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REPORT ON ELK GROUP

KNOB HILL, HOLBERG, B.C.

By:

Bradford D. Pearson, F.G.A.C., P.Eng.

Richmond, B.C. December, 1974

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ABSTRACT

The Knob Hill property lies along the northern margin of a linear alteration zone of regional extent. Preliminary work by West Coast Resources failed to disclose any anomalous zones within the altered area. Subsequent drilling tested magnetic anomalies in relatively unaltered acidic to intermediate pyroclastics and flows more than a mile from the nearest portions of the alteration belt. Evidence in the drill core indicates the possible presence of massive sulfide lenses within the volcanic sequence.

The nature and extent of the alteration belt are discussed. The origin of this belt and the reasons for its localization are unclear, as is its relation, if any, to the distribution of copper in the general area.

A mineralized rock noted in the lower section of DDH-1 and identified as argillite is believed to be identical with a type mistakenly identified by Utah geologists as andesite. This rock is a major host to copper at the Island Copper deposit at Port Hardy. The discovery of the true nature of this rock implies that the Utah ore body may be essentially sedimentary in origin, with later redistribution and local enrichment along the margins of a porphyry sill. On the basis of this interpretation, exploration for comparable deposits should be concentrated in areas underlain by the Parsons Bay Formation, and need not be restricted to the vicinity of intrusive bodies.

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INTRODUCTION

The following report deals with the Elk Group of mineral claims, situated on Knob Hill, north of Holberg, B.C. It is based on two visits to the property, a detailed examination of the core of four drill holes (3114' of BQ core) put down by West Coast Resources (see appendix for logs), an examination of data compiled by West Coast Resources and by Chevron Minerals, and extensive experience on northern Vancouver Island while in the employ of Utah Construction and Mining Company and later as an independent consultant.

HISTORY

Since the discovery of the Island Copper ore body in February, 1967, and its characterization as a "porphyry copper" type deposit, considerable effort has been devoted to the discovery of comparable deposits within the belt of Lower Jurassic Bonanza Volcanics which extends west and west-northwest from the Rupert Inlet area to the northwestern tip of Vancouver Island.

Now well exposed in the pit at Island Copper, and discontinuously exposed but apparently continuous (save for fault offsets) over the entire strike length of this volcanic belt there exists a spectacular zone of intense clay-silica alteration with a pyrite content generally exceeding 5%. Based on the assumption of a relation between this alteration zone and the presence of copper on the Utah property, later exploration has tended to concentrate largely around exposures of this feature.

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The alteration zone is present, though very poorly exposed, along the southern edge of the Elk Group and its presence or inferred presence was probably a factor in West Coast Resources' decision to stake the ground. However, initial work by that organization (magnetometer and geochemical surveys) failed to indicate the presence of any anomalous areas proximal to the altered zone. Subsequent drilling was carried out about 6,500' to the north to investigate two areas of high magnetic relief. No economic mineralization was encountered, nor were any features noted which might indicate proximity to a concealed porphyry copper deposit.

In early 1973 I was requested to examine the drill core by Cities Service Minerals Corp. In the course of this examination I noted a number of factors which indicated the possible presence nearby of a massive sulfide lens. However, Cities Service was unable to conclude an option agreement on the property, so the idea was not pursued.

The present work has reinforced my belief in the possibility of massive sulfide occurrences, and has, in addition, provided some new insights into the nature of the geology of the Island Copper deposit which require a re-evaluation of exploration approaches in the general North Island area.

GEOLOGY

Stratigraphy

The Elk Group is underlain largely by a central belt of Lower Jurassic pyroclastics, flows and sills of acid to intermediate composition referred

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to the Bonanza Formation. This belt is intruded on the northeast by the Jurassic Nahwitti Batholith. To the southwest, the volcanics are overlain unconformably by the Lower Cretaceous Longarm Formation, which is composed largely of sandstone and conglomerate derived in part from Bonanza rocks which have undergone little or no chemical weathering.

In his mapping for West Coast Resources, Peter Folk outlined an area in the northwestern part of the claim group which is underlain by basalts. He believed these not to be a part of the Bonanza sequence, and suggested that they were an upfaulted block of Middle to Upper Triassic Karmutsen Formation.

On the basis of mapping in areas adjacent to the Elk Group, the presence of the Upper Triassic Parsons Bay Formation can be inferred at depth. This unit is composed of greywackes, shales and calcareous rocks. A section of argillite encountered in the lower section of DDH-1 lends weight to this inference. The potential importance of this unit will be discussed later in this report.

Structure

Bedding attitudes are rarely obvious within the volcanic rocks, which are poorly exposed at best. Interpretations of structure must rest on inferences made on the basis of the gross distribution of rocks of contrasting lithology, and upon regional trends. Some dip information has been obtained during the core logging, but should be used with the realization

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that initial dips may represent a substantial component in rocks of volcanic origin.

Attitudes are most obvious in outcrop in a series of well-laminated rhyodacitic tuffs exposed in a creekbed about 4,000' northeast of the Elk camp. However, this location lies within a few hundred feet of the margin of the Nahwitti Batholith, and the possibility of local deformation during intrusion should be kept in mind. To compound the uncertainties, my measurement at this location, which yielded a N-S strike and a dip of 45°W, is in disagreement with the attitude shown on Folk's map for this location, indicating a similar strike but a dip of 50° to the east. I believe the latter represents an error in drafting or transcription of data, since there are no outcrops outside the creek gulley, which both Folk and myself have traversed thoroughly.

With the foregoing qualifications, it appears that we are dealing with a southwest-dipping monoclinal sequence where dips range from about 30° in the argillite intersected at the bottom of DDH-1 to about 55°, a figure which seems to be general within the volcanic rocks. Gross distribution of the rhyodacitic rocks indicates a strike of approximately N35°W. Regional strike is about N45°W.

The possibility that the sequence is overturned should be discussed, especially as the assumption of a right-side-up, southwest-dipping monocline yields a volcanic sequence which changes from acidic to intermediate with decreasing age, a rather unusual circumstance. Firstly, the sequence

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involved here is probably rather too restricted in thickness to be treated in terms of magmatic evolution. Secondly, Muller et al (1974, pp. 22, 23) noted a similar trend in a section measured along the west coast of the Island north of Quatsino Sound. Thirdly, graded bedding in tuffs intersected by the drill holes indicates that the sequence is right-side-up.

The margin of the Nahwitti Batholith is roughly parallel to the N35°W strike inferred from the gross distribution of the rhyodcitic rocks to a point about 5,500' northeast of the summit of Knob Hill. From this point the intrusive cuts sharply west into the region underlain by basalts, where it again resumes a trend slightly west of north.

Attitudes measured by Folk within the Cretaceous section show consistent north-south strikes and gentle western dips. However, the outcrop pattern indicates that the boundary between the Bonanza rocks and the Cretaceous section trends northwest, in accord with the regional mapping.

The importance of faulting is difficult to estimate. Mr. D. Arscott has called my attention to a northwest-trending line which can be drawn bounding the west side of the Farm magnetic anomaly and the east side of the Knob Hill magnetic anomsly to the northwest, and has suggested that this line represents the trace of a fault which has offset adjacent parts of a once continuous zone of magnetic rock. I find this suggestion attractive for it offers an explanation for the presence of a distinctive medium grained intrusive diorite in DDH-4 in the southeast and DDH-3 in the northwest which is absent in the centrally located DDH-2. The intrusion of this

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diorite may be responsible for the development of the secondary magnetite in the overlying volcanics in DDH-3 and the volcanics in DDH-1 which lies close to DDH-4. Following Occam's razor, a single faulted intrusive is most likely.

It has been suggested, on the basis of topography and airphoto study, that Knob Hill represents an eroded volcanic dome. Although the coarse breccias in the area imply proximity to a volcanic vent, there is no presently known evidence for a circular pattern of lithological units which might support this interpretation.

Alteration

Mention has been made in the section on History of a belt of clay-silica-pyrite alteration which lies within the Bonanza rocks. This belt may have an outcrop width locally exceeding 2,000'. It has been encountered by drill holes on the Riviera property east of Rupert Inlet, is well exposed in the Utah pit, outcrops spectacularly at the Lafarge Cement Company quarry at Apple Bay, and is responsible for the brilliant red colour of the cliffs on the Pemberton Hills. Utah has conducted drilling programmes within the belt at Wanokana and Hushamu Creeks and West Coast Resources and Cities Service have drilled it on the Red Dog property. Aside from the Island Copper deposit, significant amounts of copper seem to be present only in the Hushamu Creek area, but grades there are in the neighbourhood of 0.2%. It is my impression that such copper as has been found in these various exploration programmes lies, not within the altered rock, but in relatively unaltered rock adjacent to the alteration belt.

