THE MOUNT FLEET ALKALINE COMPLEX (92I /16): A POTENTIAL PGE TARGET

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INTRODUCTION

Alkaline intrusive complexes are receiving increased exploration activity due to their potential to host platinum group element (PGE) mineralization. The Dobbin, (MINFILE 082LSW005), Maple Leaf (082ENE009) and Sappho (082ESE147) are British Columbia examples that have some tested PGE potential. The Mount Fleet Alkaline Complex has also received exploration in the past but probably deserves more concentrated efforts. Elevated values for Au, Pt and Pd have been obtained in the area from geochemical surveys and there are reports of chalcopyrite, galena and sphalerite marginal to the complex. We report here the results of a brief reconnaissance visit to the area to sample and assay for PGE.

LOCATION AND ACCESS

The area lies approximately 18 kilometres northeast of Kamloops, north of Paul and Louis lakes. Access is provided by the Paul Lake turn-off from Yellowhead Highway 5, about 3 kilometres north of Kamloops (Figure 1). A network of roads and tracks

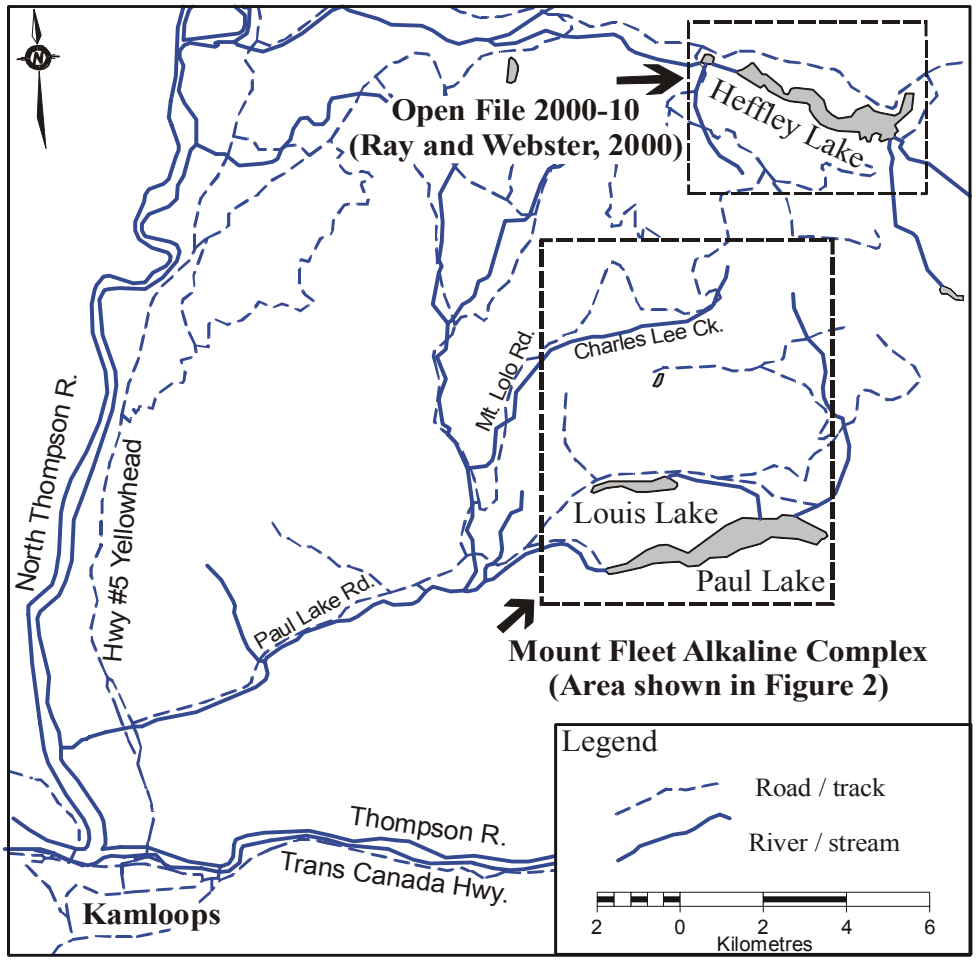

Figure 1. Location map showing the Mount Fleet Alkaline Complex and Open File 2000-10 areas.

access Mount Fleet from the east and west. A new track terminates on the upper northeast flank of the mountain, approximately 400 metres from the summit (UTM 701435E 5628265N), and probably originates as a spur on the Mount Lolo road, which roughly parallels Charles Lee Creek.

