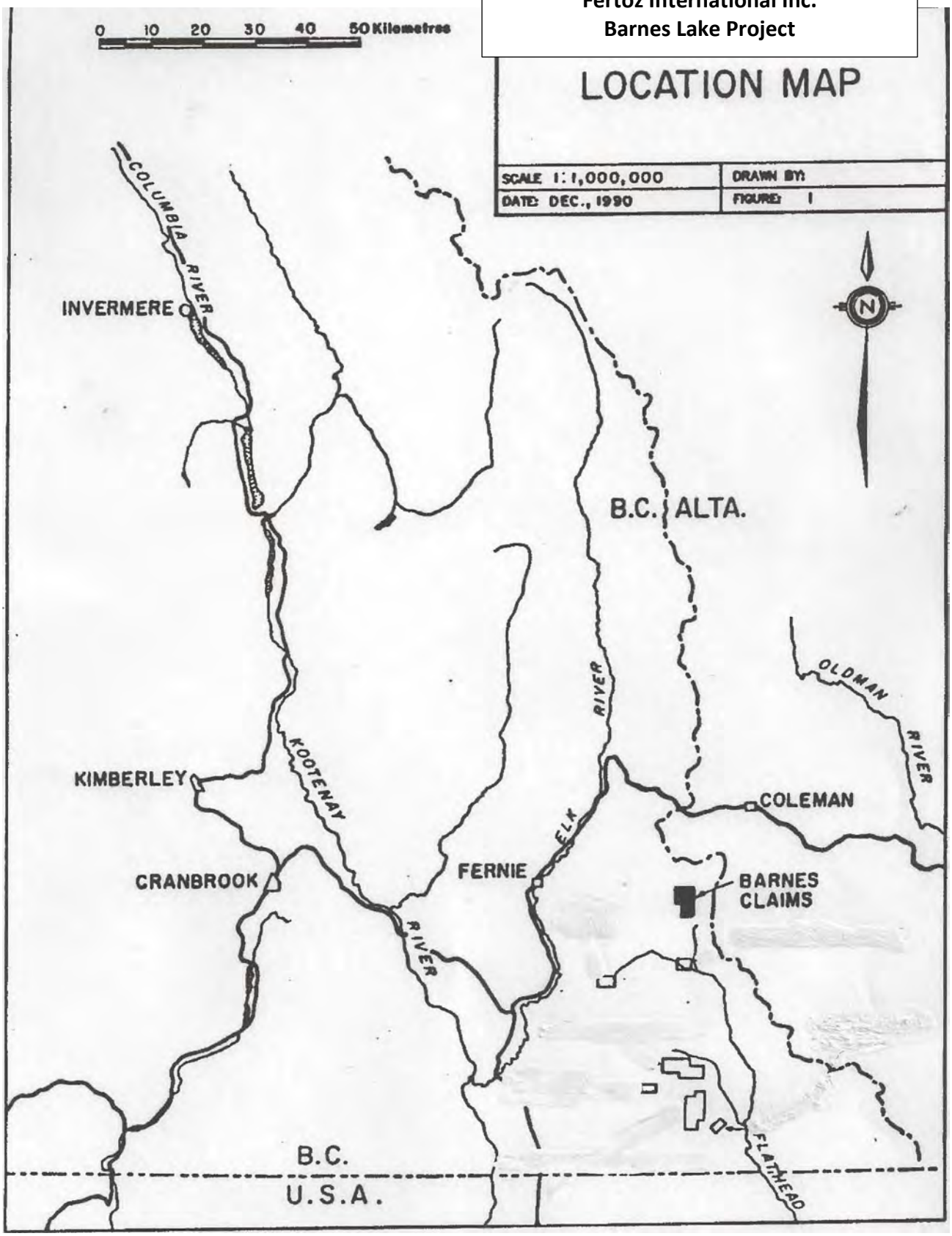


Figure 1 Location Map

PROPERTY DESCRIPTION and LOCATION

The Barnes Lake claims are located in the Barnes Lake - Michel Creek area, Flathead region, Fort Steele Mining Division, approximately 30 kilometres by road south of the town of Sparwood and 27 kilometres due east of Fernie (Figure 1). The eastern edge of the claims can be reached, by conventional vehicle, from Fernie and Sparwood by taking Highway 3 east for approximately 15 kilometres to Michel and then following the Corbin Mine road south for approximately 30 kilometres to the Corbin townsite and Coal Mountain mine. From the Corbin townsite the Michel Creek/Flathead Main haul road is followed south for around four kilometres and then a small road taken to the west that crosses Michel Creek. A four-wheel drive or all-terrain vehicle is required to follow this road, an old exploration road, southwesterly for an additional 4.5 kilometres to the main showings. Drilling in the 1960's intersected phosphorite at shallow depths on the east side of Michel Creek which was the focus of 2014 exploration.

Elevations on the property range from 1585 metres (5200 feet) to 2255 metres (7400 feet). Stands of spruce and fir are present at lower elevations: the area of the main showings is in alpine and subalpine terrain, some large firs are present but most of the area is above tree line on the west side. The east side of the claims is at a much lower elevation.

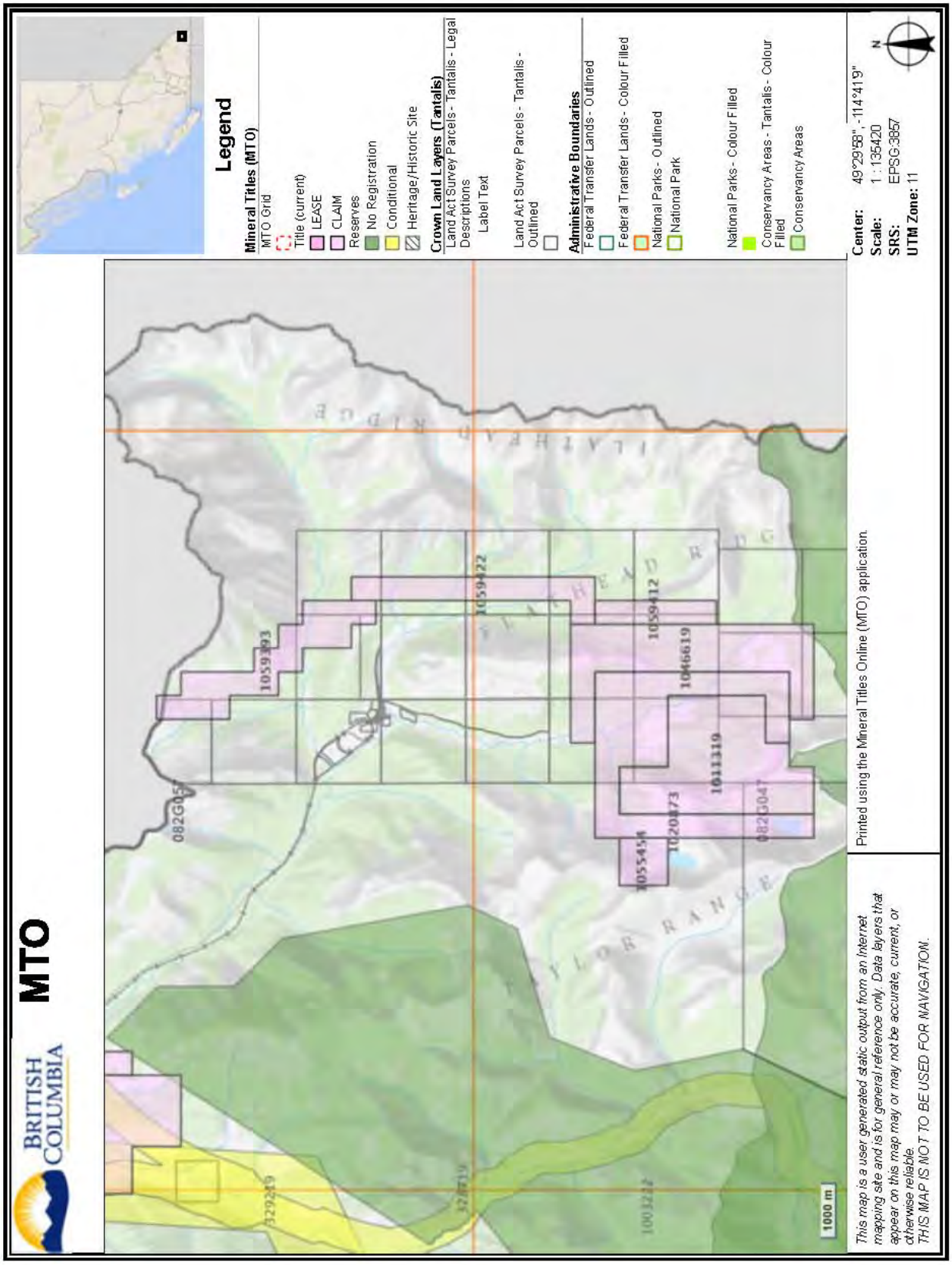


Figure 2 Claim Map

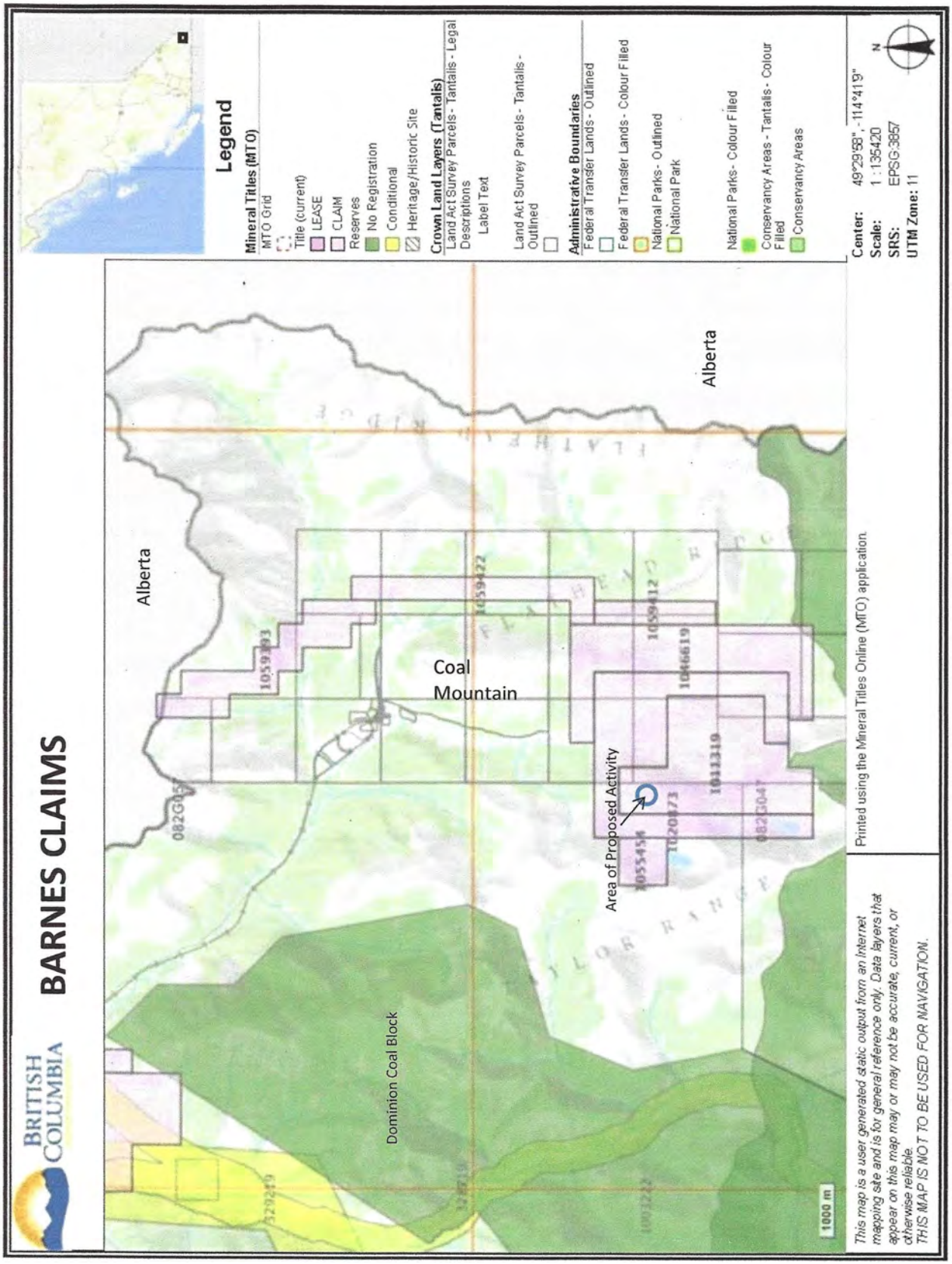


Figure 2a Claim Map Showing Area of Proposed Work

MINERAL TENURE

The Barnes Lake property, 7 claims encompassing 2,492.77 hectares was staked by Fertoz International Inc. in July 2012 and also 2013, current expiry dates are shown in Table 1 and Figure 2.

TABLE I
List of Claims

Name	Tenure #	Area (ha)	Current Expiry Date*	Registered Owner
Barnes Lake	1011319	608.98	May 19, 2024	Fertoz International
Barnes 2	1020873	629.88	April 18, 2023	Fertoz International
Barnes Lk 3	1046619	524.89	January 12, 2023	Fertoz International
Barnes Lk West	1055454	83.97	July 9, 2023	J. T. Shearer
South of Alberta 1	1059393	309.31	July 17, 2023	J.T. Shearer
Barnes 5	1059412	104.96	July 18, 2023	J.T. Shearer
Coal Mountain 1	1059422	230.78	July 19, 2023	J.T. Shearer

Total 2,492.77 ha

*by assessment work contained in this report

Cash may be paid in lieu if no work is performed. Following revisions to the Mineral Tenures Act on July 1, 2012, claims bear the burden of $5 per hectare for the initial two years, $10 per hectare for year three and four, $15 per hectare for year five and six and $20 per hectare each year thereafter.

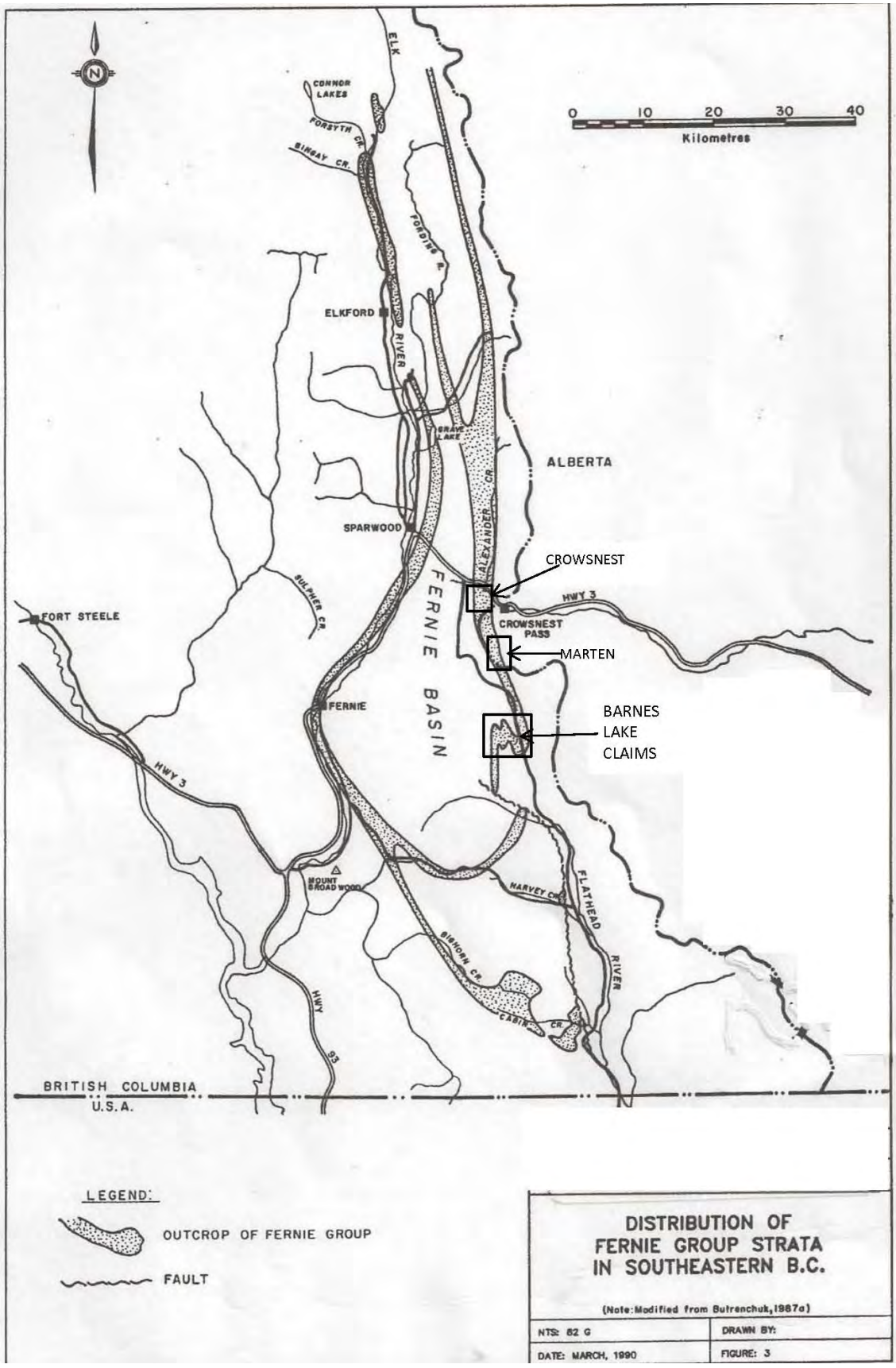


Figure 3 Distribution of Fernie Group Strata in Southern British Columbia

HISTORY

Phosphatic horizons at the base of the Jurassic Fernie Group in southeastern British Columbia were discovered in 1925 (Telfer, 1933) and have been the subject of periodic exploration by Cominco (Kenny, 1977) and others since that time. Phosphate strata in the Barnes Lake area were (in the mid and late 1970's) explored by Western Warner Oils Ltd. and Medesto Exploration Ltd. and 262,000 tonnes of phosphate to a depth of 18 metres were outlined (Dorian, 1975; Pelzer, 1977; Dales, 1978). The phosphate potential of the area was also addressed in a number of recent academic and government studies (Butrenchuk, 1987a; 198733; Macdonald, 1985; 1987).

Butrenchuk puts the potential on the east side of Michel Creek in the vicinity of the Barnes Lk Property at 4 million tonnes (Butrenchuk, 1991).

Previous Trenching (1990)

The Fernie Group rocks are generally poorly exposed; in order to measure sections through the basal phosphorite horizon it was necessary to dig trenches or pits to provide adequate sections. In the course of evaluating the economic potential of this horizon on the Barnes Lake claims, 57 samples were collected from 9 backhoe trenches and 2 hand trenches. The samples were analyzed for P_2O_5 using a gravimetric assay method, for yttrium using X-ray fluorescence (XRF) and for AU plus 33 trace elements, including some of the rare earths, using induced neutron activation analysis (INAA). As well, twenty-one samples were also analysed for major element oxide composition using the direct coupled plasma emission (DCP) method and for mercury using cold vapour atomic absorption (AA) analysis.

Nine trenches were dug using a John Deere 555 Backhoe. The trenches ranged from 3.2 to 29.6 metres in length, 1 to 4.3 metres in width and 0 to 3 metres in depth. The dimensions of individual trenches are summarized as follows:

Trench	Length (m)	Width (m)	Depth/Bank Height (m)	Material Moved (m^3)
BNT90-1	9.3	1-4.3	0-2.4	34.78
BNT90-2	12.3	1-1.5	1-2.6	26.03
BNT90-3	21.5	1	1-2.75	21.09
BNT90-4	3.3	1.3	1.8	7.72
BNT90-5	29.6	1	0-2.2	47.00
BNT90-6	13.3	1	0.4-2.8	8.86
BNT90-7	3.2	2.3	0-2.36	8.68
BNT90-8	5.35	1-3.2	2-3	28.93
BNT90-9	5.6	0.85-3.1	2-2	24.90
Total Volume of Material Moved				207.59m^3

Two hand trenches were also dug. These involved the removal of sloughed material from steeply dipping bank sections to clearly expose the phosphate strata.

Continuous samples across measured intervals were collected from all trenches. In the longer backhoe trenches, commonly more than one section was measured. Maximum depth attained by the backhoe was 3 metres: all samples collected may have been affected, to some degree, by surface weathering. Phosphate and yttrium results, from measured sections on the Barnes Lake claims are summarized as follows:

Summary of Measured Sections, Barnes Lake Claims

Section	Thickness+ (m)	Weighted Averages* P_2O_5 %	Y ppm
Hand Trenches			
BN90-23**	0.98	30.50	777
BN90-37**	0.65	27.29	658
Backhoe Trenches			
BNT90-1**	0.68	25.00	722
BNT90-2**	0.52	25.67	718
BNT90-3-1	1.11	23.16	629
BNT90-3-2	1.11	21.63	712
BNT90-4**	0.78	21.24	582
BNT90-5-1	1.24	23.73	643
BNT90-5-2**	0.75	25.14	758
BNT90-6**	0.87	24.89	712
BNT90-7	1.45	23.58	595
BNT90-8	1.62	20.94	493
BNT90-9	2.07	22.14	565

\+ Thicknesses quoted are all true stratigraphic thicknesses, either measured as such or calculated

* Measured sections are generally composed of a number of smaller interval samples; weighted averages, based on proportional sample thicknesses, were calculated to represent the yttrium and phosphate content of the entire section

** Incomplete section due to erosion or faulting

On the Barnes Lake claims, the stratigraphically complete measured sections average 22.53 per cent P_2O_5 and 606 ppm yttrium across an average thickness of 1.43 metres (1.11 to 2.07). One incomplete section contained an average of 30.5% P_2O_5 and 777 ppm Y across 0.98 metres. The values ranged from 2.66 per cent P_2O_5 and 98 ppm yttrium in shale layers within the phosphorite section to 32.18 per cent P_2O_5 and 1065 ppm yttrium in true phosphorites (Appendix 1).

In most trenches in the Barnes Lake area, the phosphorite horizon overlies orange to yellow clays (weathered Triassic siltstones) or interbedded buff to brown Triassic shales and siltstones. The lowest units commonly contain angular orange weathering fragments, probably derived from the underlying Triassic beds, that diminish in abundance upsection. The phosphorites are generally shaley to pelletal in nature and exhibit an increase in grade upsection until a fairly pure phosphorite, containing between 28 and 32% P_2O_5 is developed. Commonly, this high-grade phosphorite is black, pelletal (gritty textured) and overlain by increasingly shaley phosphorite and shale. Locally, (see trenches BNT90-7 & 8) phosphate nodules hosted in a pelletal phosphate matrix are developed in these high-grade beds. Incomplete sections exhibit similar trends, but are often complicated through mixing and erosion of units. In trenches BNT90-1 & 2 the phosphorite bed and a veneer of Triassic siltstones have been thrust westerly over very disrupted black shales and incomplete sections preserved.

All trenches were in phosphatic strata distributed along the western limb of the easternmost. Particularly in the vicinity of Trenches BNT90-3 to 6 the beds are dipping roughly parallel to slightly steeper than the hillside. This dip slope setting suggests that, in this area, it may be possible to define a fairly large deposit that is easily exploited and requires only minimal removal of overburden. Shallow drilling could be used in this area to outline reserves to an acceptable depth.

An attempt was made to access the phosphate horizon on the western limb of the syncline at the north end of the property. An old exploration road leads to the Triassic/Jurassic contact in that area.

A number of samples were analysed for their major element compositions in order to see how they compare to industry standard specifications for fertilizer plant feed. The results for samples containing greater than 20% P_2O_5 are summarized below:

Sample Number	P_2O_5%	CaO/ P_2O_5	R_2O_3*/ P_2O_5	MgO%
BNT90-1A	29.93	1.37	0.19	0.42
BNT90-1B	29.96	1.37	0.20	0.42
BNT90-1C	24.56	1.46	0.26	0.42
BNT90-2A	30.50	1.38	0.17	0.34
BNT90-2B	23.11	1.43	0.35	0.51
BNT90-3-1C	30.26	1.39	0.17	0.35
BNT90-3-1D	24.17	1.46	0.29	0.42
BNT90-3-2C	29.79	1.40	0.19	0.37
BNT90-3-2D	22.71	1.42	0.33	0.44
BNT90-23A	31.39	1.39	0.16	0.29
BNT90-23B	32.91	1.39	0.12	0.23
BNT90-9B	30.53	1.48	0.16	0.33

*R_2O_3 = Al_2O_3 + Fe_2O_3 + MgO

In all cases, the CaO/P_2O_5 ratios and MgO contents of the raw samples meet industry standard fertilizer plant feed specifications. In many samples, the P_2O_5 grades of the individual sa#2 – P_2O_5 15.33%
mples are low and therefore some beneficiation would be necessary. The R_2O_3/ P_2O_5 ratios of the raw material exceed standard requirements, ranging from 0.12 to 0.35 where they need to be less than 0.1: the higher the phosphate content, however, the lower the ratio.

