

Mikhail West Property

LOG NO: 0221	KD.
ACTION:	
FILE NO:	

Geological and Geochemical Report  
on the  
Mikhail West Property  
MIKHAIL 3 Claim  
Skeena Mining Division  
N.T.S. 104-B/10E  
Latitude 56°33' North  
Longitude 130°35' West  
British Columbia

FILMED

SUB-RECORDER  
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VANCOUVER, B.C.

November 6, 1989

on behalf of  
INDD-ALTA OIL LTD.  
Vancouver, B.C.

by

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GEOLOGICAL BRANCH  
ASSESSMENT REPORT

19,665

**ABSTRACT**

The Mikhail West property consists of one modified-grid claim of 18 units located approximately 80 km northwest of Stewart, British Columbia. Access to the property is by fixed-wing aircraft from Terrace, Stewart, or Smithers to various airstrips in the area and then via helicopter to the property.

The property lies within the Intermontaine Tectono-Stratigraphic Belt and occurs near the contact between the Stikine Terrane and the unmetamorphosed sediments of the Bowser Basin. The property is underlain primarily by Upper Triassic sediments of the Stuhini Group which have been intruded by the Tertiary King Creek Dyke swarm in the southwest part of the claim. The north-south trending Harrymel-South Unuk shear zone transects the eastern property boundary, and separates the Upper Triassic rock underlying the property from the Lower Jurassic rock east of the property.

The area has an exploration history dating back to the turn of the century when prospectors passed through the region on their way to the interior. In the 1970's, the porphyry copper boom again brought prospectors and companies into the area. The current gold exploration rush began in 1980 with the option of the Sulphurets property by Esso Minerals Canada and the acquisition of the Johnny Mountain claims by Skyline Exploration Ltd. which was brought into production in mid-1988. The adjacent SNIP property is slated for production in 1990.

At this time, the Eskay Creek prospect, located 10 km northeast of the Mikhail West property and currently being explored by Calpine and Consolidated Stikine, is the most significant showing in the area. The prospect comprises at least eight mineralized zones occurring over a strike length of 1800 m within a sequence of felsic volcanics. The mineralization is associated with disseminated sulphides in felsic volcanic breccias and graphitic argillites in contact with overlying intermediate volcanic rocks.

A review of all available information indicates that no work has been filed for the area now covered by the MIKHAIL 3 claim. These files, however,

do show that the entire Unuk River area was subjected to reconnaissance geological mapping and prospecting by Newmont Mines Ltd. in 1959-1962. The Harrymel Creek copper showing is reportedly located adjacent to the eastern edge of the property.

The 1989 exploration program consisted of a helicopter-supported heavy mineral sampling survey. Seven heavy mineral samples, collected from creeks draining the property, yielded sporadically elevated Ag, As, Ba, Cr, Cu, and Zn values. One sample yielded an elevated gold value of 300 ppb.

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## INTRODUCTION

Indo-Alta Oil Ltd. of Vancouver commissioned Keewatin Engineering Inc. to conduct a field exploration program on the Mikhail West property located in the Unuk River area of northern British Columbia. Exploration was directed by Keewatin Engineering Inc. with geological support and field supervision provided by Taiga Consultants Ltd. as a sub-contractor to augment the Keewatin crew.

The objective of the program was to evaluate the property's potential for hosting economic precious metals deposits, and for the purpose of fulfilling the assessment requirements. Exploration consisted of heavy mineral sampling of all the creeks draining the property.