GENERAL GEOLOGY

The Mount Fleet Alkaline Complex comprises three subcircular, predominantly syenitic bodies that intrude Harper Ranch Group arc-clastic rocks. These bodies total about 64 square kilometres in area and extend northward from Paul Lake to the northern flank of Mount Lolo (Figure 2). This complex may be related to similar alkaline intrusions in south central British Columbia including diorite, gabbro, granite and ultramafic rocks, such as the Late Triassic - Early Jurassic Iron Mask Batholith (Monger and McMillan, 1984). Immediately northeast of Mt. Lolo, in the vicinity of Heffley Lake, a recently recognized mafic to ultramafic hornblende pyroxenite intrusion that occupies the contact between Devonian to Triassic Harper Ranch Group to the south and the Upper Triassic to Lower Jurassic Nicola Group to the north (Ray and Webster, 2000 a, b), may also be related to the Mount Fleet Alkaline Complex. Similarities also appear to exist between the Mount Fleet and Whiterocks Alkaline Complexes. The Whiterocks complex hosts the Dobbin Cu, PGE occurrence (Nixon & Carbno, 2001).

PREVIOUS WORK

Kwak (1964) mapped and described the main features of the Mount Fleet Alkaline Complex. He described seven main intrusive phases of the complex including two layered lenses of shonkinite. These lenses occur within a mafic phase of the syenite, near the centre, and comprise mainly microperthite, andradite garnet and aegirine augite.

Kennco Explorations undertook geophysical and geochemical surveys over part of Mount Fleet in 1970. Culbert (1988) mentions that Kennco Explorations reported irregular interstitial pyrrhotite and chalcopyrite from the complex. The Kennco Explorations geology map (Ney, 1970) shows three large mafic syenite bodies on the northwest flank of the mountain, however neither the soil sampling nor geophysical surveys covered this area. Their work was concentrated in the vicinity of the small lake near the middle of the central body (Figure 2).

Duval Corporation investigated the potential for carbonatite-hosted rare-earth elements in the Mount Lolo area in 1982 (McCarthy, 1989). Elevated Au values were found in pan concentrates taken from the creek draining northward into Heffley Lake and the following year elevated Au was found in silt samples taken from intermittent drainages on the south slope of Mount Lolo.

A regional geochemical survey conducted in 1986 identified elevated Au, Ag, Pt and Pd in the vicinity of Mount Lolo which Asamera Resources further investigated (McCarthy 1988, 1989). Silt samples taken from a stream draining northward into Little Heffley Lake, from the northern flank of Mt. Lolo, contained elevated Au values, up to 780 ppb and a single elevated Pd value of 75 ppb near the headwaters (McCarthy, 1988). A line of soil samples, taken roughly parallel to the 5,000 foot contour on the northeast flank of Mount Lolo, contained elevated Pt compared with the values from the other soil lines. The elevated Au values were attributed to mineralized quartz veins surrounding the small syenite stock on the north side of Mount Lolo. These veins are reported to contain galena, pyrite and trace sphalerite. In addition, syenite float boulders in the area contain minor chalcopyrite. Rock samples taken in this locality the following year were not analyzed for PGE or Cu.

Redbird Gold Corp. explored the area northeast of Mount Lolo, south of Heffley Lake, in 1987. Seven heavy mineral samples were collected from a northward flowing stream that enters Heffley Lake. One of the samples contained values of 1.390 ounces per ton Au and 0.109 ounces per ton Pt (Roed, 1988). The stream drains an area underlain, for the most part, by the mafic-ultramafic Heffley Creek Pluton (Ray & Webster, 2000a, b). An actinolite-rich hornblendite boulder found near the centre of the mafic intrusion, east of the creek, assayed 90 ppb Pt (Roed, 1988) suggesting that this body may have PGE potential.

