GEOLOGY AND ROCK GEOCHEMISTRY

ALPEN PROPERTY

SQUAMISH, B.C.

Ursula, Diddi, Kathrin, Shannon
Nadine, Michael and Sarah
Mineral Claims (43 units)

Vancouver Mining Divison
NTS 92G/10W
Latitude 49°38' Longitude 122°25'

Owner of Claims:
Alpen Exploration Ltd.

Operator:
PLACER DEVELOPMENT LIMITED

E.T. Kimura

February, 1983

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1. Introduction

Geological mapping was undertaken on the Alpen property by Placer Development Limited geologists during period 10 August to 5 October 1982. This phase of field work was conducted simultaneously with soil geochemical sampling program. Rock samples for rock geochemistry were selected from a suite of samples that was collected as part of the mapping program. The geological field work and data interpretation are presented for submission of assessment work on the mineral claims.

2. Summary

A sequence of pyroclastic volcanic rocks correlative with Jurassic Gambier Group overlies leucocratic granodiorite in the form of a steep-sided roof pendant. Pyrite, chalcopyrite and sphalerite with minor galena are frequently associated with quartz in narrow faults and shear zones in volcanic rocks. Pyrite and minor chalcopyrite also commonly occur as disseminations in silicified volcaniclastic units of rhyolitic to andesitic composition. Intrusive granodiorite is primarily unaltered, but is locally sheared, kaolinized and mineralized by sulphide minerals. Numerous narrow dykes ranging in composition from rhyolite to basalt intrude granodiorite.

Sub-economic mineralization occurs as widely-scattered small showings on the property. The Au and Ag content of sulphide-bearing samples are very low.

Costs for geological mapping program, rock sample assaying and interpretation of data were $16,537.00.

3. Property Definition

Alpen Property is 16 km east of Squamish, B.C. at headwaters of Raffuse Creek which is a tributary of Mamquam River. The spatial position of seven mineral claims for this property is shown on index map.

Mineral Claim	Units	Record No.	Expiry Record Date
Ursula	6	476 (8)	August 20th, 1987
Diddi	12	574 (10)	October 18th, 1987
Kathrin	4	666 (5)	May 8th, 1987
Shannon	12	667 (5)	May 8th, 1987
Nadine	4	696 (6)	June 3rd, 1987
Michael	3	697 (6)	June 3rd, 1987
Sarah	2	710 (6)	June 17th, 1987

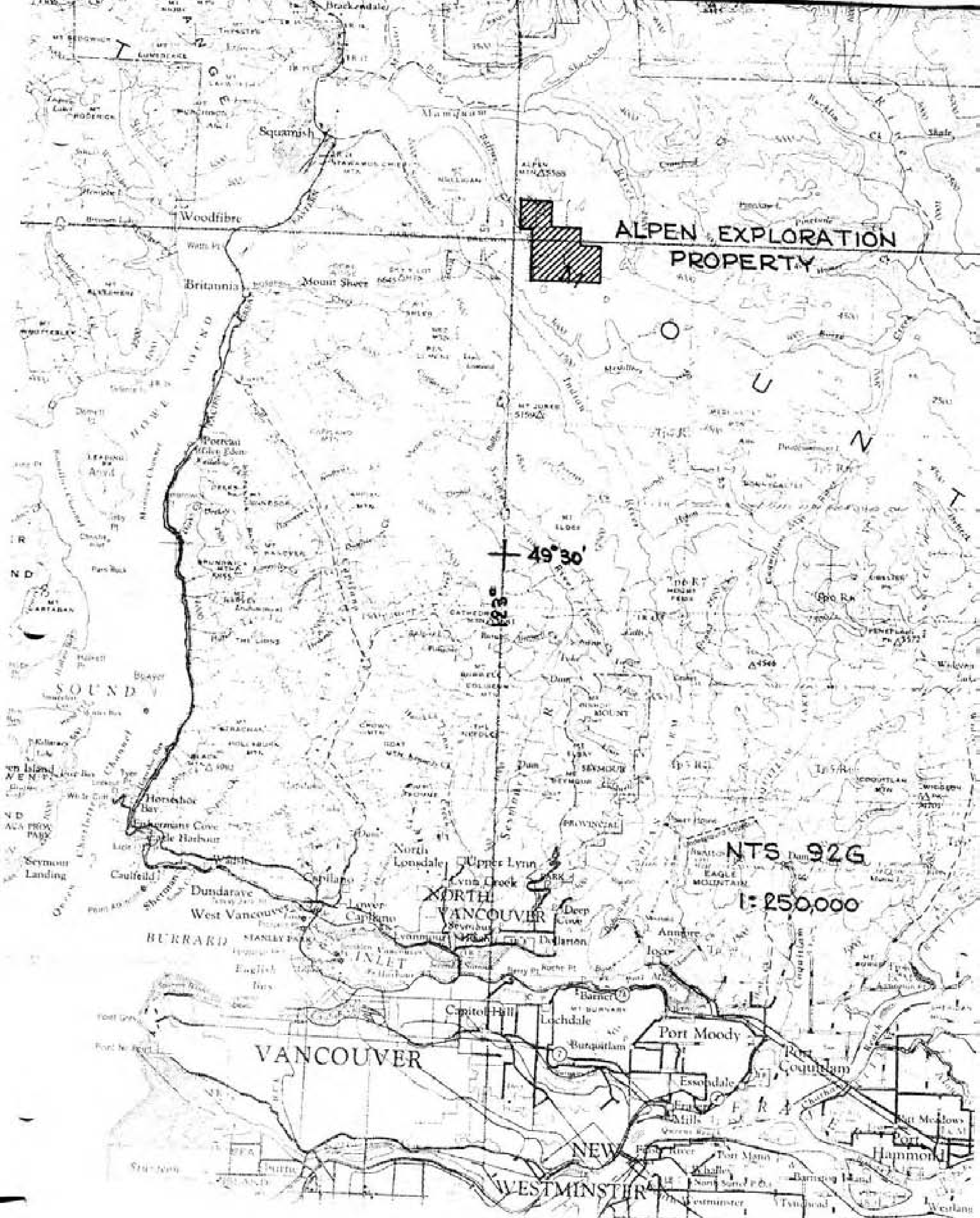
Alpen Exploration Ltd. initially conducted basic prospecting and sampling of attractive surface exposures near the southeast corner of the present property. The first claim staking in 1979 was followed by additional staking in the same year and in 1980 as favourable results together with information on the general geologic setting became available. This firm continued exploration in 1981 on several mineralized zones on the property.

Placer Development Limited optioned the property from Alpen Exploration Ltd. in 1982 for purposes of exploring economic mineral potential of the property. All field work for geological mapping as presented in this report was co-ordinated and undertaken by Placer Development Limited personnel.

4. Topography and Access

Alpen property is in heavily-timbered rugged mountainous terrain that is characteristic of coast mountain physiography. General land form at the property is dominated by a steep-sided mountain. Topographic relief from Raffuse Creek, that forms the main drainage, to the mountain peak is 750 to 775 m; the mountain peak rises to 1526 m elevation (see appended map). Mountain slopes and valley floors are heavily-forested and parts of the valley have been logged. Portions of the valley flanks are very steep at 35 to 45 degrees, but for most part these steep slopes are also forested rather than cliff forming. The crown of the mountain is characterized by rounded rolling terrain on which local alpine-type meadows are a common feature. The mountain is cornered by four deeply-carved glaciated valleys. Headwaters of these drainages are in the form of broad arcuate cirques. Local stream gradient is comparatively steep resulting in development of steep canyon-like ravines. A network of numerous subsidiary small drainages are formed on the steep valley flanks. These streams, many of which have only seasonally intermittent flow are characterized by deep narrow gullies, mini-canyons and small waterfalls.