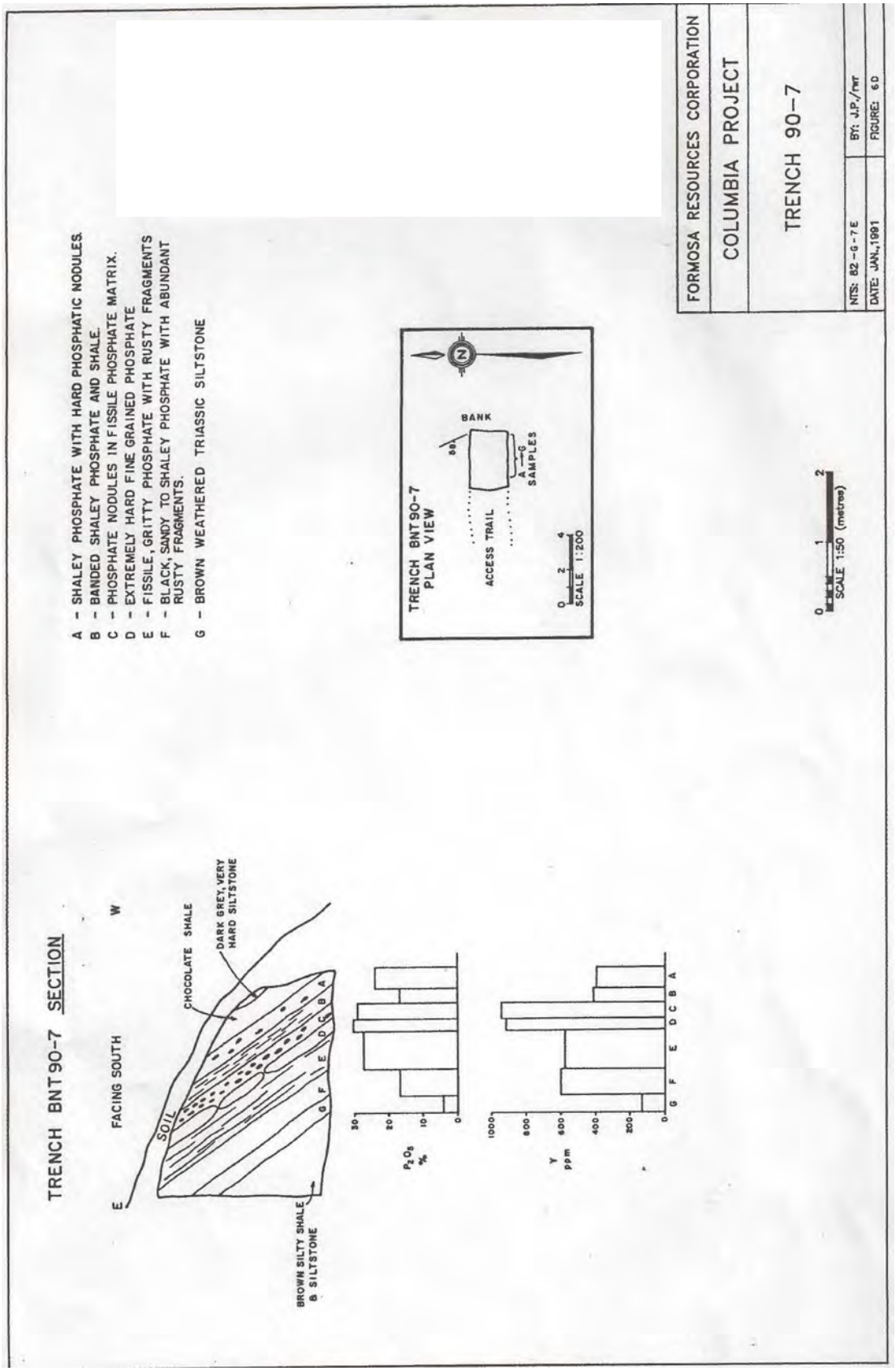


Figure 4 Previous Trench 90-7

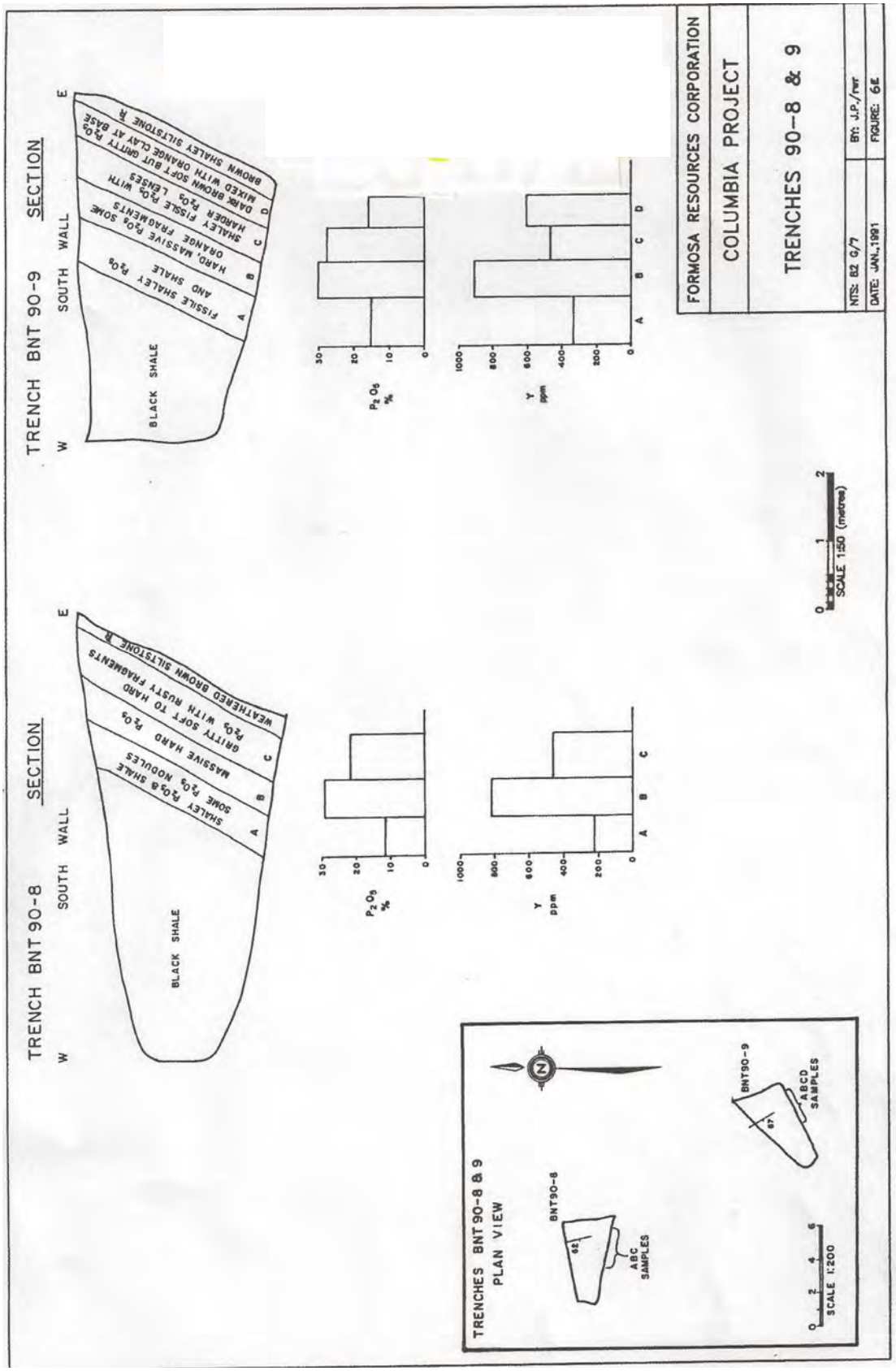


Figure 5 Trenches 90-8 & 9

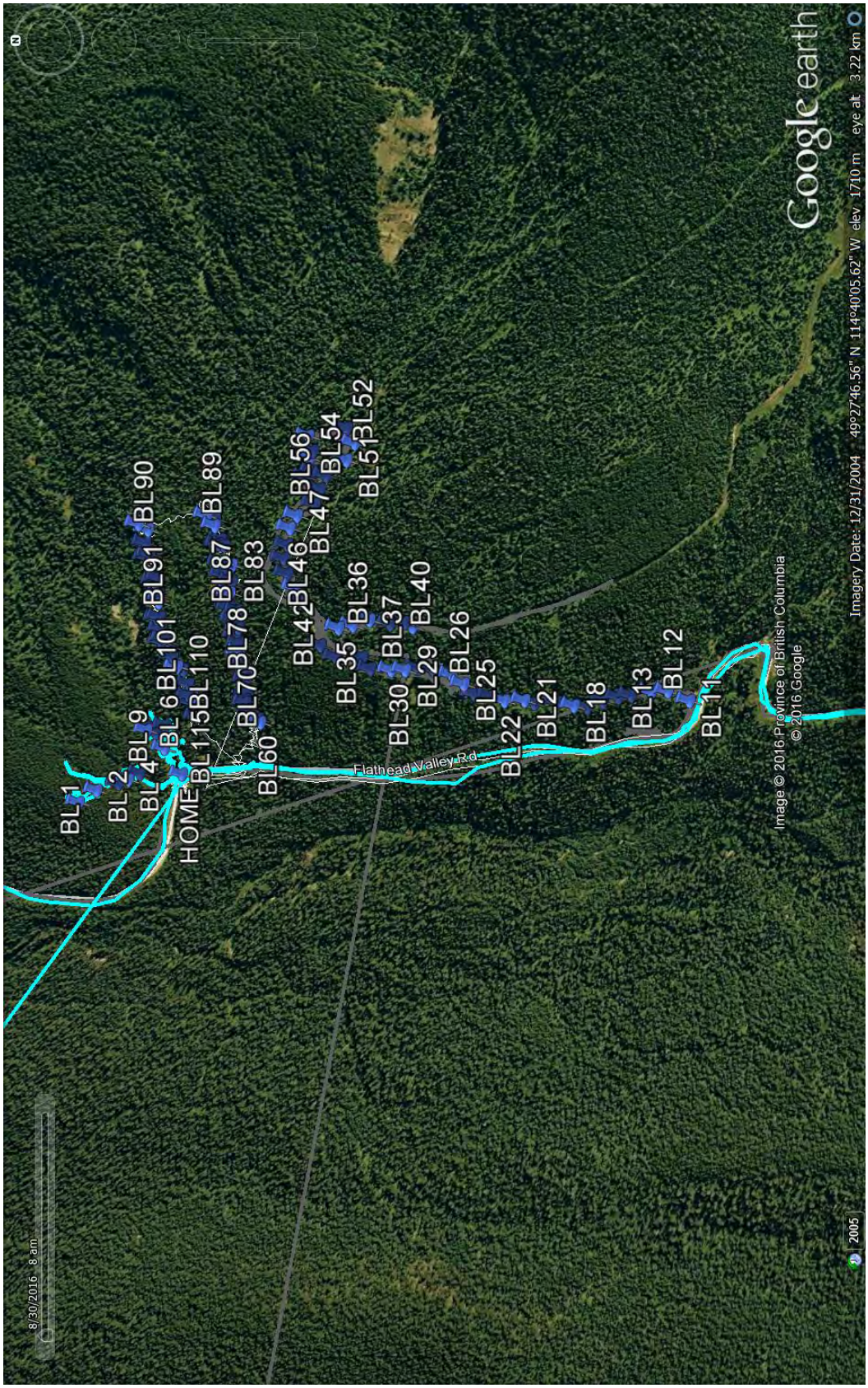


Figure 6 General Google Image of Area from 2014 Work

The 2013 program consisted of reconnaissance prospecting, rock sampling and establishing access. Thirteen samples were collected and assayed. Work in June 2013 was curtailed by unusually heavy rain which washed out the access road and the access was closed. Widespread flooding occurred in southeast BC and Alberta.

Results for 2013 sampling are generally low.

In 2014 the program consisted of prospecting the easternmost part of the claims. The area around the 1960's drill hole was examined and a suite of samples collected.

Assays were conducted by using an XRF Unit factory calibrated (Cert No. 0154-0557-1) on October 30, 2013, Instrument #540557 Type Olympus DPO-2000 Delta Premium. The instrument was calibrated using Alloy Certified reference materials by ARM1 and NIS5 standards. Only certified operators were employed and that were experienced in XRF assay procedures. Read times were 120 seconds or greater.

Results of the 2014 samples show low P_2O_5.

Work Program 2016

The program consisted of continued reconnaissance prospecting, minor rock sampling and establishing access, soil samples were collected and assayed.

Results of the XRF assays and sample descriptions were presented. Soil samples were collected with a mattock at an average depth of 20cm from mainly a poorly developed "B" horizon.

Assays were conducted by using an XRF Unit factory calibrated (Cert No. 0154-0557-1) on October 30, 2013, Instrument #540557 Type Olympus DPO-2000 Delta Premium. The instrument was calibrated using Alloy Certified reference materials by ARM1 and NIS5 standards. Only certified operators were employed and that were experienced in XRF assay procedures. Read times were 120 seconds or greater.

With steeper dips of the beds than expected the results suggest that the sampling so far, is still too high in the sedimentary sequence. Work shows slightly anomalous soil samples approximately 150m east of the main rock at an elevation of approximately 1725m to 1767m. Close spaced soil samples are recommended perpendicular to the road system (E-W) at 10m intervals. Hand trenching assisted by excavator trenching is recommended to follow up on the previous drilling and soil results.

The Barnes Lake property area is a forested area located between the south end of the Coal Mountain Mine and the upper reaches of Michel Creek. A small clearing was observed approximately 30 m to the south of a curve in the Flathead Valley Road and on the east side of the road. The small area was cleared by past operators for an historical drill site. It was also observed that a very low artesian flow of water was emanating from what is believed to be the collar of the historical drill hole. The flow is roughly estimated to be less than 0.25 litres per minute.

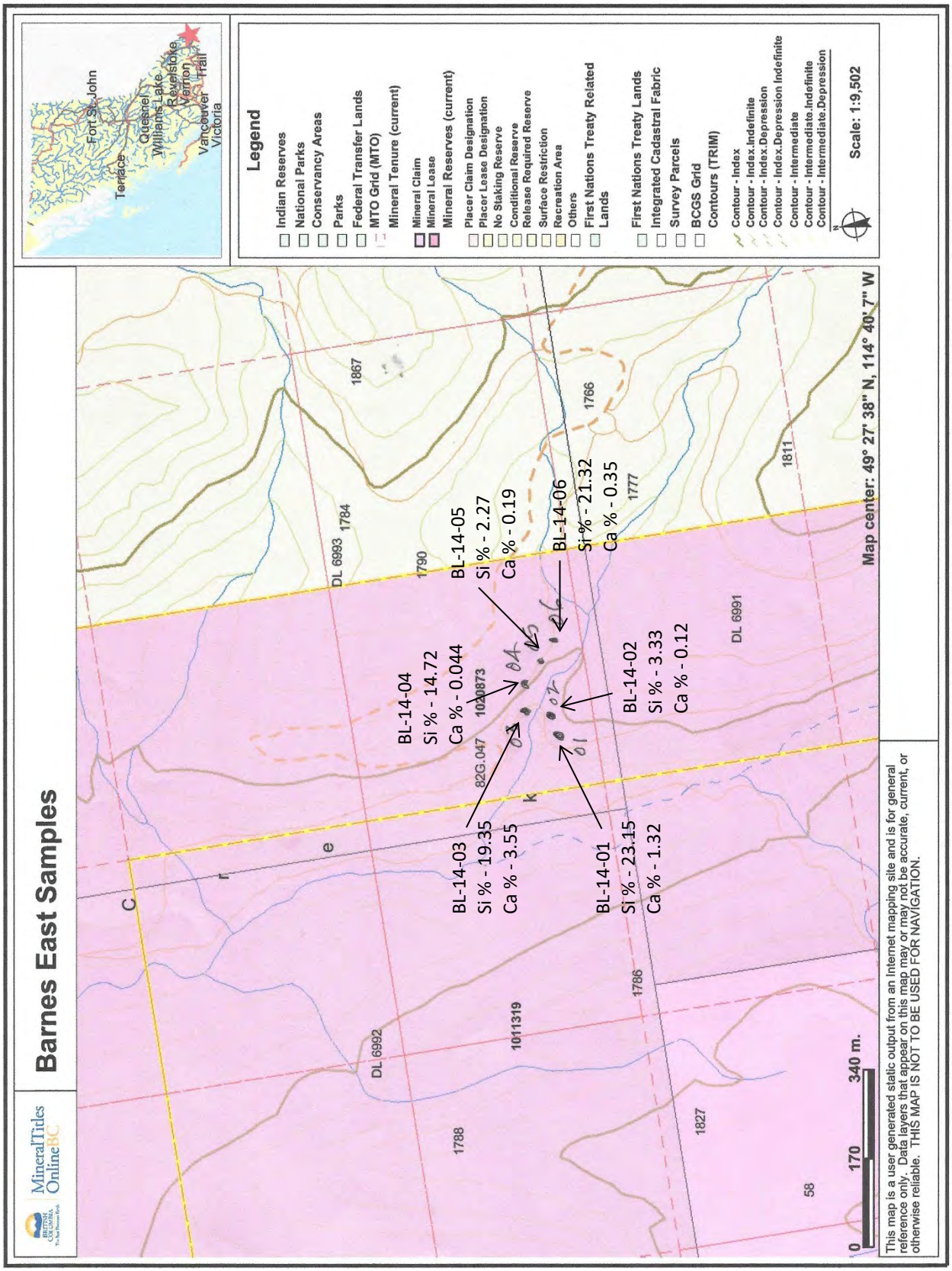


Figure 7 Sample Location and Results 2015

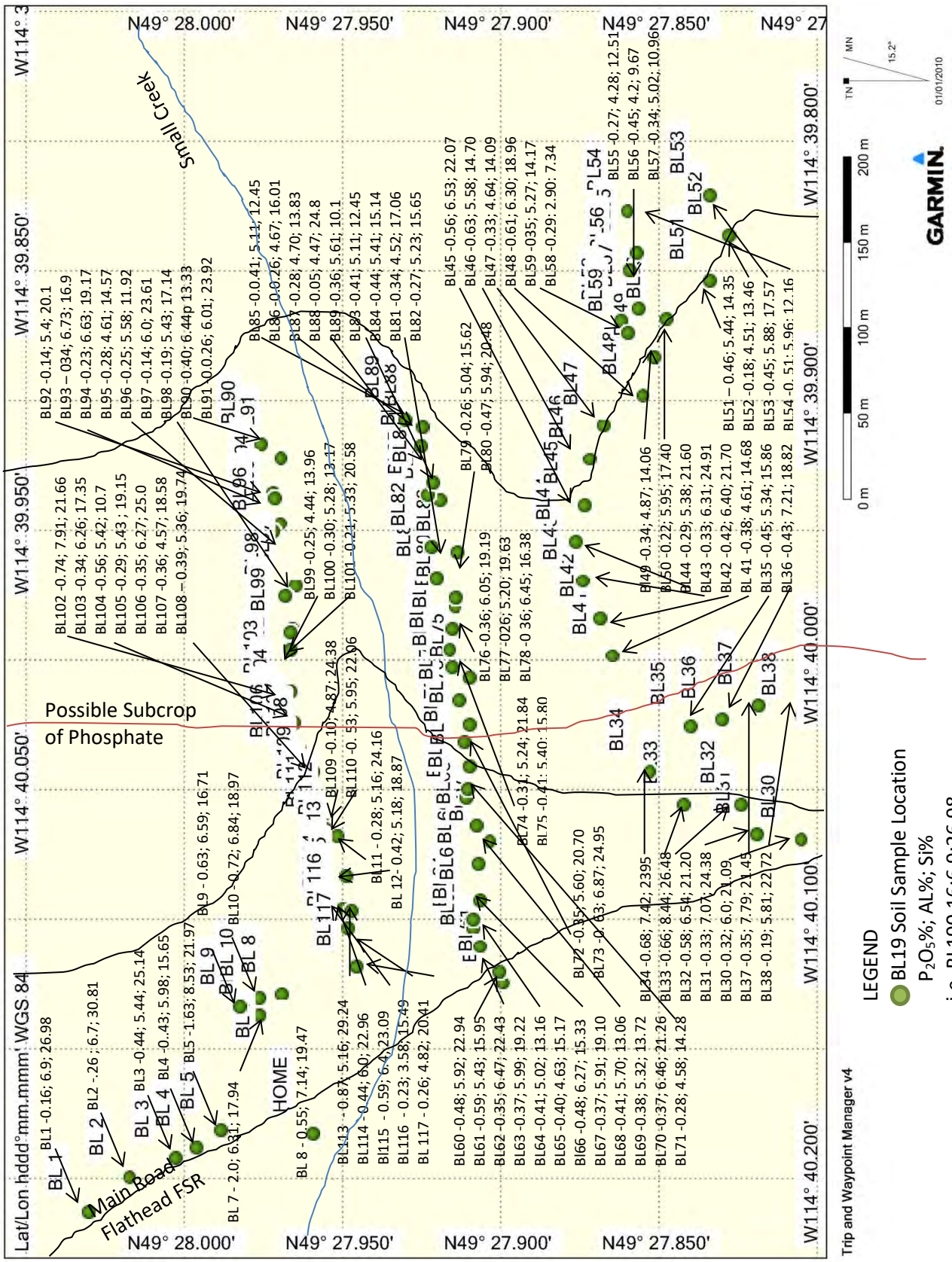


Figure 8 Sample Locations and Assay Results 2016

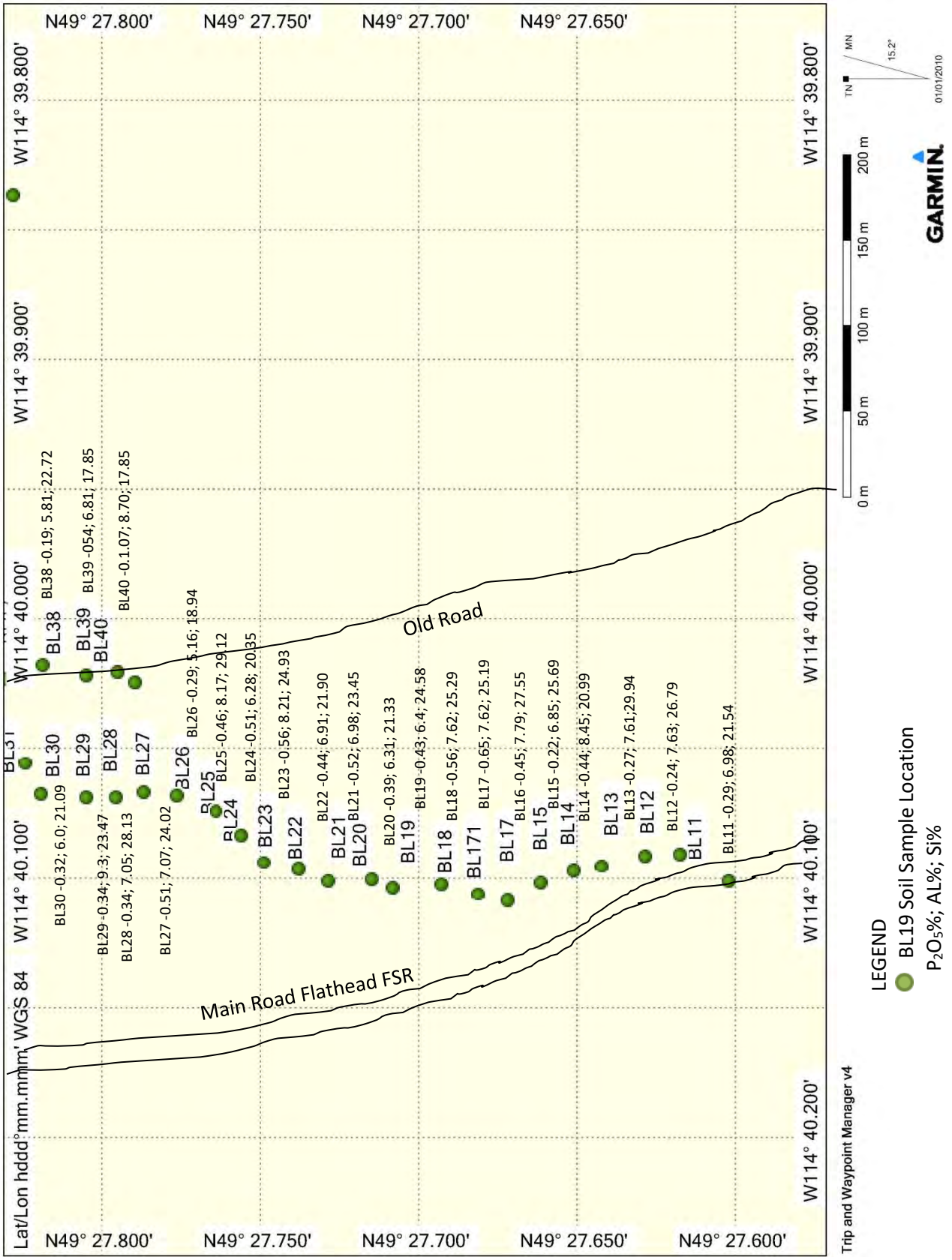


Figure 8 Sample Locations and Assay Results 2016

At the apex of the sharp curve in the Flathead Valley Road, a small creek was observed flowing over bedrock then through a culvert under the above noted road and then empties into Michel Creek.

The Barnes Lake property area is a forested area located between the south end of the Coal Mountain Mine and the upper reaches of Michel Creek. A small clearing was observed approximately 30 m to the south of a curve in the Flathead Valley Road and on the east side of the road. The small area was cleared by past operators for an historical drill site. It was also observed that a very low artesian flow of water was emanating from what is believed to be the collar of the historical drill hole. The flow is roughly estimated to be less than 0.25 litres per minute.

At the apex of the sharp curve in the Flathead Valley Road, a small creek was observed flowing over bedrock then through a culvert under the above noted road and then empties into Michel Creek.

Michel Creek is located up-gradient (upstream) of the Coal Mountain coal mine in the vicinity of the Barnes Lake property. There were no other drainages or seepages observed along the Flathead Valley Road where it traverses the Barnes Lake property.

2016 Surface Water Sampling

A total of three (3) surface water samples were collected from two creek drainages and an artesian water flow (previously described) from an historic drill hole. The three water samples were submitted to the ALS Environmental laboratory in Burnaby, BC for analysis of Total and Dissolved metals, Hardness, Alkalinity (5 types), Acidity, Fluoride, Dissolved Chloride and Sulphate, Nitrite (N), Nitrate (N), Nitrate plus Nitrite (N), Total and Dissolved Phosphorous and Orthophosphate and Ph.

The samples were identified as BLSW 1 to BLSW 3. The analytical results are presented on attached Tables 1 to 4 and are briefly described as follows:

The sample locations are shown on attached Figure 14 and are briefly described as follows:

BLSW 1 – Sample was collected from a small puddle of water that has emanated from an historic drill hole on the property. The water is an artesian flow from what is assumed to be the collar of the old borehole. Old drill logs indicated that the borehole intersected a thin bed of phosphorite at a depth of 7.6 metre below grade. The water flow rate is very low and appears to be less than 0.25 litres per minute. The water had dampened the area for approximately 9 m^2 in the cleared area around the assumed collar of the historical drill hole. Sample BLSW 1 was located at UTM Coordinates 11U 668853 5481838.

BLSW 2 – Sample was collected from a small creek flowing over bedrock near the apex of a sharp curve in the Flathead Valley Road and approximately 25 north of sample BLSW 1. The sample was collected in the creek approximately 2 m east of the road before it entered a culvert. Sample BLSW 2 was located at UTM Coordinates 11U 668849 5481864.

BLSW 3 – Sample was collected from the Michel Creek approximately 1.3 km north-northwest of sample BLSW 2 west of the Flathead Valley Road and is downstream from samples BLSW 1 and BLSW 2. The sample location BLSW 3 on Michel Creek is upstream (up-gradient) of the Coal Mountain coal mine. This is in contrast to the Marten Landing sample MLSW 4 which is located on Michel Creek downstream (down gradient) of the Coal Mountain coal mine. Sample BLSW 3 is located at UTM Coordinates 11U 668182 5482837.

Analytical Results

From the dissolved and total metals analyses and the anion analyses, the hardness concentrations ($CaCO_3$) were slightly elevated and ranged from 107 to 171 mg/L in the three samples analyzed. The field pH levels were also found to be at 8.4 to 9.0 which are at or just below the BC Water Quality Guidelines (WQG) which has a range of >6.5 to <9. The hardness and pH levels are likely due to the natural underlying geological formations in the

immediate area; however, more geological information is required. It has been reported that a phosphorite unit was intersected in the historic drill hole; however, more details are not available at this time. From the more alkaline pH level it is likely that carbonate is derived by nearby limestone formations as indicated by total and dissolved calcium concentrations.

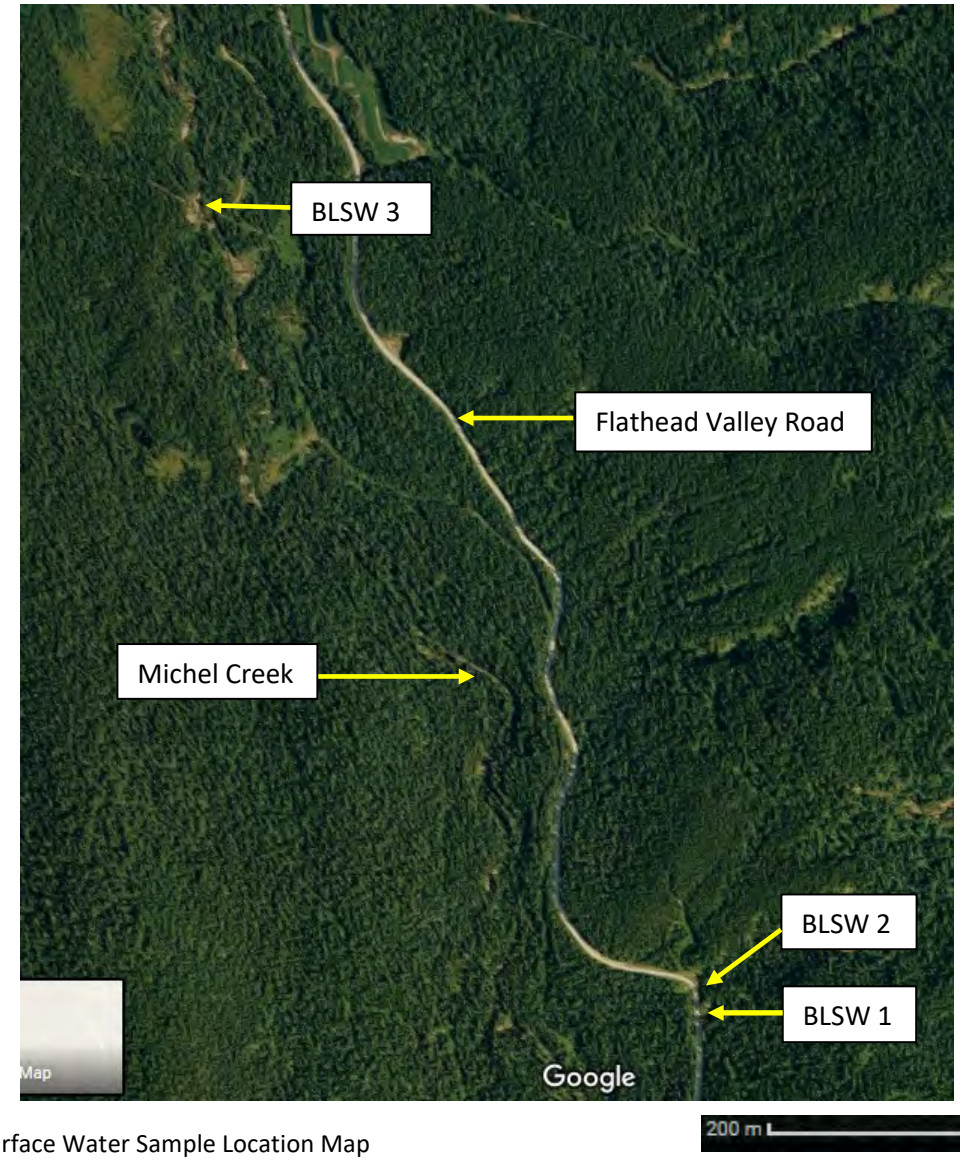


Figure 9 – Surface Water Sample Location Map

Total Metals

The total metals parameters presented on Table 1 have concentrations less than the applicable BC Approved and Working Water Quality Guidelines (WQG) for freshwater aquatic life (AW_{FW}) and Contaminated Sites Regulation (CSR) drinking water (DW) standards with the exception of sodium which exceeds the CSR DW standard of 200,000ug/L with a concentration of 210,000 ug/L. The CSR standard for sodium only applies to esthetic values such as taste and colour and not to toxicity.

In general, WQG are applied to total metals and hardness concentrations are generally applied to individual metal parameter concentrations. pH is also applied but in a smaller number of metals. Dissolved metals concentrations are generally applied to CSR standards with adjustments also made for Hardness and Ph.

For aluminum, the WQG applies to dissolved aluminum only. The results for Total Aluminum for the three water samples are elevated above the dissolved aluminum WQG of 50 ug/L; however, there are no guidelines for Total Aluminum. As observed on Table 1, CSR standards are presented for comparison only as they apply primarily to groundwater and not surface water. Standards for drinking water (DW) in Schedule 6 and Schedule 10 of the BC Contaminated Sites Regulation (CSR), which are typically 10 times higher than the BC WQG

Dissolved Metals

The dissolved metals parameters have concentrations less than the applicable WQG AW_{FW}, WQG_{DW} and CSR DW. For the most part, the concentrations of dissolved metals are similar to the total metals concentration. As with total metals concentrations, the application of hardness and pH to certain dissolved metal concentrations using the specified WQG equations has also increased the concentration limits before exceedances occur.

The concentrations of total and dissolved selenium and cadmium in the three Barnes Lake water samples (BLSW 1 to BLSW 3) were less than the reported laboratory detection limit which is also less than the WQG and CSR guidelines and standards.