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The origin of this alteration is puzzling. An intrusive mass is present at the head of Rupert Inlet and a dike (which may be part of that intrusive) within the Island Copper ore zone. Mapping by the G.S.C. shows a small stock in the Hushamu Creek area and another on Wanokana Creek, and there is a stock on the Red Dog property. These intrusives, however, are rather small, sporadically distributed occurrences, whereas the alteration is apparently continuously developed along a smoothly arcuate trend at least 34 miles in length. Too, there are numerous other small stocks and intrusive masses of apparently similar nature in the general region which have no associated alteration zones.

If the outcrop pattern of the alteration belt is plotted on the geological map of the area (Alert Bay-Cape Scott, G.S.C. Map 4-1974), it appears not to lie at a consistent stratigraphic position within the Bonanza Formation. Its surface distribution in an area of sharply incised relief implies a steep dip, but at least one drill hole on the Island Copper property passed out of the alteration into nnaltered volcanics at a depth of approximately 500'. Outcrop evidence on the Red Dog and adjacent Utah Expo claims is contradictory and can be interpreted to indicate both vertical and sub-horizontal boundaries.

The apparently continuous nature of the belt in an area where deformation consists primarily of block faulting, tilting and cross faulting (Muller et al, 1974, p. 50) implies a post-deformational age for the development of the alteration, yet the Lower Cretaceous rocks which overlie the belt on portions of the Elk Group show no signs of alteration whatsoever. Perhaps

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coincidently, the belt follows the erosional updip edge of the Lower Cretaceous Longarm Formation in the two areas along the belt where the Longarm overlies the Bonanza Formation.

It is tempting to speculate that the fluids responsible for the development of this belt were derived by dewatering and burial metamorphism of the thick sequence of Karmutsen basalts which underlies most of this region. Current reserach on low-grade metamorphic processes may shed more light on the relations of such alteration to the deposition of sulfides. More detailed mapping may assist in solving the problems associated with localization of the belt, but this mapping should be carried out on a regional scale.

Attention is called to a small area of somewhat similar alteration on the west shore of Kashutl Inlet north of Kyuquot. Pyrophyllite and natro-alunite occur on the Morris and Monteith properties. Pyrophyllite is sporadically developed throughout the belt of clay-silica alteration described above.

MASSIVE SULFIDE POSSIBILITIES

Massive sulfide deposits generally occur within volcanic sequences at a position within the stratigraphic column where there is an abrupt transition (up or down) from intermediate to acidic rocks. There is an association with coarsa fragmental rocks which is interpreted as refleoting proximity to a volcanic vent. Intercalated sediments indicate that the rocks were deposited subaqueously.

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Mapping by Peter Folk which I have rechecked in the field, and my examination of the drill core have led me to the conclusion that these factors are all present on the Elk Group. The following factors should also be considered. Both intermediate and acid extrusives in the transition zone outlined by mapping contain significant amounts of disseminated iron sulfides. In addition, breccias present in DDH-1 contain angular to subrounded fragments composed almost entirely of fine-grained pyrrhotite. One of these fragments also contains a small amount of chalcopyrite.

The presence of subrounded fragments of fine-grained sulfides up to several inches in size in an environment such as this is interpreted as evidence that massive sulfide lenses were deposited during deposition of the volcanic rocks and that these lenses were shortly thereafter disrupted by explosive episodes. No evidence is available to indicate the probable size of these lenses nor the likelihood that any may have survived the period of explosive disruption. No evidence has yet been noted in the form of float or in the basal till-sampling to indicate that any lenses suboutcrop on the property. However, in view of the grid spacing involved in the till-sampling (800' x 400'), as compared with the area of a lens likely to be exposed at the erosion surface in a region of steep dips (45°-50°), it is probable that such a lens would go undetected. The fact that most lenses are conformable with the enclosing rocks, taken in conjunction with the fact that the short (400') spacing was aligned along strike, would exacerbate the problem of detection. Lenses which did not suboutcrop would, of course, go undetected regardless of grid spacing and orientation.

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In order to overcome these difficulties, a low-level airborne E.M. survey is recommended. Line spacing should be very close (400' if possible) with lines oriented east-west, at right angles to strike. A magnetic survey should be carried out simultaneously, which should, by the separation of instrument from surface, overcome some of the shortcomings of the West Coast survey which was obviously affected by variations within the uppermost few feet of bedrock and possibly even by the presence of boulders in the till.

NATURE OF THE ISLAND COPPER DEPOSIT AND ITS RELATION TO EXPLORATION STRATEGY

During the logging of DDH-1 I noted a fine-grained dark rock below 664' which seemed to me to be macroscopically indistinguishable from one of the major host rocks at Island Copper. The rock was logged there as andesite based on characteristics observable under a 16x hand lens, since we had no access to facilities for petrographic work. Although laminations are only locally developed in the 54' section encountered in DDH-1, they indicate clearly that the rock is a sediment. Petrographic work by Dr. D.L. Cooke (see Appendix III) confirms this judgement. Dr. Cooke classes this rock as an argillite composed largely of amphibole, alkali feldspar and chlorite. Reference to assaying by West Coast Resources shows that this sedimentary section contains the highest copper content (> 0.10%) detected by them during their drill programme.

With these facts in mind, it now seems that most of the copper in the Utah

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deposit may occur in sedimentary rock, and that this rock sequence, which had been thought, based on regional attitudes and faulty rock identifications, to be a moderately south-dipping sequence of volcanics, is probably a very steeply-dipping sequence of intermixed mineralized sediments and largely (perhaps completely) unmineralized tuffs and breccias. Drilling in the general area has demonstrated the presence of great volumes (perhaps as much as several billion tons) of 0.2% rock, some of which is definitely, and most of which is probably, sedimentary in nature. It now seems reasonable to conclude that the porphyry dike (which can be considered a sill in the light of the above comments) has merely effected a local redistribution in a pre-existing deposit which may be essentially sedimentary in origin. The pre-porphyry deposit may thus be comparable with Granduc, save for the difference in grades.

In the light of these considerations, attention might profitably be shifted from the volcanics of the Bonanza Formation to the underlying sediments of the Parsons Bay Formation. As a final note, mention should be made of that unit as it appears in the area west of Bonanza Lake. There it is made up largely of well-laminated black shale and argillite containing fine-grained bands of sedimentary pyrite. One speciment of this rock which I submitted for uranium and vanadium assays several years ago returned a vanadium assay in excess of 1%. At that time I considered this unit to be comparable to the Urquhart Shale of the Mount Isa region or the Kupferschiefer of Central Europe. I feel increasingly optimistic about its economic potential, and would suggest that it be studied on a regional basis.

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APPENDIX I

SUMMARY OF DRILL HOLE LOGGING

DDH-1 (718')

Largely acid breccias. Magnetite and strongly magnetic pyrrhotite common. Some of the breccia fragments consist entirely of pyrrhotite. Lower section of hole passes through argillite of volcanic derivation, containing copper values up to 0.13%. Dips about 55° in volcanic section, about 30° in sedimentary section.

DDH-2 (759')

Tuffs and flow breccias of intermediate composition. Pyrite very common. Pyrrhotite very minor or absent.

DDH-3 (998')

Sericitized ash tuffs and trachyte sills near top. Magnetite and strongly magnetic pyrrhotite common in tuffs. Below lie acid tuffs and flows with minor intermediate units. Medium-grained intrusive diorite occurs at the bottom of the hole.

DDH-4 (698')

Andesitic tuffs predominate in the upper 200'. Most of the remainder of the hole is in medium-grained intrusive diorite identical to that in DDH-3.

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GENERAL OBSERVATIONS

The magnetic anomalies in the vicinity of DDH-1 and DDH-3 are obviously due to the presence of the magnetite and pyrrhotite noted in the tuffs and breccias.

Alteration is generally uniform within any particular bed, but widely variable from one bed to the next. This is interpreted to mean that most of the alteration took place during the cooling of each unit in sequence. (Alteration is used here in the sense of reaction between fragments and groundmass as evidenced by the diffuseness of fragment borders.)

Numerous fragments show the development of secondary very-fine-grained light brown biotite. Although its occurrence in this mode may reflect a preferential alteration of certain lithologies present within the heterogeneous fragment content, I gained the general impression that the alteration predated the period of fragmentation which led to the development of breccia.