Equinox Resources Ltd. conducted geochemical sampling and prospecting in 1988 around the summit and on the northeast shoulder of Mount Fleet. The program was designed to test for Au, Pt and rare earth elements in the complex. Soils were analyzed for Au, Ag, As, Cu, La and Ni: La was considered to be representative of rare earth elements and Ni for PGE. Rock samples were assayed for Au, Pt, Pd and Rh but there were no encouraging results. However, the mafic rocks and shonkinite near the centre of the intrusion may not have been sampled. The soil sam-

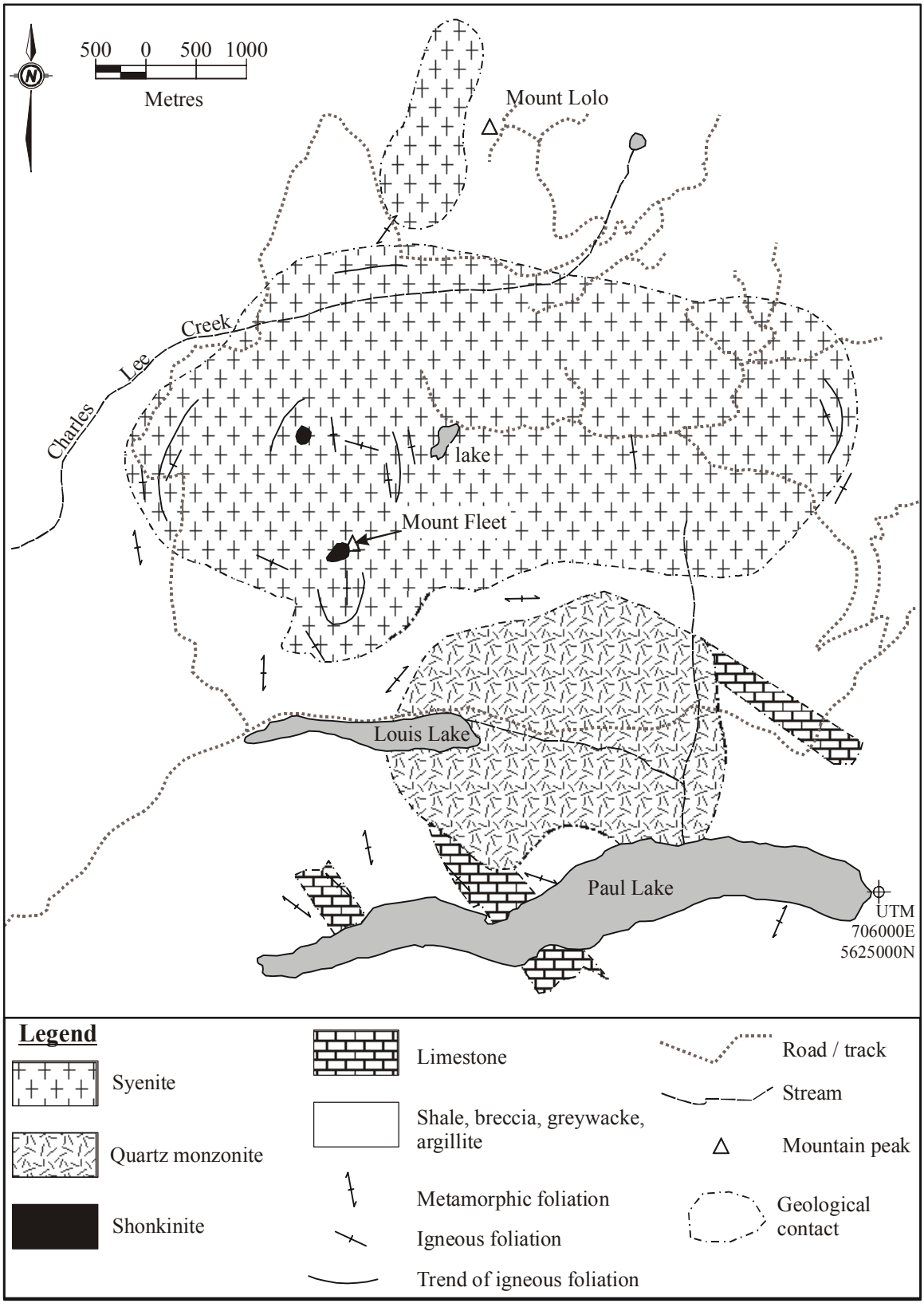

Figure 2. Geology of the Mount Fleet Alkaline Complex, simplified after Kwak (1964).

ples did define a belt of elevated Cu and La (Culbert, 1988).