Conventional Parameters

Total Alkalinity concentrations for samples BLSW 1 to BLSW 3 reflects the elevated hardness and calcium concentrations found in these three samples along with pH levels of 8.4 to 9.0 (towards the alkaline side of the neutral range of pH from 6.5 to 9). From Table 3 the total alkalinity of these three samples exceeds the WQG AW_{FW} range of 20 mg/L; however, in the natural environment of this area, it is likely that the area has low sensitivity to acid inputs. In low sensitivity environments, total alkalinity concentrations are permitted to exceed 20 mg/L. There are no guidelines under the WQG or CSR standards for PP Alkalinity ($CaCO_3$), Bicarbonate Alkalinity (HCO_3), Carbonate Alkalinity (CO_3) nor for Hydroxide Alkalinity (OH).

For Anions such as Fluoride (total) the range of concentrations to exceed the WQG is between 1.36 and 1.55 based on the application of hardness ranging from 107 to 171 mg/L for samples BLSW 1 to BLSW 3. The Fluoride concentration of these four samples is, therefore, less than the guidelines and CSR DW standard.

Dissolve Chloride ion (CL) and Dissolved Sulphate concentrations for the four samples previously noted are well below the WQG guidelines and CSR DW standard.

Concentrations of Nitrate (N), Nitrite (N) and Nitrate plus Nitrite (N) are also less than the applicable WQG guidelines and CSR DW standards.

As previously noted, pH levels were found to be between 8.4 and 9.0 for the three water samples are at or are just below the BC Water Quality Guidelines (WQG) which has a range of >6.5 to <9. The acidity concentration at was 3.3 mg/L at BLSW 1 and less than the reported laboratory detection limit at BLSW 2. Acidity at sample BLSW 3 was 1 mg/L which is at the laboratory detection limit. There are no guidelines under the WQG nor the CSR for acidity.

Conclusions

Elevated hardness and pH levels in the drainages at the Barnes Lake project site have a buffering or neutralizing effect on total and dissolved metals concentrations that may be exposed to the natural environment. The elevated hardness and pH levels also appear to be derived from the natural underlying geologic strata as it undergoes weathering and releases several species of alkalinity to the other strata and overlying soil. To date sulphides have been not observed in the field. The current surface water sample results for total and dissolved metals provide some support for these findings.

The surface water sampling program conducted in August indicated generally low concentrations of total metals and dissolved metals. This may indicate that there is low potential for metals to leach from the potential discovery and exposure phosphorite material at concentrations that could exceed water quality guidelines. This is particularly evident in sample BLSW 1 where phosphorite material was apparently intersected in the historical drill hole. Artesian water from the historical drill hole collected as sample BLSW 1 supports this low potential with total and dissolved metals concentrations less than the WQG. It is also noted that in the Barnes Lake property area that total and dissolved selenium concentrations in Michel Creek in sample BLSW 3 were less than the laboratory detection limits. As Michel Creek in the area of the Barnes Lake Property is located upstream (up-gradient) on the Coal Mountain coal mine confirms the influence of coal deposits on selenium levels in Michel Creek where concentrations of selenium exceed WQG downstream of the Coal Mountain mine at samples site MLSW 4 at the Marten Landing project site.

Metals Notes Table
Marten Project

METALS NOTES: CSR AW_{FW}

Cd 0.1 @ H<30
0.3 @ H=30-<90
0.5 @ H=90-<150
0.6 @ H=150-<210
0.8 @ H=210-<270
0.9 @ H=270-<330
1.1 @ H=330-<390
1.2 @ H=390-<450
1.3 @ H=450-<500

Cu 20 @ H<50
30 @ H=50-<75
40 @ H=75-<100
50 @ H=100-<125
60 @ H=125-<150
70 @ H=150-<175
80 @ H=175-<200
90 @ H>=200

Zn 75@ H<90
150 @ H=90-<100
900 @ H=100-<200
1650 @ H=200-<300
2400 @ H=300-<400
3150@ H=400-<500

Ni 250 @ H<60
650 @ H=60-<120
1100 @ H=120-<180
1500 @ H>=180

Pb 40 @ H<50
50 @ H=50-<100
60 @ H=100-<200
110 @ H=200-<300
160 @ H>=300

Ag 0.5 @ H<=100
15 @ H>100

CONV. PARAMETER NOTES: CSR AW

N Nitrite
0.2 @ Cl<2 mg/L
0.4 @ Cl=2-<4
0.6 @ Cl=4-<6
0.8 @ Cl=6-<8
1 @ Cl=8-<10
2 @ Cl>=10

F 0.2 @ H<50
0.3 @ H>=50

Total Alkalinity
< 10 mg/L highly senstive to acidic inputs
10-20 mg/L moderately senstive
> 20 mg/L low sensitivity

CONV. PARAMETER NOTES: WQG AWFW

N Nitrite
0.06 @ Cl<2 mg/L
0.12 @ 2-4
0.18 @ 4-6
0.24 @ 6-8
0.30 @ 8-10
0.60 @ >10

METALS NOTES: WQG AW_{FW}

Al 100 @ pH>=6.5
7.4 @ pH=6.4
4.7 @ pH=6
2.3 @ pH=5
2.0 @ pH<=4

Cd 0.01 @ H=30
0.02 @ H=60
0.03 @ H=90
0.04 @ H=120
0.05 @ H=150
0.06 @ H=210
0.13 @ H=500
0.24 @ H=1000
0.44 @ H=2000
0.62 @ H=3000
0.79 @ H=4000
0.96 @ H=5000

Cu 2.9 @ H=10
6.7 @ H=50
11.4 @ H=100
49 @ H=500
96 @ H=1000
190 @ H=2000
378 @ H=4000
472 @ H=5000

Pb 3 @ H=< 8
4 @ H=10
34 @ H=50
82 @ H=100
633 @ H=500
1531 @ H=1000
3699 @ H=2000
8940 @ H=4000
11877 @ H=5000

Mn Acute
800 @ H=25
1100 @ H=50
1600 @ H=100
2200 @ H=150
3800 @ H=300

Mn Chronic
700 @ H=25
800 @ H=50
1000 @ H=100
1300 @ H=150
1900 @ H=300

Ni 25 @ H=0-60
65 @ H=60-120
110 @ H=120-180
150 @ H=>180

Ag 0.1 @ H=<100
3.0 @ H>100

Tl 6.3 ug/L human health, consumption of organism only
Ti 2000 ug/L mean threshold level Scenedesmus
4600 ug/L mean threshold level Daphnia
K 373,000-432,000 ug/L threshold for Daphnia immobilization

Zn Max
33 @ H=<90
40 @ H=100
115 @ H=200
190 @ H=300
265 @ H=400
341 @ H=500
716 @ H=1000
2966 @ H=4000
3716 @ H=5000

Zn 30 day average
7.5 @ H=<90
15 @ H=100
90 @ H=200
165 @ H=165
240 @ H=400
315 @ H=500

Ca <4000 highly sensitive to acid inputs
4000-8000 moderately sensitive
>8000 low sensitivity
the more restrictive of calcium or alkalinity applies

Alkalinity
<10000 highly sensitive to acid inputs
10000-20000 mod sensitive to acid inputs
>20000 low sensitivity

METALS NOTES: WQG AW_M

Mn 100 ug/L guideline to protect consumers of shellfish

METALS NOTES: PL/RL (AW_{FW})

Cd pH<7.0 = 2
pH 7.0-<7.5 = 2.5
pH 7.5-<8.0 = 25
pH≥ 8.0 = 35

Cu pH<5.0 = 90
pH 5.0-<5.5 = 100
pH≥5.5 = 150

Pb pH<5.5 = 150
pH 5.5-<6.0 = 250
pH≥6.0 = 500

Zn pH<6.0 = 150
pH 6.0-<6.5 = 300
pH≥6.5 = 450

METALS NOTES: PL/RL (DW)

Cd pH<6.5 = 1.5
pH 6.5-<7.0 = 3
pH 7.0-<7.5 = 15
pH≥7.5 = 35

Cu at any pH = 150

Pb pH<6.0 = 100
pH 6.0-<6.5 = 250
pH≥6.5 = 500

Zn pH<5.0 = 150
pH 5.0-<5.5 = 200
pH 5.5-<6.0 = 300
pH≥6.0 = 450

METALS NOTES: IL (AW_{FW})

Cd pH<7.0 = 2
pH 7.0-<7.5 = 2.5
pH 7.5-<8.0 = 25
pH≥8.0 = 150

Cu pH<5.0 = 90
pH 5.0-<5.5 = 100
pH 5.5-<6.0 = 200
pH≥6.0 = 250

Pb pH<5.5 = 150
pH 5.5-<6.0 = 250
pH≥6.0 = 2000

Zn pH<6.0 = 150
pH 6.0-<6.5 = 300
pH≥6.5 = 600

METALS NOTES: IL (DW)

Cd pH<6.5 = 1.5
pH 6.5-<7.0 = 3
pH 7.0-<7.5 = 15
pH 7.5-<8.0 = 200
pH≥8.0 = 500

Cu at any pH = 250

Pb pH<6.0 = 100
pH 6.0-<6.5 = 250
pH≥6.5 = 2000

Zn pH<5.0 = 150
pH 5.0-<5.5 = 200
pH 5.5-<6.0 = 300
pH≥6.0 = 600

Reconnaissance mapping and sampling surveys were carried in two separate areas (Zones 1 & 2) of the Barnes Lake property. A mapping traverse was conducted up a stream bed with the objective of locating a historical sample point that reported to contain rich (>30% P2O5) phosphate. Garmin-GPS was used to position all bedrock outcrop encountered with photographs.

Reconnaissance survey was conducted up stream along creek bed, which exposes a section of mildly folded bedrock comprised of black shale and gray siltstone (Fernie Basin) and tan-creamy coloured siltstone and silty-sandstone (Spray River) rocks. Each rock outcrop encountered was marked with Garmin GPS and identified with survey station (e.g. BL-OC2) with accuracy of ± 3 metres. Each ID outcrop was also briefly described and noted in field book included structure. Table 1 below brief describes grab samples collected and rock outcrops encountered.

ID Number	Sample Type	Brief Description	GPS Station (± m)
BL-01dc	Grab sample	Black shale some nodules <10%	668900E-5481889N
BL-06dc	Grab sample	Black shale, carbonaceous w/abundant slickensides	669333E-5481598N

ID Number	Bedrock Outcrop	Brief Description	GPS Station (± m)
BL-OC2	Mapped	Tan colour, silty-sandstone	669340E-5481653N
BL-OC5	Mapped bedrock	Fine gr., brownish siltstone	668970E-5481917N
BL-OC6	outcrop creek bed	Bedded siltstone Bedding dips 20° westerly (photo)	668993E-5481923N
BL-OC7	As above	Siltstone as above, beds dip west	669042E-5481904N
BL-OC8	Along creek bed	Thick, tan colour siltstone beds dipping 20-25° west (photo)	669056E-5481882N
BL-OC9	Creek exposure	Fine grain siltstone with dips as above	669097E-5481835N
BL-OC10	As above	Subcrop of oxidized siltstone	669449E-5481603N
BL-OC11	Outcrop along creek	Finely laminated black shale strike: north, dip: approx. 35°	669494E-5481609N
BL-OC12	As above	Black shale with siltstone interbeds	669599E-5481552N
BL-OC13	Along creek bed	(Fernie) black shale, strike north dip 45-50° west	669695E-5481523N
BL-OC14	Exposed along creek bank	Anticline with siltstone and overlying carbonaceous black shale (photo)	669743E-5481510N

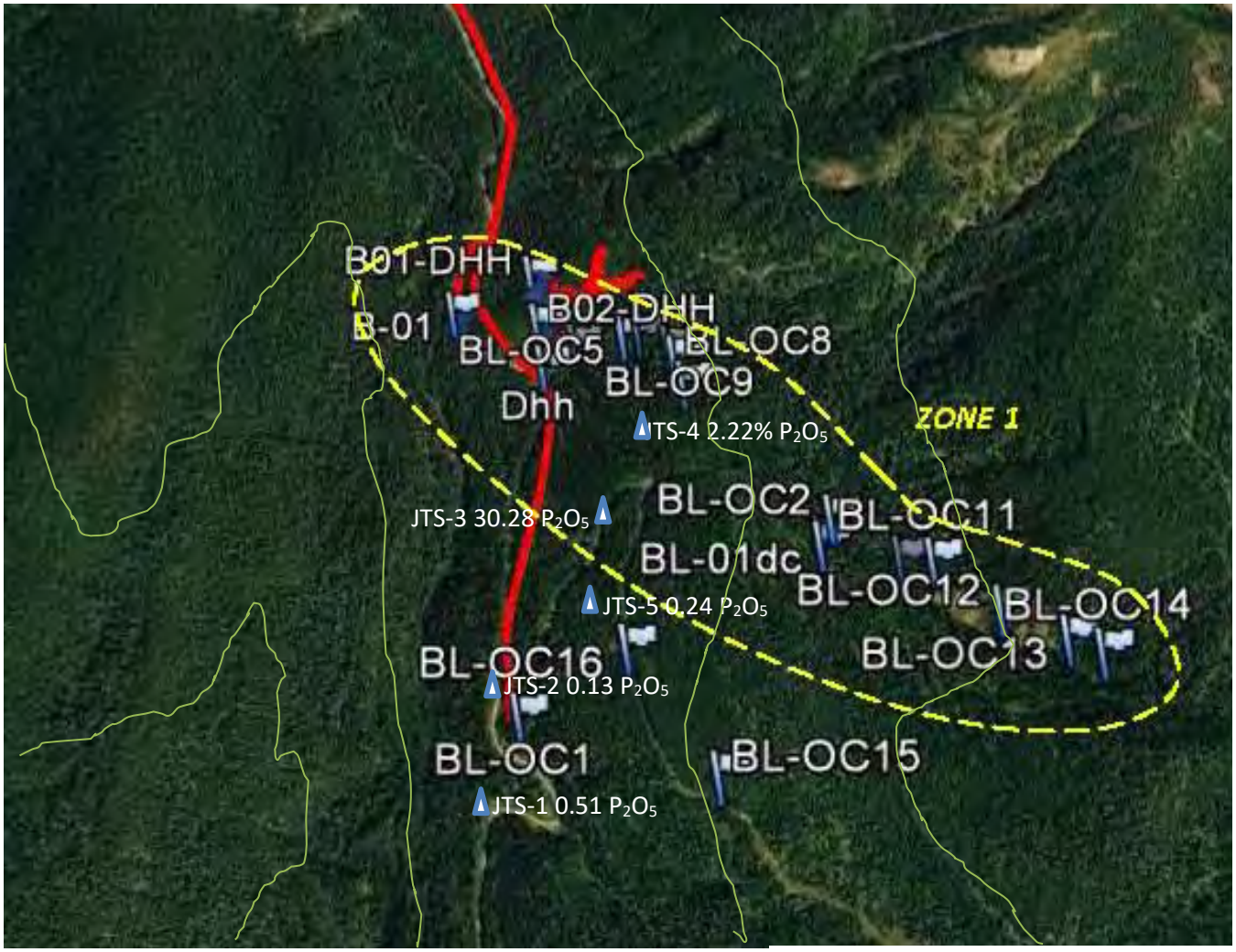


Figure 10 Reconnaissance Mapping and Sampling 2017

Legend

JTS – Rock Sample 0.13 P_2O_5

BLOC-16 Geological Station

Road

Contours

Area of P_2O_5 (Yellow Line)

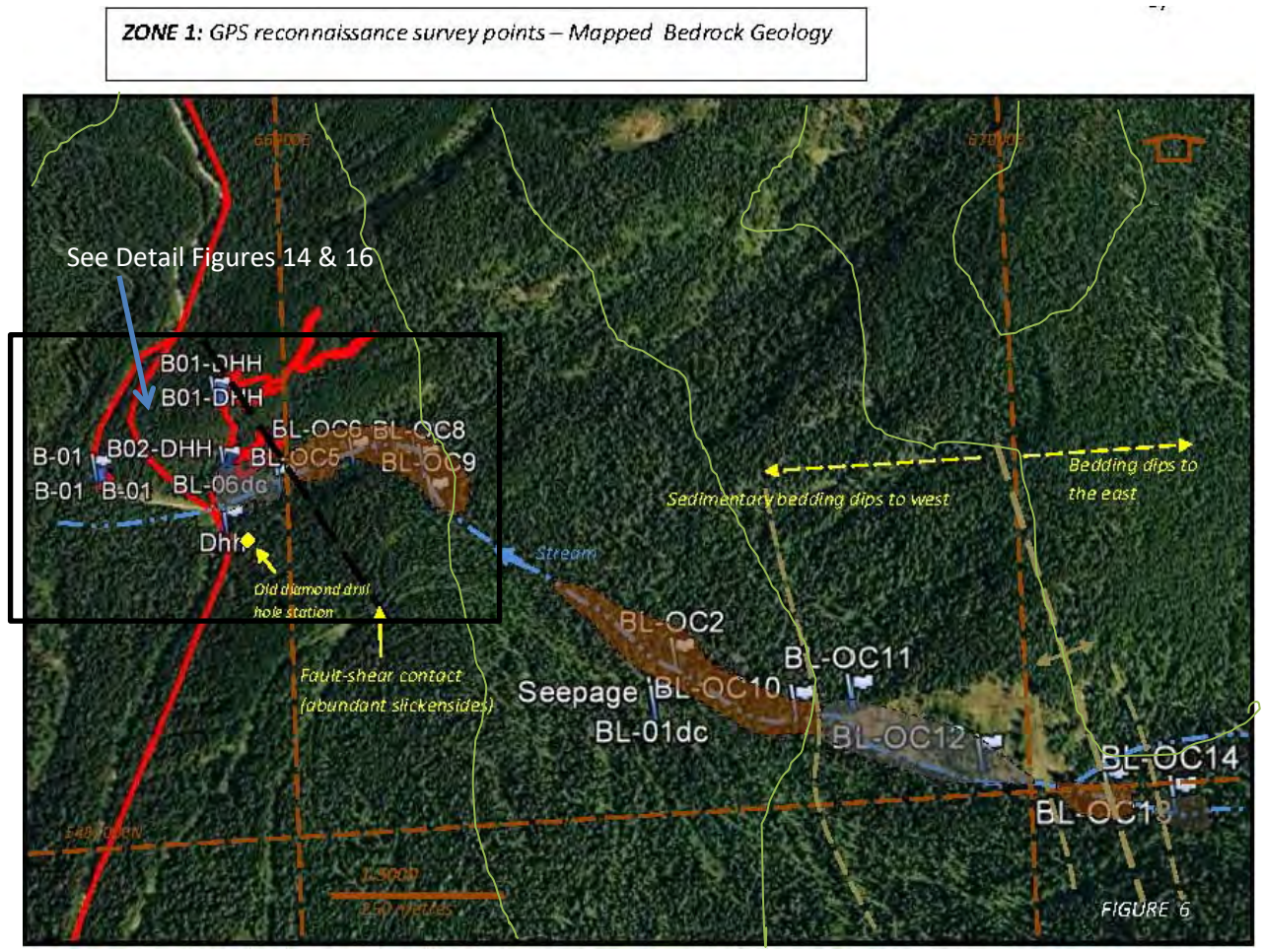


Figure 11 Zone 1

Legend

BLOC-16 Geological Station

Road

Contours

Dominate bedrock outcrop mapped along creek section in Figure 6 above is underlain by north-northwest striking, moderately west dipping brownish-tan coloured siltstone and fine grain, silty-sandstone, which makes up part of the Spray River group (Photo 5). This unit is in contact with overlying west dipping gray-black shale belonging to the Fernie Group. Structurally, the bedding gradually dips from about 20o southwesterly to about 50o west along the upper section of the creek. At station BL-OC14 here exposed on the creek bank anticline structure where the bedding changes dip from west to east (see Photo 6 below and Figure 6 above).

Bedded siltstone exposed along creek dipping about 20° west-southwesterly. Part of the Spray River Formation. Bedding increases in dip angle to about 50° further upstream (above). At station BL-OC14 bedding abruptly dips easterly.

At station BL-OC14 (Photo looking southerly) an anticlinal structure was mapped as shown above photo with shear zone of thrusted black shale over folded siltstone. All sedimentary beds mapped up to this point dipped westerly here attitude of bedding abruptly changes east.

Road Rehab and Bridge Installation

Our permit MX-5-813 calls for an engineered bridge crossing of Michel Creek. Brad Nelson, Structural Engineer, P. Eng. of McElhanney Engineering was engaged to assess and propose a safe and environmentally sound bridge crossing (see Figure 16). Subsequently, an 80ft bridge was installed by Johnston Construction (@bcbridgebuilder) the bridge firm of choice in the East Kootenays (see photo below). Our permit MX-5-813 stipulates that the bridge crossing was to be temporary in nature, so the bridge was removed in late September, 2018.

The existing road had not been used for 25 years and was not put to bed properly. There were no drainage structures along the road and subsequent freshets had eroded the road bed. Our work in 2018 was to rehab 4.0km of road up to a standard that a 4x4 truck could pass in dry weather. Drainage structures were completed using cross ditching and culverts to allow water to exit the road structure.

The rehabbed road allowed access to complete our excavator trenching and other exploration work.

The lower 1km of the road was rebuilt by CanFor in 2019 and a new logging bridge installed.

Michel Creek Bridge 2018

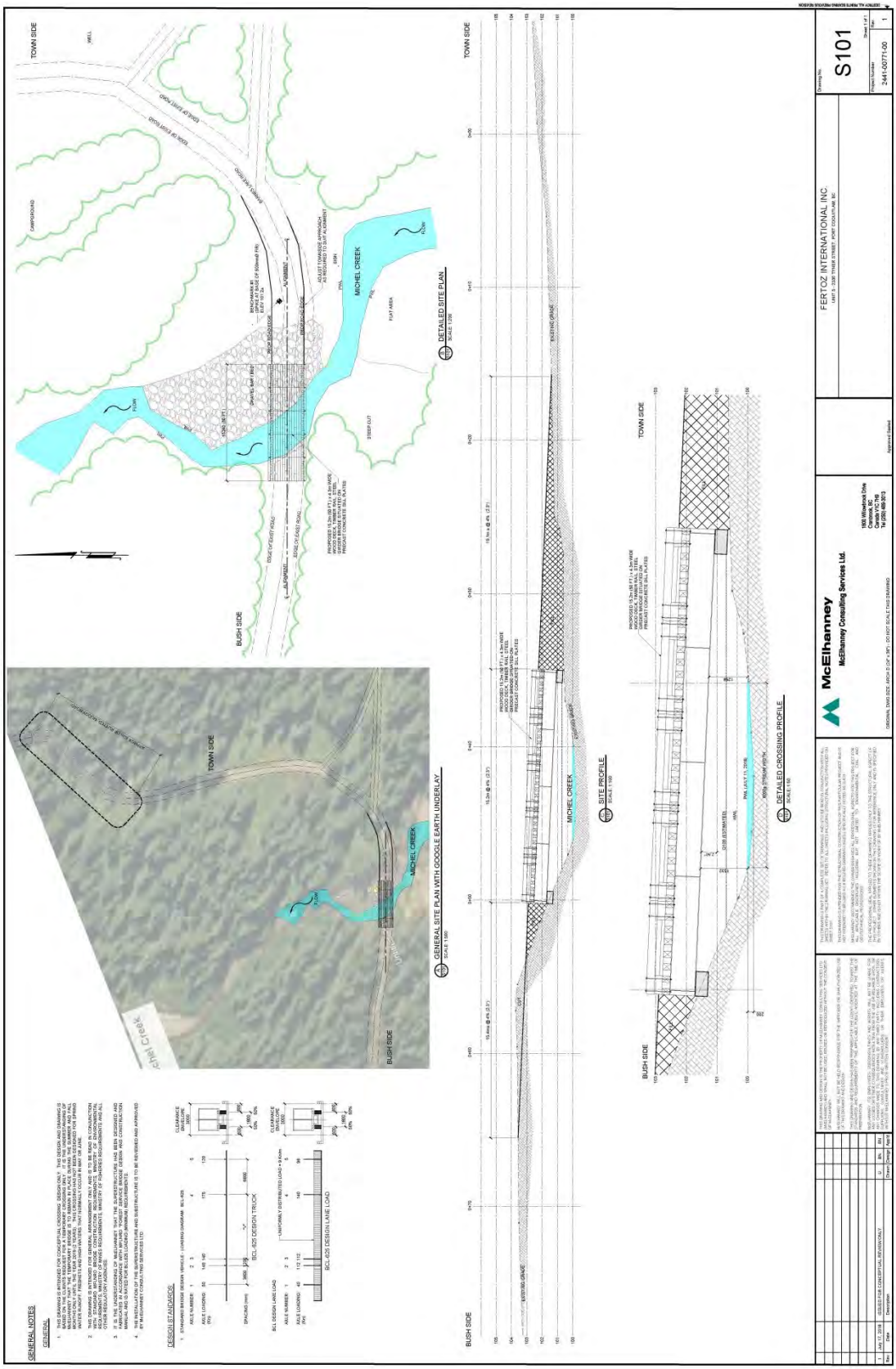


Figure 12 Michel Creek Crossing Plan

Work Program 2018

For mapping and sampling control, maps were downloaded from BC Mineral Title Online and hand held Garmin – GPSmap60CSx was utilized. Most times the accuracy of GPS readings were within ± 3 metres of the mapping (i.e. rock outcrop) or sampling site. Each rock outcrop was briefly noted in field book and plotted on base map and each grab sample collected was briefly described with GPS position recorded, photographs were also taken as part of field documentation.

Assays were conducted by using an XRF Unit factory calibrated (Cert No. 0154-0557-1) on October 30, 2013, Instrument #540557 Type Olympus DPO-2000 Delta Premium. The instrument was calibrated using Alloy Certified reference materials by ARM1 and NIS5 standards. Only certified operators were employed and that were experienced in XRF assay procedures. Read times were 120 seconds or greater.

Zone 2 is located about 2.5 km due north-northwest (see Figure 16) of Zone 1 discussed above. Zone 2 covers a series of older (1990) trenches which report high grade (30.5%) phosphate mineralization. Reconnaissance mapping and sampling was over this phosphate zone and a number of trenches sampled. This area was mapped at a scale of 1:3000 and all mapped rock outcrops and grab sample sites plotted onto base map utilizing hand-held Garmin GPS as well, detail field notes were taken at each mapping and sampling station. GPS survey stations were transferred and overlaid unto a Google earth map.

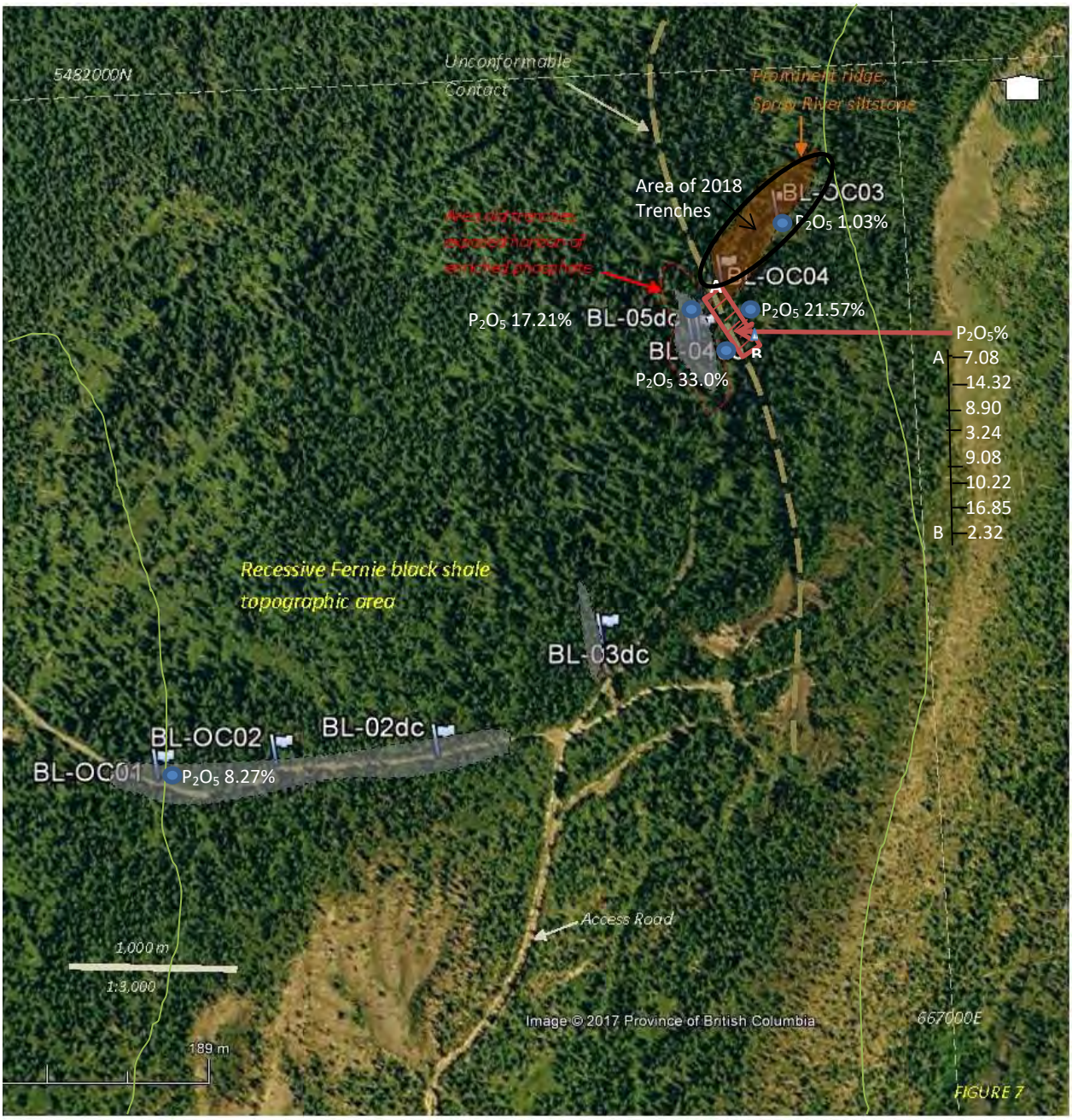
Zone 2 area represents highly enrich phosphate horizon. Old trenches and stripped area, as shown in Photo 7and depicted in idealized schematic section above, expose part of the phosphate. Here the phosphate bed appears to be at least 2 metres thick and near to surface with shallow (<1m thick) overburden. It dips about 35-40° west approximately slope of surface profile. It is underlain by siltstone and fine grain, silty sandstone of the Spray River Formation, which is exposed just to the east and up slope of the stripped area. Overall dip and foliation of the black shale suggest structure is part of east limb of a synform. Examination of fresh phosphate mineralization hosted in black shale contains abundant nodules >20% (historical analysis returned >30% P_2O_5).