The distribution of epidote, biotite, magnetite and pyrite, indicate that mineral zoning is present. Data are insufficient to allow any geometrical characterization at this time, although the zoning appears to be on a small scale and local in nature.

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APPENDIX II

REPORTED OCCURRENCE OF ANDALUSITE

Petrographic section No. 22168 was originally examined by Peter Folk who reported the presence of small crystals of andalusite (20%) in a groundmass of quartz (amount unspecified), sericite (50%), biotite (trace) and opaque minerals (5%). In view of this uncharacteristic setting for the occurrence of andalusite, Dr. D.L. Cooke was asked to re-examine the slide. His examination was brief and his volume estimates can only be considered as first-order approximations, but his mineral identifications are believed to be accurate. He reported as follows:

> Rock appears to be an altered tuff:
> 40% sericite
> 20% fine-grained alkali feldspar
> 20% fine-grained secondary brown biotite
> 10% quartz as crystals 2-3 mm.
> 8% disseminated pyrite
> 2% magnetite

It would appear that Folk mistook the fine-grained alkali feldspar for quartz and called the larger quartz grains andalusite.

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APPENDIX III

PETROGRAPHIC REPORT
ON TEN THIN SECTIONS

for

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by

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October 23, 1974

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INTRODUCTION

The ten specimens were examined in thin sections on the instruction of Mr. B. D. Pearson, Consulting Geologist. This petrographic examination was done to determine the rock types, origin of and alteration within the various specimens.

The textures, primary minerals, and the secondary alteration products were identified optically. The percentages of minerals were visually estimated, and each section described and classified separately.

CONCLUSIONS

This suite of rocks represented by drill cores are essentially volcanic in origin. Included are intermediate to acid flows and argillaceous tuffs. The intrusive rocks are medium to fine grained and sub-volcanic in nature. They are similar in composition to the lavas.

The two hand specimens are from clastic feldspathic sandstones which contain some volcanic fragments. However, they are believed to be far removed from the center of volcanism, or deposited during a quiescent period. These samples are unaltered.

The most fine grained units are the mineralized argillites which appear to be affected by thermal activity. These have been altered almost to the hornfels stage, and it is uncertain whether the contained pyrrhotite is primary or secondary. Magnetite appears to be secondary.

The volcanic rocks exhibit moderate amounts of hydrothermal alteration consisting mainly of sericite, and to a lesser extent of quartz and carbonate replacement. Abundant pyrrhotite and minor pyrite and/or chalcopyrite occur within the altered specimens.

Respectfully submitted

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PETROGRAPHIC REPORT

NUMBER: DDH 3-187' LOCALITY: DATE: October 20, 1974

NAME AND CLASSIFICATION: TRACHYTE

MEGASCOPIC DESCRIPTION: The hand specimen appears grey, mottled and feldspathic. Irregular 2-4 mm. grey spots are numerous. The matrix is medium to fine grained.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Alkali Feldspar	35	Anhedral, untwinned grains are confined to the matrix.
2. Sericite	20	Fine grained, secondary sericite permeates the phenocrysts and the interstices of alkali feldspar in the matrix.
3. Carbonate	15	Like sericite, secondary carbonate permeates the section.
4. Plagioclase	15	2-5 mm. plagioclase phenocrysts (An_{10+}) are partially replaced by sericite and carbonate.
5. Chlorite	10	Secondary chlorite forms 3-6 mm. spots and are probably secondary after ferromagnesian phenocrysts. Some chlorite occurs in the groundmass.
6. Leucoxene	3	Cloudy leucoxene appears secondary after disseminated iron oxide.
7. Sphene	2	Suthedral sphene occurs in accessory amounts. It appears to be primary.
8. Apatite	Tr.	A few grains of apatite are evident.

TEXTURE: Small phenocrysts of plagioclase are set in a groundmass of equigranular to matted, untwinned, alkali feldspar. Patches of chlorite and carbonate may have been derived from ferromagnesian phenocrysts. Sericite is also secondary and hydrothermal in origin.

CONCLUSION:

The specimen is representative of the central portion of a trachyte flow or the margins of a syenite sill. From the porphyritic feldspar and medium to fine grained matrix, the unit seems to be extrusive in origin. Moderate sericite alteration is apparent.

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PETROGRAPHIC REPORT

NUMBER: DDH 3-192' LOCALITY: DATE: October 20, 1974

NAME AND CLASSIFICATION: SERICITIZED ASH TUFF

MEGASCOPIC DESCRIPTION: The core sample is dark brown and fine grained. It also contains some grey fragmental material.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Sericite	60	Hydrothermal (?) sericite permeates the entire section. It is very fine grained.
2. Alkali Feldspar	15	Remnant alkali feldspar occurs as a very fine mixture together with the sericite.
3. Magnetite	15	Anhedral grains of various sizes are scattered throughout.
4. Apatite	8	Apatite occurs in sprays and clusters. It is usually in the form of euhedral needles.
5. Pyrite	2	Pyrite occurs as fine disseminations.

TEXTURE: The tuffaceous nature of the specimen is preserved by magnetite, which occurs as a dust around glassy shards and impregnations within rock fragments. Sericite and feldspar occur as a fine grained mixture, and apatite as sprays of crystalline needles.

CONCLUSION:

The rock is tuffaceous, consisting originally of both glassy and lithic ash material. Magnetite preserves this texture although the rock is almost entirely replaced by sericite, alkali feldspar and apatite. Alteration is phyllic in nature.

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PETROGRAPHIC REPORT

NUMBER: DDH 2-60' LOCALITY: DATE: October 20, 1974

NAME AND CLASSIFICATION: ALTERED ANDESITE

MEGASCOPIC DESCRIPTION: This is a dark green fine grained rock which is riddled with epidote veinlets and fine sulphides.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Plagioclase	25	$An_{28\pm5}$. Subhedral plagioclase phenocrysts are replaced by epidote, sericite and chlorite.
2. Chlorite	25	Chlorite permeates the section as a replacement of feldspars and ferromagnesians.
3. Epidote	20	Epidote is secondary after plagioclase. It also occurs in veinlets and seams.
4. Sericite	15	Sericite is associated with epidote and the feldspars.
5. Carbonate	7	Carbonate is scattered about in irregular patches.
6. Pyrite	5	Irregular grains of pyrite are scattered throughout.
7. Leucoxene	3	Cloudy irregular leucoxene grains occur throughout.
8. Chalcopyrite (?)	Tr.	A trace of chalcopyrite may be associated with the other vein minerals.

TEXTURE: The porphyritic nature of the original rock is partially preserved by the plagioclase phenocrysts. The intensity of fracturing gives it the appearance of a flow breccia. The matrix is fine grained and equigranular.

CONCLUSION:
The rock is an andesite flow, which is intensely brecciated and replaced by chlorite, epidote and sericite. Alteration may be classed as propyllitic.

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PETROGRAPHIC REPORT

NUMBER: DDH 2-488' LOCALITY: DATE: October 20, 1974

NAME AND CLASSIFICATION: ALTERED TRACHYTE PORPHYRY

MEGASCOPIC DESCRIPTION: Numerous 2 - 5 mm. feldspar crystals are scattered throughout this greenish grey, porphyritic specimen.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Plagioclase	50	Feldspar tablets (2 - 5 mm.) are nearly all replaced by sericite, carbonate and alkali feldspar.
2. Sericite	20	Fine, secondary sericite has replaced a large part of the feldspars.
3. Chlorite	18	Chlorite is the main secondary mineral after the ferromagnesian phenocrysts (1-3 mm.)
4. Carbonate	10	Carbonate occurs mainly after feldspar phenocrysts.
5. Leucoxene	1	A few grains of leucoxene are present.
6. Magnetite	1	Subhedral magnetite is accessory.
7. Apatite	Tr.	Apatite crystals are also accessory.

TEXTURE: The feldspar phenocrysts and chlorite pseudomorphs give the specimen a distinct porphyritic texture. The groundmass exhibits "flow texture" and consists primarily of alkali plagioclase laths.

CONCLUSION:

This extrusive trachyte porphyry has undergone moderate phyllic to argillic alteration (sericite, carbonate and chlorite).