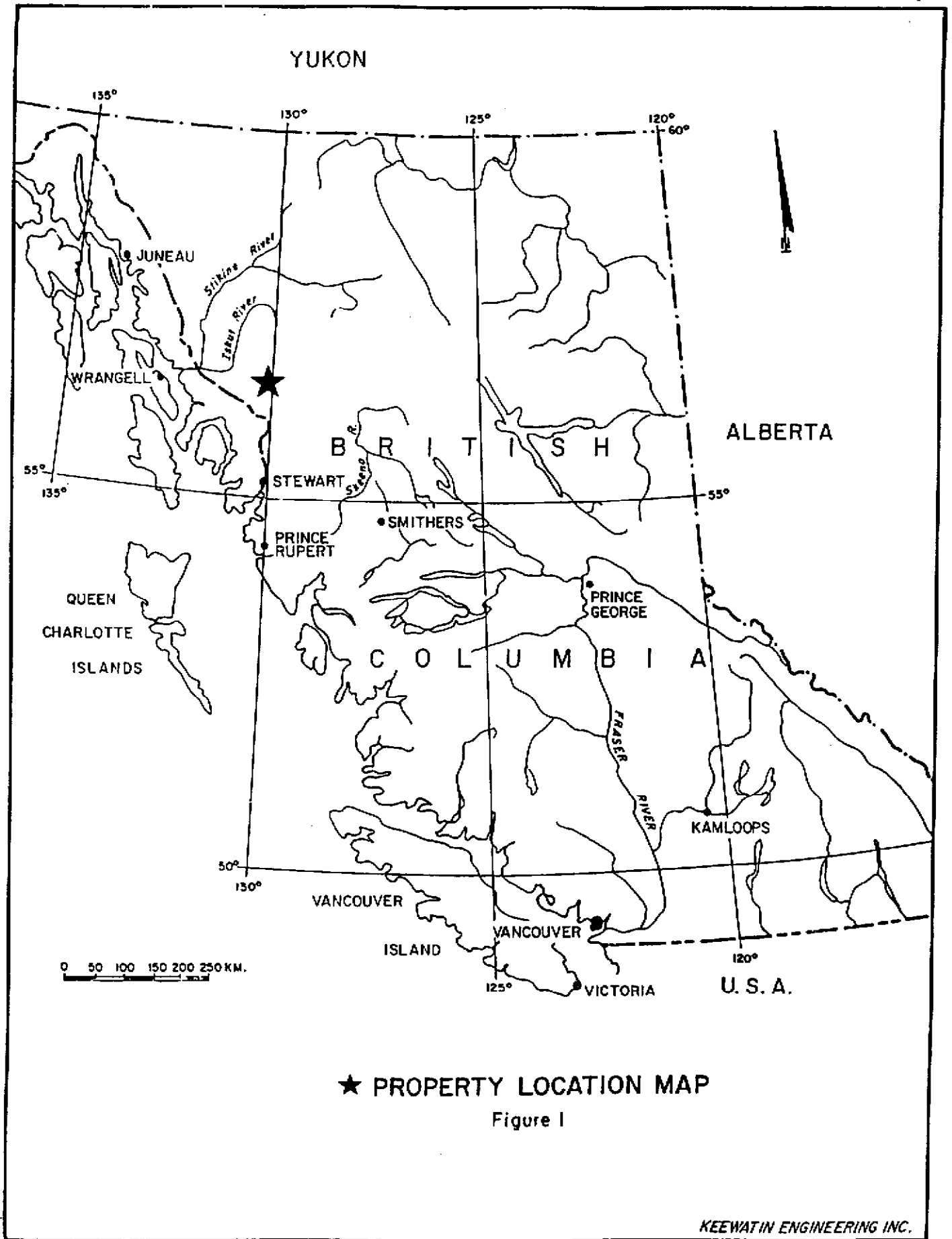
### Location and Access

The Mikhail West property is located in northwestern British Columbia, approximately 80 km northwest of Stewart (Figure 1). The claims are situated within N.T.S. map-sheet 104-B/10E and centered about 56°33' North latitude and 130°35' West longitude. Access to the property is by fixed-wing aircraft from Terrace, Stewart, or Smithers to various airstrips in the area and then via helicopter to the property. The claims can also be directly accessed by helicopter from Stewart.

At some future date, road access to the area from the Stewart-Cassiar Highway could be obtained via the Upper Unuk River and Tiegen Creek valleys.