This zone 2 is an excellent exploration target and future bulk sample test site. More detail mapping is required and structural interpretation in order to constrain the enriched phosphate horizon.

The 2018 trench program completed 8 separate trenches. The Assay results are contained in Appendix IV and shown on figures 18 to 26.

Assay results indicate a folded and faulted phosphate horizon. In places the phosphate horizon has been duplicated as shown in Trench 3 and 4 where the lower part of Trench 4 exhibits a thickened phosphate zone.

Careful mapping is needed to outline the >20% P_2O_5 zones using additional trenching and sampling.



Zone 2: GPS control points, BL-OC1 denotes bedrock 'outcrop' (i.e. outcrop 1) and BL-02dc (i.e. d.cardinal sample 2) denotes grab sample location. Area mapped is dominantly underlain mildly foliated, westerly dipping black shale part of the Fernie Formation overlying and in contact with Spray River siltstone.

Legend
- Soil Sample
- Contours
- Area of P_2O_5 (Yellow Line)

Figure 13 Zone 2

WORK PROGRAM 2019

For mapping and sampling control, maps were downloaded from BC Mineral Title Online and hand held Garmin – GPSmap60CSx was utilized. Most times the accuracy of GPS readings were within ± 3 metres of the mapping (i.e. rock outcrop) or sampling site. Each rock outcrop was briefly noted in field book and plotted on base map and each grab sample collected was briefly described with GPS position recorded, photographs were also taken as part of field documentation.

Assays were conducted by using an XRF Unit factory calibrated (Cert No. 0154-0557-1) on October 30, 2013, Instrument #540557 Type Olympus DPO-2000 Delta Premium. The instrument was calibrated using Alloy Certified reference materials by ARM1 and NIS5 standards. Only certified operators were employed and that were experienced in XRF assay procedures. Read times were 120 seconds or greater.

Zone 2 is located about 2.5 km due north-northwest (see Figure 12) of Zone 1 discussed above. Zone 2 covers a series of older (1990) trenches which report high grade (30.5%) phosphate mineralization. Reconnaissance mapping and sampling was over this phosphate zone and a number of trenches sampled. This area was mapped at a scale of 1:3000 and all mapped rock outcrops, grab sample sites and drillholes plotted onto base map utilizing hand-held Garmin GPS as well, detail field notes were taken at each mapping and sampling station. GPS survey stations were transferred and overlaid unto a Google earth map.

Zone 2 area represents highly enrich phosphate horizon. Old trenches and stripped area, as shown in Photo 7and depicted in idealized schematic section above, expose part of the phosphate. Here the phosphate bed appears to be at least 2 metres thick and near to surface with shallow (<1m thick) overburden. It dips about 35-40° west approximately slope of surface profile. It is underlain by siltstone and fine grain, silty sandstone of the Spray River Formation, which is exposed just to the east and up slope of the stripped area. Overall dip and foliation of the black shale suggest structure is part of east limb of a synform. Examination of fresh phosphate mineralization hosted in black shale contains abundant micro-nodules >20% (historical analysis returned >30% P_2O_5).

The 2018 trench program completed 8 separate trenches.

The 2019 program completed 19 separate drillholes. The Assay results are contained in Appendix IV and shown on figure 19 to 38. The drill core is stored at Unit 5-2330 Tyner Street, Port Coquitlam, BC
V3C 2Z1.

Drill logs are contained in Appendix V. Hole B-19-01 intersected some silty black shale boulders, Spray River Formation fragments and poker chip shale. Fernie Phosphorite at 2m assayed 12.59% P_2O_5. The very top of Hole DDH B-19-02 assayed 4.5% P_2O_5, and 14.62% P_2O_5 but the rest of the hole returned Spray River Siltstone chips.

Drillholes DDH B-19-03 to B-19-06 were collared in good phosphorite with values up to 27.72% P_2O_5. Phosphate values in Holes 7 to 19 contained low P_2O_5 values due to being higher up in the stratigraphy.

This zone 2 is an excellent exploration target and future bulk sample test site. More detail mapping is required and structural interpretation in order to constrain the enriched phosphate horizon.

Assay results indicate a folded and faulted phosphate horizon. In places the phosphate horizon has been duplicated as shown in Trench 3 and 4 where the lower part of Trench 4 exhibits a thickened phosphate zone.

Careful mapping is needed to outline the >20% P_2O_5 zones using additional trenching and sampling.

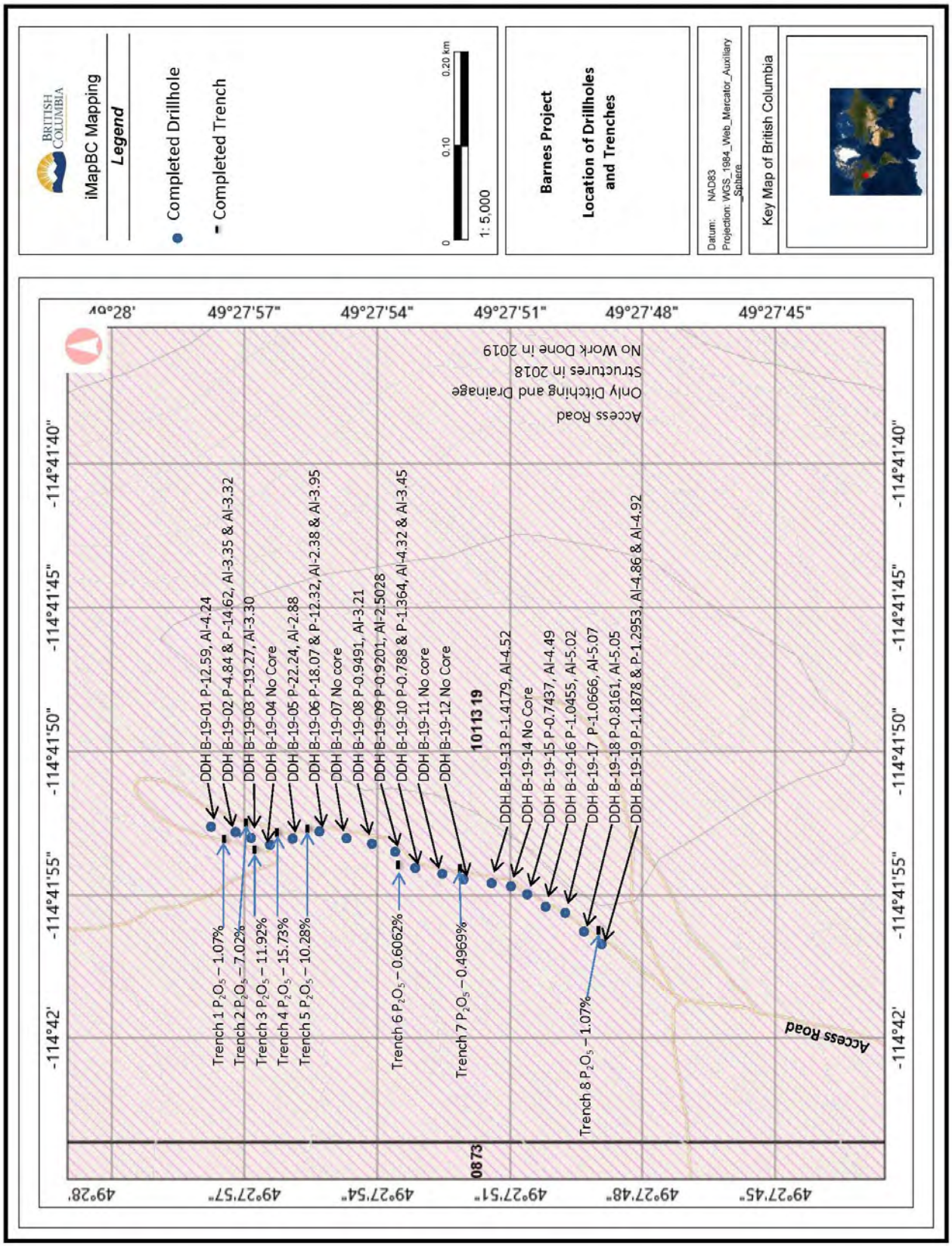


Figure 14 Plan Map of 2019 Drillholes and 2018 Trenches

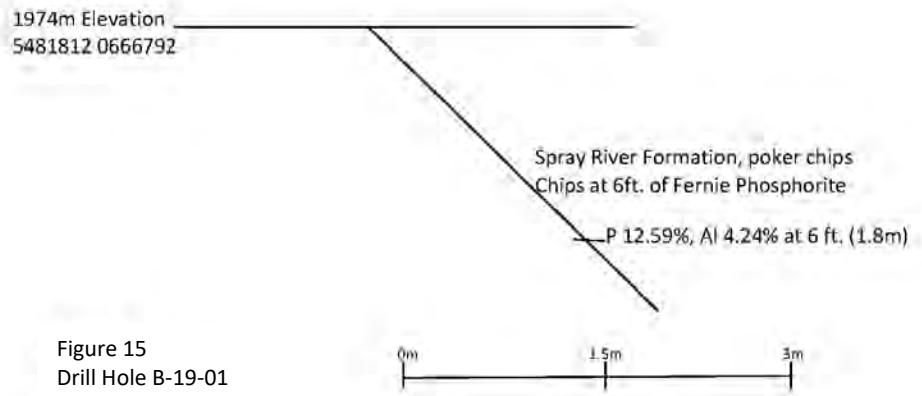


Figure 15
Drill Hole B-19-01

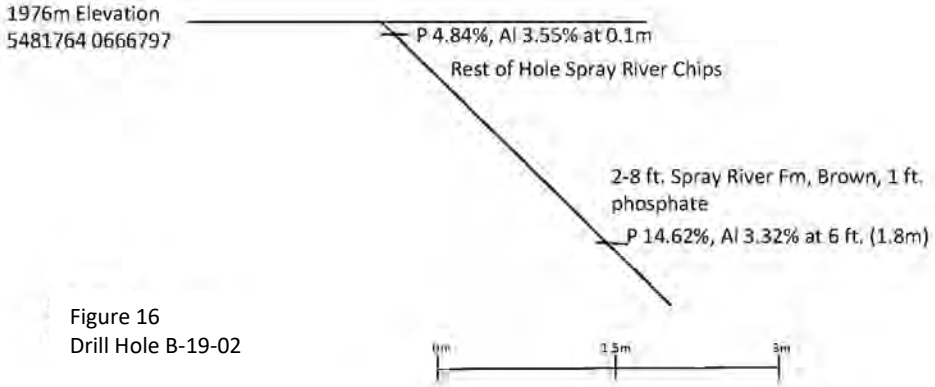
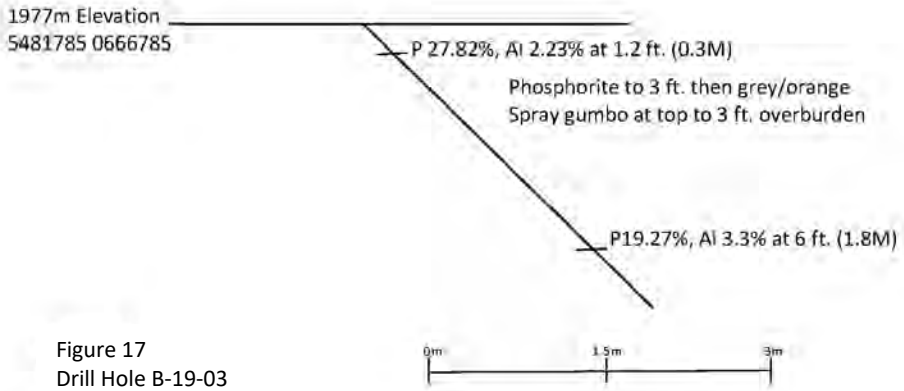


Figure 16
Drill Hole B-19-02



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Drill Hole B-19-03

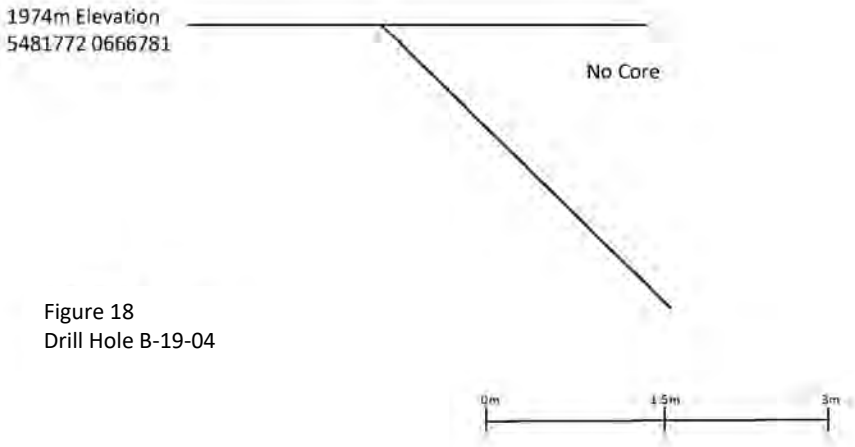
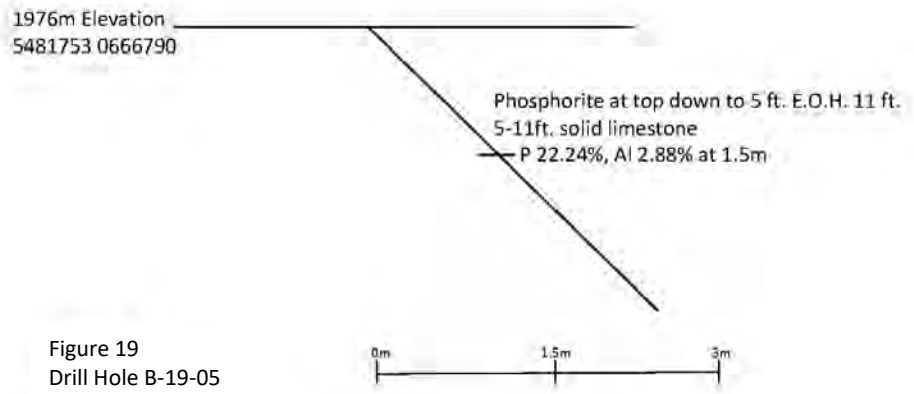


Figure 18
Drill Hole B-19-04



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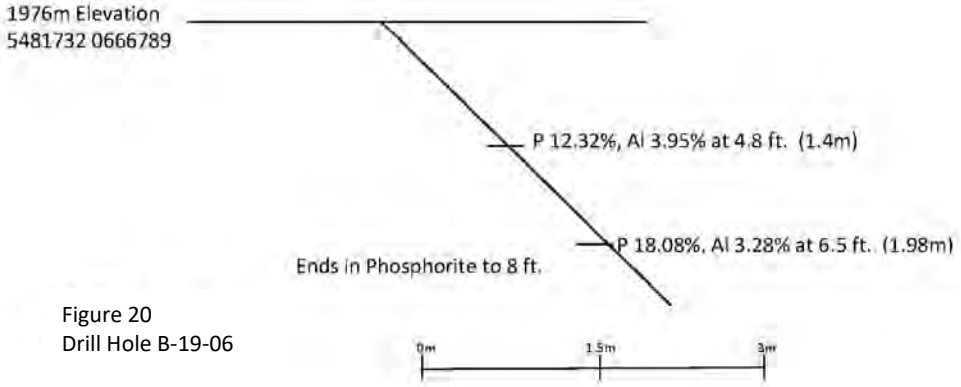
Drill Hole B-19-05



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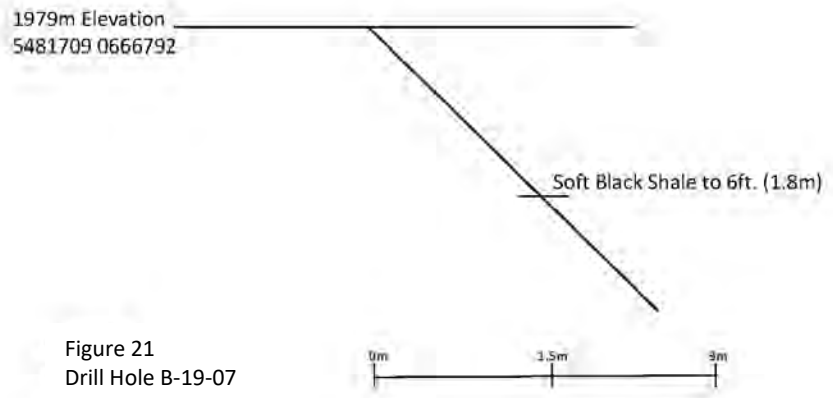
Drill Hole B-19-06



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Drill Hole B-19-07

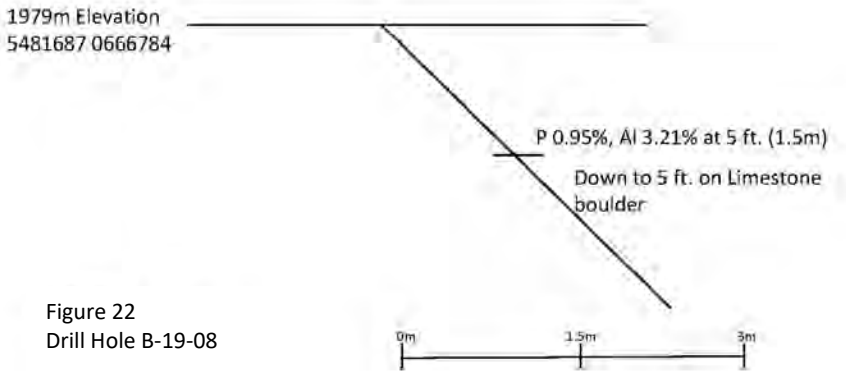
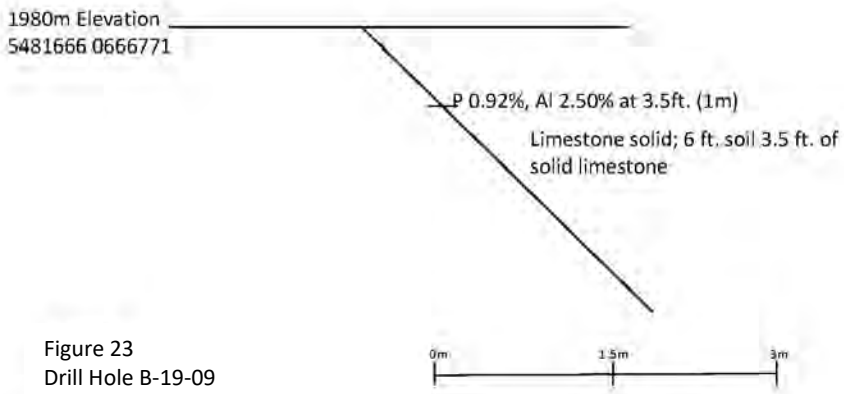


Figure 22
Drill Hole B-19-08



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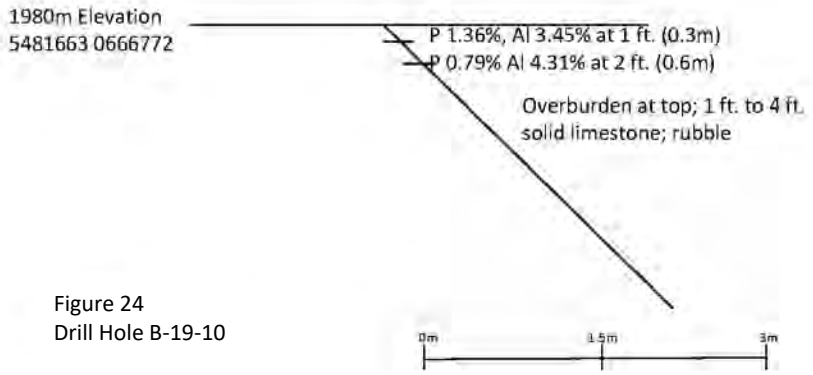
Drill Hole B-19-09



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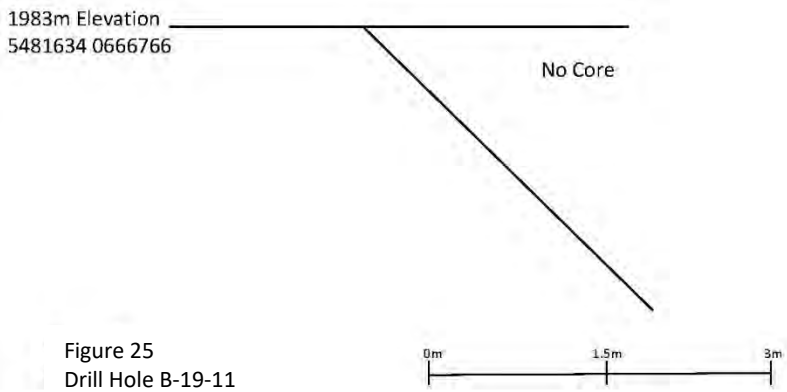
Drill Hole B-19-10



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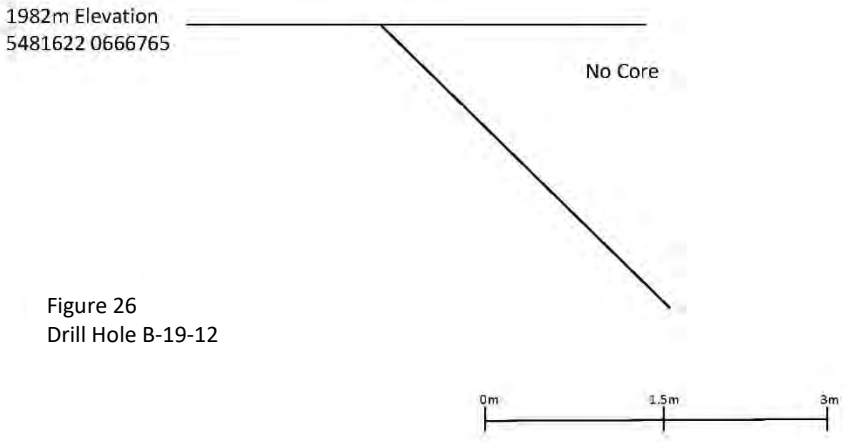
Drill Hole B-19-11



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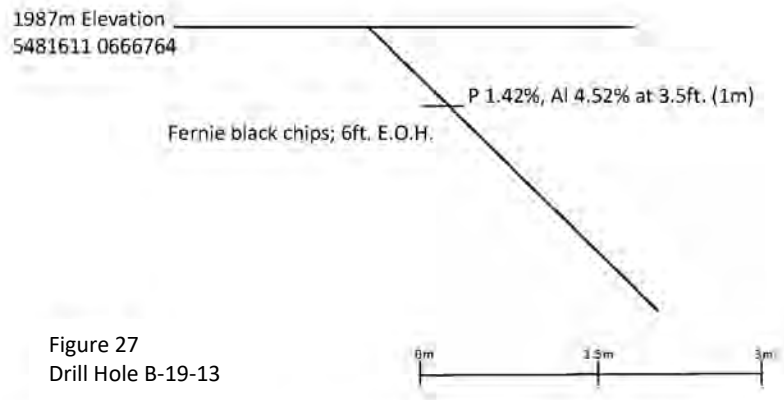
Drill Hole B-19-12



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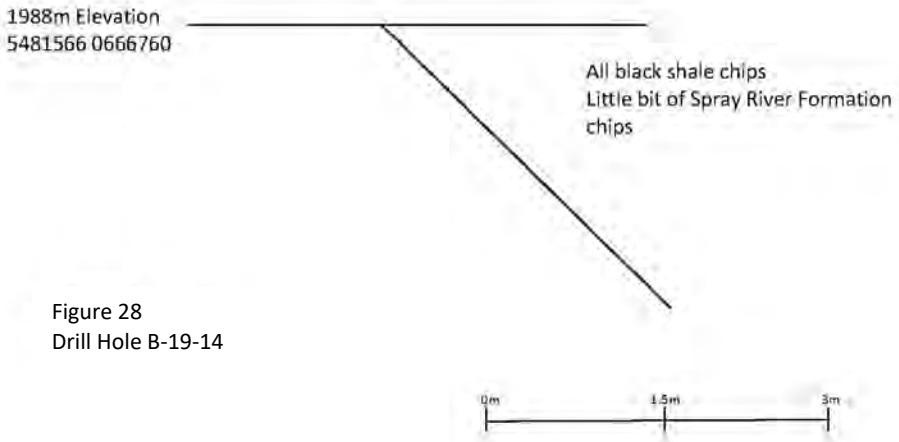
Drill Hole B-19-13