DETAILED GEOLOGY

Three subcircular intrusive bodies comprising the Mount Fleet Alkaline Complex range in composition from quartz monzonite to monzo-syenite to syenite. Textures are generally coarse to very coarse with feldspar crystals up to 10 centimetres in length and often aligned parallel. Kwak (1964) reports a concentric pattern, especially in the central body, related to alignment of feldspar crystals and an increase in mafic minerals towards the centre (Figure 2). He also reports two zones of thinly layered shonkinite, containing chiefly euhedral andradite garnet, aegirine augite and alkali feldspar, that occur in the most mafic part of the body near the centre. The northern body which underlies part of Mount Lolo is comprised, for the most part, of syenite whereas the southern body is quartz monzonite with a fine-grained border and a porphyritic coarse-grained core. The presence of possible igneous garnet is also reported in the Whiterocks Mountain Alkaline Complex (Nixon and Carbno, 2001).

An outcrop of megacrystic syenite, on the north side of Mount Lolo, was sampled for uranium/lead isotopic dating and has yielded a preliminary age of Early Jurassic (Richard Friedman, personal communication, 2001). This age probably represents the time of emplacement for the Mount Fleet Alkaline Complex. The spatial association of this syenite with the mafic-ultramafic body south of Heffley Lake, less than one kilometre, suggests that the Mount Fleet Alkaline Complex may be related to the Heffley Creek Pluton.

The authors effected a one day traverse in the vicinity of Mount Fleet to collect samples for assay from the shonkinite. Access was gained by driving to a small lake 1 kilometre northeast of the mountain and then walking to the top of Mount Fleet. Subcrop near the lake (UTM 701879E 5628460N) is coarse-grained grey syenite with potassium feldspar crystals up to 2 centimetres long. The rock contains about 5 per cent amphibole with possible accessory garnet. Six hundred metres northeast of the peak (UTM 701667E 5628294N) massive salmon-pink coloured, coarse-grained porphyritic feldspar syenite outcrops with crystals up to 1.5 centimetres long. Amphibole crystals comprise about 2 to 3 per cent.

Sub parallel aligned feldspar crystals, trending 160 degrees, impart a layering in coarse-grained pink syenite near the top of Mount Fleet (UTM 701215E 5628066N). Amphibole comprises 8 to 15 per cent of the syenite with garnet and pyroxene accessories.

A number of mafic, hornfelsic, magnetic, garnet-bearing float boulders occur in the vicinity of UTM 701234E 562799N. Float samples GR00-20 and 21 were taken for assay and did show elevated values for Au, Cr and Ni (Table 1, next page). Samples GR00-22, 23 and 24 were taken in the vicinity of UTM 701044E, 5627915N. These samples probably represent the shonkinite described by Kwak (1964) however we were unable to locate the larger occurrences he describes, given the short duration spent in the area. The samples collected were of rusty weathering garnet and pyroxene-rich zones, with trace pyrite, occurring within coarse-grained syenite. Locally there are 1 centimetre thick layers of more mafic (>50% mafics), finer grained material interlayered with 1-4 centimetres thick layers of more felsic syenite. Ce and La are elevated in these samples.

Samples GR00-25 and 26 were taken in a southerly trending draw on the southeast side of the summit (UTM 701084E 5627884N). Layers of orange weathering, magnetic shonkinitic rock were sampled including a 1-2 centimetre wide pod of magnetite. PGE values were not elevated, but again, the rare earth elements Ce and La are somewhat elevated.

SUMMARY AND CONCLUSIONS

The association of PGE with alkaline complexes in south-central British Columbia makes the Mount Fleet Alkaline Complex a potential target. Previous PGE exploration in the area was directed more toward the mafic rocks south of Heffley Lake or the sedimentary rocks on the margins of the Mount Lolo syenite. Some exploration work has occurred over the Mount Fleet area. However the area underlain by the mafic syenite and shonkinite was not directly tested for PGE. Although the results presented herein are not particularly encouraging, more work is required to adequately test the area. Detailed geological mapping and systematic sampling, especially of the mafic and shokinitic phases is required. Alteration around the margins of the complex should be mapped and sampled: there is potential for skarn mineralization where limestone is mapped. Detailed stream sediment sampling, especially in those areas already identified as having elevated PGE values, may prove valuable.

Table 1. Assay data of rock samples collected from the Mount Fleet Area.