A network of well-maintained logging roads from Squamish provided excellent access to the property. Approximately 80% of the field work on this project was conducted from these access roads. Helicopters were utilized for part of the program when work was concentrated on crest of the mountain.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Upper Lynn
Lynn Creek
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West Vancouver
Dundarave
Caulfeild
Capilano
Deep Cove
Dollarton
Ioco
Port Moody
Port Coquitlam
Essondale
VANCOUVER
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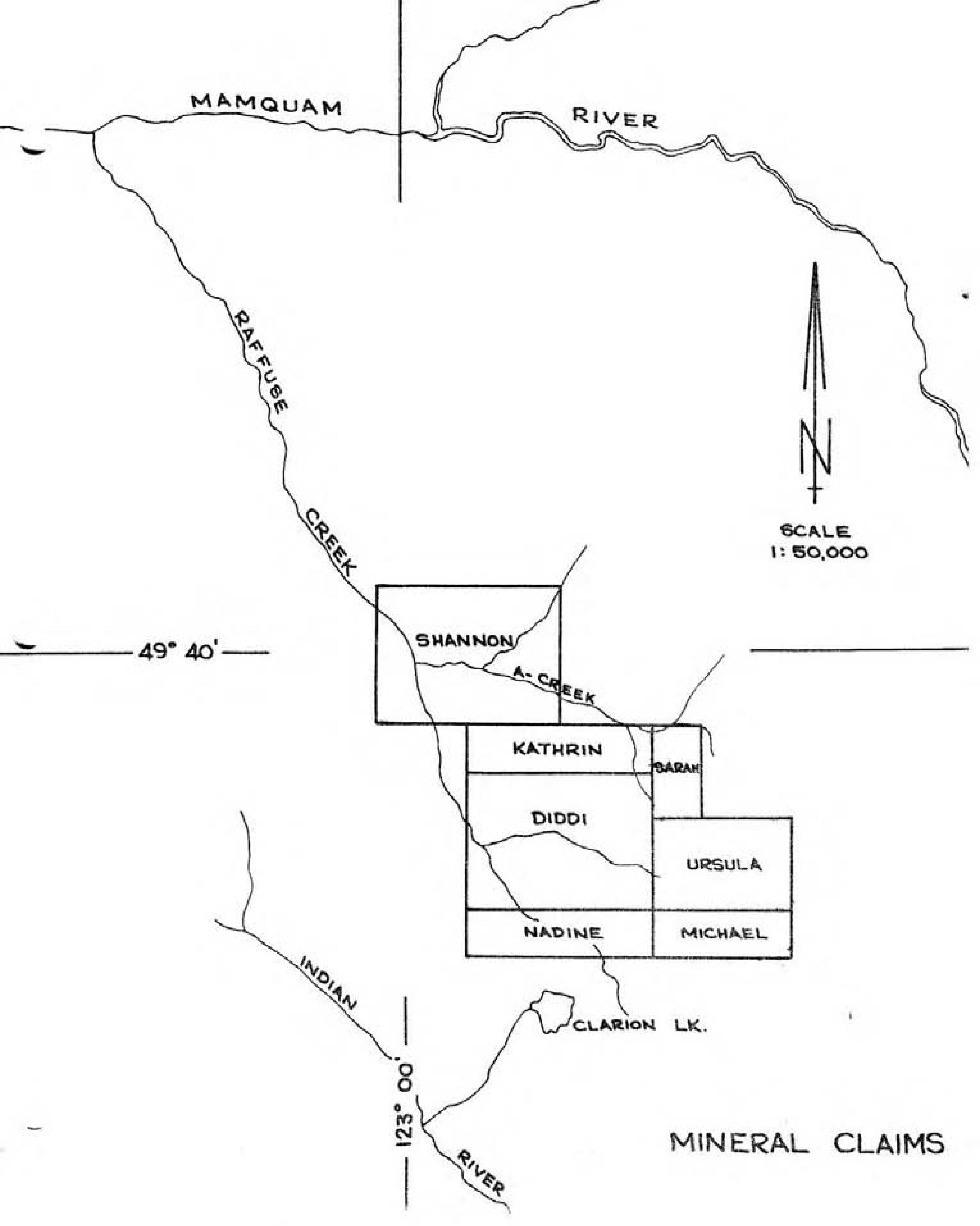
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DIDDI
URSULA
NADINE
MICHAEL
INDIAN
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CLARION LK.
123° 00'
MINERAL CLAIMS

5. Economic Assessment

Preliminary prospecting and sampling by Alpen Exploration Ltd. were concentrated over five separate mineralized targets within a roof pendant of volcanic rock and its bounding igneous rocks. This early field work indicated interesting Cu, Zn and minor Pb mineralization with possible Au and Ag associations.

Follow-up geological mapping and sampling by Placer Development Limited were complemented by soil geochemical sampling, VLF-EM and ground magnetometer surveys. The main emphasis of these programs was to delineate mineralized targets and evaluate precious metal potential.

6. Geology

Rock exposures over Alpen property are plentiful along crest of the main mountain and along many of the steep gradient streams. Outcrops on the steep sidehills are scattered. Part of the geologic information was collected along with the soil geochemical sampling program, but majority of more meaningful geologic information was obtained from traverses along a number of stream beds. A suite of over 400 rock samples was collected from traverses and examined megascopically for interpretive purposes.

6.1 General Property Geology

Jurassic Gambier Group volcanic rocks overlie younger intrusive granodiorites as a roof pendant. It is interpreted as an elongated irregularly-shaped pendant that roughly conforms to topographic crest and shoulders of main mountain on property (see appended map). Attitudes along the contact indicate that larger portion of pendant is a steep-sided deep keel-shaped body approximately 2,500 by 700 m in size. Contact along north side of pendant is noticeably undulating, possibly indicating and attributable to fault offsets. Along the southerly boundary there are indications of a connected off-shoot that may be conformable to the topographic ridge to the south. Volcanic rock sequence within the main body of roof pendant consists primarily of light grey and light green rhyolitic tuff and dark green andesitic volcaniclastic units. The rhyolitic tuff unit for most part occurs as an irregular peripheral rind within the roof pendant. An arcuate subaqueous mixture of coarse fragmental agglomerate, poorly-bedded tuff and tuffaceous agglomerate is centered in the pendant and forms the topographic crown of mountain. Angular to subrounded fragments of dark to bright red jasper occasionally form inclusions in andesitic volcaniclastic unit and also occurs as fragments in breccia float. A much smaller separate outlier of volcanic rocks is exposed near the confluence of A-Creek and Raffuse Creek; but due to lack of exposure in Raffuse Creek valley, the extent of this smaller pendent is not known.

The intrusive granodiorite that bounds the volcanic rocks is generally unaltered. Composition of intrusive rock actually varies from quartz monzonite to quartz diorite, but scope of mapping, was not in sufficient detail to allow differentiation into separate rock units. Proximal and along contact with the volcanic rock, granodiorite is often highly shattered and partly altered by chlorite and kaolinite. Kaolinization is also quite intense in southeast corner of property where surficial gossan is well-developed.