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PETROGRAPHIC REPORT

NUMBER: SP - 1 LOCALITY: DATE: October 20, 1974

NAME AND CLASSIFICATION: FELDSPATHIC SANDSTONE

MEGASCOPIC DESCRIPTION: The sample is grey, fine grained, and slightly granular in appearance.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Alkali Feldspar	20	Grains of orthoclase and microcline occur in a fine grained matrix.
2. Quartz	20	Subangular quartz grains are a common constituent.
3. Plagioclase	15	Fragments of twinned alkali plagioclase are commonly observed.
4. Chlorite	15	Fine grained chlorite occurs in patches and throughout the matrix, together with clay minerals.
5. Carbonate	10	Subangular grains of carbonate are not uncommon.
6. Hornblende	8	Hornblende is present as angular fragments.
7. Leucoxene	5	Moderate amounts of leucoxene occur within the matrix.
8. Rock Fragments	5	These consist mainly of feldspathic volcanic material.
9. Magnetite	2	Magnetite grains are irregular in outline.
10. Epidote	Tr.	The occasional grain of epidote is evident.

TEXTURE: Subrounded clastic grains of feldspar, quartz, carbonate and hornblende are packed closely together and cemented by a fine grained mixture of chlorite and clay minerals. Grain size is about 1 mm.

CONCLUSION:

The specimen is a feldspathic sandstone of fairly uniform grain size. No alteration is in evidence.

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PETROGRAPHIC REPORT

NUMBER: SP - 2 LOCALITY: DATE: October 21, 1974

NAME AND CLASSIFICATION: ARGILLACEOUS SANDSTONE

MEGASCOPIC DESCRIPTION: This is a dark grey, aphanitic specimen containing the occasional pea-size fragment.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Chlorite & Clays	30	Fine chlorite and clay minerals comprise most of the cementing matrix.
2. Alkali Feldspar	15	Anhedral alkali grains include orthoclase, microcline and myrmekite.
3. Quartz	15	Quartz appears very angular in this section.
4. Plagioclase	15	Fragments of alkali plagioclase are abundant.
5. Carbonate	12	Carbonate grains are generally rounded.
6. Leucoxene	8	Magnetite grains are entirely altered to leucoxene.
7. Rock fragments	5	These are chiefly of alkaline flow rocks.
8. Epdiote	Tr.	A few epidote grains are present.

TEXTURE: The texture is one of a massive, fine grained, clastic sedimentary rock. Angular fragments of alkali feldspar, plagioclase, quartz and carbonate occur in a fine grained matrix of chlorite and clay minerals. Grain size is $\frac{1}{4} - \frac{1}{2}$mm.

CONCLUSION:

This section has a similar mineralogy to SP -1, but it is finergrained and more argillaceous in composition. It is unaltered.

Telephones:
Bus: 576-8148
Res: 576-8170

D.L. COOKE AND ASSOCIATES LTD.
MINERAL EXPLORATION CONSULTANTS

16331 Bell Road,
Surrey, B.C.
Canada

PETROGRAPHIC REPORT

NUMBER: DDH 4-697 LOCALITY: DATE: October 21, 1974

NAME AND CLASSIFICATION: DIORITE

MEGASCOPIC DESCRIPTION: This is a medium to fine grained, grey, equigranular rock.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Plagioclase	50	An_{35-40}. Plagioclase crystals are zoned normally. They exhibit subhedral outlines and broad twins.
2. Hornblende	13	Remnants of altered hornblende are characteristic of the interstitial positions between the feldspars.
3. Biotite	12	Small biotite flakes occur within the hornblende crystals.
4. Chlorite	12	Biotite is associated with abundant chlorite after hornblende.
5. Quartz	8	Irregular quartz grains are an abundant constituent.
6. Myrmekite	4	Quartz-feldspar myrmekite intergrowths occupy interstices.
7. Apatite	1	Euhedral needles of apatite are scattered throughout.
8. Magnetite	Tr.	A few grains of magnetite are accessory.

TEXTURE: An equigranular to diabasic texture is characteristic. Subhedral plagioclase tablets are the major constituent, with hornblende, biotite, quartz and chlorite occupying interstices. The texture is medium grained.

CONCLUSIONS: The rock is intrusive. It is probably a residual derivative of a basic parent magma. The presence of quartz and myrmekite leads to such a conclusion. Biotite appears to be hydrothermally derived from chlorite which has replaced hornblende.

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16331 Bell Road,
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Canada

PETROGRAPHIC REPORT

NUMBER: DDH 1-652' LOCALITY: DATE: October 21, 1974

NAME AND CLASSIFICATION: LATITE

MEGASCOPIC DESCRIPTION: The grey, fine grained appearance is characteristic of this sulphide-bearing specimen.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Plagioclase	40	An_{35-45}. Scattered tablets with oscillatory zoning range in size up to 2 cm. Other plagioclase laths comprise a large portion of the groundmass.
2. Alkali Feldspar	25	Inclusions of alkali feldspar are common replacement of plagioclase laths and groundmass material.
3. Amphibole	10	"Shredded" amphibole occurs in the groundmass as fine blades.
4. Chlorite	10	Chlorite is located in the groundmass and interstices.
5. Carbonate	7	A few patches of carbonate appear to be secondary.
6. Pyrrhotite	4	Irregular grains are disseminated in habit.
7. Chalcopyrite	1	Chalcopyrite is also disseminated and associated with pyrrhotite.
8. Magnetite	1	Although disseminated, magnetite shows no obvious special affinity for the sulphides.
9. Leucoxene	1	Irregular secondary grains are abundant.
10. Apatite	1	Subhedral forms are typical of the apatite.

TEXTURE: A matted texture is formed by plagioclase laths. All other constituents are fine grained and more interstitial in relation to the plagioclase.

CONCLUSION:
Chlorite and amphibole appear to be secondary (deuteric). The rock is extrusive and intermediate to felsic in composition.

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Res: 576-8170

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16331 Bell Road,
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Canada

PETROGRAPHIC REPORT

NUMBER: DDH 1-687a LOCALITY: DATE: October 21, 1974

NAME AND CLASSIFICATION: ARGILLITE

MEGASCOPIC DESCRIPTION: The specimen is dark grey, fine grained and probably laminated and mineralized. A few hairline seams are present.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Amphibole	50	Actinolite (?). A very fine matte of amphibole crystals constitutes the larger portion of the section.
2. Alkali Feldspar	30	Fine equigranular feldspar is associated with amphibole throughout. Within secondary seams, these minerals are slightly more coarse grained.
3. Chlorite (?)	9	Some chlorite or carbonaceous material (?) may be associated with the amphibole.
4. Carbonate	5	Minor amounts of carbonate occur in narrow veinlets.
5. Pyrrhotite	4	Irregular grains occur as disseminations.
6. Magnetite (?)	2	Magnetite (?) grains are scattered throughout the section in feldspars, and within feldspar-amphibole seams.
7. Quartz	Tr.	Minor amounts of quartz occur in veinlets and seams together with sulphides.

TEXTURE: The texture is very fine grained with a slight suggestion of bedding being indicated by subtle variations in grain size and mineral composition. Individual grains are equigranular or blade-like.

CONCLUSION:

This is an argillaceous sediment which has undergone lowgrade thermal metamorphism.

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Res: 576-8170

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16331 Bell Road,
Surrey, B.C.
Canada

PETROGRAPHIC REPORT

NUMBER: DDH 1-687b LOCALITY: DATE: October 21, 1974

NAME AND CLASSIFICATION: ARGILLITE

MEGASCOPIC DESCRIPTION: The specimen is similar to 1-687a, but the laminations are cross-cut by grey vein material containing pyrrhotite.

MICROSCOPIC DESCRIPTION:

Minerals	%	Remarks
1. Amphibole	30	Minute blades of amphibole (actinolite) are randomly oriented and uniformly distributed along layers. Some alkali feldspar is also present.
2. Alkali Feldspar	30	The lighter areas of the section contain fine equigranular alkali feldspar and less amphibole.
3. Chlorite	20	Fine chlorite occurs throughout.
4. Biotite	7	Small blades of brown biotite have been developed in patches and veinlets.
5. Pyrrhotite	6	Patches and grains of pyrrhotite are widely distributed.
6. Magnetite	4	This mineral occurs as minute disseminated grains.
7. Quartz	3	Some quartz is found in association with the opaque minerals.

TEXTURE: The texture is one of a fine grained laminated rock. Some layers appear light grey because of the abundance of feldspar. Seams of quartz, alkali feldspar and magnetite are also evident.

CONCLUSION:

The original rock was argillaceous. Possible thermal activity has caused the development of actinolite, biotite and chlorite. Quartz and magnetite appear to be introduced.

NOTE ON APPENDIX IV

Detailed logs of the core obtained by West Coast Resources are enclosed with the report as Appendix IV. The logging of DDH-1 was carried out in considerably greater detail than for the remainder of the drill holes, since it was judged that the time involved in such detailed logging might better be devoted to outcrop examination. In view of the results achieved, this change in emphasis is now open to question.