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Drill Hole B-19-14

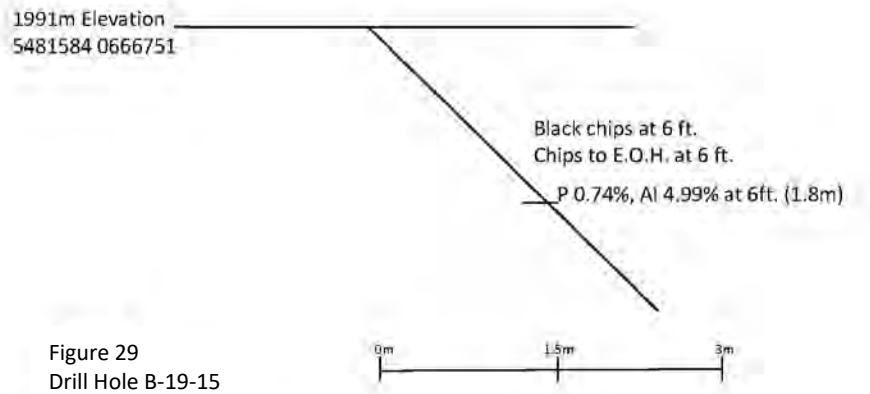


Figure 29
Drill Hole B-19-15

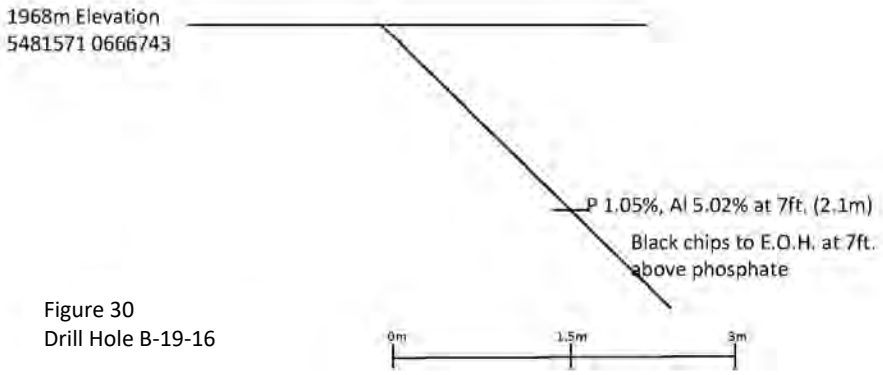


Figure 30
Drill Hole B-19-16

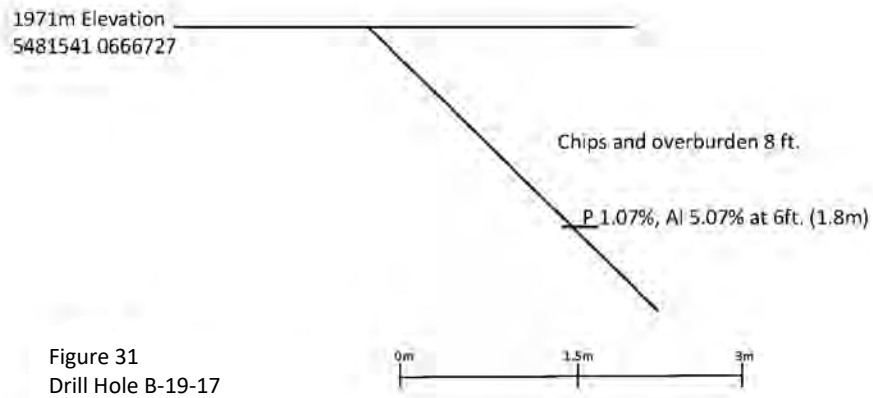


Figure 31
Drill Hole B-19-17

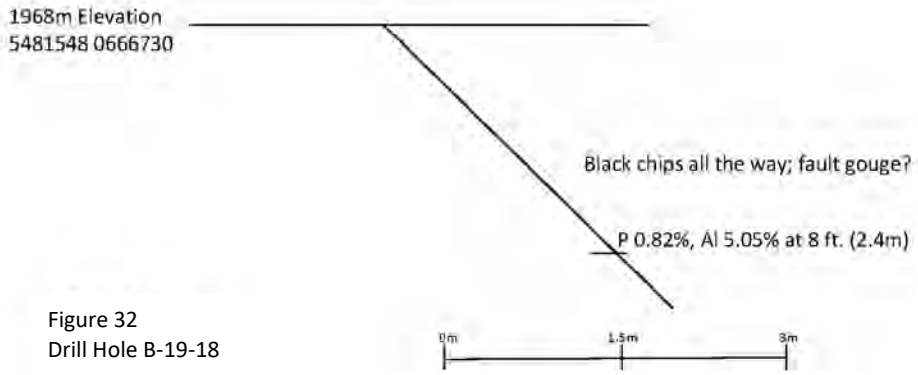


Figure 32
Drill Hole B-19-18

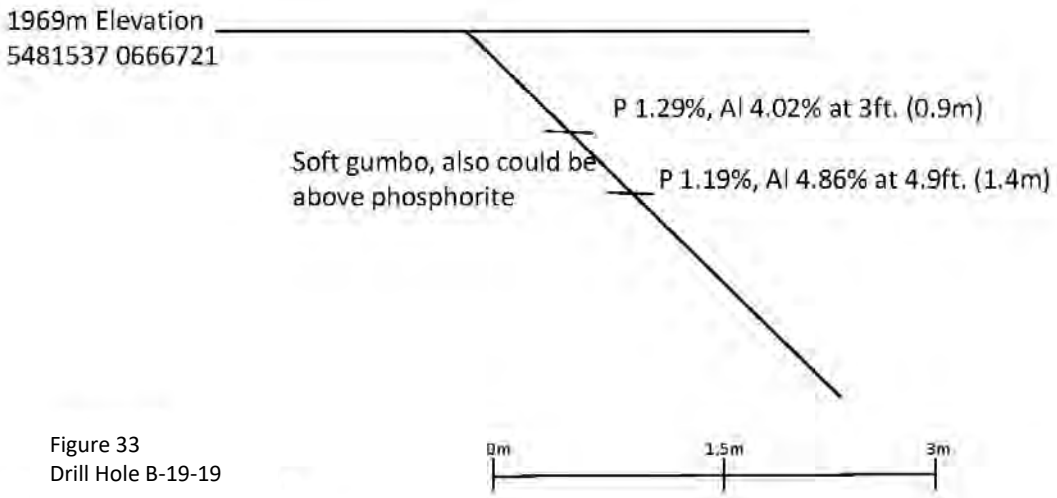
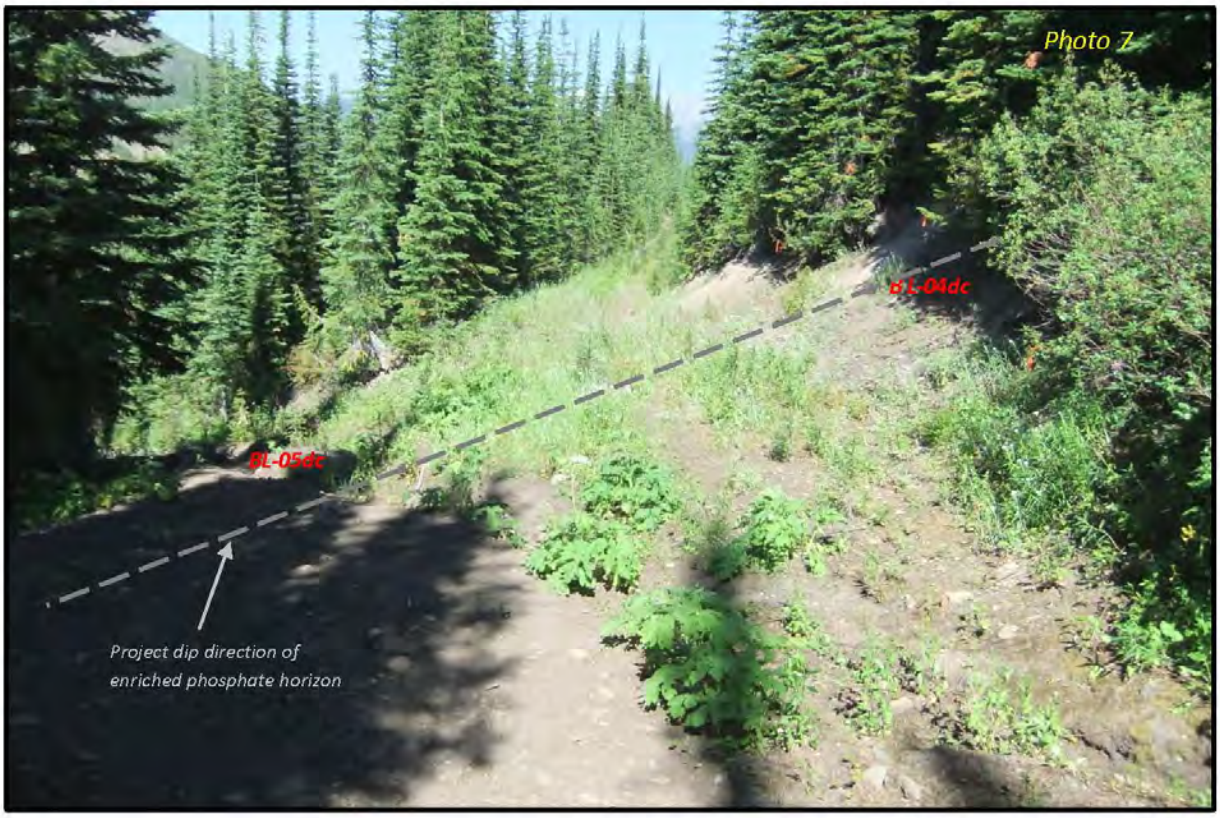


Figure 33
Drill Hole B-19-19



GPS sample location sites noted in red. Old trench-road cuts expose high grade (>20-25% phosphate. Photo looking north. Phosphate bed approx. 35-40° dip west. Before 2018 Trenching

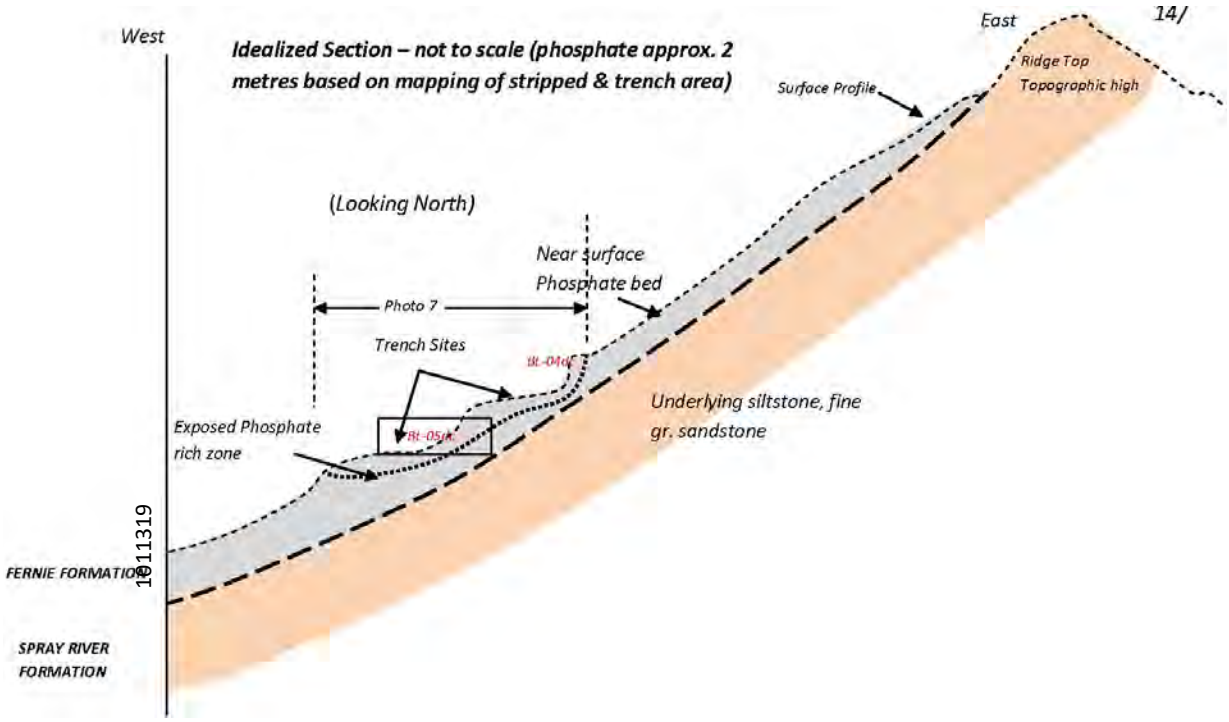


Figure 34 Idealized Section

REGIONAL GEOLOGY

The Barnes Lake area is underlain by a series of predominantly marine strata which range in age from Devonian to Jurassic and non-marine fluvio-deltaic sediments of late Jurassic to Cretaceous age. Reconnaissance geological mapping in the region (Newmarch, 1953; Price, 1965; 1964; 1962; 1961) has shown that these strata are now exposed in a broad, doubly plunging synclinorium, commonly referred to as the Fernie Basin. This synclinorium is broadly delineated by the distribution of the Jurassic Fernie Group in southeastern British Columbia (Figure 3): the structure is complicated by second order folds and later faults, both easterly directed thrusts and west-side down normal faults.

Phosphatic horizons (Figure 4) are known to occur at a number of intervals within the Paleozoic and Mesozoic stratigraphic section (Butrenchuk, 1987a; Kenny, 1977; Macdonald, 1987; Telfer, 1933). Phosphatic strata at the base of the Fernie Group are considered to have the best potential (Butrenchuk, 1987a; Macdonald, 1987).

Age	Group/Formation (Thickness, metres)	Lithology	Phosphatic Horizons	Thickness (metres)	Grade (% P_2O_5)
Cretaceous	Kootenay Fm.	-grey to black carbonaceous siltstone and sandstone; nonmarine; coal			
Jurassic	Fernie Gp. (±244)	-black shale, siltstone, limestone; marine to nonmarine at top -glauconitic shale in upper section -belemnites; common fossil	-approximately 60 metres above base low-grade phosphate bearing calcareous sandstone horizon or phosphatic shale -Bajocian -basal phosphate in Sinemurian strata; generally pelletal/oolitic; rarely nodular; 1-2 metres thick; locally two phosphate horizons; top of phosphate may be marked by a yellowish-orange weathering marker bed.	1-2	11-30
		regional unconformity			
Triassic	Whitehorse Fm.	-dolomite, limestone, siltstone			
	Sulphur Mntn. Fm. (100-496)	-grey to rusty brown weathering sequence of siltstone, calcareous siltstone and sandstone, shale, silty dolomite and limestone	-nonphosphatic in southeastern British Columbia		
Permian	Ranger Canyon Fm. (1-60)	-sequence of chert, sandstone and siltstone; minor dolomite and gypsum; conglomerate at base -shallow marine deposition	-upper portion-brown, nodular phosphatic sandstone; also rare pelletal phosphatic sandstone (few centimetres to +4 metres) -basal conglomerate-chert with phosphate pebbles present (<1 metre)	0.6 0.5-1.0	9.5 13-18
		unconformity			
	Boss Creek Fm. (90-150)	-sequence of siltstone, shale chert, carbonate and phosphatic horizons areally restricted to Telford thrust sheet -west of Elk River, shallow marine deposition	-phosphate in a number of horizons as nodules and finely disseminated granules within the matrix -phosphatic coquinoid horizons present	0.4-1.0	1.7-6.0
	Telford Fm. (210-225)	-sequence of sandy carbonate containing abundant brachiopod fauna; minor sandstone -shallow marine deposition	-rare, very thin beds or laminae of phosphate; rare phosphatized coquinoid horizon	0.3	11.4
	Johnson Canyon Fm. (1-60)	-thinly bedded, rhythmic sequence of siltstone, chert, shale, sandstone and minor carbonate; basal conglomerate	-locally present as a black phosphatic siltstone or pelletal phosphate -phosphate generally present as	0.2-0.3 1-22	3.0-4.0 0.1-11.0
		-shallow marine deposition	black ovoid nodules in light coloured siltstone; phosphatic interval ranges in thickness from 1-22 metres -basal conglomerate (maximum 30 cm thick) contains chert and phosphate pebbles	1-2	14.2-21.2
		regional unconformity			
Pennsylvanian	Kananaskis Fm. (±55)	-dolomite, silty, commonly contains chert nodules or beds	-locally, minor phosphatic siltstone in uppermost part of section		
	Tunnel Mntn Fm. (±500)	-dolomitic sandstone and siltstone			
Mississippian	Rundle Gp. (±700)	-limestone, dolomite, minor shale, sandstone and cherty limestone			
	Banff Fm. (220-430)	-shale, dolomite, limestone			
Devonian-Mississippian	Exshaw Fm. (6-30)	-black shale, limestone -areally restricted in southeastern British Columbia	-an upper nodular horizon -phosphatic shale and pelletal phosphate 2-3 metres above base -basal phosphate <1 metre thick		
Devonian	Palliser Fm.	-limestone			

FIGURE 4: STRATIGRAPHIC SUMMARY INCLUDING PHOSPHATE-BEARING HORIZONS IN SOUTHEASTERN BRITISH COLUMBIA (modified from Butrenchuk, 1987a). Thickness not to scale.

Figure 35 Stratigraphic Summary

REGIONAL STRATIGRAPHY

Upper Devonian strata exposed in the vicinity of the Fernie Basin consist of massive, grey, fine grained, cliff forming limestones of the Palliser Formation. These limestones are commonly mottled and locally interbedded with brown dolostones. They are overlain by the Devono-Mississippian Exshaw Formation, which predominantly consists of black, fissile shale, cherty shale, siltstone and minor limestone (Kenny, 1977). The Exshaw Formation is generally 6 to 30 metres in thickness (Figure 4). Four phosphatic horizons exist within the Exshaw Formation: the lowest is less than 50 cm thick and has grades of less than 9 per cent P_2O_5; the middle two horizons are both around one metre thick, have grades of up to 10 per cent P_2O_5 and are separated by approximately two metres of shale: and the uppermost phosphatic zone, which has very limited extent, contains grades which always exceed 15 per cent P_2O_5 and is always less than 15 cm thick (Macdonald, 1987).

The Mississippian Banff Formation has a gradational contact with the underlying Exshaw Formation. It is 280 to 430 metres thick and consists of dark grey, fissile shale and bands of argillaceous limestone that grade upwards into dark grey, massive, finely crystalline limestone and dolostone. The Rundle Group, which is also Mississippian in age, conformably overlies the Banff Formation and attains a thickness of approximately 700 metres. It consists of a series of resistant, thick-bedded crinoidal limestones, grey and black, finely crystalline limestones, dark, argillaceous limestones, dolostones and minor black and green shale (Butrenchuk, 1987a: Kenny, 1977).

Conformably overlying the Mississippian carbonates are Pennsylvanian strata of the Spray Lakes Group which consist of a lower unit, the Tunnel Mountain Formation and an upper unit, the Kananaskis Formation. The Tunnel Mountain Formation comprises a uniform, monotonous sequence of reddish-brown weathering dolomitic sandstone and siltstone that attains a maximum thickness of 500 metres at its western margin, near the Elk River. The Tunnel Mountain Formation is disconformably overlain by the Kananaskis Formation which consists of light grey, silty dolostones and dolomitic siltstones and is generally around 55 metres thick. Chert nodules and intraformational chert breccias are found in the upper part of the section. Slightly phosphatic horizons, containing up to 9 per cent P_2O_5, are reported as rare occurrences within the Kananaskis Formation (Macdonald, 1987).

The Kananaskis Formation of the Spray Lakes Group is unconformably overlain by Permian strata of the Ishbel Group. Together, the Spray Lake Group and the Ishbel Group comprise the Rocky Mountain Supergroup (Figure 4). The Ishbel Group, which has been correlated with the Phosphoria Formation in the western United States, consists of the Johnston Canyon, Telford, Ross Creek and Ranger Canyon formations, from oldest to youngest, respectively.

The Johnston Canyon Formation comprises a series of recessive weathering, thin to medium-bedded siltstones, silty carbonate rocks and sandstones, with minor shale and chert. It varies from 1 to 60 metres in thickness and commonly contains phosphatic rocks. Thin, intraformational, phosphate-pebble conglomerate beds are common throughout the formation and, locally, mark its base. Phosphate is present as black nodules in distinct horizons within the siltstones, locally cements siltstone beds and, locally occurs in pelletal siltstone or pelletal silty phosphorite beds which are slightly greater than 1 metre in thickness (Butrenchuk, 1987a; Macdonald, 1987). The pelletal phosphorites can contain up to 21 per cent P_2O_5, but are of limited distribution: the basal conglomerate is less than 50 centimetres thick and generally contains 3-4 per cent P_2O_5, only; the nodular and phosphate pebble-conglomerate beds can have cumulate thicknesses of up to 22 metres, but grades rarely exceed 10 per cent P_20_5 over a few 10s of centimetres.

The Telford and Ross Creek Formations, which attain thicknesses of 210-225 and 90-150 metres respectively, are of limited distribution, exposed only in the Telford Thrust, west of the Elk Valley in the Sparwood region. The Telford Formation consists of resistant-weathering, thick-bedded, sandy, oolitic and fossiliferous rocks. Rarely, slightly phosphatic horizons are present, with grades commonly around 11 per cent P_2O_5 across 30 centimetres. The Ross Creek Formation is composed of recessive, thin-bedded siltstone, argillaceous siltstone, minor carbonate and chert. Nodular phosphate horizons are present throughout this unit and are best developed in the upper portions. Locally, phosphatic coquinoid beds are also present. Reported phosphate grades are only 1.7 to 6 per cent P_2O_5 (Butrenchuk, 1987a; Macdonald, 1987).

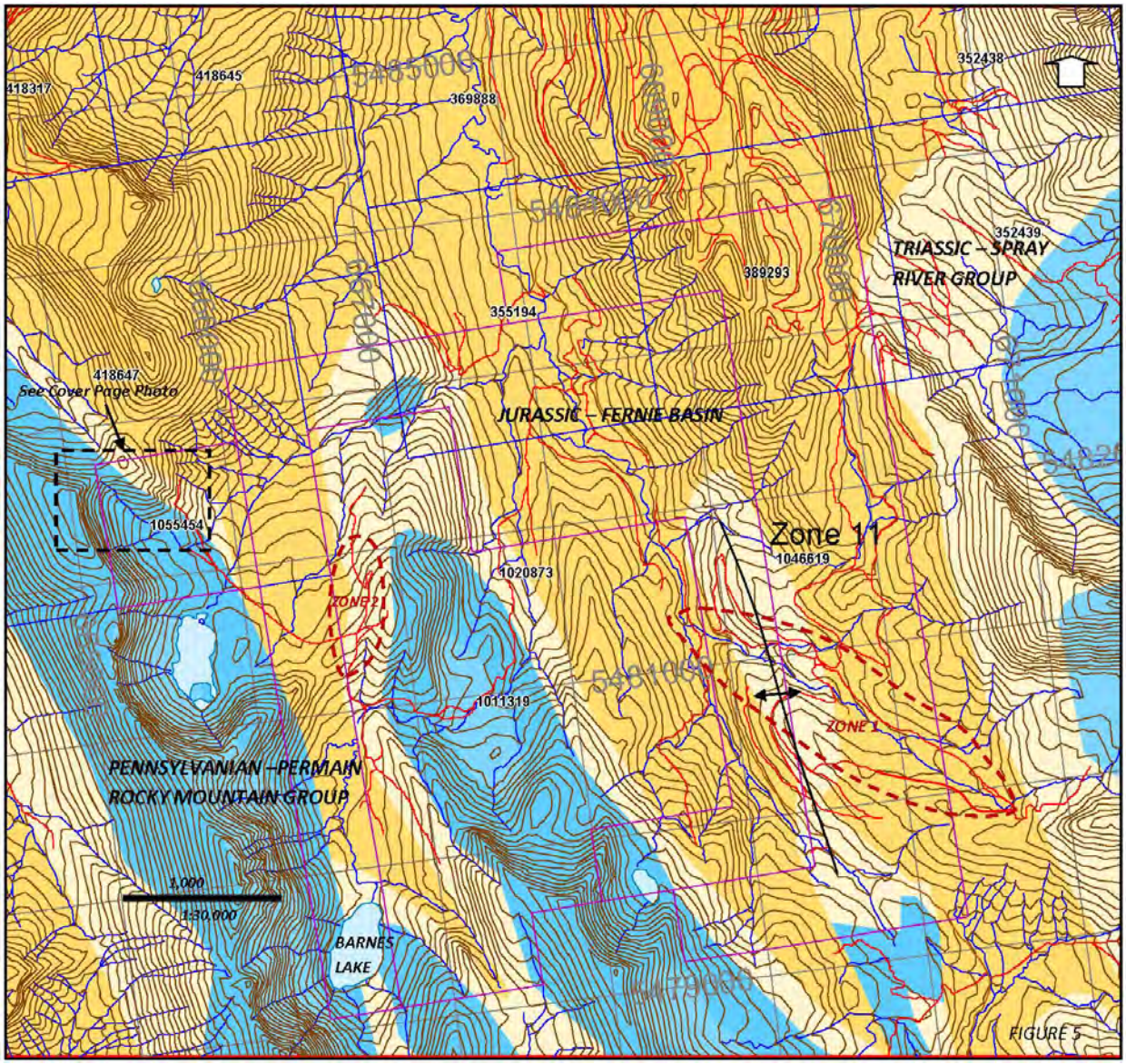
The Ranger Canyon Formation, which can be up to 60 metres thick, paraconformably to disconformably overlies the Ross Creek Formation. It predominantly consists of resistant, cliff-forming, thick-bedded, blue-grey cherts, cherty sandstones, siltstones, fine sandstones and conglomerates. Minor gypsum and dolomite are also present. The base of the formation is marked by thin, phosphate-cemented, chert-pebble conglomerates that locally contain massive, phosphatic intraclasts. Phosphate also occurs as nodules in brownish weathering sandstone beds in the upper part of the formation. With the exception of phosphatic strata near the Fernie ski hill, most of the horizons are reportedly low grade: the highest values reported are 13.3 per cent P_2O_5 across 0.5 metres (Butrenchuk, 1987a; Macdonald, 1987).

Permian strata are unconformably overlain by the Triassic Sulphur Mountain Formation of the Spray River Group. The Sulphur Mountain Formation is between 100 and 496 metres thick and typically consists of rusty brown weathering, medium-bedded siltstones, calcareous and dolomitic siltstones, silty dolostones and limestones and minor shale. Locally, the Sulphur Mountain Formation is overlain by pale weathering, variegated dolostones, limestones, sandstones and intraformational breccias of the Whitehorse Formation. The Whitehorse Formation, which can be from 6 to 418 metres in thickness, is middle to upper Triassic in age and is the upper member of the Spray River Group. It is not present in most areas (Butrenchuk, 1987a).

The Jurassic Fernie Group unconformably overlies the Triassic strata. It consists of a lower zone of dark grey to black shales, dark brown shales, phosphates and minor limestones, siltstones and sandstones (the basal phosphate zone and equivalent Nordegg Member, Poker Chip Shales and the Rock Creek Member), a middle unit of light grey shale, calcareous sandstone and sandy limestone (the Grey Beds) and an upper unit of yellowish-grey to pale brown or dark grey weathering glauconitic sandstone and shale grading upwards into interbedded fine grained sandstone, siltstone and black shales (the Green and Passage beds). In southeastern British Columbia, the Fernie Group is 70 to 376 metres in thickness and generally thickens to the west (Freebold, 1957; Kenny, 1977; Macdonald, 1987; Price, 1965).

The base of the Fernie Group is marked by a persistent pelletal phosphorite horizon that is 1 to 2 metres in thickness and generally contains greater than 15 per cent P_2O_5; grades up to 30 per cent P_2O_5 have been found. It commonly consists of two pelletal phosphorite beds separated by a thin, chocolate brown to black phosphatic shale bed. The basal phosphorite rests either directly on Triassic strata or is separated from the underlying rocks by a thin phosphatic conglomerate. Phosphatic shales of variable thickness, generally less than 3 metres, overlie the phosphorites. The top of this sequence is locally marked by a yellow-orange bentonite bed. This part of the formation is Sinemurian in age and generally considered to be a lateral facies of the Nordegg Member and Nordegg equivalent beds. A second phosphatic horizon is present in the Bajocian Rock Creek Member, approximately 60 metres above the base of the Fernie Group. This zone is extremely low grade, generally containing less than one per cent P_2O_5 and is often associated with belemnite-bearing calcareous sandstone beds (Butrenchuk, 1987a; Freebold, 1957; Macdonald, 1987).

The Kootenay Formation, of upper Jurassic to Cretaceous age, overlies rocks of the Fernie Group. It consists of dark grey carbonaceous sandstone, gritty to conglomeratic sandstone, siltstone, shale and coal and can be from 150 to 520 metres thick (Price, 1965).



BARNES LAKE PROPERTY is underlain by 3 main rock formations: (i) Pennsylvanian-Permian-Rocky Mountain Group: dolomitic siltstone; (ii) Triassic – Spray River Group: tan-creamy colour, siltstone and shale: (iii) Jurassic – Fernie Group (Fernie Basin): recessive, dark grey-black, shale and siltstone. Mapped and sampled areas are noted above as Zone 1 and Zone 2. Zone 1 is mapped as antiform structure disc used in more detail below from work in 2017.

Figure 36 Barnes Lake Property – Detail Geology

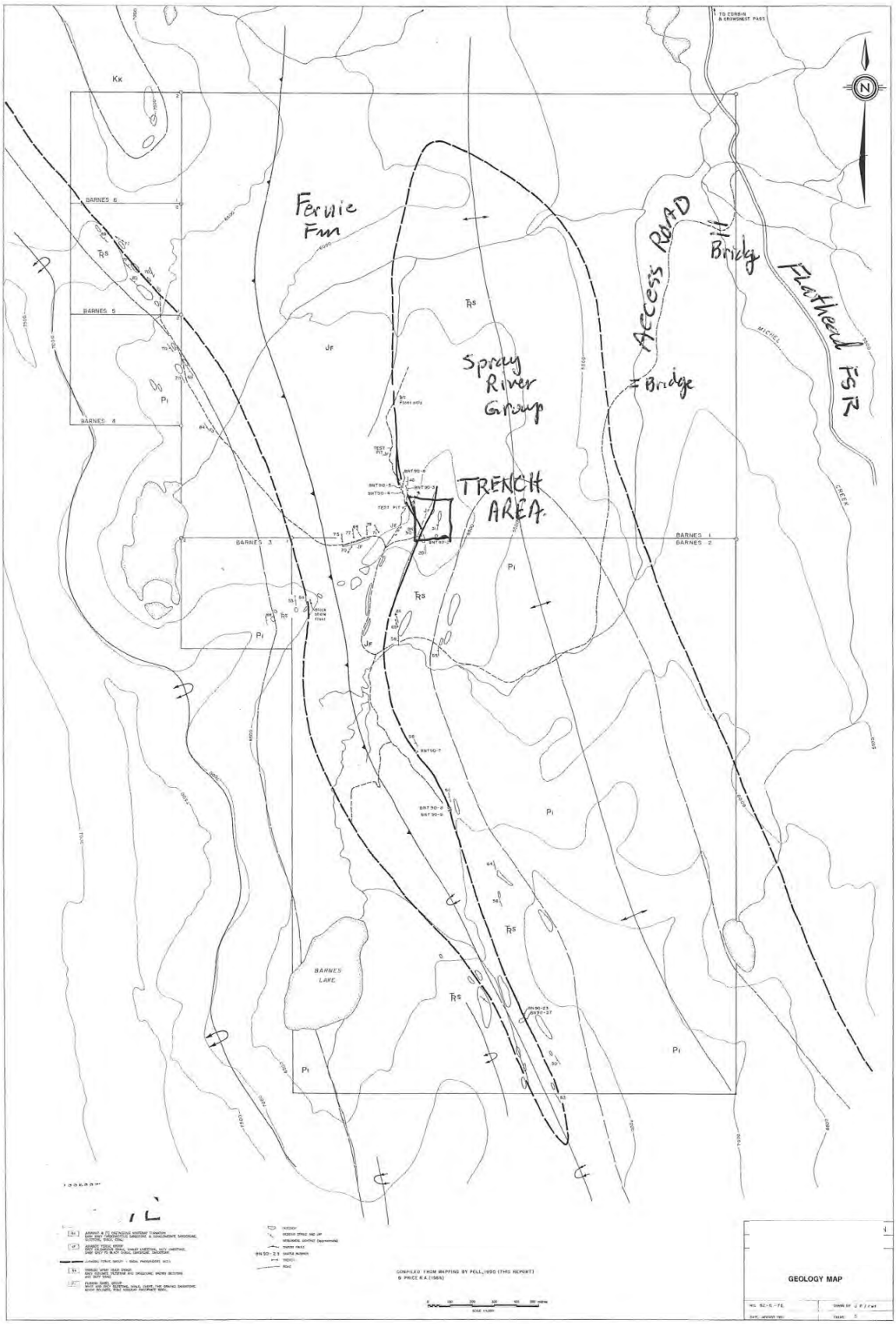


Figure 37 Detail Geology (refer to Figure 13 for colour copy)

PROPERTY GEOLOGY

The Barnes Lake area is underlain by a sequence of sedimentary rocks which range from Permian to Lower Cretaceous in age (Figure 5). Geological mapping (using topographic base map + altimeter control) at a scale of 1:5,000, concentrated on locating the basal Fernie Group phosphorite horizon, which marks the Triassic/Jurassic boundary in this region.