A host of narrow acidic to basic dykes intrude granodiorite and related intrusive rocks. There are evidences that several of these late-stage dykes cross-cut both intrusive and volcanic rocks.

Pyrite is most common ore mineral. It principally occurs as disseminations and narrow fracture or shear zone fillings in volcanic and locally intrusive rocks. Pyrite is especially prominent in the silicified rhyolitic tuff unit and can attain quantities up to 10%. Minor sphalerite, chalcopyrite and galena are locally associated with pyrite as widely-scattered small showings. Thin quartz and minor calcite veins are developed along shears and fractures.

6.2 Volcanic Rocks

Three main units have been recognized in the roof pendant. Spatial distribution of these units is shown on appended geological map.

6.2.1 Agglomerate and Spherulitic Tuff

This coarse heterogeneous fragmental rock possibly represents lithology within or immediately surrounding a pipelike vent. The rock unit is readily recognized by its conspicuous jumbled mixture of coarse 0.5 to 15.0 cm size angular to well-rounded volcanic rock and quartzose fragments in a coarse to fine tuffaceous matrix. Based on fragment size there are several varieties of coarse fragmental rocks that comprise this agglomerate unit. The most common type is the coarse agglomerate in which one to fifteen centimeter fragments consisting up to 70% of the rock are chaotically emplaced in lapilli tuff matrix. Majority of fragments are angular white to light green banded siliceous tuff, white quartz, dark green andesitic volcaniclastic rock, black soft pumice and occasional red jasper fragments. Parts of these fragments are abruptly segregated by irregular black wavy 0.5 to 3.0 cm thick bands that commonly show delicate swirl and occasional overturned bands; these features are possibly indicative of flow and slump. Close to the contact with the adjoining rock unit the coarse agglomerate has been observed to be very siliceous and flinty to the degree that rock breaks with concoidal fracturing.

The coarse fragmental agglomerate is interbanded with bedded lapilli tuff and well-sorted fine to coarse laminated tuff. These rock types were observed as 15 to 100 cm thick bands in which lapilli fragments are similar in composition to those in the agglomerate. The tuff beds appear to vary from 1.0 to 10.0 cm thick. Cross-bedding and scour or cavity filling were noted to indicate subaqueous depositional environment. Bedding attitudes of these banded sediments show no consistent orientation.

A less common variety of the agglomerate unit is a unique spherulitic tuff in which 0.4 to 1.0 cm siliceous spherulites formed by devitrification are crowded in a tuff matrix. Individual spherulites show a fine radiating texture. They are resistant to weathering, and as a result, surface exposures show a coarse pisolitic habit.

With reference to the appended map a smaller separate lense of agglomerate is spatially mapped 500 m, north of the main core. Pyroclastic fragments in this separate exposure are not as large and not as well consolidated as in the main unit. Well-sorted tuffaceous sandstone or grit bands are interbedded with agglomerate. The contact between agglomerate and underlying andesitic volcaniclastic unit is demarked by a two-meter thick limonitic stained zone that may be an irregular shear plane; there are other evidences of shearing at this location. This small agglomerate outlier probably represents a remnant or a separated segment of the original subaqueous pyroclastic flow.

No mineralization has been observed in agglomerate and spherulitic tuff units.

6.2.2 Andesitic Volcaniclastic Unit

This dark green rock unit is the most abundant rock within roof pendant. Rock is uniform medium to dark green and greenish grey with tiny <1.0 to 4.0 mm size clasts in a very fine and generally massive tuffaceous matrix. Rock composition is predominantly andesitic. Some light to medium green varieties are probably closer to dacitic composition. Locally rock is weakly foliated and intensely fractured or jointed. Visible irregular-shaped clasts in matrix are shattered dark green lithic fragments, dark coloured glass, mineral grains, and light grey rock fragments. Feldspar fragments are common and locally some grains are elongated and subhedral to impart a vague porphyritic texture to the fabric; this type of textural feature was evident near the northwest perimeter of roof pendant where the volcaniclastic unit simulates a dacite porphyry.

Parts of this unit are weakly foliated and silicified with local minor mineralization in the form of disseminated pyrite. However, these features do not appear to be consistent, and as a result, distinct zones or trends can only be questionably inferred.

Silicification of andesitic volcaniclastic unit is apparent for a local semi-circular area on the apex of the mountain. These altered rocks are in contact with coarse fragmental agglomerate and they form the westerly half of a sub-circular pipelike feature. The silicified rock is typically light to medium grey with a greenish cast and contains shattered rounded clasts as silicified remnants in an essentially light grey, very fine sugary textured siliceous matrix.

6.2.3. Silicified Rhyolitic Tuff Unit

The silicified rhyolitic tuff unit is an irregularly shaped peripheral rind of the roof pendant. Rock unit pinches and swells; it attains a maximum 500 m width along the south boundary and at the east end of roof pendant. Development is restricted to a narrow 30 to 100 m wide border along north contact. It is noted that this rock unit hosts most of the sulphide mineralization on this property, and the more intense and broader segments of silicification are reflected by a conformable soil geochemical response in copper, lead and zinc.

The rock is characteristically very light grey to buff grey and comprises minor remnant white to grey silicified irregular-shaped clasts in a hard siliceous matrix. The original rock fabric has been destroyed by the alteration, but the presence of remnant mineral clasts plus the odd spherule suggests that rock was a crystal or lithic tuff. Occasionally larger one to five centimeter angular fragments are noted in the silicified matrix; this type of occurrence is isolated and may be suggestive of a localized coarse pyroclastic flow deposit that was subsequently silicified.

This silicified unit is locally sericitized. Rock is then light to medium grey and generally foliated. Flattened and elongated dark biotite and light grey quartz clasts are subparallel to foliation. Other remnant clasts that were observed in silicified rhyolitic tuff are apparently obliterated by sericitic overprinting. Overall rock is softer than the silicified variety, but it is noted that hard siliceous layers or bands are common among the predominantly soft foliated fabric. These foliated rocks are included with the silicified rhyolitic tuff unit, mainly because of their spatial distribution wherein these sericitized and silicified tuffs occur as comparatively restricted bands or localized patches within silicified rhyolitic tuff unit. Sulphide mineralization; mainly in the form of disseminated pyrite, tends to be better developed in the foliated phase as compared to the silicified rhyolitic phase. Development of foliation is probably attributable to structural deformation.

The silicified rhyolitic tuff unit is probably closely related to former andesitic volcaniclastic unit. Basic compositions of the two units are different, but the occurrences of intercalated dacitic and andesitic tuff lenses and bands within the rhyolitic tuff suggest that the two units were sequentially deposited as successive subaerial pyroclastic flows with some overlapping of initially rhyolitic and then andesitic material. The subaqueous coarse agglomerate unit is a younger sequence as evidenced by presence of silicified rhyolitic tuff and jasper fragments as inclusions in the agglomerate.

6.3 Intrusive Rocks

The intrusive rocks that surround the roof pendant are probably related to the Cretaceous Squamish Batholith. Although compositional variations were noted for the intrusive rock, no attempt was made to subdivide the body into separate rock units.