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth: 718'

Page No: 1 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B. D. Pearson.

Section	ALTERATION: Zeolite	ALTERATION: Saussurite	ALTERATION:	ALTERATION:	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
0						Overburden		Overburden - not recovered.									
10																	
20																	
30																	
40							← Sulfides strongly oxidized. ← Nature and attitude of contact uncertain due to fracturing. Apparently abrupt	32'-37': Coarse fragmental Dacite to Andesite. Cream to light grey color. Some angular Pyrrh. frags. to 0.5" diam. with dissem. Pyrrh. Angular to sub-rounded volc. frags. to +1". Pyrrh. very mag.	1 %	-37.5							
50							High-angle fault zone. Zeolitic flour, possibly some chlorite.	37'-76': Strong zeolite alteration and veining. Rock near top is probably P.g. Andesitic tuff, with groundmass pervasively saussuritized. Lower parts appear to be coarsely fragmental.	0.5 %	-48-							
60							← Small vug with euhedral zeolite crystals.			-57-							

Ave Core Rec'y/Hole 99.3%

COMMENTS:

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 2 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Sausurite	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
60					Weak			37'-76' (Cont.)									
70					Very Strong		Zeolite vein zone at 15° to core axis.		< 0.5	-67-							
80					Weak		Weak fracture zones.	76'-127': Coarse fragmental. Angular to subrounded fragments to 1" diam. (Exceptionally, to 3".) Some may be larger, but diam. of core makes them appear as layers. Composition ranges from Andesite to Rhyolite. Outlines sometimes obscured by pervasive sauss. alteration. Some small fragments contain up to 50% dissem. Pyrrh., but average sulfide content is low.		-77-						
90					Very Strong		2" zone of f.g. dissem. Biotite. Blocky frags in fracture zone.			-87-							
100							6" zone of very fine grain banded tuff at 37° to core axis. Grades downward into coarse fragmental.	Note on Biotite: Where it occurs, rock is light-chocolate brown color. Mineral is very fine grained, almost certainly secondary. In chloritized zone, fragments are a distinctive tan color. Pyrite is dissem. along fractures in chloritic zone.	< 1	-96-							
110										-106-							
120										-117-							

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 3 Of 12
Core Size: B3
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Saussurite	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
120				Nil	Wk			76'-127': Continued. Note on sulfides: Pyrrh. is assoc. with fragments and fragmental rock, Pyrite is found only along late fractures.									
								127'-129': Feldspar Microporphyry. Much Biotite gives it a strongly brown color. Alteration has made boundaries indistinct. May be a large fragment.		127							
130					Nil			129'-136': Massive green (chloritic) and brown (Biotitic) fragmental. Rhy.-Dac. Frags. to 2".	1-2								
								137'-138': Core missing. Fragments indicate core ground.		137							
140								138'-142': Massive with dissem. Biotite. Mottling suggests fragmental. Pyrite/Pyrrh = ~5. At 142', whisps of f.g. Pyrite suggest disrupted banding.	4								
							Edges of fragments often indistinct.	142'-144': Massive gray-green f.g. rock. - grades into -									
150					Very Weak		Tuffaceous banding, with Biotite, curved, about 35° to core axis.	144'-159': Coarse fragmental, cream to light gray color. At 157', several 1"-3" frags. of feldspar microporphyry with Biotite in matrix of frags. Rock grades down over 2' (157'-159') into -	1-2 (P_{yrrh}) (P_y)	147							
								159'-165': Mottled, light grey f.g. volcanic. Grain size diminishes downwards. Nearly sharp base at 60° to core axis.		157							
160								165'-~179': Tuff, grey, brown, green, with numerous small grey Feldspar phenos. Bottom contact gradational.									
					Nil to Very Weak		Tuffaceous banding at ~45°.			167.5							
170							Tuff-breccia contact gradational.	175'-179': Small patches of Pyrrh. are bordered by Chlorite.									
							¼" streak Pyrrh. at 30°			177.5							
180								179'-510': Volcanic breccia (see next page)									

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 4 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
180				Strong		0.1" vein at 15° (Prob. haumontite)	179'-510': Volcanic breccia, spectacularly developed. Fragments angular to subrounded, up to several inches across. Some sections have Pyrrh. as fragments and in matrix. (188'-196' and 296'-298'). At 195' one subrounded Pyrrh. fragment contains one small patch of Chalcopyrite.									
190						closely packed angular fragments especially conspicuous here. Very heterogeneous. Pyrrh. & Chalcop.			-186.5								
200							Short sections are dominantly tuffaceous (228'-234' and 291'-296'). There are high-angle Zeolite veins and alteration in the intervals 182'-185' and 301'-303'. Fragments above 298' are more heterogeneous. Irregular patches of Pyrrh. are conspicuous at 324'-325'. Biotite largely confined to individual fragments.		-197.5							
210				Nil		Pyrrh. predom. in matrix of breccia, as patches and dissem. surrounded by Chlorite.		1 - 2%	-208							
220							190'-192': Some of fragments are very fine-grained, and light tan with a whitish altered border. Suspect orthoclase with later alteration.		-218							
230							In sections which are dominantly tuffaceous, fragment boundaries are generally indistinct.		-228							
240						WK. fracture with Zeol.			-238							

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 5 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B. D. P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
240							1" thick zone of very thin, parallel zeolite veins at 25° to core axis.	179'-510': Volcanic Breccia (cont.)									
250					N.F.		3" frag. contains ~10% Pyrrh.	Most of this section is very light grey. 276.5'-278' is exception, being very dark grey, save for several irreg. thin light streaks.	1 - 2	248							
260							Conspic. Patches of Pyrite, Others of Pyrrh.			258							
							Frag. texture especially distinct.										
270							Largely tuffaceous. May be some fragments			268							
							See note on color.										
280							Occasional suggestion of fragmental texture. Largely tuffaceous.		0.5 - 1	278							
290								295.5'-298': Irreg. patches and whisps of Pyrrh. in dark (probably Chloritic) groundmass. Some Biotite developed.	10	288						
300									1	298							

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 6 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
300					Sl.		Set of thin (0.1") zeolite veins at 10° to core axis. Part of section entirely altered to clay.	179'-510': Volcanic Breccia (cont.)	1	301							
310								303'-316': Sulfides as Pyrrh. dissem., and randomly oriented planar concentrations (as opposed to discrete, sharply-bounded veins.). Occasional angular patch suggests fragment. (See 314').	5-10	308							
320							Several very white P.g. frags. Albitite?		2-4	318							
330					Virtually Nil		Pyrrh. prominent. Biotite suggests fragments.	Very minor Pyrite scattered through Pyrrh.	0.5-2	328							
340								343'-345': Small, mostly anhedral, white Feldspar phenos, are conspicuous in Biotite-rich groundmass.	2-4	338							
350								See DDH 3, 123'-129' ↗ 358'-365': Black irreg. patches of coarsely crystalline Actinolite (?) as radiating crystalline aggregates. Minor Pyrrh. inside clusters. Aggregates have grown in matrix, often adjacent to a fragment.	1-2	348							
360										358							

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 7 Of 12
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
360					Nil			179'-510': Volcanic Breccia (cont.)
370							groundmass much darker in this section.	Fragmental texture much more obvious below 363', groundmass much darker. Light gray again by 370'.
380							Patchy chlorite developed in groundmass, often with Pyrrh.	
390							← Thin (<1") Biotitic tuffaceous band at 65°	
400							← Prominent patches of Pyrrh. ← Small white feldspar phenos. prominent.	
410							← 0.5" Zeolite vein at 15°	
420								

COMMENTS:

Ave Core Rec'y/Hole

% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
1-2	368							
2-4	378							
10	388							
2-4	398							
2-4	408							
	418							

Largely Pyrrh. Minor Pyrite locally.