STRATIGRAPHY

The Barnes Lake claims are underlain by strata correlative with the Ranger Canyon Formation of the Permian Ishbel Group, the Sulphur Mountain Formation of the Triassic Spray River Group and the Jurassic Fernie Group (Figures 5). Ishbel Group strata older than the Ranger Canyon Formation may also be present on the property, but little attention was paid to this part of the stratigraphy. Late Jurassic to early Cretaceous sandstones, siltstones and coal beds of the Kootenay Formation are exposed on a ridge crests on the northwestern corner of the claims (Figure 5).

Rocks assigned to the Ranger Canyon Formation are predominantly medium to thick bedded, cream to buff to light grey weathering, fine grained sandstones, siltstones and dolomitic siltstones with white to light grey fresh surfaces. Locally, thin cherty and chert nodule rich layers are present within the siltstones. Thin grey limey beds may also be present, interlayered with the siltstones and are particularly common at the top of the section, immediately underlying Triassic siltstones. These limey beds are locally fossiliferous, containing rugosan corals and possible crinoid fragments. At one location, along the main access road, dark grey siltstones containing black phosphate nodules were present near the top of the Permian section and were overlain by grey calcareous beds.

Rocks correlative with the Triassic Sulphur Mountain Formation in the Barnes Lake area are predominantly buff, yellowish-brown and chocolate brown weathering, thin to medium bedded siltstones and shaley siltstone with a grey to buff fresh surface. Horizons consisting of dark brown shale with thin siltstone interlayers are common within this formation and, throughout much of the property, occur at the top of the formation.

Fernie Group rocks are recessive weathering and for the most part not well exposed. Where the base of the Fernie is exposed and the section complete, it is marked by a phosphorite horizon that is commonly 1.1 to 2.1 metres thick. In many areas the top of the section has been eroded and therefore thicknesses impossible to estimate; locally, backthrusting has placed Triassic and basal Jurassic strata over Jurassic Fernie shales, disrupting the sequence. The basal phosphorite horizon generally consists of poorly to well consolidated, gritty, pelletal phosphorite and shaley phosphorite capped by phosphatic shale. Trenches and hand pits at the southern part of the property revealed beds containing phosphate nodules within a pelletal phosphorite matrix. Brown and black shales commonly overlie the phosphorites; locally, extremely hard, dark grey nodular siltstone layers occur within the shales immediately overlying the phosphatic sequence.

The monotonous, fissile black shales which overlie the basal Fernie phosphorites give way, upsection to black, brown and dark grey shales with interbedded boudinaged buff to orange weathering dolostones, buff fossiliferous fine-grained sandstones and light grey limestone beds. Further upsection light grey to yellowish grey calcareous shales occur within the Fernie Group.

On the northwestern corner of the property, gritty grey sandstones, siltstones and thin coal beds of the late Jurassic to Cretaceous Kootenay Formation crop out, but were not examined in detail.

STRUCTURE

The structure of the Barnes Lake are is dominated by a pair of north-northwest trending, upright to overturned anticlines and the intervening overturned syncline which is cored, in the central and northern part of the property, by a thrust fault. At the south end of the property, parasitic folds on the limbs of these major structures affect outcrop patterns. Small backthrusts occur along the western limb of the easternmost anticline and locally disrupt phosphatic strata.

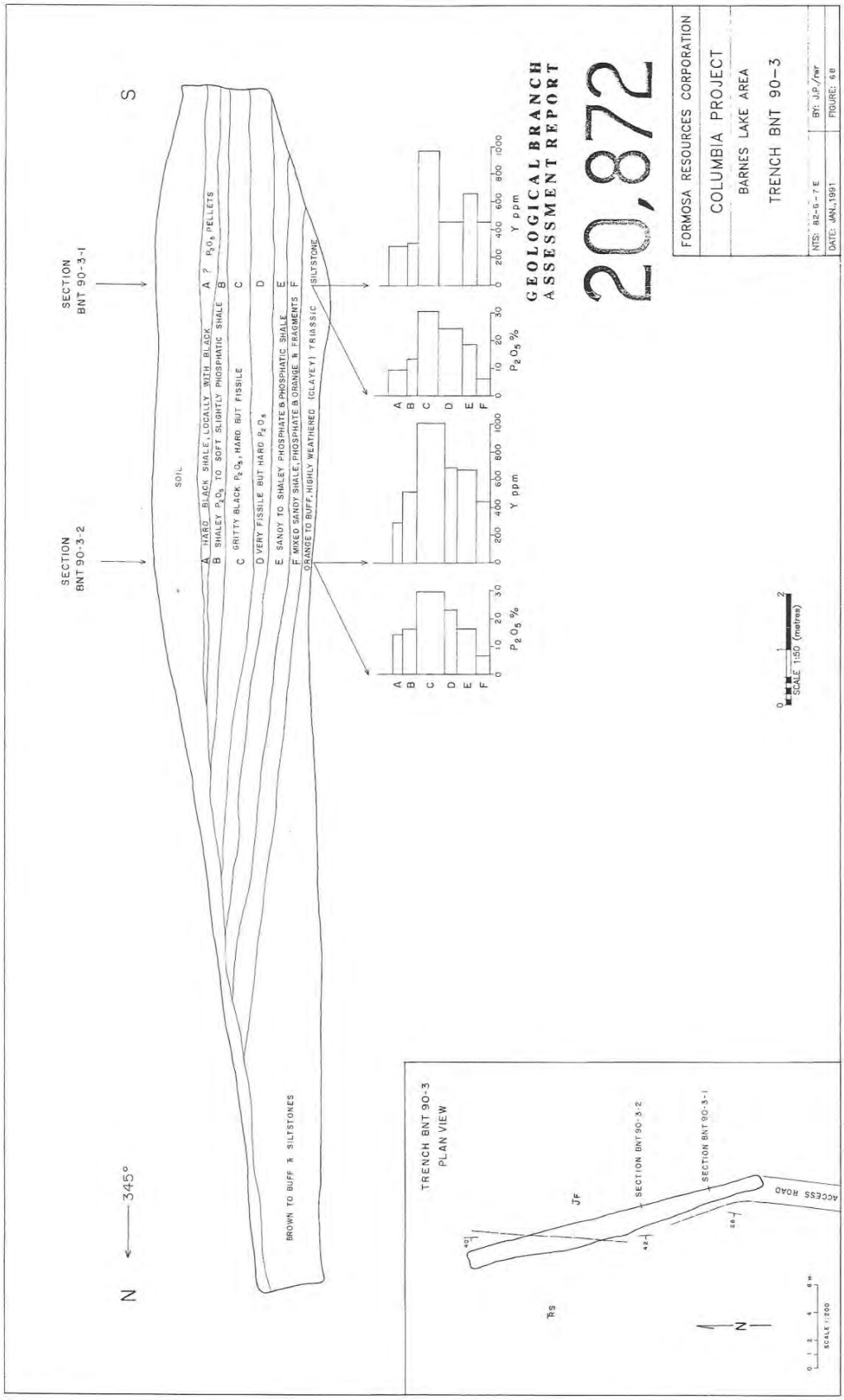


Figure 38 Barnes Lake Area Trench 90-3

WORK PROGRAM 2021

The work program in 2021 focussed on trail building.

A total 6 rock samples were assayed by XRF methods. The results, locations and rock descriptions are contained in Appendix III and also plotted on Figure 39.

Results range from 10.74% P_2O_5 to 18.83% P_2O_5 in copper. Distinct variation in P_2O_5 content are evident in the depth of the phosphate layer.

Assays were conducted by using an XRF Unit factory calibrated (Cert No. 0154-0557-1) on October 30, 2013, Instrument #540557 Type Olympus DPO-2000 Delta Premium. The instrument was calibrated using Alloy Certified reference materials by ARM1 and NIS5 standards. Only certified operators were employed and that were experienced in XRF assay procedures. Read times were 120 seconds or greater.

Samples assayed by XRF are shown in Appendix III and illustrated on Figure 39. Samples sent to ALS Labs are also contained in Appendix IV.

The results of the Water Tests for samples collected from the Barnes Phosphorite Mine bulk sample area.

Sample No.	Location	Comments	Location
BLSW3	Upstream on Michel Creek		11U 668040E 5484344N
BLSW4	Downstream on Michel Creek		11U 668101E 5483035N
BEW	Unnamed watercourse east of Bulk Sample Site 10m downstream of trail crossing	Drains from Barnes Lake	11U 667837E 5482360N
BWW1	Unnamed watercourse west and downslope of Bulk Sample Site	Upper section of the watercourse visible but dry. Aquifer noted approximately 300m downstream of the access road	11U 666405E 5481914N
BWW2	Unnamed watercourse west of Bulk Sample Site and BWW1	Drains from an unnamed lake west of the Bulk Sample Site	11U 665890E 5481934N

Sampling Procedures
One (1) set of soil samples were obtained at each testing location. All sampling equipment and containers were sterilized to avoid contamination of the sample.

All samples were compared to BC Water Quality Guidelines (BCWQG) for the Protection of Aquatic Life.

Results

Based on a review of the results all water samples collected were within BCWQG for the Protection of Aquatic Life guidelines.

The sampling determined the soils characterization of the overburden from the bulk sampling site prior to any mining, as this soil will be maintained onsite and placed back on the mined area as part of the sites reclamation plan.

Sample No.	Location	Comments	Location
BS1	• Near the northern extent of the bulk sample site • Approximately 0.10 metres depth	Red soils	11U 666799E 5481805N
BS2	• Approximately 0.10 metres depth	Sandy Soils	11U 666784E 5481797N
BS3	• Approximately 0.10 metres depth	Brown Soils	11U 666784E 5481746N
BS4	• Approximately 0.10 metres depth	Brown Soils	11U 666767E 5481767N
BS5	• Approximately 0.10 metres depth	Brown Soils	11U 666756E 5481592N

Sampling Procedures
Soil sampling was carried out in general accordance with the *Ministry of Environment Technical Guidance on Contaminated Sites* document entitled *Site Characterization And Confirmation Testing* Part II *Batch Testing of Suspect Material in Stockpiles (Ex Situ)*.

Five (5) set of representative grab samples (aliquots) of roughly equal volume were obtained and combined to make up each composite sample for testing at each testing location. All sampling equipment and containers were sterilized to avoid contamination of the sample.

All samples were compared to CSR Guidelines for Wildlands: Reverted which means a wildlands land use other than a natural wildlands land use.

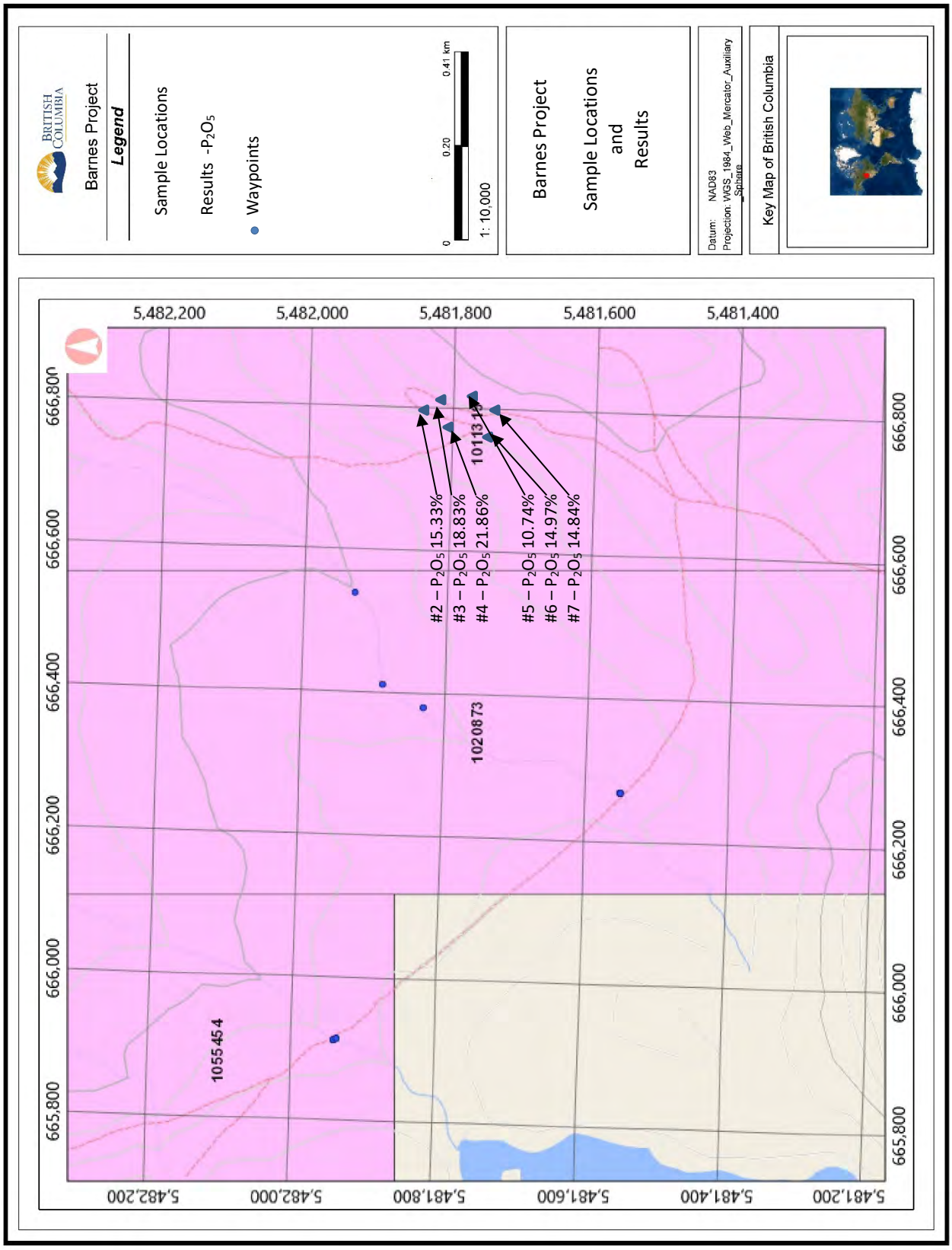


Figure 39 Rock Sample Locations and Results

Figure 40 Google Image Showing Waypoints

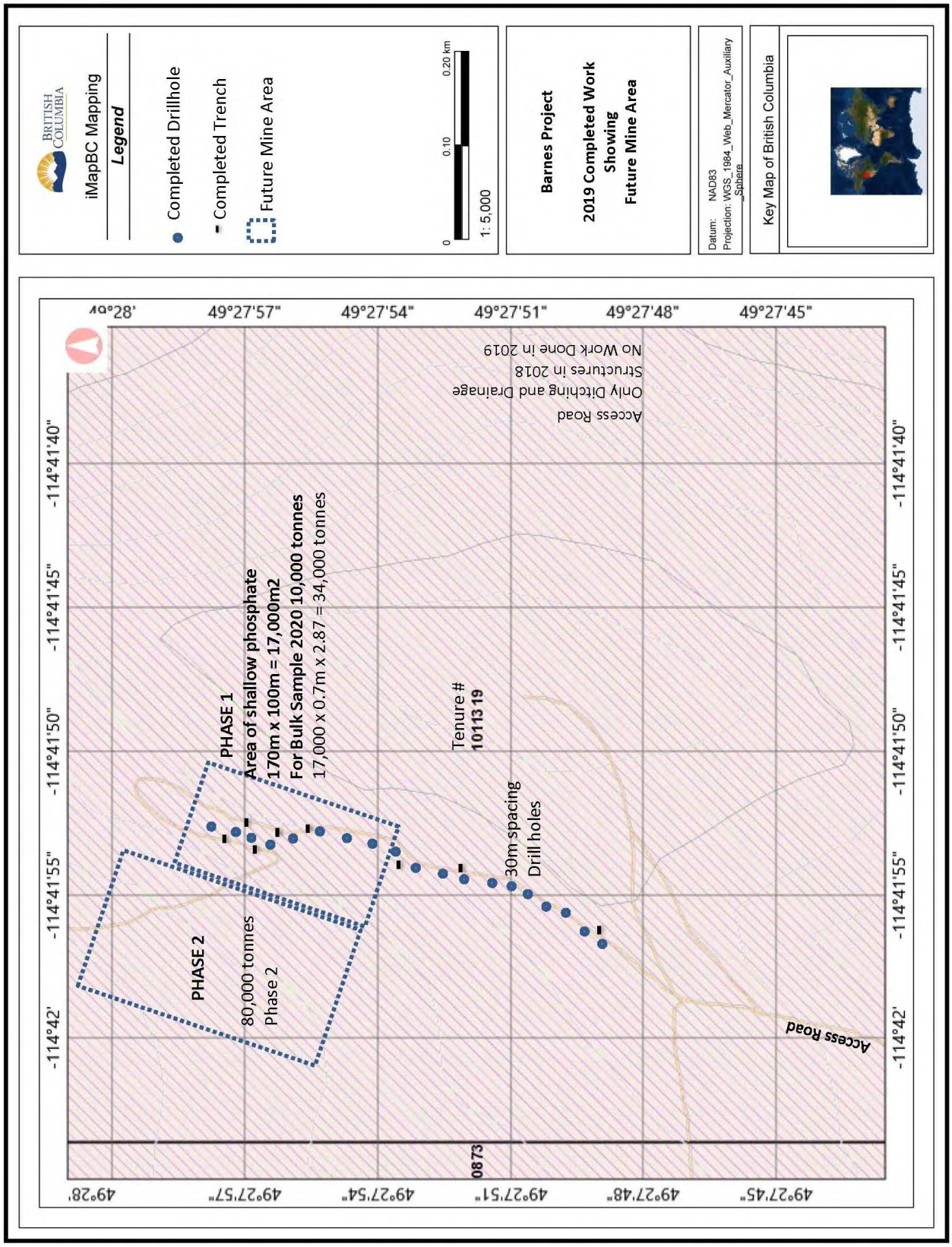


Figure 41 2019 Proposed Work Showing Future Mine Area

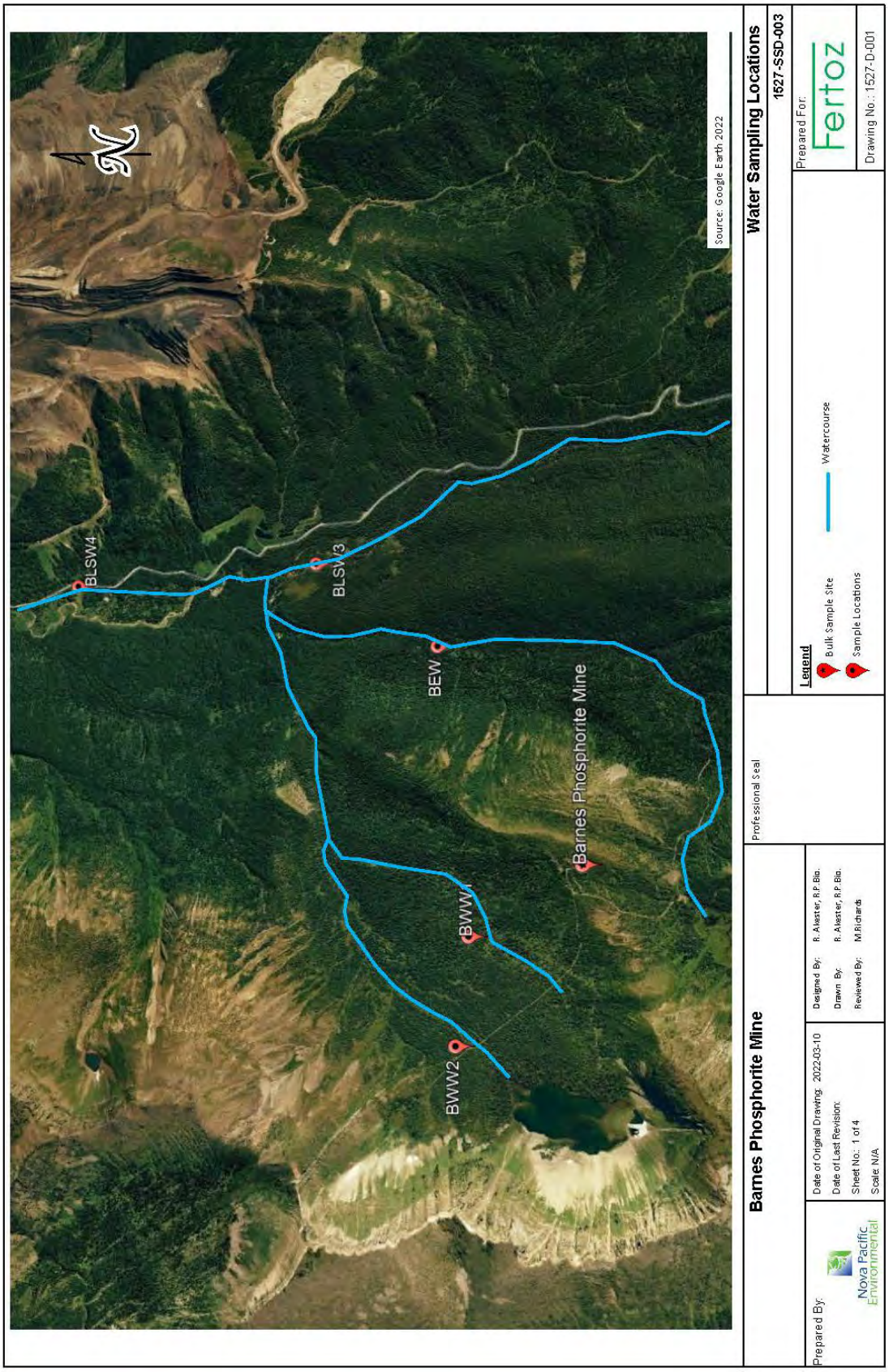


Figure 42 Water Sampling Locations

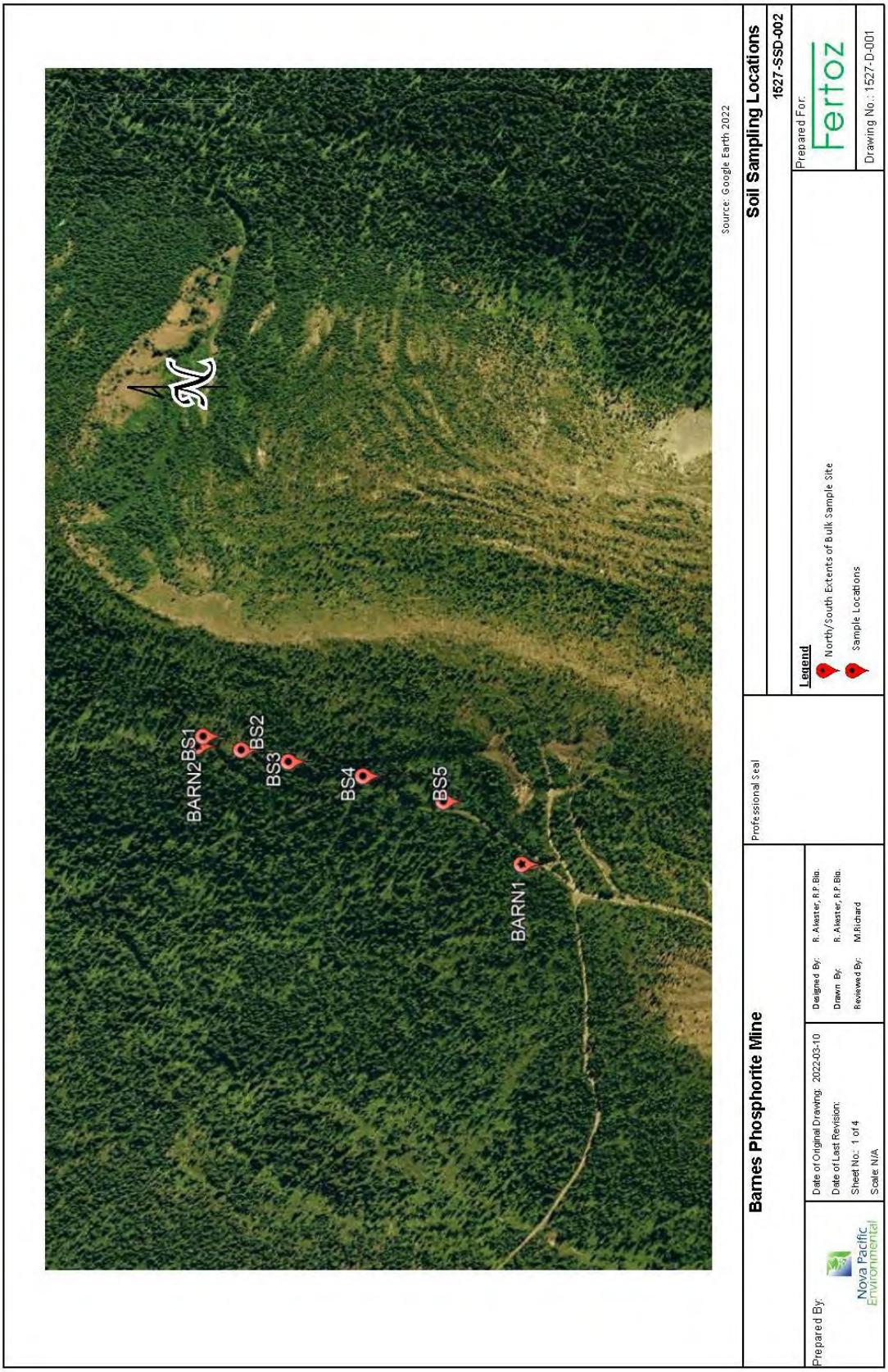


Figure 43 Soil Sampling Locations

CONCLUSIONS and RECOMMENDATIONS

The Barnes Lake claims, which can be reached by road from Sparwood, B.C., is underlain by a series of Upper Paleozoic and Mesozoic strata that were deposited off the western margin of North America between the Permian and late Jurassic. Considerable phosphatic strata occur at the base of the Jurassic Fernie Group, and in addition to P_2O_5, contain anomalous concentrations of yttrium. On the Barnes Lake claims, phosphorites (>12% P_2O_5) average around 660 ppm Y vs 260 ppm, which is the worldwide phosphorite average.

On the Barnes Lake claims, complete sections of the phosphatic strata are 1.11 to 2.1 metres in thickness and average 22.5 per cent P_2O_5 and 610 ppm yttrium. One incomplete section, where the upper beds were eroded away, was 0.98 metres in thickness and contained 30.5 per cent P_2O_5 and 777 ppm yttrium (Pell, 1990).

North of Barnes Lake, on the western limb of the easternmost anticline, an area was located where the phosphate horizon dips in a downslope direction at an angle approximately parallel to or slightly steeper than the slope: this scenario is favourable for exploiting the resource with minimal removal of overburden.

Beneficiation would be required to produce a product that would meet fertilizer plant feed specifications but the material appears suitable for the direct application, organic market without further upgrading.

The work done to date has been preliminary and has not addressed questions such as the effects of surface weathering and the potential of changes in grade with depth from surface.

The previous 2013 program consisted of reconnaissance prospecting, rock sampling and establishing access. Thirteen samples were collected and assayed. Work in June 2013 was curtailed by unusually heavy rain which washed out the access road and the access was closed. Widespread flooding occurred in southeast BC and Alberta.

Work in 2016 shows slightly anomalous soil samples approximately 150m to 200m east of the main rock at an elevation of approximately 1725m to 1767m. Close spaced soil samples are recommended perpendicular to the road system (E-W) at 10m intervals. Hand trenching assisted by excavator trenching is recommended to follow up on the previous drilling and soil results.

Follow-up sampling and geological mapping was completed in 2017 east of the main access road and also west of Michel Creek and north of Barnes Lake which confirmed the high grade (>30% P_2O_5) nature of the phosphate zone at surface. This zone 2 is an excellent exploration target and future bulk sample test site. More detail mapping is required and structural interpretation in order to constrain the enriched phosphate horizon.

Assay results indicate a folded and faulted phosphate horizon. In places the phosphate horizon has been duplicated as shown in Trench 3 and 4 (Figures 21 and 22) where the lower part of Trench 4 exhibits a thickened phosphate zone.

The program in 2019 consisted of 19 drillholes completed using a Shaw backpack drill.

The 2019 program completed 19 separate drillholes. The Assay results are contained in Appendix IV and shown on figure 19 to 38.

Drill logs are contained in Appendix V. Hole B-19-01 intersected some silty black shale boulders, Spray River Formation fragments and poker chip shale. Fernie Phosphorite at 2m assayed 12.59% P_2O_5. The very top of Hole DDH B-19-02 assayed 4.5% P_2O_5, and 14.62% P_2O_5 but the rest of the hole returned Spray River Siltstone chips.

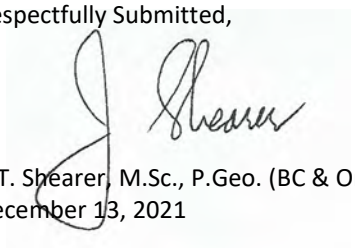
Drillholes DDH B-19-03 to B-19-06 were collared in good phosphorite with values up to 27.72% P_2O_5. Phosphate values in Holes 7 to 19 contained low P_2O_5 values due to being higher up in the stratigraphy.

This zone 2 is an excellent exploration target and future bulk sample test site. More detail mapping is required and structural interpretation in order to constrain the enriched phosphate horizon.

The program in 2021 consisted of continued water samples and phosphorite samples.

Careful mapping is needed to outline the >20% P_2O_5 zones using additional trenching and sampling.

Respectfully Submitted,



J. T. Shearer, M.Sc., P.Geo. (BC & Ontario)
December 13, 2021

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APPENDIX I

STATEMENT of QUALIFICATIONS

December 13, 2021

STATEMENT of QUALIFICATIONS

I, Johan T. Shearer of Unit 5 – 2330 Tyner Street, in the City of Port Coquitlam, in the Province of British Columbia, do hereby certify:

1. I graduated in Honours Geology (B.Sc., 1973) from the University of British Columbia and the University of London, Imperial College, (M.Sc. 1977).