Majority of intrusive rocks are unaltered leucocratic coarse allotriomophic granular with compositions correlative with quartz monzonite, granodiorite and quartz diorite. Modal composition varies from 20-25% pink K-feldspar, 30-40% plagioclase, 25-30% quartz and 5-10% K-feldspar, 50-70% plagioclase, 10-20% quartz and 10-15% biotite for more acidic phases; and 10-15% K-feldspar, 50-70% plagioclase, 10-20% quartz and 10-15% biotite and minor hornblende for intermediate phases of granodiorite and quartz diorite. Mapping indicated that granodiorite is most prevalent especially close to the main roof pendant; quartz diorite is more common in and around the small volcanic rock outlier at northwest corner of the claim arèa. Leucocratic pale pink quartz monzonite was recognized from a series of outcrops in a creek that drains southwesterly from roof pendant. It is noted that one exposure on the ridge south of main mountain is a comparatively dark granodiorite with slightly higher percentage of mafic minerals.

Kaolinization has locally altered the coarse grained intrusive rocks. Degree of kaolinization can be described as very weak for parts of the exposure near northeast corner of the claim. It is noted that disseminated pyrite and very minor chalcopyrite occur in exposures along the creek. This weak mineralization is undoubtedly the source for a small copper soil geochemical anomaly over this area. Kaolinization based on degree of feldspar breakdown can be classified as intense for exposures at southeast corner of map area. Granodiorite from this area is often altered to a soft bleached chalky material. Minor disseminated pyrite, chalcopyrite and rare galena have been observed in several scattered exposures in association with intense kaolinization. This type of mineralization is probably the source for copper, lead, zinc and erratic silver geochemical anomalies.

6.4 Dyke Rocks

A variety of acidic and basic dykes intrudes the intrusive rocks; several of these dykes also crosscut volcanic rocks. Majority of these dykes are only 0.3 to 5.0 m wide with several late-stage basalt dykes attaining 30 m widths. Dyke contacts are generally irregularly angular, sharp and tight with host rock. Occasionally chilled selveges are developed. With reference to appended geology map, dykes were mapped and plotted in an attempt to determine possible trends or patterns in areas immediately surrounding the roof pendants. A quick overview of dyke trends shows that due to traverse directions a bias in dyke attitudes becomes apparent wherein dykes parallel and subparallel to traverse lines are rarely encountered. Due to this bias no dyke trends can be established from field data. Additionally, there does not appear to be any preferred concentrations of any one type of dyke in the form of a dyke swarm.

The following dykes were recognized. The majority of these dykes are narrow, and as a result they are represented on the geology map by a single line to represent their trend; dip and type of dyke are designated for each dyke. The wider dykes are plotted to scale.

i. Rhyolite is a very hard pale buff to light brownish grey rock with an aphanitic texture. A slightly different phase or variety of rhyolite is a very light grey, very fine grained to sugary textured dyke rock that contained tiny biotite grains. This latter dyke has been identified as intruding volcanic rocks.

ii. Quartz-eye rhyolite has small 0.5 to 1.0 mm rounded and lense-shaped quartz eyes in a tan to brownish grey aphanitic matrix.

iii. Quartz-feldspar porphyry is a crowded porphyry in which euhedral to anhedral 2.0 to 5.0 mm pink and white feldspar and anhedral quartz eyes occur randomly in a light brown aphanitic matrix. A similar dyke rock with only feldspar phenocrysts is identified as rhyolite porphyry.

iv. Dacite is a brown to greenish brown aphanitic to very fine grained rock that occasionally contains minor small feldspar phenocrysts. Disseminated pyrite occurs in several of these dykes. The dacite porphyry essentially is the same rock as above except that it contains varying amounts of euhedral to anhedral 0.5 to 2.0 mm size feldspar phenocrysts.

v. Andesite is a medium to dark greenish grey and dark grey rock with a groundmass varying from very fine phaneritic to aphanitic. Composition of phaneritic rock is roughly 50 to 60% plagioclase and 40 to 50% dark minerals, most of which appears to be hornblende. Other dykes with similar groundmass contain euhedral feldspar phenocrysts and occasional white soft amygdules; these dykes are referenced as andesite porphyry and amygdaloidal andesite respectively.

vi Two types of basalt dykes are recognized. More common type is narrow, very dark grey to black, very fine grained to aphanitic textured unaltered rock. These dykes are normally very hard and resistant to erosion, and they often form steep faces and backwalls for waterfalls in creeks. Other type of basalt is considered to be late-stage intrusions. These rocks are medium to dark green and grey, comparatively soft, occasionally vesicular, chloritized with a clayey odour, and frequently contains calcite amygdules; angular host rock fragments are included in the matrix. The former unaltered dykes are usually 0.3 to 4.0 m wide whereas the latter can attain widths up to 30 m. The altered late-stage basalt dykes intrude both granodiorite and volcanic rocks. Interestingly, a small five centimeter vug in late-stage basalt was incrusted with positively identified chabazite crystals.

6.5 Structure

The intrusive rock/volcanic rock contact is the only major structural feature. The contact, where observed, is sharply defined with granodiorite being altered over widths ranging up to 7.0 m. Alteration in the form of bleaching, kaolinization and possibly minor silicification are complicated by attendant faulting that is represented by gouge, brecciation and intense fracturing over 1.0 to 5.0 m. Late-stage basalt dyke intrusions appear to be related to the structurally disrupted contact zone.

Mineralization is frequently associated with narrow shear zones in volcanic rock units. A plot of the more prominent shears and associated quartz vein zones shows a prevalent northwest trend with vertical to steep southwest dips. No dominant trends are apparent for faults in intrusive granodiorite.

Mapping depicted other structural elements such as bedding and foliation in volcanic rocks, and dyke attitudes in intrusive rocks. No definite trends or patterns can be established for these features.

Notable brecciation is associated with the contact zone of late-stage basalt dykes. These poorly consolidated 1.0 to 3.0 m wide breccia zones are comprised of a heterogeneous mixture of angular rock fragments up to 0.5 m in size in a crushed rock and altered basalt matrix. Rock fragments are predominantly granodiorite, but also included rhyolite and andesite dyke fragments. No mineralization is associated with these breccia zones.

6.6 Mineralization and Alteration

The economically significant mineralization occurs predominantly in volcanic rock units as widely scattered isolated patches. Pyrite, minor chalcopyrite, sphalerite and galena are primary ore minerals. Pyrite is widely-distributed in silicified rhyolitic tuff unit; it is generally in tiny cubes and its occurrence can range from a few scattered crystals to more abundant "salt and pepper" type disseminations, and also as more concentrated granular masses that often exhibit a banded appearance or an irregular breccia-filling style. Pyrite is also intimately associated with chalcopyrite, sphalerite and galena as clots and small patches in quartz-filled fracture and shear zones. This type of mineral assemblage also occurs in highly silicified breccia and in foliated and sericitized rhyolitic tuff. With the exception of widespread pyrite in silicified rhyolitic unit, sulphide mineralization is exposed in comparatively restricted zones. Some of the better mineralized samples were discovered as angular float in creeks.

A number of mineralized samples were assayed primarily to evaluate potential grade of copper, lead, zinc, silver and gold. Assay results indicate that grades are sub-economic (see Table 1 in succedent section on Rock Geochemistry).