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 8 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
420								179'-510': Volcanic Breccia (cont.)									
430										428							
440								Below 448', core is generally darker in color. Although obviously a mixture of tuff and breccia, many fragments have indistinct outlines. However, some are sharply outlined.		438							
450					Nil			Probably significant is the first appearance of Epidote below 460'. Individual fragments and thin streaky sections affected. These were probably originally lime-rich.	2-3	448							
460										458							
470								Core cut for 3' length by 0.1" Zeolite vein subparallel with axis.		468							
480										478							

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 9 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	COMMENTS: / Ave Core Rec'y/Hole	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
480					Weak	0			179'-510': Volcanic Breccia (cont.)	1								
490					Moderate	0					488							
500					Weak	0			508'-510': largely tuffaceous with some small fragments of Pyrrh.		498							
					Mod.	0			Thin open veinlet with Calcite crystals.									
510					Weak	0			510'-562': Epidote-altered Tuff, locally with subrounded fragments.	1-2 except locally where shown.	508							
520					Nil	0			Below 520' core is dark grey to black, presumably due to increase in content of f.g. mafics. slightly magnetic. Possibly some f.g. Magnetite as well as Pyrrhotite.		518							
530						0					528							
540						0					538							

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 10 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
540								510'-562': Epidote-Altered Tuff (cont.)
550					Nil			
560								562'-566': Brown (Biotitic) and grey f.g. Tuff with fluidal banding at 60°-90° to axis of core. Some poorly defined fragments at top.
570								566'-577': Porphyritic Tuff, in part with f.g. Biotite.
580					Weak		Sharp contact at 35° to core axis.	577'-598': Grey Tuff, v.f.g. with infrequent small mottled patches (0.2" diam. max.) (Fragments?) Sulfides dissem., very fine grained, and generally sparse. Rare small clots.
590					Nil		0.1" Zeolite vein at 7° to core axis has 1" bleached zone on either side.	598': Contact zone is peculiar. Angular fragments from the lower unit sit within the overlying f.g. tuff. Does not appear to be a sub-aqueous phenomena.
600							1" zone with Strong Pyrrh. dissem. See note on contact.	598'-606': See over

Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
	2-4	548							
		558							
	1	568							
		578							
	2-4	588							
		596							
		598							

COMMENTS:

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 11 Of 12
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
600								598'-606': Porphyritic Fragmental Tuff, rich in Biotite. Fragments small (0.1"-0.5") and only occasionally well-defined.	2-4								
610								Note: Block at 608' was mistakenly labelled 618' by drillers, and all subsequent blocks mislabelled. Corrected figures are given in this log.	1-3	608							
620					Weak		Contact sharp but highly irregular. Grey Tuff below contact is partially Biotitized within ½" of contact.	606'-620': Grey tuff with small (<0.02") irreg. green patches and Feldspar microphenocrysts. Infrequent scattered fragments rounded to angular < 1" across. The upper foot and lower 2" are fine grained.		618							
							Contact sharp and planar at 22° to core axis.		<1								
630					Nil		Contact sharp and planar at 60°.	620'-623' and 625'-663': Fragmental tuff, with indistinct, strongly Biotitic fragments.* Biotite diminishes during interval 644'-652' and below 654'.		628							
							Contact sharp and planar at 60°.	623'-625': Andesite - Dike?- fg. light green. Sharp contacts. Enclosing rocks are identical in appearance and are classed as one unit. Small black Biotite flakes in Andesite totally unlike hydrothermal Biotite tend to confirm its identification as a dike.	2-4	638							
640																	
650					Core has been split, but apparently weak.		652' - Thin section identified as extrusive Latite. Presence of Chalcopyrite confirmed.	625'-664': Fragmental tuff (cont.) * Groundmass often rich in Biotite. Pyrrh. common as disseminated and irreg. fragments. Minor Pyrite, possibly some Chalcopyrite.		648							
660										658							

Hole No. 1
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: ELK
Date Started:
Date Finished:
Total Depth:

Page No: 12 Of 12
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Zeolite	Epidote	Biotite	Chlorite	Fracturing	Geology	COMMENTS:	Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
660									625'-664': Fragmental Tuff (cont.) This unit appears to be a Tuffite in the sense used by Ridler.										
								Core split. Attitude and nature of contact uncertain but abrupt.											
664									664'-718': Andesite, very fine grain, dark grey-green, with numerous weak irreg. veinlets of Pyrrh. and intermixed minor Pyrite. Both sulphides also occur as disseminations.										
670												669							
									~~Rock appears to be a flow and not a tuff.~~ It is similar, almost identical to one of the important host-rocks at Island Copper.			678							
680								Sedimentary banding at 60°-65°, beautifully developed.				679							
									At 683' sedimentary laminations are beautifully developed.			683							
									Thin erratically-oriented dark grey quartz veins are sparsely developed in this rock type (again ∥ with Island Copper) and contain a moderate (5%) amount of sulfide.		2 - 4								
690								Two specimens taken at 687' for thin-section study, indicate that this unit is an argillite, with 30%-50% f.g. actinolite, 30% alkali Feldspar, 9%-20% Chlorite.										
									Note: Rock has a cherty appearance. Can it be? Locally (see at left) it contains Biotite. Should be thin-sectioned.			693							
700																			
												703							
710								See note	T12'-713': Light grey section composed largely of small crystals (visible under 10x) of Feldspar plus 5% Pyrrh.			713							
718									End of hole.			718							

Core split but apparently weak to Nil.

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth: 759'.

Page No: 1 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D. Pearson

Section	ALTERATION: Epidote	ALTERATION: Zeolite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
0						0-6': Overburden.
6						6'-117.5': Epidote-altered Andesite Tuff-Breccia. Numerous irreg. fragments (most of them rich in Epidote) in a medium-green f.g. matrix often porphyritic in Feldspar. Sulfide is Pyrite.
10			Weak			
20			Mod.	0	set of weak closely-spaced Zeolite veins with red (Hematitic?) stain.	
30						
40			Weak		1" zone of Calcite and Zeolite veins at 20°-35°. (Veins are monomineralic.)	↑ Porphyritic Mostly fine-grained, Porph. in sections. ↓
50			Str. W/Str. Str.	0		60'- Thin-section identified as brecciated Andesite flow with Plagioclase phenocrysts. Epidote veinlets developed in interstices of breccia.
60						

% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
< 0.1 ← increasing	6							
	18							
2-3	28							
	38							
5	48							
2-3	58							

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 2 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Epidote	ALTERATION: Zeolite	ALTERATION	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
60								6'-117.5': Epidote-Altered Tuff (cont.) Most frags. are altered to Epidote.									
70					Weak					68							
80					Weak					78							
90										88							
100					Str			Actually, an assortment of lithologies, including porphyritic felsic + mafic volcanics. Mafics are rare. Porphyries minor. Epidote rare.		98							
110					Weak			Steep (15° to core axis) zone of zeolite veining and clay alteration; possibly some faulting.		108							
120								117.5'-118.2': Subrounded white fragments (chert?) in sparse chlorite-rich matrix. Some thin chloritic seams at upper contact. Chloritic slip at 45°. Irreg. contact. 118.2'-122', 123'-126': Heterogeneous fragments, rounded to subrounded, of volcanic and cherty banded rock, to 2" diam.		118							

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 3 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Epidote	ALTERATION: Zeolite	ALTERATION	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
120								122'-123': Rhyodacite with small mafic clots, may be large boulder.	5								
126						← gradational contact		126'-197': Andesite Tuff-Breccia similar to 6'-117.5'. Unit becomes lighter in color downward. Bottom contact abrupt at 38° to core axis, marked by thin sheared vein. Groundmass generally lighter grey to white below 126'. Fragments only hazily defined. May be Dacitic over much of this interval.		128							
130																	
140										138							
150					Nil				2-5	148							
160										158							
170										168							
180										178							

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 4 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION: Kaolinite	ALTERATION: Chlorite	ALTERATION: Zeolite	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
180							126'-197': And.-Tuff Breccia (cont.) Fragmental texture more sharply defined over bottom several feet.
190				Nil to Weak		Contact abrupt at 38°.	Probably dikes.
197						Contact sharp at 26°	197'-200': Fine-grained green Andesite, with scattered darker fragments of similar material, identical with rock at collar.
200						Contact sharp at approx. 15°.	200'-205': Dacite crystal tuff with scattered Andesite fragments to 2" in diam.
205						Contact sharp at 10°	205'-210': Same as 197'-200'.
210							210'-224': Same as 200'-205', but with some rounded Andesite fragments up to 6" in diam. Where darker, identical with rock at collar.
220							
224							224'-225': Probably same but darker.
225							225'-227': Chloritic clay with white (Qtz-Cal.) vein material. Prob. some Zeolite
227	Weak to Absent			Mod. to Strong			
230							227'-245': Andesite Tuff, fine-grained, dark grey, slightly porphyritic. Fragments are small (<0.2") numerous, and with a distinctive light tan (clay?) alteration.
240							

COMMENTS:

Ave Core Rec'y/Hole

% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
1-3	188							
	198							
	208							
	218							
—	228							
	238							

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 5 Of 13
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
240					227'-245': Andesite Tuff (cont.)									
245				← Contact sharp at 55°.	245'-262': Dacite Crystal Tuff, same as 200'-205'. Some f.g. Andesite fragments to 4" diam. Fine-grained (chill?) border at base.		-247							
250														
260				← Contact sharp but irreg. at approx. 45°.	262'-270': Andesite Tuff, f.g. dark grey, with several large, irreg. subrounded fragments of overlying unit near top.									
270				← Sharp but irreg.	270'-282': Dacite Crystal Tuff, but altered and veined. Dirty-looking. Sheared 276'-278'.									
280														
282	Altered during depos.			← Gradational over 1".	282'-321': Dacite to Andesite. Some silicification, shearing, veining. Very complex: locally with Feldspar phenocrysts.									
290														
300														

Ave Core Rec'y/Hole

COMMENTS:

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 6 Of 13
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

300
310
320
321
325
330
340
350
360

Altered during deposition.