2. I have practiced my profession as an Exploration Geologist continuously since graduation and have been employed by such mining companies as McIntyre Mines Ltd., J.C. Stephen Explorations Ltd., Carolin Mines Ltd. and TRM Engineering Ltd. I am presently employed by Homegold Resources Ltd.

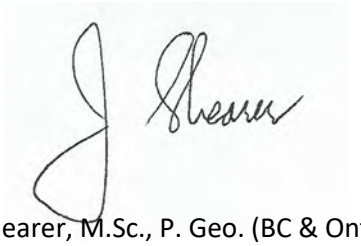
3. I am a fellow of the Geological Association of Canada (Fellow No. F439). I am also a member of the Canadian Institute of Mining and Metallurgy, the Geological Society of London and the APO (Ontario). I am a member in good standing of the Association of Professional Engineers and Geoscientists of British Columbia (P.Geo., Member Number 19,279).

4. I am an independent consulting geologist employed since December 1986 by Homegold Resources Ltd. At Unit #5 2330 Tyner Street, Port Coquitlam, British Columbia.

5. I am the author of the report entitled " Geochemical Assessment Report on the Barnes Property" dated December 13, 2021.

6. I have worked on the property on October 7, 2021 and August 12 to 29, 2018 and August 18 to 29, 2019. I have carried out mapping and sample collection and am familiar with the regional geology and geology of nearby properties. I have become familiar with the previous work conducted on the Barnes Project by examining in detail the available reports and maps and have discussed previous work with persons knowledgeable of the area.

Dated at Port Coquitlam, British Columbia, this 13th day of December 2021.



J.T. Shearer, M.Sc., P. Geo. (BC & Ontario)

APPENDIX II

STATEMENT of COSTS

December 13, 2021

Appendix II

STATEMENT of COSTS

BARNES PROJECT 2021`

Wages & Benefits	Without GST
J. T. Shearer, M.Sc., P.Geo; 1 day @ $800/day, October 7, 2021	$800.00
R. Akester, P.Bio., 3 days @ $800/day, October 7, 8, 10, 2021	2,400.00
Subtotal	$3,200.00
Transportation	
Truck 1 - Fully equipped 4x4 truck, 1 day @ $125/day	125.00
Truck 2 - Fully equipped 4x4 truck, 3 days @ $125/day	375.00
Side-by-Side ATV & Trailer, 2 days @ $250/day	500.00
Fuel	395.00
H. Dixon & Trailer, 2 days @ $450/day, October 7+8, 2021	900.00
Airfare, Vancouver-Cranbrook	350.00
Hotel – 3 nights	285.00
Meals	190.00
XRF Analysis	300.00
Water Analysis	525.00
Data Compilation & Mapping	800.00
Report Preparation	1,200.00
Word Processing	500.00
Subtotal	$ 6,445.00
Grand total	$ 9,645.00

Event #	5855946
Date Filed	December 13, 2021
Amount	$ 8,000.00
PAC	$ 2,617.96
Total Filed	$ 10,617.96

APPENDIX III

XRF RESULTS

December 13, 2021

Barnes XRF 2021

All Results in %

Sample	Mg	Mg +/-	Al	Al +/-	Si	Si +/-	P	P +/-	S	S +/-	Cl	Cl +/-	K	K +/-	Ca	Ca +/-	Ti	Ti +/-
#2	ND		2.8	0.05	10.1	0.07	15.33	0.11	0.14	0.0035	ND		2.5	0.018	29.87	0.19	0.4223	0.0282
#3	ND		2.1	0.049	8.07	0.06	18.83	0.14	0.24	0.0042	ND		1.8	0.013	34.01	0.23	0.6443	0.0342
#4	ND		1.5	0.0415	6.7328	0.0481	21.86	0.15	0.58	0.0057	ND		1.6	0.011	39.09	0.24	0.1961	0.0226
#5	ND		1.1	0.05	5.86	0.07	10.74	0.13	0.04	0.0038	ND		0.7	0.01	10.4	0.12	0.1205	0.0212
#6	ND		3.4	0.06	11.26	0.08	14.97	0.11	0.09	0.0031	ND		2.4	0.016	22.24	0.14	0.4165	0.0252
#7	ND		3.2	0.05	10.73	0.07	14.84	0.11	0.08	0.0031	ND		2.3	0.016	21.47	0.14	0.4133	0.025

V	V +/-	Cr	Cr +/-	Mn	Mn +/-	Fe	Fe +/-	Co	Co +/-	Ni	Ni +/-	Cu	Cu +/-	Zn	Zn +/-	As	As +/-
0.0722	0.0129	0.049	0.0068	0.0466	0.0053	1.7979	0.0237	ND		0	0.002	0.0062	0.0011	0.0114	0.0009	0.0018	0.0003
0.3373	0.0201	0.0318	0.0076	0.1013	0.0071	1.5417	0.023	ND		0	0.002	0.006	0.0011	0.0261	0.0013	ND	
0.0567	0.0117	0.0391	0.0063	0.0537	0.0054	0.6726	0.0138	ND		0	0.001	0.0053	0.001	0.0086	0.0008	ND	
ND		ND		0.0912	0.0071	15.86	0.19	ND		ND		ND		0.0147	0.0014	0.0032	0.0006
0.0934	0.0117	0.0351	0.0054	0.0533	0.0049	2.6805	0.0281	ND		0	0.001	0.0084	0.001	0.0293	0.0012	0.0017	0.0003
0.059	0.0107	0.0348	0.0053	0.0519	0.0048	2.6387	0.028	ND		0	0.001	0.008	0.001	0.0289	0.0012	0.0018	0.0003

Se	Se +/-	Rb	Rb +/-	Sr	Sr +/-	Y	Y +/-	Zr	Zr +/-	Mo	Mo +/-	Ag	Ag +/-	Cd	Cd +/-	Sn	Sn +/-	Sb
ND		0.0038	0.0003	0.0697	0.0009	0.1028	0.0011	0.0209	0.0005	0.0011	0.0002	ND		ND		ND		ND
ND		0.0024	0.0003	0.0609	0.0008	0.0904	0.0011	0.0161	0.0005	0.0012	0.0003	ND		ND		ND		ND
ND		0.0024	0.0002	0.0608	0.0008	0.0859	0.001	0.0147	0.0004	0.0014	0.0002	ND		ND		ND		ND
ND		0.0018	0.0003	0.0113	0.0005	0.0042	0.0004	0.0137	0.0006	0.0046	0.0004	ND		ND		ND		ND
0.0005	0.0002	0.0045	0.0003	0.0616	0.0007	0.0556	0.0007	0.0203	0.0005	0.0016	0.0002	ND		ND		ND		ND
0.0006	0.0002	0.0042	0.0002	0.0609	0.0007	0.0543	0.0007	0.0216	0.0005	0.0016	0.0002	ND		ND		ND		ND

Sb +/-	W	W +/-	Hg	Hg +/-	Pb	Pb +/-	Bi	Bi +/-	Th	Th +/-	U	U +/-	LE	LE +/-
	ND		ND		ND		ND		0.0048	0.0009	0.0066	0.0007	36.6	0.3
	ND		ND		ND		ND		0.0038	0.0009	0.0051	0.0007	32.08	0.32
	ND		ND		ND		ND		0.003	0.0009	0.0071	0.0007	27.49	0.3
	ND		ND		ND		ND		0.0044	0.0012	0.0063	0.0008	55.03	0.41
	ND		ND		0.0019	0.0004	ND		ND		0.0044	0.0006	42.26	0.27
	ND		ND		0.0012	0.0004	ND		ND		0.0043	0.0006	44.06	0.27

APPENDIX IV

SAMPLE DESCRIPTIONS and LOCATIONS

December 13, 2021

Barnes Sample Descriptions 2021

Sample	Zone	Northing	Easting	Description
#2	11	666795	5481840	
#3	11	666817	5481829	
#4	11	666785	5481819	
#5	11	666800	5481788	
#6	11	666771	5481769	
#7	11	666795	5481745	

Waypoints 2021-10-09

198	09-OCT-21 11:03:16AM	N49 28.046 W114 42.604	1929 m
199	09-OCT-21 11:03:19AM	N49 28.046 W114 42.604	1933 m
200	09-OCT-21 11:03:44AM	N49 28.044 W114 42.602	1933 m
201	09-OCT-21 12:07:55PM	N49 27.830 W114 42.318	1935 m
202	09-OCT-21 12:07:58PM	N49 27.830 W114 42.318	1937 m
203	09-OCT-21 12:08:03PM	N49 27.830 W114 42.318	1936 m
204	09-OCT-21 12:18:42PM	N49 27.978 W114 42.219	1921 m
205	09-OCT-21 12:31:16PM	N49 28.009 W114 42.192	1914 m
206	09-OCT-21 12:44:18PM	N49 28.029 W114 42.085	1904 m

APPENDIX V

WATER SAMPLE RESULTS

December 13, 2021

The results of the Water Tests for samples collected from the Barnes Phosphorite Mine bulk sample area.

Sample No.	Location	Comments	Location
BLSW3	Upstream on Michel Creek		
BLSW4	Downstream on Michel Creek		
BEW	Unnamed watercourse east of Bulk Sample Site 10m downstream of trail crossing	Drains from Barnes Lake	
BWW1	Unnamed watercourse west and downslope of Bulk Sample Site	Upper section of the watercourse visible but dry. Aquifer noted approximately 300m downstream of the access road	
BWW2	Unnamed watercourse west of Bulk Sample Site and BWW1	Drains from an unnamed lake west of the Bulk Sample Site	

Sampling Procedures
One (1) set of soil samples were obtained at each testing location. All sampling equipment and containers were sterilized to avoid contamination of the sample.

All samples were compared to BC Water Quality Guidelines (BCWQG) for the Protection of Aquatic Life.

Results

Based on a review of the results all water samples collected were within BCWQG for the Protection of Aquatic Life guidelines.

The sampling determined the soils characterization of the overburden from the bulk sampling site prior to any mining, as this soil will be maintained onsite and placed back on the mined area as part of the sites reclamation plan.

Sample No.	Location	Comments	Location
BS1	• Near the northern extent of the bulk sample site • Approximately 0.10 metres depth	Red soils	
BS2	• Approximately 0.10 metres depth	Sandy Soils	
BS3	• Approximately 0.10 metres depth	Brown Soils	
BS4	• Approximately 0.10 metres depth	Brown Soils	
BS5	• Approximately 0.10 metres depth	Brown Soils	

Sampling Procedures
Soil sampling was carried out in general accordance with the *Ministry of Environment Technical Guidance on Contaminated Sites* document entitled *Site Characterization And Confirmation Testing* Part II *Batch Testing of Suspect Material in Stockpiles (Ex Situ)*.

Five (5) set of representative grab samples (aliquots) of roughly equal volume were obtained and combined to make up each composite sample for testing at each testing location. All sampling equipment and containers were sterilized to avoid contamination of the sample.

All samples were compared to CSR Guidelines for Wildlands: Reverted which means a wildlands land use other than a natural wildlands land use.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21C2477**	Page	: 1 of 6
Client	: **Nova Pacific Environmental Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Rob Akester	Account Manager	: Carla Fuginski
Address	: 97 North Renfrew Street Vancouver BC Canada V5K 3N6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1527 - Barnes	Date Samples Received	: 10-Oct-2021 15:40
PO	: ----	Date Analysis Commenced	: 13-Oct-2021
C-O-C number	: 17-866430	Issue Date	: 27-Oct-2021 09:49
Sampler	: ----		
Site	: ----		
Quote number	: VA21NPEL100_01 Disposal at Sea		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jay Jang	Lab Assistant	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	No Unit
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

Water samples for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers

Qualifier	*Description*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BLSW4	BWW1	BLSW3	BEW	BWW2
					Client sampling date / time	09-Oct-2021 15:15	09-Oct-2021 09:45	09-Oct-2021 14:30	09-Oct-2021 12:20	09-Oct-2021 10:45
						VA21C2477-001	VA21C2477-002	VA21C2477-003	VA21C2477-004	VA21C2477-005
						Result	Result	Result	Result	Result
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		144	114	148	122	72.4
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		5.8	<1.0	6.2	4.8	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L		2.9	<1.0	3.1	2.4	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		150	114	154	127	72.4
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		151	112	153	129	86.2
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		153	112	154	130	85.4
pH	----	E108	0.10	pH units		8.39	8.27	8.40	8.36	8.13
Anions and Nutrients										
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50
fluoride	16984-48-8	E235.F	0.020	mg/L		0.085	0.052	0.074	0.074	0.307
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	0.0121	0.0235	0.0215
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	<0.0010	0.0030	0.0084 RRV	0.0012
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0073	0.0118	0.0063	0.0143	0.0092
phosphorus, total dissolved	7723-14-0	E375-T	0.0020	mg/L		<0.0020	<0.0020	<0.0020	0.0076	<0.0020
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		13.7	9.29	14.2	10.5	16.1
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		0.95	1.14	1.18	1.12	2.40
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		0.93	0.92	0.90	0.70	2.14
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0149	0.0385	0.0232	0.0136	0.0070
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00016	0.00012	0.00018	0.00017	0.00025
barium, total	7440-39-3	E420	0.00010	mg/L		0.0548	0.0375	0.0532	0.0263	0.0158
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.012	0.014	<0.010	<0.010

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BLSW4	BWW1	BLSW3	BEW	BWW2
					Client sampling date / time	09-Oct-2021 15:15	09-Oct-2021 09:45	09-Oct-2021 14:30	09-Oct-2021 12:20	09-Oct-2021 10:45
						VA21C2477-001	VA21C2477-002	VA21C2477-003	VA21C2477-004	VA21C2477-005
						Result	Result	Result	Result	Result
Total Metals										
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000064	0.0000220	0.0000116	<0.0000050	0.0000072
calcium, total	7440-70-2	E420	0.050	mg/L		41.0	28.4	43.2	32.3	17.2
cesium, total	7440-46-2	E420	0.000010	mg/L		<0.000010	0.000011	<0.000010	<0.000010	<0.000010
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	0.00089	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.00083	0.00269	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		0.052	0.062	0.023	0.016	<0.010
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000136	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0034	0.0050	0.0049	0.0011	<0.0010
magnesium, total	7439-95-4	E420	0.0050	mg/L		12.2	10.1	11.1	12.1	10.3
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0166	0.0132	0.00104	0.00231	0.00104
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000743	0.000600	0.000889	0.000690	0.00171
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	0.00059	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.050	mg/L		0.523	0.714	0.484	0.325	0.103
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00024	0.00048	0.00022	<0.00020	<0.00020
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000241	0.000229	0.000212	0.000254	0.000439
silicon, total	7440-21-3	E420	0.10	mg/L		2.01	2.40	2.27	1.72	0.57
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	17341-25-2	E420	0.050	mg/L		2.18	1.86	3.04	0.584	0.123
strontium, total	7440-24-6	E420	0.00020	mg/L		0.114	0.123	0.160	0.0568	0.0508
sulfur, total	7704-34-9	E420	0.50	mg/L		5.08	3.65	5.54	4.13	6.15
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	0.00066	<0.00030	<0.00030	<0.00030
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000307	0.000133	0.000254	0.000519	0.000655
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BLSW4	BWW1	BLSW3	BEW	BWW2
					Client sampling date / time	09-Oct-2021 15:15	09-Oct-2021 09:45	09-Oct-2021 14:30	09-Oct-2021 12:20	09-Oct-2021 10:45
						VA21C2477-001	VA21C2477-002	VA21C2477-003	VA21C2477-004	VA21C2477-005
						Result	Result	Result	Result	Result
Total Metals										
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0076	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0014	0.0026	0.0013	0.0012	0.0036
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00015	<0.00010	0.00016	0.00015	0.00022
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0570	0.0378	0.0561	0.0276	0.0163
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.012	0.014	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000054	0.0000093	0.0000065	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		39.5	27.4	42.3	31.2	16.7
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00048	0.00125	<0.00020	<0.00020	<0.00020
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0030	0.0046	0.0046	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		12.8	10.7	11.5	12.4	10.8
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00961	0.00012	<0.00010	<0.00010	<0.00010
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000735	0.000578	0.000843	0.000662	0.00172
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L		0.516	0.699	0.490	0.296	0.071
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00021	0.00041	<0.00020	<0.00020	<0.00020
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000257	0.000244	0.000191	0.000338	0.000473
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.01	2.34	2.20	1.73	0.536
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		2.26	1.84	3.16	0.598	0.133

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BLSW4	BWW1	BLSW3	BEW	BWW2
					Client sampling date / time	09-Oct-2021 15:15	09-Oct-2021 09:45	09-Oct-2021 14:30	09-Oct-2021 12:20	09-Oct-2021 10:45
						VA21C2477-001	VA21C2477-002	VA21C2477-003	VA21C2477-004	VA21C2477-005
						Result	Result	Result	Result	Result
Dissolved Metals										
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.113	0.122	0.157	0.0540	0.0513
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		4.91	3.44	5.09	3.79	5.79
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000280	0.000111	0.000221	0.000465	0.000594
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0015	0.0037	<0.0010	<0.0010	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Laboratory	Laboratory	Laboratory	Laboratory	Laboratory
dissolved metals filtration location	----	EP421	-	-		Laboratory	Laboratory	Laboratory	Laboratory	Laboratory

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21C2477**	Page	: 1 of 18
Client	: **Nova Pacific Environmental Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Rob Akester	Account Manager	: Carla Fuginski
Address	: 97 North Renfrew Street Vancouver BC Canada V5K 3N6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1527 - Barnes	Date Samples Received	: 10-Oct-2021 15:40
PO	: ----	Issue Date	: 27-Oct-2021 09:49
C-O-C number	: 17-866430		
Sampler	: ----		
Site	: ----		
Quote number	: VA21NPEL100_01 Disposal at Sea		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Total Metals	QC-324069-001	----	sulfur, total	7704-34-9	E420	0.55 mg/L B	0.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Recoveries								
Physical Tests	QC-318075-002	----	acidity (as CaCO3)	----	E283	124 % LCS-H	85.0-115%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
BEW	E235.Br-L	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
BLSW3	E235.Br-L	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
BLSW4	E235.Br-L	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
BWW1	E235.Br-L	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
BWW2	E235.Br-L	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
BEW	E235.Cl	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
BLSW3	E235.Cl	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC										
HDPE BLSW4	E235.Cl	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE BWW1	E235.Cl	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE BWW2	E235.Cl	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE BEW	E378-U	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE BLSW3	E378-U	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE BLSW4	E378-U	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE BWW1	E378-U	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE BWW2	E378-U	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Fluoride in Water by IC										
HDPE BEW	E235.F	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE BLSW3	E235.F	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE BLSW4	E235.F	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE BWW1	E235.F	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE BWW2	E235.F	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE BEW	E235.NO3-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE BLSW3	E235.NO3-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE BLSW4	E235.NO3-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE BWW1	E235.NO3-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE BWW2	E235.NO3-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE BEW	E235.NO2-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE BLSW3	E235.NO2-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE BLSW4	E235.NO2-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE BWW1	E235.NO2-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE BWW2	E235.NO2-L	09-Oct-2021	----	----	----		13-Oct-2021	3 days	4 days	× EHT
Anions and Nutrients : Sulfate in Water by IC										
HDPE BEW	E235.SO4	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE BLSW3	E235.SO4	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE BLSW4	E235.SO4	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE BWW1	E235.SO4	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
BWW2	E235.SO4	09-Oct-2021	----	----	----		13-Oct-2021	28 days	4 days	✓
Anions and Nutrients : Total Dissolved Phosphorus by Colourimetry (Trace Level)										
Amber glass dissolved (lab preserved)										
BEW	E375-T	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Dissolved Phosphorus by Colourimetry (Trace Level)										
Amber glass dissolved (lab preserved)										
BLSW3	E375-T	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Dissolved Phosphorus by Colourimetry (Trace Level)										
Amber glass dissolved (lab preserved)										
BLSW4	E375-T	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Dissolved Phosphorus by Colourimetry (Trace Level)										
Amber glass dissolved (lab preserved)										
BWW1	E375-T	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Dissolved Phosphorus by Colourimetry (Trace Level)										
Amber glass dissolved (lab preserved)										
BWW2	E375-T	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (lab preserved)										
BEW	E372-U	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (lab preserved)										
BLSW3	E372-U	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (lab preserved)										
BLSW4	E372-U	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (lab preserved)										
BWW1	E372-U	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (lab preserved)										
BWW2	E372-U	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	22-Oct-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE - dissolved (lab preserved)										
BEW	E509	09-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	----	17 days	
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE - dissolved (lab preserved)										
BLSW3	E509	09-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	----	17 days	
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE - dissolved (lab preserved)										
BLSW4	E509	09-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	----	17 days	
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE - dissolved (lab preserved)										
BWW1	E509	09-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	----	17 days	
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
HDPE - dissolved (lab preserved)										
BWW2	E509	09-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	----	17 days	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
BEW	E421	09-Oct-2021	25-Oct-2021	----	----		25-Oct-2021	180 days	16 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
BLSW3	E421	09-Oct-2021	25-Oct-2021	----	----		25-Oct-2021	180 days	16 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
BLSW4	E421	09-Oct-2021	25-Oct-2021	----	----		25-Oct-2021	180 days	16 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
BWW1	E421	09-Oct-2021	25-Oct-2021	----	----		25-Oct-2021	180 days	16 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
BWW2	E421	09-Oct-2021	25-Oct-2021	----	----		25-Oct-2021	180 days	16 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved)										
BEW	E358-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved)										
BLSW3	E358-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved)										
BLSW4	E358-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved)										
BWW1	E358-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (lab preserved)										
BWW2	E358-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (lab preserved)										
BEW	E355-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (lab preserved) BLSW3	E355-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (lab preserved) BLSW4	E355-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (lab preserved) BWW1	E355-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (lab preserved) BWW2	E355-L	09-Oct-2021	21-Oct-2021	3 days	12 days	× EHT	21-Oct-2021	28 days	0 days	✓
Physical Tests : Acidity by Titration										
HDPE BEW	E283	09-Oct-2021	----	----	----		13-Oct-2021	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE BLSW3	E283	09-Oct-2021	----	----	----		13-Oct-2021	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE BLSW4	E283	09-Oct-2021	----	----	----		13-Oct-2021	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE BWW1	E283	09-Oct-2021	----	----	----		13-Oct-2021	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE BWW2	E283	09-Oct-2021	----	----	----		13-Oct-2021	14 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE BEW	E290	09-Oct-2021	----	----	----		14-Oct-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE BLSW3	E290	09-Oct-2021	----	----	----		14-Oct-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE BLSW4	E290	09-Oct-2021	----	----	----		14-Oct-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE BWW1	E290	09-Oct-2021	----	----	----		14-Oct-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE BWW2	E290	09-Oct-2021	----	----	----		14-Oct-2021	14 days	5 days	✓
Physical Tests : pH by Meter										
HDPE BLSW4	E108	09-Oct-2021	----	----	----		14-Oct-2021	0.25 hrs	114 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE BLSW3	E108	09-Oct-2021	----	----	----		14-Oct-2021	0.25 hrs	115 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE BEW	E108	09-Oct-2021	----	----	----		14-Oct-2021	0.25 hrs	117 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE BWW2	E108	09-Oct-2021	----	----	----		14-Oct-2021	0.25 hrs	118 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE BWW1	E108	09-Oct-2021	----	----	----		14-Oct-2021	0.25 hrs	119 hrs	× EHTR-FM
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) BEW	E508	09-Oct-2021	----	----	----		23-Oct-2021	28 days	14 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) BLSW3	E508	09-Oct-2021	----	----	----		23-Oct-2021	28 days	14 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) BLSW4	E508	09-Oct-2021	----	----	----		23-Oct-2021	28 days	14 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) BWW1	E508	09-Oct-2021	----	----	----		23-Oct-2021	28 days	14 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) BWW2	E508	09-Oct-2021	----	----	----		23-Oct-2021	28 days	14 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) BEW	E420	09-Oct-2021	----	----	----		23-Oct-2021	180 days	14 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) BLSW3	E420	09-Oct-2021	----	----	----		23-Oct-2021	180 days	14 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) BLSW4	E420	09-Oct-2021	----	----	----		23-Oct-2021	180 days	14 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
BWW1	E420	09-Oct-2021	----	----	----		23-Oct-2021	180 days	14 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
BWW2	E420	09-Oct-2021	----	----	----		23-Oct-2021	180 days	14 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	318075	1	6	16.6	5.0	✓
Alkalinity Species by Titration	E290	318067	1	6	16.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	318070	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	318069	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	329425	1	6	16.6	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	329029	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	326106	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	318074	1	6	16.6	5.0	✓
Fluoride in Water by IC	E235.F	318068	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	318071	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	318072	1	20	5.0	5.0	✓
pH by Meter	E108	318065	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	318073	1	20	5.0	5.0	✓
Total Dissolved Phosphorus by Colourimetry (Trace Level)	E375-T	326104	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	327784	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	324069	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	326102	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	326103	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	318075	1	6	16.6	5.0	✓
Alkalinity Species by Titration	E290	318067	1	6	16.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	318070	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	318069	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	329425	1	6	16.6	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	329029	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	326106	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	318074	1	6	16.6	5.0	✓
Fluoride in Water by IC	E235.F	318068	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	318071	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	318072	1	20	5.0	5.0	✓
pH by Meter	E108	318065	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	318073	1	20	5.0	5.0	✓
Total Dissolved Phosphorus by Colourimetry (Trace Level)	E375-T	326104	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	327784	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	324069	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	326102	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	326103	1	19	5.2	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB)							
Acidity by Titration	E283	318075	1	6	16.6	5.0	✓
Alkalinity Species by Titration	E290	318067	1	6	16.6	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	318070	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	318069	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	329425	1	6	16.6	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	329029	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	326106	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	318074	1	6	16.6	5.0	✓
Fluoride in Water by IC	E235.F	318068	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	318071	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	318072	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	318073	1	20	5.0	5.0	✓
Total Dissolved Phosphorus by Colourimetry (Trace Level)	E375-T	326104	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	327784	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	324069	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	326102	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	326103	1	19	5.2	5.0	✓
Matrix Spikes (MS)							
Bromide in Water by IC (Low Level)	E235.Br-L	318070	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	318069	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	329425	1	6	16.6	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	329029	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	326106	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	318074	1	6	16.6	5.0	✓
Fluoride in Water by IC	E235.F	318068	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	318071	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	318072	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	318073	1	20	5.0	5.0	✓
Total Dissolved Phosphorus by Colourimetry (Trace Level)	E375-T	326104	1	19	5.2	5.0	✓
Total Mercury in Water by CVAAS	E508	327784	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	324069	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	326102	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	326103	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Bromide in Water by IC (Low Level)	E235.Br-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Vancouver - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Vancouver - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Dissolved Phosphorus by Colourimetry (Trace Level)	E375-T Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Dissolved Phosphorus is determined colourimetrically using a discrete analyzer after filtration through a 0.45 micron filter followed by heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Vancouver - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Total Organic Carbon by Combustion	EP355 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Digestion for Dissolved Phosphorus in water	EP375 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are filtered through a 0.45 micron membrane filter and then heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **VA21C2477**	Page	: 1 of 18
Client	: Nova Pacific Environmental Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Rob Akester	Account Manager	: Carla Fuginski
Address	: 97 North Renfrew Street Vancouver BC Canada V5K 3N6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1527 - Barnes	Date Samples Received	: 10-Oct-2021 15:40
PO	: ----	Date Analysis Commenced	: 13-Oct-2021
C-O-C number	: 17-866430	Issue Date	: 27-Oct-2021 09:49
Sampler	: ----		
Site	: ----		
Quote number	: VA21NPEL100_01 Disposal at Sea		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jay Jang	Lab Assistant	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 318065)											
VA21C2460-001	Anonymous	pH	----	E108	0.10	pH units	8.13	8.09	0.493%	4%	----
Physical Tests (QC Lot: 318067)											
VA21C2477-002	BWW1	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	114	114	0.438%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, phenolphthalein (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	114	114	0.438%	20%	----
Physical Tests (QC Lot: 318075)											
VA21C2477-001	BLSW4	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 318068)											
VA21C2460-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.454	0.451	0.768%	20%	----
Anions and Nutrients (QC Lot: 318069)											
VA21C2460-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	0.58	0.57	0.01	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 318070)											
VA21C2460-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 318071)											
VA21C2460-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0870	0.0861	1.08%	20%	----
Anions and Nutrients (QC Lot: 318072)											
VA21C2460-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 318073)											
VA21C2460-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	33.2	33.2	0.146%	20%	----
Anions and Nutrients (QC Lot: 318074)											
VA21C2476-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0019	0.0017	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 326103)											
FJ2101136-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0071	0.0071	0.00002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 326104)											
FJ2101136-001	Anonymous	phosphorus, total dissolved	7723-14-0	E375-T	0.0020	mg/L	0.0034	0.0040	0.0006	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 326102)											
FJ2101136-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.67	1.56	0.11	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 326106)											
FJ2101136-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.98	1.99	0.006	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 324069)											
KS2103363-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00122	0.00119	2.13%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0169	0.0173	2.62%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000113	0.0000128	0.0000014	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	41.2	41.3	0.307%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	0.00074	0.00078	0.00004	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0605	0.0607	0.465%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000548	0.000541	1.29%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0019	0.0018	0.00003	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	17.8	17.8	0.393%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00293	0.00292	0.381%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00145	0.00146	0.407%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.61	1.61	0.0352%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00062	0.00064	0.00002	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000235	0.000251	0.000016	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	7.70	7.74	0.543%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	7.68	7.77	1.08%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.271	0.267	1.51%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	7.08	7.32	3.36%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 324069) - continued											
KS2103363-001	Anonymous	uranium, total	7440-61-1	E420	0.000010	mg/L	0.00214	0.00215	0.496%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00104	0.00103	0.000008	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0280	0.0289	0.0008	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Total Metals (QC Lot: 327784)											
VA21C2439-009	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 327785)											
VA21C2477-002	BWW1	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 329029)											
VA21C2477-001	BLSW4	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0014	0.0016	0.0002	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00015	0.00013	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0570	0.0564	1.15%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000054	0.0000066	0.0000012	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	39.5	40.1	1.49%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00048	0.00046	0.00001	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0030	0.0030	0.00004	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	12.8	12.7	0.724%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00961	0.00965	0.380%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000735	0.000693	5.86%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.516	0.516	0.00234%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00021	0.00023	0.00002	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000257	0.000243	0.000013	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.01	1.98	1.82%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 329029) - continued											
VA21C2477-001	BLSW4	sodium, dissolved	17341-25-2	E421	0.050	mg/L	2.26	2.25	0.873%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.113	0.113	0.0594%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	4.91	4.92	0.006	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000280	0.000277	0.937%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0015	0.0015	0.00001	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 329425)											
VA21C2476-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 318067)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 318075)						
acidity (as CaCO3)	----	E283	2	mg/L	2.0	----
Anions and Nutrients (QCLot: 318068)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 318069)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 318070)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 318071)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 318072)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 318073)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 318074)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 326103)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 326104)						
phosphorus, total dissolved	7723-14-0	E375-T	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 326102)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 326106)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 324069)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 324069) - continued						
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	# 0.55	B
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 327784)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 327785)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 329029)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 329029) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 329425)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 318065)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 318067)									
alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	229 mg/L	95.8	75.0	125	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	102	85.0	115	----
Physical Tests (QCLot: 318075)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	# 124	85.0	115	LCS-H
Anions and Nutrients (QCLot: 318068)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 318069)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 318070)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 318071)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 318072)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 318073)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 318074)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	102	80.0	120	----
Anions and Nutrients (QCLot: 326103)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	94.1	80.0	120	----
Anions and Nutrients (QCLot: 326104)									
phosphorus, total dissolved	7723-14-0	E375-T	0.002	mg/L	0.05 mg/L	88.5	80.0	120	----
Organic / Inorganic Carbon (QCLot: 326102)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	100	80.0	120	----
Organic / Inorganic Carbon (QCLot: 326106)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Total Metals (QCLot: 324069)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 324069) - continued									
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.7	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	97.8	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	96.3	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	91.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	97.2	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	100	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	96.6	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	97.7	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.0	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	99.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.1	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	101	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	98.4	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	98.6	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	97.3	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	97.8	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	98.8	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	98.6	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	91.8	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	98.4	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	111	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	97.7	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	96.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	94.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	96.2	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	96.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	108	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	98.9	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	108	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	89.4	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 327784)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	98.2	80.0	120	----
Total Metals (QCLot: 327785)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	97.6	80.0	120	----
Dissolved Metals (QCLot: 329029)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	107	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	106	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	94.6	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	103	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	99.0	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	107	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	105	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	107	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	111	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	105	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.8	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	91.5	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	111	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	109	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	102	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	93.5	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 329029) - continued									
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	96.8	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	104	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	93.9	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	97.8	80.0	120	----