Silicification is the most prominent alteration feature. It is most noticeable in the silicified rhyolitic tuff unit, but silicification has also altered parts of all rock units including intrusive rocks. Sericitization has affected parts of the rhyolitic and andesitic tuff units. Both of these alteration features are affecting rocks that form the peripheral fringe within the roof pendant; this spatial relationship may suggest that these alteration phases may in part be attributable to effects of proximal intrusive rocks.

The following are brief descriptions of mineralized showings on the property. Locations of respective showings as referenced in this list are shown on appended geology map with an encircled number.

1. Pyrite, minor chalcopyrite and sphalerite occur as small clots in light grey foliated silicified rhyolitic tuff; major northwest trending shear with 25 cm gouge controls 20 m wide rusty mineralized zone.

2. Thin 0.5 to 3.0 mm quartz-galena veinlets occur as unoriented fracture fillings in limonite stained, medium greenish grey pyritized andesitic volcaniclastic rock.

3. Pyrite, chalcopyrite, galena and minor sphalerite occur sporadically in a stockwork of narrow 0.1 to 5.0 cm thick quartz veins that are associated with a strong northwest trending shear zone. Wall rocks are intensely silicified and sericitized.

4. Erratic pyrite with minor chalcopyrite and galena are disseminated in a 20 m wide zone of intensely sericitized and kaolinized granodiorite.

5. Pyrite, chalcopyrite, galena and possibly minor tetrahedrite occur with quartz as a 10 cm wide breccia filling in highly silicified rock.

6. Minor specks and small clots of galena are associated with an intensely pyritized and silicified light grey to buff rhyolitic volcaniclastic rock. Mineralization occurs in several small exposures over a 50 m area, and it appears as if the favourable zone is confined to a 10 m width.

7. Very minor galena specks occur with thin micro-quartz veinlets in a light grey pyritized silicified rhyolitic tuff that is weakly sericitic altered.

8. Mineralized float sample contains clots of pyrite, sphalerite and minor chalcopyrite in an intensely silicified rock or quartz vein. The angular shape of float suggests that it has not been transported far from the source.

9. Pyrite and minor chalcopyrite occur as disseminations and fine fracture coatings in unaltered to weakly kaolinized granodiorite (also described in section 6.3 of this report).

10. Mineralized float sample contains small shreds, clots, and disseminations of galena, pyrite, chalcopyrite and sphalerite in whitish grey coarse crystalline silicified or intensely quartz-veined granodiorite.

11. Rusty 1.0 to 1.5 m wide shattered shear zone in a silicified andesitic volcaniclastic unit is mineralized by quartz lenses and veinlets with associated pyrite, chalcopyrite and galena up to five centimeters thick. This steeply southwest-dipping shear can be traced over 60 m, but it is noted that mineralization pinches to a narrow 15 cm width. Wall rocks adjacent to the shear zone are comparatively unaltered and unmineralized.

12. A narrow five centimeter quartz vein in a steep southwest-dipping shear zone has associated pyrite, chalcopyrite and sphalerite. This shear zone occurs in weakly altered andesitic volcaniclastic rock, and is a subparallel structure to former Showing #11.

There are other mineralized showings on the property. However due to the program schedule all prospective showings were not examined.

7. Rock Geochemistry

Rock and mineralized samples were collected as part of the geological mapping program. A number of these samples was selected for assaying, primarily to provide more conclusive information on metal content of mineralization. In particular an appreciation of silver and gold content was required in order to properly evaluate the economic potential of property.

7.1 Rock and Mineral Samples

Visible sulphides were present in most samples that were submitted for assaying. A few unmineralized rock samples were analyzed to obtain general background levels of metal content. Several shear and fault gouge samples were analysed with the objective of investigating possible metal leakages along discontinuities.

Soil geochemical anomaly locations and trends were utilized as a guide when selecting many of the rock and mineralized samples. It was hoped that lithogeochemical results would provide supplementary information to assist evaluation of soil geochemistry. The gold and silver content in soil geochemistry was generally very weak, but a few erratic isolated anomalies were indicated. A number of pyritized silicified rhyolitic tuff and other samples with associated sulphides were analyzed to determine whether this style of mineralization could be silver and/or gold-bearing.

7.2 Analytical Procedure

All rock and mineralized samples were assayed by Placer Development Limited Geochemical Laboratory at Vancouver, B.C.

7.2.1 Analysis for Cu, Pb, Zn, Ag and As

Samples are initially dried in a hot-air dryer, then crushed and pulverized to -150 mesh. A 0.50 gm portion of -150 mesh material is weighed with a precision torsion balance. Samples are digested in hot solution of HNO_3 and $HClO_4$ for three and a half hours, then cooled, diluted and prepared for analysis on Perkin-Elmer 603 Atomic Absorption Spectrophotometer for Cu, Pb, Zn, Ag and As.

Detection limits and ranges are listed below:

Metal	Detection Limit & Range
Copper	2 - 4,000 ppm
Lead	2 - 3,000 ppm
Zinc	2 - 3,000 ppm
Silver	0.20 - 20 ppm
Arsenic	2 - 1,000 ppm

TABLE 1

Sample Number	Cu	Zn	Pb	Ag	Au	As	Brief Rock Description
	Assay Data in ppm unless recorded as %						
A107	500	0.13%	1.94%	50.0	3.05	NA	Float; py gal. sph. minor cp clots and lenses in quartz (see (10))
A145	80	59	169	1.3	0.18	4	Vuggy qtz veining & stockwork zone with diss py.
C22A	550	0.31%	420	1.6	0.02	8	Minor py rare gal. sph in thin qtz veinlets with pyritic sil rhy. tuff host
C22B	820	0.49%	1.06%	2.0	0.18	30	Thin qtz veinlets with specks gal. py and minor sph in pyritic sil rhy tuff
C22C	13	78	0.13%	1.5	0.03	24	5-10% py minor thin qtz veining with specks gal in sil rhy tuff
E80A	14	0.16%	65	0.5	<0.02	6	Float; 10% py 2% sph is very siliceous rock or qtz vein incipient banding
E93	44	124	20	<0.2	<0.02	6	Silicified and pyritized GD
E98	37	141	21	<0.2	<0.02	4	GD comparatively fresh,py and cp diss.
E99	88	105	39	<0.2	<0.02	8	Fault material no visible mineral
E106	5	84	16	<0.2	<0.02	6	Rusty GD, no vis. mineral
E111	137	0.22%	0.44%	4.0	<0.02	4	GD, disseminated and wispy py possible minor cp
E112	71	160	49	<0.2	<0.02	10	Shear zone, rusty staining
E113	650	48	8	0.4	<0.02	12	GD weakly silicified, dissm py cp qtz veining with py cp
E124	57	87	10	<0.2	<0.02	<2	Crumbly cracked rusty shear zone near fw of contact
E125	8	154	172	<0.2	<0.02	4	Shear zone at GD/volc rx contact - sheared GD
E126	6	120	39	0.6	<0.02	4	Shear zone at GD/volc rx contact - sheared tuff
E127	8	185	181	<0.2	<0.02	<2	Intensely crackled kaol GD, micro bx qtz healing rusty staining
E128	8	108	9	0.2	0.03	8	Silicified GD? 2% py and vein with py sph cp
E133	20	205	58	<0.2	<0.02	<2	Dk oxidized dacite porphyry or possibly med-grained GD no vis. sulph
E137	21	93	17	0.4	<0.02	2	Fine grained light gy siliceous volcanicl. with dissm py.
E139	10	340	25	0.3	<0.02	4	Med gn chl. volcanicl. with 5% py.
E140	10	126	20	0.3	<0.02	<2	Altered (kaolinized) stained GD
E145	79	216	37	<0.2	<0.02	<2	Limonitic stained GD
E149	46	273	80	1.2	<0.02	12	Silicified rhy-dacite volcanicl with diss. py
E154	7	225	66	0.3	<0.02	2	Light gy silicified rhyo tuff with 5-7% diss py
E158	960	530	37	1.3	<0.02	8	Dacitic-andesitic volcanicl with minor diss py.
E161	216	0.51%	1020	0.6	0.02	4	Silicified rhyo-tuff rusty with diss py and clots of gal.
E172	8	128	51	0.9	<0.02	48	Silicified rhyo-tuff rusty no visible sulphides
E179	51	143	43	3.4	<0.02	40	Highly pyritized med. gy gn volcaniclastic, silicified
E225	0.26%	0.47%	169	2.9	<0.02	6	Pyritized jasper in dk gn pyritic andesitic volcanicl.
E257	24	78	42	1.0	<0.02	10	Altered tuff silicified chl or sericitized with intense py; rusty
E264	73	0.55%	0.23%	3.0	0.02	<2	Silicified rhy with diss py. rusty also gal & sph grains.
E267	257	0.17%	0.19%	2.0	0.02	2	Dk gn volcanicl. minor py and rare diss gal.
E271	94	0.22%	143	<0.2	0.04	<2	Shear zone 15-20 cm width limonitic stained gouge
E272	20	580	53	<0.2	<0.02	<2	Sheared wallrock talcose luster highly chloritized
E274	0.50%	4.06%	0.16%	0.4	0.21	<2	Extension of E271 shear; 5 cm qtz vein py cp sph minor gal is shear