← Sedimentary contact at approx. 55°.

← Sed. contact at 50°.

321'-325': Fresh Andesite Crystal Tuff

325'-389': Porphyritic Dacite to Andesite. Upper 2' complex with fragments (?) and silica (?).

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 7 Of 13
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

360

325'-389': Porph. Dacite to Andesite (cont.)

370

380

1" Qtz. (chert?)-pyrite zone at 60°.

390

389'-397': Same as overlying unit. Top 2' similar to Top 2' of overlying unit.

397'-423'; Same, with variable degrees of Feldspar pheno. development and bleaching. Upper foot as in top of overlying units. This section may contain several units.

400

410

420

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 8 Of 13
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval # No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									
420				← gradational contact.	423'-503': Andesite, porphyritic in Feldspar, with reasonably consistently fine grained medium to dark green groundmass. Upper contact is gradational. At 503' there are a few angular fragments.									
423														
430														
440														
450														
460														
470														
480														

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 9 Of 13
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

480
490
500
503
510
520
530
540

423'-503': Andesite (cont.)

488' - Thin section indicates rock is an extrusive Trachyte porphyry with altered plagioclase phenocrysts.

503-548': Andesite - same as above, but badly shattered, faulted and with Chloritic alteration.

Below 516', rock appears more heterogeneous with possible flowage texture. Possibly an ash flow.

Qtz. veining and dissem. Calcite.

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 10 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval.	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MOS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									
540				503'-548': Andesite (cont.)										
548														
550				548'-627': Andesite to Dacite Ash-flow Toffs.										
560														
570														
580														
590														
600														

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 11 Of 13
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									
600					548'-627': Andesite to Dacite Ash-Flow Tuffs (cont.)									
610														
620														
627														
630					627'-637': Porphyritic Andesite Crystal Tuff. Upper 4" fine-grained.									
637														
640					637'-703': Andesite, fine-grained, dark green and grey, with numerous irreg. bedding(?) lines.									
650														
660														

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 12 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

660

637'-703': Andesite (cont.)

670

680

690

700

703

703'-708': Chloritized Fault Zone with $2quart_3$ and Calcite filling. Rock shattered and Chloritized from 696' to 712'.

708

710

708'-734': Andesite (same as 637'-703')

730

Hole No. 2
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth: 759'

Page No: 13 Of 13
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval.	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
720					708'-734': Andesite (cont.)										
730															
734					734'-750': Andesite - same rock as above, but sericitized and chloritized. Almost a powder.										
740															
750					750'-759': Andesite - Same as 637'-703' and 708'-734'. Unaltered.										
759															

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 1 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D. Pearson

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

Mineralogy & Structure	Descriptive Geology
	0-13': Overburden
	13'-25': Andesite Crystal Tuff - grey, fragments to 0.1", less than 10% by volume. Grades down into
	25'-90': Andesite Tuff-Breccia. Fragments indistinct, rarely to 1" in size,
1' Zeolite vein at 23°	

0
10
13
20
25
30
40
44
45
50
60

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 2 Of 17
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

60

25'-90': Andesite Tuff-Breccia (cont.)

70

80

84'-85': Distinctive layer at 22°.

See note

Contact gradational

90

90'-116': Dacite Breccia. Fragments darker than groundmass, irreg. with diffuse borders.

100

110

116

116'-123': Crystal Tuff

120

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 3 Of 17
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

120

116'-123': Crystal Tuff (cont.)

123

123'-129': Complex zone with silica, much dissem. Pyrrhotite and radiating clusters of coarse Actinolite crystals. Similar sections occur at 230'-236' and 348'-355' and in DDH-1 at 358'-365'.

129
130

129'-147': Dacite tuff with mottled dark irreg. fragments and much Pyrite as disseminations and veinlets. Minor Pyrrhotite.

140

147 ← gradational contact.

147'-154': Andesite Tuff, dark grey to black, fine grained. Probably welded.

150

154 ← Contact sharp at 20°.

154'-163': Rhyodacite Crystal Tuff, white Feldspar phenocrysts and small (0.1"-0.2") dark green mafic clots. Bottom contact is sharp and highly irregular, marked by 0.1" veinlet of small black Actinolite crystals.

160

163 ← Contact is 0.1" Actinolite veinlet

163'-170': Andesite Tuff - same as 147'-154'. Crude indistinct banding at 50°.

170 ← Some ground rock and pyrite. Probably fault causing repetition of section.

170'-186': Rhyodacite Crystal Tuff - same as 154'-163'.

180

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 4 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

Mineralogy & Structure	Descriptive Geology
	170'-186': Rhyodacite Crystal Tuff (cont.)
~ *Contact is same irreg. 0.1" Actinolite veinlet as at 163'.	186'-198?': Andesite Tuff- Same as 147'-154', 163'-170'. All sorts of flow attitudes. Contact gradational and arbitrary over several feet. Underlying section is certainly part of same cooling unit.
	198'-266': Dacite to Rhyodacite Tuff-Breccia. Fine-grained, light grey matrix with 20% dark irregular fragments (to 1" max. diam.) with diffuse borders. Below 223', matrix contains Feldspar phenocrysts. Below 219', fragments appear rarely, and are indistinct.
	187'- Thin section identified as Trachyte from centre of flow or margin of sill.
	192' - Thin-section identified as sericitized Ash tuff. Note: This specimen contains 8% Apatite, 60% Sericite, 15% Magnetite, 15% Alkali Feldspar. This rock is exposed in outcrop where Folk called it an Ignimbrite. Magnetite content makes it appear very basic.

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 5 Of 17
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

240

198'-266': Dacite to Rhyodacite Tuff-Breccia (cont.)

250

Contact at 266' is sharp but highly irregular with irreg. seams of underlying f.g. black rock penetrating up 4"-5" into overlying unit.

260

See note on contact

266

266'-341': Andesite, light to medium green. Groundmass fine grained at both margins for 8' at top and 5' at bottom. Well-developed crystal structure internally. Crystals anhedral, max. 0.02". Several fragments noted at 320'. Rather thick for dike. Probably sill.

270

280

290

300

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 6 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

266'-341': Andesite (cont.) sill?

Sharp irreg. contact.

341'-396': Rhyodacite? – medium to light grey, locally with Feldspar phenocrysts. Similar to Dacite to Rhyodacite Breccia in section 198'-266'. Section from 348' to 355' identical with section from 230' to 236', contains coarse clots of black Actinolite, with Pyrite and Pyrrhotite.

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 7 Of 17
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

360
370
380
390
396
398
400
410
420

341'-396': Rhyodacite (cont.)

Contact sharp at 45°.
" " but irreg. at approx. 45°.

396'-398': Andesite, same as 266'-341'. fine-grained at margins, crystalline at center. A dike, or very thin sill.

398'-570': Rhyodacite to Dacite. Same as 198'-266', 341'-396'. Sections from 497' to 500' and 528'- to 530' are identical with 230'-236', 348'-355' containing aggregates of coarse radiating Actinolite crystals. At 547', some f.g. Biotite is developed. Perhaps a flow breccia in part.

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 8 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
420					398'-570': Rhyodacite to Dacite (cont.)										
430															
440															
450															
460															
470															
480															

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 9 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
480					398'-570': Rhyodacite to Dacite (cont.)									
490														
500														
510														
520														
530														
540														

COMMENTS:

Ave Core Rec'y/Hole

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 10 Of 17
Core Size: B.
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval.	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

540
560
560
570
580
590
600

398'-570' : Rhyodacite to Dacite (cont.)

Highly irreg. contact.

570'-588' : Chalk-White f.g. Porphyry. Glowing-ash deposit? Bottom contact extremely irregular over 6' zone, with 3' section of f.g. Dacite containing 0.1" mafic clots.