Qualifiers

Qualifier	Description
LCS-H	*Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 318068)										
VA21C2460-002	Anonymous	fluoride	16984-48-8	E235.F	1.04 mg/L	1 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 318069)										
VA21C2460-002	Anonymous	chloride	16887-00-6	E235.Cl	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 318070)										
VA21C2460-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.526 mg/L	0.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 318071)										
VA21C2460-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.65 mg/L	2.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 318072)										
VA21C2460-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.524 mg/L	0.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 318073)										
VA21C2460-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 318074)										
VA21C2477-001	BLSW4	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0371 mg/L	0.03 mg/L	124	70.0	130	----
Anions and Nutrients (QCLot: 326103)										
FJ2101136-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0494 mg/L	0.05 mg/L	98.9	70.0	130	----
Anions and Nutrients (QCLot: 326104)										
FJ2101136-002	Anonymous	phosphorus, total dissolved	7723-14-0	E375-T	0.0506 mg/L	0.05 mg/L	101	70.0	130	----
Organic / Inorganic Carbon (QCLot: 326102)										
FJ2101136-002	Anonymous	carbon, total organic [TOC]	----	E355-L	5.37 mg/L	5 mg/L	107	70.0	130	----
Organic / Inorganic Carbon (QCLot: 326106)										
FJ2101136-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.54 mg/L	5 mg/L	111	70.0	130	----
Total Metals (QCLot: 324069)										
VA21C2536-001	Anonymous	aluminum, total	7429-90-5	E420	0.209 mg/L	0.2 mg/L	104	70.0	130	----
		antimony, total	7440-36-0	E420	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		barium, total	7440-39-3	E420	0.0190 mg/L	0.02 mg/L	94.9	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00860 mg/L	0.01 mg/L	86.0	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 324069) - continued										
VA21C2536-001	Anonymous	boron, total	7440-42-8	E420	0.090 mg/L	0.1 mg/L	90.5	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00396 mg/L	0.004 mg/L	99.1	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.00979 mg/L	0.01 mg/L	97.9	70.0	130	----
		chromium, total	7440-47-3	E420	0.0402 mg/L	0.04 mg/L	101	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		iron, total	7439-89-6	E420	1.96 mg/L	2 mg/L	98.2	70.0	130	----
		lead, total	7439-92-1	E420	0.0179 mg/L	0.02 mg/L	89.5	70.0	130	----
		lithium, total	7439-93-2	E420	0.0974 mg/L	0.1 mg/L	97.4	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		molybdenum, total	7439-98-7	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, total	7440-02-0	E420	0.0380 mg/L	0.04 mg/L	95.1	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.8 mg/L	10 mg/L	108	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		selenium, total	7782-49-2	E420	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.03 mg/L	10 mg/L	90.3	70.0	130	----
		silver, total	7440-22-4	E420	0.00379 mg/L	0.004 mg/L	94.8	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		thallium, total	7440-28-0	E420	0.00352 mg/L	0.004 mg/L	87.9	70.0	130	----
		thorium, total	7440-29-1	E420	0.0198 mg/L	0.02 mg/L	99.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0192 mg/L	0.02 mg/L	96.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0185 mg/L	0.02 mg/L	92.5	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, total	7440-66-6	E420	0.380 mg/L	0.4 mg/L	94.9	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
Total Metals (QCLot: 327784)										
VA21C2439-010	Anonymous	mercury, total	7439-97-6	E508	0.0000993 mg/L	0.0001 mg/L	99.3	70.0	130	----
Total Metals (QCLot: 327785)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 327785) - continued										
VA21C2477-003	BLSW3	mercury, total	7439-97-6	E508	0.0000985 mg/L	0.0001 mg/L	98.5	70.0	130	----
Dissolved Metals (QCLot: 329029)										
VA21C2477-002	BWW1	aluminum, dissolved	7429-90-5	E421	0.198 mg/L	0.2 mg/L	98.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0396 mg/L	0.04 mg/L	99.1	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00841 mg/L	0.01 mg/L	84.1	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.094 mg/L	0.1 mg/L	93.6	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00394 mg/L	0.004 mg/L	98.5	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00959 mg/L	0.01 mg/L	95.9	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0198 mg/L	0.02 mg/L	98.9	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.01 mg/L	2 mg/L	100	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0955 mg/L	0.1 mg/L	95.5	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.95 mg/L	4 mg/L	98.8	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0207 mg/L	0.02 mg/L	103	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0446 mg/L	0.04 mg/L	112	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.13 mg/L	10 mg/L	91.3	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00377 mg/L	0.004 mg/L	94.3	70.0	130	----
		sodium, dissolved	17341-25-2	E421	1.93 mg/L	2 mg/L	96.6	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.9 mg/L	20 mg/L	104	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00366 mg/L	0.004 mg/L	91.5	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0200 mg/L	0.02 mg/L	100.0	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0185 mg/L	0.02 mg/L	92.7	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 329029) - continued										
VA21C2477-002	BWW1	tungsten, dissolved	7440-33-7	E421	0.0188 mg/L	0.02 mg/L	94.2	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00381 mg/L	0.004 mg/L	95.4	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.398 mg/L	0.4 mg/L	99.6	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
Dissolved Metals (QCLot: 329425)										
VA21C2477-001	BLSW4	mercury, dissolved	7439-97-6	E509	0.0000977 mg/L	0.0001 mg/L	97.7	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 866430

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Nova Pacific Environmental	Select Report Format: ☐ PDF ☑ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☐ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Bob Allester	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	778-957-8903	☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200%] (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Street:	67 W Renfrew Street	Email 1 or Fax rallester@novapacific.net	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Vancouver BC	Email 2	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	V5K 3N6	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	**Invoice Distribution**	
	Copy of Invoice with Report ☐ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:	as above	Email 1 or Fax rallester@novapacific.net	
Contact:		Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	1527 - Barnes	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact:	Sampler:

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Analysis Request: Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below: Total/Dissolved metals; Total Mercury; Dissolved Mercury; Speciated Alkalinity; Anions; Acidity; Orthophosphate; Total Nutrients; Dissolved Nutrients; Total Phosphorus; Dissolved Phosphorus; Total/Diss organic Carbon; Hardness/pH	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BLSW 4	10/9/21	3:15	Water	4			
	BWW 1		9:45		4			
	BLSW 3		2:30		4			
	BEW		12:20		4			
	BWW2		10:45		4			

Environmental Division
Vancouver
Work Order Reference
VA21C2477

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☐ NO	
Are samples for human consumption/ use? ☐ YES ☐ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
	8.8			2.3			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Robert Allester	Date: 10/10/21	Time: 3:30	Received by: R Chong	Date: Oct 10, 2021	Time: 3:40 PM	Received by: RJ	Date: OCT-10	Time: 9:10

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2016 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21C2492**	Page	: 1 of 4
Client	: **Nova Pacific Environmental Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Rob Akester	Account Manager	: Carla Fuginski
Address	: 97 North Renfrew Street Vancouver BC Canada V5K 3N6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1527 - Barnes Project	Date Samples Received	: 10-Oct-2021 15:40
PO	: ----	Date Analysis Commenced	: 26-Oct-2021
C-O-C number	: 17-866426	Issue Date	: 27-Oct-2021 09:57
Sampler	: ----		
Site	: ----		
Quote number	: VA21NPEL100_01 Disposal at Sea		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Paul Cushing	Team Leader - Organics	Organics, Burnaby, British Columbia
Rebecca Sit	Supervisor - Organics Extractions	Organics, Burnaby, British Columbia

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/kg	milligrams per kilogram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	BS3-Soil	BS4-Soil	BS5-Soil	BS1-Soil	BS2-Soil
					Client sampling date / time	07-Oct-2021 12:15	07-Oct-2021 12:45	07-Oct-2021 13:15	07-Oct-2021 10:36	07-Oct-2021 11:32
						VA21C2492-001	VA21C2492-002	VA21C2492-003	VA21C2492-004	VA21C2492-005
						Result	Result	Result	Result	Result
Physical Tests										
pH (1:2 soil:water)	----	E108	0.10	pH units		4.85	5.18	6.57	5.25	4.87
Metals										
aluminum	7429-90-5	E440	50	mg/kg		25100	13400	22200	28100	16300
antimony	7440-36-0	E440	0.10	mg/kg		0.62	1.54	0.35	0.31	0.41
arsenic	7440-38-2	E440	0.10	mg/kg		7.40	19.6	8.20	5.53	6.46
barium	7440-39-3	E440	0.50	mg/kg		274	197	504	85.9	111
beryllium	7440-41-7	E440	0.10	mg/kg		0.75	0.98	1.08	0.78	0.72
bismuth	7440-69-9	E440	0.20	mg/kg		0.39	0.34	0.30	0.27	0.30
boron	7440-42-8	E440	5.0	mg/kg		10.4	12.0	10.3	5.1	6.0
cadmium	7440-43-9	E440	0.020	mg/kg		0.544	3.16	3.39	0.144	0.431
calcium	7440-70-2	E440	50	mg/kg		2340	4300	7760	531	1200
chromium	7440-47-3	E440	0.50	mg/kg		28.1	14.8	21.6	20.3	17.0
cobalt	7440-48-4	E440	0.10	mg/kg		8.56	11.2	8.35	5.24	7.26
copper	7440-50-8	E440	0.50	mg/kg		11.8	54.2	19.9	10.5	8.94
iron	7439-89-6	E440	50	mg/kg		21000	28700	24900	22400	19100
lead	7439-92-1	E440	0.50	mg/kg		29.5	22.8	16.7	10.6	18.1
lithium	7439-93-2	E440	2.0	mg/kg		17.8	11.3	26.6	20.5	12.1
magnesium	7439-95-4	E440	20	mg/kg		3030	1780	2380	2280	2040
manganese	7439-96-5	E440	1.0	mg/kg		6820	1150	994	596	3980
mercury	7439-97-6	E510	0.0500	mg/kg		0.0589	0.0594	<0.0500	0.0578	<0.0500
molybdenum	7439-98-7	E440	0.10	mg/kg		3.01	40.3	6.00	1.85	1.54
nickel	7440-02-0	E440	0.50	mg/kg		20.1	93.4	44.9	16.1	13.6
phosphorus	7723-14-0	E440	50	mg/kg		1470	1460	1710	1210	1120
potassium	7440-09-7	E440	100	mg/kg		2490	3490	3400	1160	1600
selenium	7782-49-2	E440	0.20	mg/kg		0.46	2.26	1.24	0.33	0.22
silver	7440-22-4	E440	0.10	mg/kg		0.10	0.49	0.66	0.23	0.13
sodium	7440-23-5	E440	50	mg/kg		100	96	71	77	58
strontium	7440-24-6	E440	0.50	mg/kg		10.0	72.0	37.2	4.84	6.54
sulfur	7704-34-9	E440	1000	mg/kg		<1000	<1000	<1000	<1000	<1000
thallium	7440-28-0	E440	0.050	mg/kg		0.740	2.36	0.642	0.291	0.402

Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID	BS3-Soil	BS4-Soil	BS5-Soil	BS1-Soil	BS2-Soil
					Client sampling date / time	07-Oct-2021 12:15	07-Oct-2021 12:45	07-Oct-2021 13:15	07-Oct-2021 10:36	07-Oct-2021 11:32
Analyte	CAS Number	Method	LOR	Unit		VA21C2492-001	VA21C2492-002	VA21C2492-003	VA21C2492-004	VA21C2492-005
						Result	Result	Result	Result	Result
Metals										
tin	7440-31-5	E440	2.0	mg/kg		<2.0	<2.0	<2.0	<2.0	<2.0
titanium	7440-32-6	E440	1.0	mg/kg		221	26.8	21.6	294	139
tungsten	7440-33-7	E440	0.50	mg/kg		<0.50	<0.50	<0.50	<0.50	<0.50
uranium	7440-61-1	E440	0.050	mg/kg		0.748	2.25	1.25	0.836	0.636
vanadium	7440-62-2	E440	0.20	mg/kg		50.7	61.3	34.6	40.3	32.9
zinc	7440-66-6	E440	2.0	mg/kg		116	310	177	57.3	65.5
zirconium	7440-67-7	E440	1.0	mg/kg		<1.0	<1.0	1.2	<3.0 DLM	<1.0

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21C2492**	Page	: 1 of 5
Client	: **Nova Pacific Environmental Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Rob Akester	Account Manager	: Carla Fuginski
Address	: 97 North Renfrew Street Vancouver BC Canada V5K 3N6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1527 - Barnes Project	Date Samples Received	: 10-Oct-2021 15:40
PO	: ----	Issue Date	: 27-Oct-2021 09:57
C-O-C number	: 17-866426		
Sampler	: ----		
Site	: ----		
Quote number	: VA21NPEL100_01 Disposal at Sea		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BS1-Soil	E510	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	28 days	19 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BS2-Soil	E510	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	28 days	19 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BS3-Soil	E510	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	28 days	19 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BS4-Soil	E510	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	28 days	19 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
BS5-Soil	E510	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	28 days	19 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BS1-Soil	E440	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	180 days	19 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BS2-Soil	E440	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	180 days	19 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BS3-Soil	E440	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	180 days	19 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BS4-Soil	E440	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	180 days	19 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
BS5-Soil	E440	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	180 days	19 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
BS1-Soil	E108	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	30 days	19 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
BS2-Soil	E108	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	30 days	19 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
BS3-Soil	E108	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	30 days	19 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
BS4-Soil	E108	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	30 days	19 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
BS5-Soil	E108	07-Oct-2021	26-Oct-2021	----	----		26-Oct-2021	30 days	19 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury in Soil/Solid by CVAAS	E510	328362	1	19	5.2	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	328361	1	19	5.2	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	328363	1	19	5.2	5.0	✓
Laboratory Control Samples (LCS)							
Mercury in Soil/Solid by CVAAS	E510	328362	2	19	10.5	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	328361	2	19	10.5	10.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	328363	1	19	5.2	5.0	✓
Method Blanks (MB)							
Mercury in Soil/Solid by CVAAS	E510	328362	1	19	5.2	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	328361	1	19	5.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 Vancouver - Environmental	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 ºC) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Metals in Soil/Solid by CRC ICPMS	E440 Vancouver - Environmental	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Elemental Sulfur may be poorly recovered by this method. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 Vancouver - Environmental	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, followed by CVAAS analysis.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 Vancouver - Environmental	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Digestion for Metals and Mercury	EP440 Vancouver - Environmental	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.

QUALITY CONTROL REPORT

Work Order	: **VA21C2492**	Page	: 1 of 10
Client	: Nova Pacific Environmental Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Rob Akester	Account Manager	: Carla Fuginski
Address	: 97 North Renfrew Street Vancouver BC Canada V5K 3N6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 1527 - Barnes Project	Date Samples Received	: 10-Oct-2021 15:40
PO	: ----	Date Analysis Commenced	: 26-Oct-2021
C-O-C number	: 17-866426	Issue Date	: 27-Oct-2021 09:57
Sampler	: ----		
Site	: ----		
Quote number	: VA21NPEL100_01 Disposal at Sea		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Paul Cushing	Team Leader - Organics	Organics, Burnaby, British Columbia
Rebecca Sit	Supervisor - Organics Extractions	Organics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 328363)											
VA21C2492-001	BS3-Soil	pH (1:2 soil:water)	----	E108	0.10	pH units	4.85	4.99	2.8%	5%	----
Metals (QC Lot: 328361)											
VA21C2492-001	BS3-Soil	aluminum	7429-90-5	E440	50	mg/kg	25100	22500	11.0%	40%	----
		antimony	7440-36-0	E440	0.10	mg/kg	0.62	0.68	0.07	Diff <2x LOR	----
		arsenic	7440-38-2	E440	0.10	mg/kg	7.40	6.67	10.3%	30%	----
		barium	7440-39-3	E440	0.50	mg/kg	274	334	19.6%	40%	----
		beryllium	7440-41-7	E440	0.10	mg/kg	0.75	0.64	15.6%	30%	----
		bismuth	7440-69-9	E440	0.20	mg/kg	0.39	0.43	0.05	Diff <2x LOR	----
		boron	7440-42-8	E440	5.0	mg/kg	10.4	9.9	0.4	Diff <2x LOR	----
		cadmium	7440-43-9	E440	0.020	mg/kg	0.544	0.634	15.2%	30%	----
		calcium	7440-70-2	E440	50	mg/kg	2340	2970	23.8%	30%	----
		chromium	7440-47-3	E440	0.50	mg/kg	28.1	25.7	9.05%	30%	----
		cobalt	7440-48-4	E440	0.10	mg/kg	8.56	6.96	20.7%	30%	----
		copper	7440-50-8	E440	0.50	mg/kg	11.8	9.99	16.8%	30%	----
		iron	7439-89-6	E440	50	mg/kg	21000	19300	8.57%	30%	----
		lead	7439-92-1	E440	0.50	mg/kg	29.5	39.8	29.6%	40%	----
		lithium	7439-93-2	E440	2.0	mg/kg	17.8	16.6	7.56%	30%	----
		magnesium	7439-95-4	E440	20	mg/kg	3030	2800	7.92%	30%	----
		manganese	7439-96-5	E440	1.0	mg/kg	6820	6920	1.54%	30%	----
		molybdenum	7439-98-7	E440	0.10	mg/kg	3.01	2.69	11.4%	40%	----
		nickel	7440-02-0	E440	0.50	mg/kg	20.1	18.0	10.7%	30%	----
		phosphorus	7723-14-0	E440	50	mg/kg	1470	1140	25.1%	30%	----
		potassium	7440-09-7	E440	100	mg/kg	2490	2410	3.08%	40%	----
		selenium	7782-49-2	E440	0.20	mg/kg	0.46	0.36	0.10	Diff <2x LOR	----
		silver	7440-22-4	E440	0.10	mg/kg	0.10	<0.10	0.003	Diff <2x LOR	----
		sodium	7440-23-5	E440	50	mg/kg	100	108	9	Diff <2x LOR	----
		strontium	7440-24-6	E440	0.50	mg/kg	10.0	11.4	12.7%	40%	----
		sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		thallium	7440-28-0	E440	0.050	mg/kg	0.740	0.647	13.5%	30%	----
		tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		titanium	7440-32-6	E440	1.0	mg/kg	221	211	4.64%	40%	----
		tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 328361) - continued											
VA21C2492-001	BS3-Soil	uranium	7440-61-1	E440	0.050	mg/kg	0.748	0.702	6.41%	30%	----
		vanadium	7440-62-2	E440	0.20	mg/kg	50.7	47.0	7.44%	30%	----
		zinc	7440-66-6	E440	2.0	mg/kg	116	120	3.08%	30%	----
		zirconium	7440-67-7	E440	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	----
Metals (QC Lot: 328362)											
VA21C2492-001	BS3-Soil	mercury	7439-97-6	E510	0.0500	mg/kg	0.0589	0.0701	0.0111	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 328361)						
aluminum	7429-90-5	E440	50	mg/kg	<50	----
antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
boron	7440-42-8	E440	5	mg/kg	<5.0	----
cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
calcium	7440-70-2	E440	50	mg/kg	<50	----
chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
iron	7439-89-6	E440	50	mg/kg	<50	----
lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
lithium	7439-93-2	E440	2	mg/kg	<2.0	----
magnesium	7439-95-4	E440	20	mg/kg	<20	----
manganese	7439-96-5	E440	1	mg/kg	<1.0	----
molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
phosphorus	7723-14-0	E440	50	mg/kg	<50	----
potassium	7440-09-7	E440	100	mg/kg	<100	----
selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
sodium	7440-23-5	E440	50	mg/kg	<50	----
strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
tin	7440-31-5	E440	2	mg/kg	<2.0	----
titanium	7440-32-6	E440	1	mg/kg	<1.0	----
tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
zinc	7440-66-6	E440	2	mg/kg	<2.0	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 328361) - continued						
zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
Metals (QCLot: 328362)						
mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 328363)									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	100	95.0	105	----
Metals (QCLot: 328361)									
aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	107	80.0	120	----
antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	112	80.0	120	----
arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	107	80.0	120	----
barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	106	80.0	120	----
beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	102	80.0	120	----
bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	105	80.0	120	----
boron	7440-42-8	E440	5	mg/kg	100 mg/kg	92.5	80.0	120	----
cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	104	80.0	120	----
calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	102	80.0	120	----
chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	106	80.0	120	----
copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
iron	7439-89-6	E440	50	mg/kg	100 mg/kg	103	80.0	120	----
lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	104	80.0	120	----
lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	99.5	80.0	120	----
magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	105	80.0	120	----
manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	106	80.0	120	----
molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	106	80.0	120	----
phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	104	80.0	120	----
potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	106	80.0	120	----
selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	106	80.0	120	----
silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	94.5	80.0	120	----
sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	106	80.0	120	----
strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	102	80.0	120	----
thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	104	80.0	120	----
tin	7440-31-5	E440	2	mg/kg	50 mg/kg	104	80.0	120	----
titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	100	80.0	120	----
tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	106	80.0	120	----
uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	105	80.0	120	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Metals (QCLot: 328361) - continued									
vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	106	80.0	120	----
zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	107	80.0	120	----
zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	104	80.0	120	----
Metals (QCLot: 328362)									
mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	97.0	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 328361)									
QC-328361-003	SCP SS-2	aluminum	7429-90-5	E440	9817 mg/kg	111	70.0	130	----
QC-328361-003	SCP SS-2	antimony	7440-36-0	E440	3.99 mg/kg	109	70.0	130	----
QC-328361-003	SCP SS-2	arsenic	7440-38-2	E440	3.73 mg/kg	103	70.0	130	----
QC-328361-003	SCP SS-2	barium	7440-39-3	E440	105 mg/kg	103	70.0	130	----
QC-328361-003	SCP SS-2	beryllium	7440-41-7	E440	0.349 mg/kg	115	70.0	130	----
QC-328361-003	SCP SS-2	boron	7440-42-8	E440	8.5 mg/kg	116	40.0	160	----
QC-328361-003	SCP SS-2	cadmium	7440-43-9	E440	0.91 mg/kg	109	70.0	130	----
QC-328361-003	SCP SS-2	calcium	7440-70-2	E440	31082 mg/kg	105	70.0	130	----
QC-328361-003	SCP SS-2	chromium	7440-47-3	E440	101 mg/kg	110	70.0	130	----
QC-328361-003	SCP SS-2	cobalt	7440-48-4	E440	6.9 mg/kg	105	70.0	130	----
QC-328361-003	SCP SS-2	copper	7440-50-8	E440	123 mg/kg	102	70.0	130	----
QC-328361-003	SCP SS-2	iron	7439-89-6	E440	23558 mg/kg	103	70.0	130	----
QC-328361-003	SCP SS-2	lead	7439-92-1	E440	267 mg/kg	103	70.0	130	----
QC-328361-003	SCP SS-2	lithium	7439-93-2	E440	9.5 mg/kg	106	70.0	130	----
QC-328361-003	SCP SS-2	magnesium	7439-95-4	E440	5509 mg/kg	103	70.0	130	----
QC-328361-003	SCP SS-2	manganese	7439-96-5	E440	269 mg/kg	106	70.0	130	----
QC-328361-003	SCP SS-2	molybdenum	7439-98-7	E440	1.03 mg/kg	106	70.0	130	----
QC-328361-003	SCP SS-2	nickel	7440-02-0	E440	26.7 mg/kg	104	70.0	130	----
QC-328361-003	SCP SS-2	phosphorus	7723-14-0	E440	752 mg/kg	96.6	70.0	130	----
QC-328361-003	SCP SS-2	potassium	7440-09-7	E440	1587 mg/kg	111	70.0	130	----
QC-328361-003	SCP SS-2	sodium	7440-23-5	E440	797 mg/kg	105	70.0	130	----
QC-328361-003	SCP SS-2	strontium	7440-24-6	E440	86.1 mg/kg	105	70.0	130	----
QC-328361-003	SCP SS-2	thallium	7440-28-0	E440	0.0786 mg/kg	103	40.0	160	----
QC-328361-003	SCP SS-2	tin	7440-31-5	E440	10.6 mg/kg	105	70.0	130	----
QC-328361-003	SCP SS-2	titanium	7440-32-6	E440	839 mg/kg	112	70.0	130	----
QC-328361-003	SCP SS-2	uranium	7440-61-1	E440	0.52 mg/kg	114	70.0	130	----
QC-328361-003	SCP SS-2	vanadium	7440-62-2	E440	32.7 mg/kg	106	70.0	130	----
QC-328361-003	SCP SS-2	zinc	7440-66-6	E440	297 mg/kg	101	70.0	130	----
QC-328361-003	SCP SS-2	zirconium	7440-67-7	E440	5.73 mg/kg	99.1	70.0	130	----

Sub-Matrix: **Soil/Solid**

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 328362)									
QC-328362-003	SCP SS-2	mercury	7439-97-6	E510	0.059 mg/kg	96.7	70.0	130	----

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 866426

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	Nova Pacific Environmental
Contact:	Rob Akester
Phone:	778-957-8903
	Company address below will appear on the final report
Street:	97 N Renfrew Street
City/Province:	Vancouver
Postal Code:	V5K 3N6
Invoice To	Same as Report To [x] YES [ ] NO
	Copy of Invoice with Report [ ] YES [ ] NO
Company:	
Contact:	

Report Format / Distribution	
Select Report Format:	[x] PDF [x] EXCEL [ ] EDD (DIGITAL)
Quality Control (QC) Report with Report	[x] YES [ ] NO
[ ] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	rakester@novapacific.net
Email 2	
Email 3	

Invoice Distribution	
Select Invoice Distribution:	[x] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	rakester@novapacific.net
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	1527 - Barnes Project
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [ ] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E - 100%] [ ] | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Nutrients	Metals	Characterization	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	BS3-Soil	10/7/21	12:15	Grab	2	/	/	/		
	BS4-Soil	10/7/21	12:45	Grab	2	/	/	/		
	BS5-Soil	10/7/21	1:15	Grab	2	/	/	/		
	BS2-Soil	10/7/21	10:36	Grab	2	/	/	/		
	BS2-Soil	10/7/21	11:32	Grab	2	/	/	/		

Environmental Division
Vancouver
Work Order Reference
VA21C2492

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [ ] NO	
Are samples for human consumption/ use? [ ] YES [ ] NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [x] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
15.9	7.5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Robert Akester	10/10/21	3:00	R.Chong	Oct 10, 2021	3:49pm	RKS	OCT/10/21	9:40

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.