TABLE 1 (continued)

Sample Number	Assay Data in ppm unless recorded as % Cu	Zn	Pb	Ag	Au	As	Brief Rock Description
E279	172	0.40%	301	0.2	0.04	< 2	Gouge 10 cm fault; minor limonitic stain, no vis. sulph
E282	650	0.61%	345	6.0	0.12	< 2	Chip sample 1 meter shear zone with qtz-py veinlets
E284	203	1.20%	0.67%	4.0	0.56	16	Chip sample across 10 cm shear zone with qtz-gal, sph, py vein (2 cm)
G9	150	0.69%	1810	2.1	0.02	6	Dk gn volcanicl. with diss. py and thin qtz-gal fr. fillings. Limonite stain
KM1	2.75%	27	7	1.2	0.06	< 2	30% py minor cp in highly silicified rock?or qtz vein. Float collected by Ken MacKenzie in ravine at southeast corner of property. This sample is not part of Assess. Report.

ETK/cs

7.2.2 Analysis for Au

Following the drying, crushing and pulverizing process, a 3.0 gm portion of -150 mesh material is heated to 600 degrees Celsius for one an a half hours, then HBr solution is added and allowed to stand overnight. Water and MIBK solution are added, shaken, centrifuged and then 1% HBr in water is added the top organic layer separate. Solution is shaken prior to analysis for Au by atomic absorption. Detection limit and range are 0.02 to 4.00 ppm.

7.3 Results

Assay results are tabulated in Table 1 along with brief geologic descriptions of samples. Assays are also plotted for respective sample sites on two sets of appended maps; one map shows Cu, Zn and Pb values, and second map shows Ag, Au and As values.

With reference to the results, the following facts are evident.

i Assays for all rock and mineralized samples are sub-economic.

ii Best grades were obtained from chip samples across narrow mineralized shear zones in the small volcanic rock outlier at northwest corner of property. Wall rock of these shear zones is barren.

iii Silver and gold content is very low. Gold was essentially undetectable in majority of samples. Based on these results it is assumed that pyrite and associated sulphide minerals in silicified rhyolitic tuff unit do not contain appreciable gold.

iv Fault and shear zones that are visually unmineralized do not show any indications of being conduits of metal dispersion.

8. Statement of Expenses

The following expenses were incurred by Placer Development Limited for conducting geological field work, compiling and interpreting data on Alpen Exploration Ltd.'s Squamish B.C. property. Field work was undertaken during the period of 10 August to 5 October, 1982. Compilation and interpretation of results and assessment report preparation were on-going during above period and completed on 26 January, 1983.

Personnel Costs

i Field work and preliminary data compilation.

Personnel	Period Employed	Man-days & Rate		Costs
T.M. Allen	10 Aug. - 23 Sept.	5 @ $220	$1100	
B. Barde	24 Aug. - 9 Sept.	4½ @ 200	900	
R.A. Boyce	27-30 Sept.	1½ @ 200	300	
M.B. Gareau	24-30 Aug.	1½ @ 220	330	
H.R. Goddard	10 Aug. - 30 Sept.	3½ @ 190	665	
P.R. Hodgson	16 Sept.	1 @ 190	190	
E.T. Kimura	10 Aug. - 5 Oct.	10½ @300	3150	
W.S. Pentland	27 Aug. - 4 Oct.	6 ½@ 250	1625	
C.C. Rennie	13-30 Sept.	4½ @ 250	1125	
J.M. Thornton	16 Sept.	1 @ 220	220	$9,360

ii Geological interpretation; report and map preparation

Personnel	Man-days & Rate		
A.W. Kemp (draftsman)	3 @ $150	$ 450	
E.T. Kimura (geologist)	9 @ 300	2700	
W.S. Pentland (geologist)	2 @ 250	500	
C.J. Sawyer (Micom Operator)	1 @ 140	140	$3,790

Helicopter Costs

Placer Development Limited helicopter (G-VMS) 2.4 hours @ $500/hr. during period 29 Sept. - 1 Oct., 1982	$1,200

Accommodation and Meal Costs	521

Vehicle Expenses

One 4x4 Suburban 9 days @ $60.00	$ 540	
One 4x4 Pick-up 4 days @ $60.00	240	$ 780

Assaying Costs

40 rock samples for Cu, Pb, Zn, Ag, Au and As analyses @ $13.05/sample	$ 522

Miscellaneous Costs

Map reproductions	69	
Sampling supplies	25	$ 94

Total Expenditures	**$16,537**

9. Conclusion

Sub-economic pyrite-chalcopyrite-sphalerite-galena mineralization occurs as scattered small zones in pyroclastic rhyolitic and andesitic tuff units of a roof pendant that overlies and is bounded by intrusive granodiorite.

Submitted by:

E.T. Kimura
Senior Geologist
PLACER DEVELOPMENT LIMITED

ETK/cs
Attachments

APPENDIX I

STATEMENT OF QUALIFICATIONS

I, E.T. Kimura, of Placer Development Limited do hereby certify that:

1. I am a geologist.

2. I am a graduate of the Univeristy of British Columbia with a BA degree in Geology and Physics in 1955.

3. From 1954 until the present, I have been engaged in mining geology, both in underground and open pit operations, and in exploration geology in British Columbia, Saskatchewan and Yukon Territory.

4. I personally supervised and participated in the field work, compiled and interpreted the data resulting from this work.