588'-590' : Silica-rich mottled rock - grades down into -

590'-604' : Mottled Andesite, dark grey, with numerous dark streaks. Some coarse-grained Actinolite patches in interval 598'-600'. Possibly a flow breccia.

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 11 Of 17
Core Size: B.
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

600
604
610
620
623
630
633
638
640
650
660

590'-604': Mottled Andesite (cont.)

604'-623': Rhyodacite (Crystal Tuff?)
607'-622'— light grey with diffuse green mottled patches. Margins of unit are light grey with small feldspar phenos. At 606' upper undulating contact reappears for a few inches. Lower contact sharp but highly irregular over 1' of core length. No bleaching. Upper contact lighter in color, apparently graded in size. Probably right side up.

623'-633': Andesite (flow?)

633'-638': Dark green Andesite Tuff.

638'-677': Dacite Flow Breccia

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 12 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
660					638'-677': Dacite Flow Breccia (cont.)
670					
677					677'-691': Porphyritic Dacite to Andesite. Top foot and lower two feet show brown matrix; rest is light green.
680					
690					
691					691'-714': Andesite flow breccia Lower contact siliceous.
700					
710					
714				contact sharp at 55°	
715				" " at approx. 60°	714'-715': Andesite flow breccia.
					715'-722': Andesite Crystal Tuff. Lower contact sharp but irregular.
720					

COMMENTS:

Ave Core Rec'y/Hole

% Sulphides	Drilling Interval	% Core Recovered	Sample Interval # No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 13 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
720					715'-722': Andesite Crystal Tuff (cont.)
722					722'-737': Andesite flow.
730					
737					
740				← Contact irreg. at 20°	737'-743': Andesite crystal tuff, very fine grained in center.
743					743'-753': Andesite Flow Breccia. High-angle fracturing with light chloritic clay over interval 747'-748'.
750					
753					753'-775': Andesite to Dacite Tuff. Fine-grained groundmass with 5%-7% small blocky feldspar phenocrysts and green mafic clots. Several subrounded fragments about 2" in diam. Small Feldspar lathes developed in lower foot. Bottom contact irregular but sharp.
760					
770					
775					775'-814': Diorite with approx. 10% mafics (hornblende) as irreg. clots.
780					

COMMENTS:

Ave Core Rec'y/Hole

% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 14 Of 17
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology
780					775'-814': Diorite (cont.)
790					
800					
810					
814					814'-819': Andesite (Tuff?). Upper contact irreg. lower appears to be planar at approx. 45°. Possibly a dike but no marginal alteration or chill border.
819					819'-829': Diorite, but complex. Much more mafic than section from 775'-814', but very variable. Lower contact sharp but undulating at approx. 45°.
829					829'-831': Andesite to Dacite. Fine-grained medium grey with green mottled patches lower contact gently curved at 15° to 18°.
831				Sed. laminations parallel with contact.	831'-861': See over.
840					

COMMENTS:

Ave Core Rec'y/Hole

% Sulphides	Drilling Interval.	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 15 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
840					831'-861': Rhyolite-Rhyodacite, fine-grained chalky white, with small diffuse mafic spots throughout. No internal banding, but upper 3" show sedimentary laminations parallel with the contact. Banding in basal 2".									
850														
861				← Irreg. contact at approx. 30°.	861'-898': Diorite with variable mafic content. Complex. 1" Pyrrhotite band with minor Pyrite at 889' at 55°.									
870														
880														
890				← 1" Pyrrh. band.										
898				← Contact sharp at 30°	898'-943': See over.									
906														

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

900
898'-943': Andesite (top 5') dacite Crystal Tuff.
910
920
Complex zone
943'-944': Diorite - fine to med. grain 40% mafics.
944'-945': Diorite - medium to coarse-grained, 7% mafics.
945'-950': Same as 943'-944'.
930
950'-950.5': Andesite, same as 898'-903'.
950.5'-951': Diorite, same as 943'-944'.
951'-953': Andesite as in 950'-950.5'. Feldspars are blocky, up to 0.2".
940
953'-979': Diorite, very complex.
943 ← Contact sharp but highly irregular.
950 ← Contact sharp at 50°.
953
960

Hole No. 3
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 17 Of 17
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

960

953'-979': Diorite (cont.)

970

979 ← Contact sharp at 50°

981

979'-981': Andesite flow breccia. Lower contact sharp at 50°.

981'-986': Andesite Tuff. Lower contact irregular.

986

990

986'-998': Complex Diorite.

998

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth: 698'.

Page No: 1 Of 11
Core Size: BX
Scale: 1" = 10'
Logged By: B.D. Pearson

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

0-8': Overburden

8'-79': Andesite Tuff, f.g., medium to dark green. Rare subrounded fragments of Andesite. Occasional zones of very small (0.02") Feldspar phenos.

53'-58': Andesite undergoing Dioritization. Rock resembles much of that from 306' to 698'.

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 2 Of 11
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

60
70
79
90
100
110
120

79'-161': Mixed f.g. Andesite Tuff, Diorite (87'-123') as poorly defined fragments, and Andesite fragments subrounded to angular. (Biotitized and porphyritic below 124'.) Origin pussling.

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 3 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

120
130
140
150
161
163
170
177.5
180

161'-163': Andesite Tuff, f.g. and slightly porphyritic.

163'-177.5': Biotitized porphyritic Tuff fragments in a fine-grained largely Andesitic matrix.

177.5'-192': See over.

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 4 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

180

Dike → ?

177.5' - 192': Andesite Tuff, porphyritic, medium green. Contains short irreg. sections of surrounding unit.

190

192

192' - 210': Same as 163' - 177.5'.

200

Diorite !

210

210' - 286': Andesite - Dacite < Tuff ? Flow ?
Relatively uniform medium to f.g. speckled grey. Rare scattered small (0.2") white-rimmed mafic fragments at 222' - 223'.

220

230

240

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 5 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

240

210'-286': Andesite-Dacite (cont.)

250

260

270

280

286

290

286'-306': Diorite, medium grained, with scattered irreg. sections of above unit. No contact phenomena. Gradational borders.
Note made after thin-section work: This is probably an extrosive rock, probably a porphyritic Andesite.

300

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 6 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
				Mineralogy & Structure	Descriptive Geology									

286'-306': Diorite (cont.)

306'-698': Andesite-Dacite ~ Tuff? ~ Flow?
Same as 210'-286'. Monotonously uniform throughout, with local slight coarsening of texture. Occasionally slightly porphyritic. Badly broken from 493' to 555'. Numerous chloritic clay fault zones. Broken 388'-398', 454'-465', 665'-668'.

697' - Thin-section identified as intrusive Diorite. Contains 50% normally-zoned Plagioclase (An 35-40), 13% Hornblende, 12% Biotite, 12% Chlorite, 8% Quartz, 4% Myrmekite, 1% Apatite and a trace of Magnetite.

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 6 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION				Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
							Mineralogy & Structure	Descriptive Geology									
360																	
370																	
380																	
390																	
400																	
410																	
420																	

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: EIK
Date Started:
Date Finished:
Total Depth:

Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
420															
430															
440															
450															
460															
470															
480															

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 8 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
480															
490															
500															
510															
520															
530															
540															

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 9 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
540															
550															
560															
570															
580															
590															
600															

Hole No. 4
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: EIK
Date Started:
Date Finished:
Total Depth:

Page No: 10 Of 11
Core Size: B
Scale: 1"=10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	Mineralogy & Structure	Descriptive Geology	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay

COMMENTS:

Ave Core Rec'y/Hole

600
610
620
630
640
650
660

Hole No. 4
Casing Collar Elev: _ Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project: Elk
Date Started:
Date Finished:
Total Depth:

Page No: 11 Of 11
Core Size: B
Scale: 1" = 10'
Logged By: B.D.P.

Section	ALTERATION	Fracturing	Geology	COMMENTS: / Mineralogy & Structure	Descriptive Geology	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MoS_2 Assay	Au Assay	Ag Assay
660															
670															
680															
690															
698															

Hole No.
Casing Collar Elev: Ground Elev:
Co-Ordinates: N. E.
Inclination: Bearing:

Project:
Date Started:
Date Finished:
Total Depth:

Page No: Of
Core Size:
Scale:
Logged By:

Section	ALTERATION				Fracturing	Geology	COMMENTS:	Ave Core Rec'y/Hole	% Sulphides	Drilling Interval.	% Core Recovered	Sample Interval & No.	% Rec'y. Sample Int.	Cu. Assay	MOS_2 Assay	Au Assay	Ag Assay
							Mineralogy & Structure	Descriptive Geology									