Sample No.	GR00-19	GR00-20	GR00-21	GR00-22	GR00-23	GR00-24	GR00-25	GR00-26
Au	<0.03	0.15	0.51	<0.03	<0.03	<0.03	<0.03	<0.03
Pt	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Pd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Rh	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
As	3	6	<1	<1	2	11	<1	<1
Hg	<10	<10	<10	<10	<10	<10	<10	<10
Al	7.98	7.75	1.78	8.33	8.38	8.94	9.03	8.74
Sb	0.1	0.2	1.1	0.1	<0.1	<0.1	<0.1	<0.1
Ba	1680	1040	10	2330	5690	1210	1780	1850
Be	1.8	2.85	0.15	1.75	0.6	1.65	1.25	1.05
Bi	0.02	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02
Cd	0.16	0.2	0.18	0.1	0.08	0.1	0.06	0.06
Ca	3.16	5.95	10.2	1.84	1.2	1.61	1.92	1.37
Ce	67	39.3	5.44	58.3	110.5	105.5	64	115
Cs	1.1	2.1	0.05	1	3.1	1	3.25	0.85
Cr	45	303	243	42	42	42	37	46
Co	7.6	32.2	61.3	4	5	2.2	8.6	2.2
Cu	113	28	<1	31	32	19	23	19
Ga	21	16.6	10.6	21	20.4	19.9	24	19.1
Ge	1.4	1.3	1.7	1.3	1.3	1.2	2	1.3
Fe	2.8	5.62	8.4	3.12	4.64	3.27	6.15	3.23
La	35	17.5	2	28.5	55.5	51	33	50.5
Pb	8	8.5	0.5	8.5	9	10	8.5	9
Li	10.8	11.6	7.4	8.2	36.8	20	52	13.4
Mg	0.63	4.17	6.92	0.63	1.36	0.82	1.43	0.68
Mn	685	1125	1065	775	1385	1230	1715	975
Mo	<0.2	2	<0.2	1	0.2	1	0.2	1.4
Ni	6	88.5	90.4	3	6.2	2.8	4.2	1.6
Nb	23.6	6.8	<0.2	14.6	17	13.4	9.4	14.4
P	1460	2470	40	520	1010	1130	1630	1610
K	6.72	2.56	0.03	6.37	6.84	3.75	3.9	4.79
Rb	135	109.5	1.6	110	173	60.6	120	73.8
Ag	0.6	0.2	<0.05	0.35	0.4	0.3	0.25	0.35
Na	2.96	2.2	0.14	3.36	2.47	5.25	3.82	4.52
Sr	1800	797	56.9	1415	789	593	658	369
Ta	1	0.3	<0.05	0.6	0.85	0.6	0.45	0.7
Te	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tl	0.38	0.14	<0.02	0.36	0.56	0.24	0.62	0.32
Th	4.4	4.4	<0.2	3.2	5.8	5.6	4.8	6.6
Ti	0.45	0.61	0.48	0.32	0.69	0.56	0.54	0.5
W	0.3	0.4	0.1	0.1	0.2	0.3	0.1	0.1
U	1.6	1.8	<0.2	1	1.8	1.6	1.4	2
V	188	234	397	153	134	99	204	84
Y	18.4	20.1	9.2	15.6	34.9	34.1	25.1	37.5
Zn	64	92	48	64	142	104	114	70

Analytical methods, sample location & descriptions (UTM = NAD 83). All sample analysed by:
ALS Chemex, Aurora Laboratory Services Ltd., 212 Brookbank Ave, Vancouver, BC, V7J 2C1
Methods used for all data in this table: Au, Pt, Pd, Rh = Fire assay - ICP; Other elements = ICP-MS Ultratrace.
Au, Pt, Pd, Rh = g/tonne; Hg = ppb; Al, Fe, Ca, Mg, K, Na, Ti = per cent; other elements in ppm.
GR00-19 701215E 5628066N Coarse feldspar syenite with 8-15% mafic minerals; near the summit of Mt. Fleet.
GR00-20 701234E 5627999N 15 cm wide piece of magnetic, garnet-bearing ?hornfels float.
GR00-21 701150E 5627930N 15 cm piece of magnetic ultramafic serpentinite-bearing float.
GR00-22 701044E 5627915N Mafic "shonkinite" with >50% pyroxene & garnet; trace pyrite.
GR00-23 701044E 5627915N Mafic "shonkinite" with >50% pyroxene & garnet; trace pyrite.
GR00-24 701044E 5627915N Mafic "shonkinite" with 20% ?aegirine-augite.
GR00-25 701084E 5627884N Mafic, magnetite-bearing "shonkinite".
GR00-26 701084E 5627884N Mafic, magnetite-bearing & rust-stained "shonkinite".

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