E.T. Kimura

GEOLOGICAL ASSOCIATION OF CANADA
E. T. KIMURA
FELLOW

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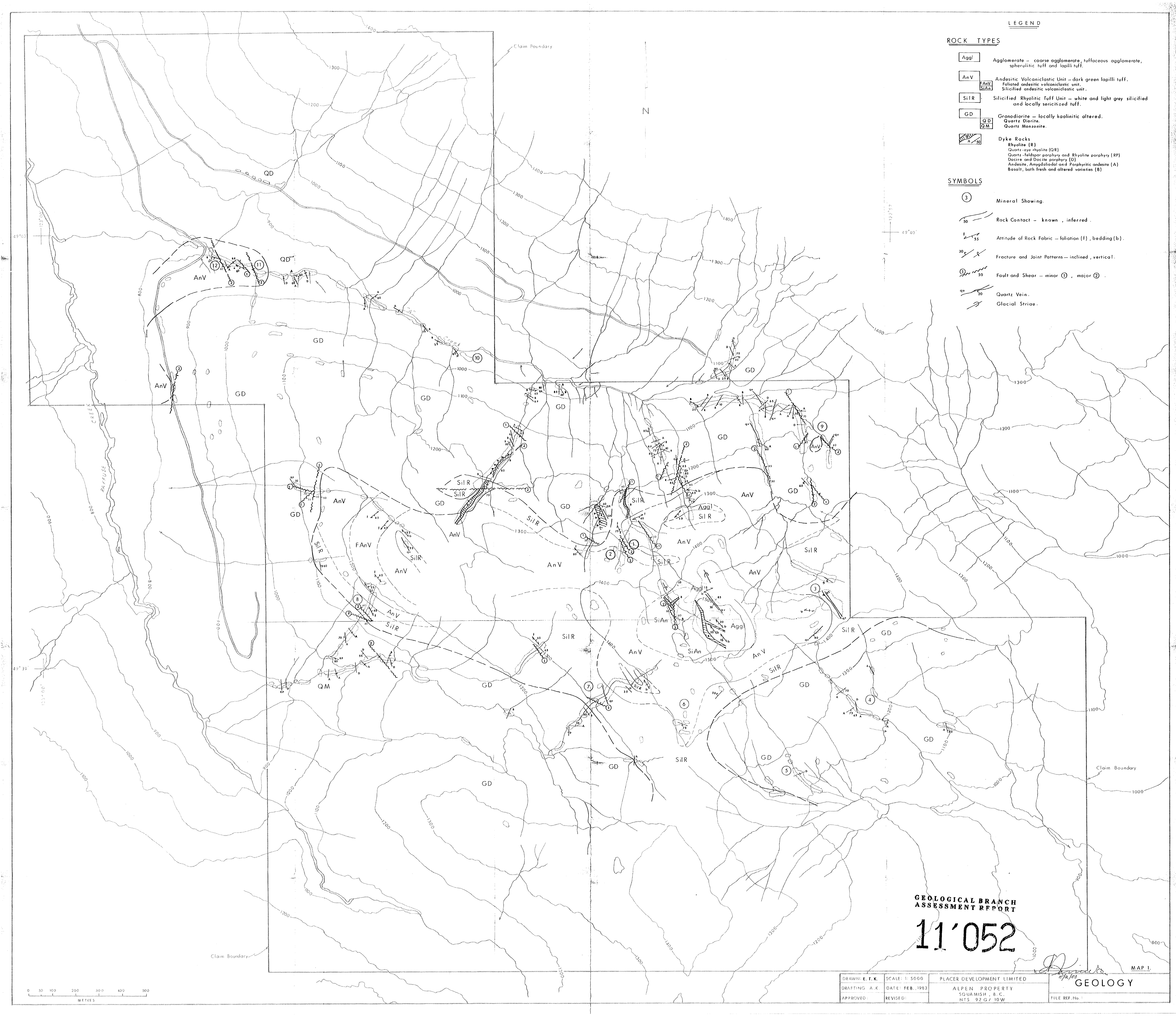
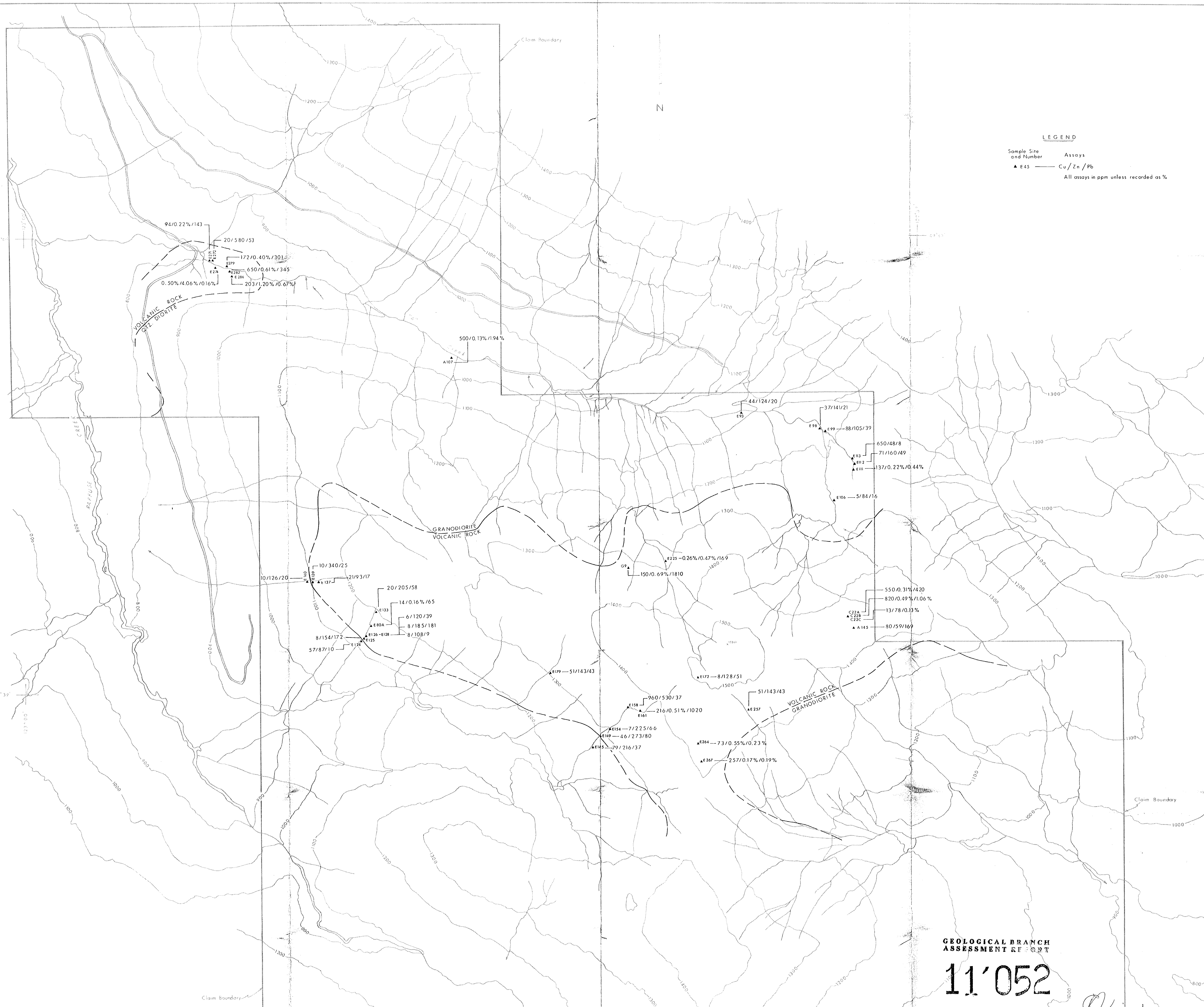
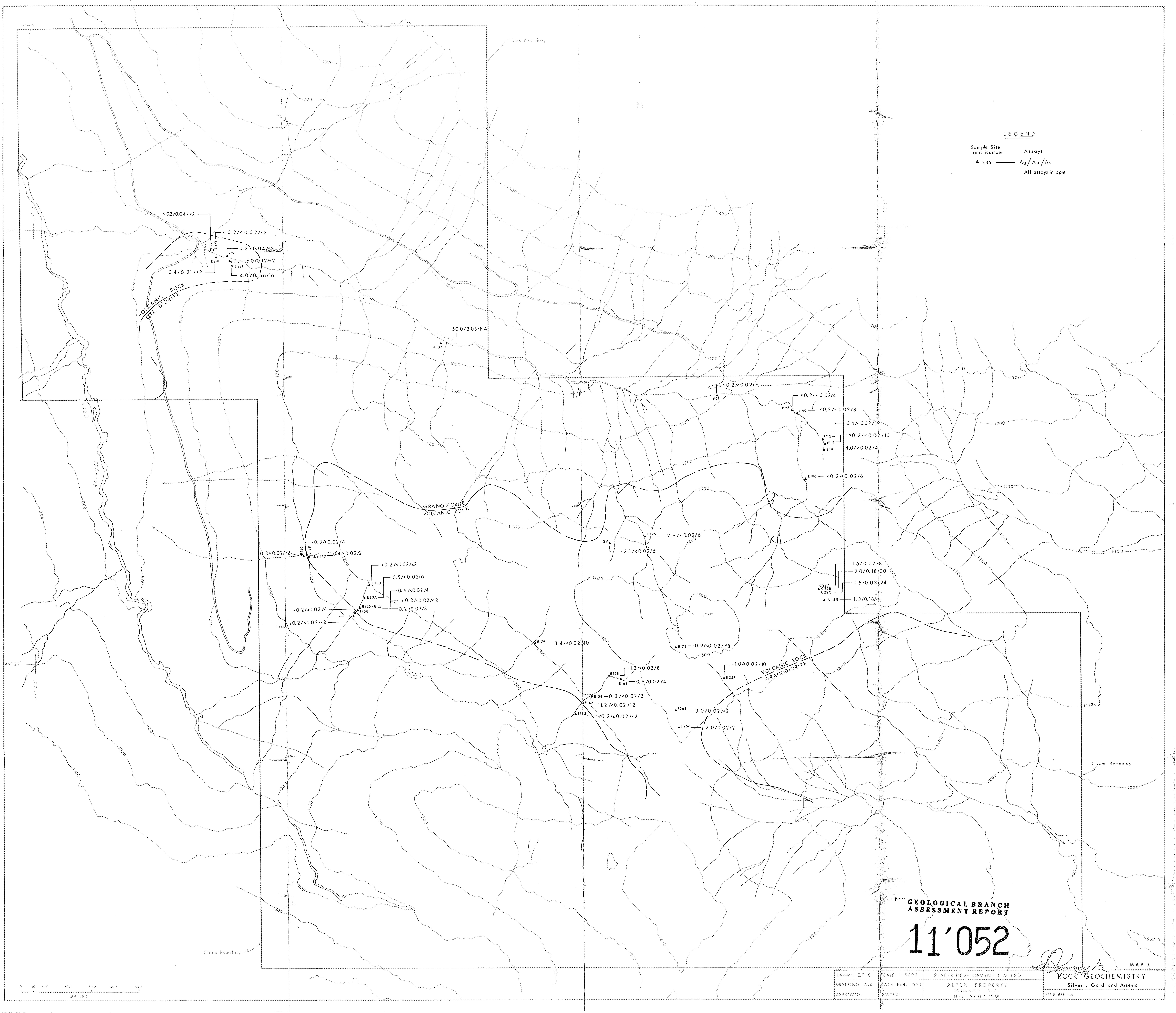

LEGEND
ROCK TYPES
Aggl
Agglomerate – coarse agglomerate, tuffaceous agglomerate, spherulitic tuff and lapilli tuff.
AnV
Andesitic Volcaniclastic Unit – dark green lapilli tuff.
FAnV
Foliated andesitic volcaniclastic unit.
SiAn
Silicified andesitic volcaniclastic unit.
SiIR
Silicified Rhyolitic Tuff Unit – white and light grey silicified and locally sericitized tuff.
GD
Granodiorite – locally kaolinitic altered.
QD
Quartz Diorite.
QM
Quartz Monzonite.
Dyke Rocks
Rhyolite (R)
Quartz-eye rhyolite (QR)
Quartz-feldspar porphyry and Rhyolite porphyry (RP)
Dacire and Dacite porphyry (D)
Andesite, Amygdaliodal and Porphyritic andesite (A)
Basalt, both fresh and altered varieties (B)
SYMBOLS
Mineral Showing.
Rock Contact – known, inferred.
Attitude of Rock Fabric – foliation (f), bedding (b).
Fracture and Joint Patterns – inclined, vertical.
Fault and Shear – minor ①, major ②.
Quartz Vein.
Glacial Striae.
N
Claim Boundary
GEOLOGICAL BRANCH
ASSESSMENT REPORT
11'052
MAP 1.
DRAWN: E. T. K.
DRAFTING A.K.
APPROVED:
SCALE: 1:5000
DATE: FEB., 1983
REVISED:
PLACER DEVELOPMENT LIMITED
ALPEN PROPERTY
SQUAMISH, B.C.
NTS 92 G / 10W
8/2/83
GEOLOGY
FILE REF. No.:
METRES



GEOLOGICAL BRANCH
ASSESSMENT REPORT

11'052

DRAWN: E.T.K.	SCALE: 1:5000	PLACER DEVELOPMENT LIMITED	ROCK GEOCHEMISTRY Copper, Zinc and Lead
DRAFTING: A.K.	DATE: FEB. 1983	ALPEN PROPERTY SQUAMISH, B.C. NTS 92G/10W	
APPROVED:	REVISED:		FILE REF. No.:


N
LEGEND
Sample Site and Number
Assays
E 45 — Ag / Au / As
All assays in ppm
VOLCANIC ROCK
QTZ. DIORITE
GRANODIORITE
VOLCANIC ROCK
VOLCANIC ROCK
GRANODIORITE
Claim Boundary
50.0/3.05/NA
A107
GEOLOGICAL BRANCH
ASSESSMENT REPORT
11'052
MAP 3.
DRAWN: E.T.K.
SCALE: 1:5000
PLACER DEVELOPMENT LIMITED
DRAFTING: A.K.
DATE: FEB. 1983
ALPEN PROPERTY
SQUAMISH, B.C.
NTS 92 G / 10W
APPROVED:
REVISED:
ROCK GEOCHEMISTRY
Silver, Gold and Arsenic
FILE REF. No
METRES