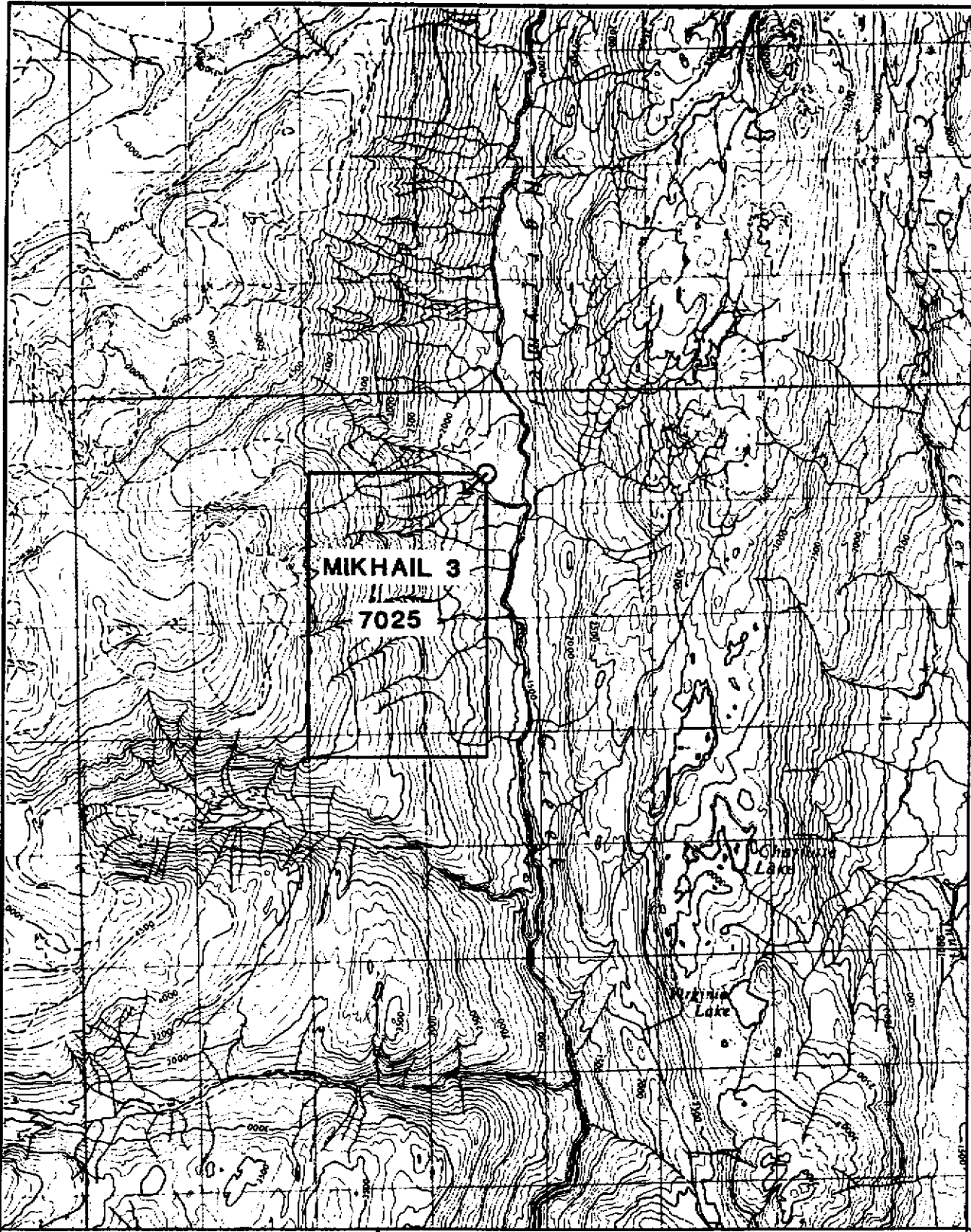
### Property Status and Ownership

The Mikhail West property (Figure 2) consists of one modified-grid claim totalling 18 units, located within the Skeena Mining Division. Relevant claim data are tabulated below:



★ PROPERTY LOCATION MAP

Figure 1



56° 35'



130° 35'

# CLAIM MAP MIKHAIL WEST

DATE NOV., 1989	NTS 104 B/10
PROJECT BC-89-4	MAPPED/ DRAWN BY
SCALE 1:50,000	0 1000 2000 m
KEEWATIN ENGINEERING INC.	FIG. 2

<u>Claim Name</u>	<u>Record Number</u>	<u>No. of Units</u>	<u>Date of Record</u>	<u>Expiry Date</u>
MIKHAIL 3	7025	18	Dec.05/1988	1989

These claims are apparently the subject of an agreement between the claim holder (Teuton Resources Corp.) and Winslow Gold Corp. which have recently optioned the property to Indo-Alta Oil Ltd. The claim records and maps show that the MIKHAIL 3 was subsequently overstaked.

### Physiography and Climate

The Mikhail West property is situated within the Coast Range Physiographic Division and is characterized by northern rain forests and sub-alpine plateaux. Elevations (see Figure 2) range from 518 m near the valley of Harrymel Creek to 1220 m in the western part of the property. The toes of several glaciers reach the western boundary of the property.

A transitional treeline, characterized by dense sub-alpine scrub, meanders through the property at approximately the 915 m elevation. Terrain above tree-line is typified by intermontane alpine flora. Conifers up to 30 metres tall are common below tree-line, especially in stream valleys. Water for camp and drilling purposes is generally in good supply from the numerous creeks draining the claim area.

Precipitation is heavy, exceeding 200 cm per annum, with short mild summers but very wet spring and fall periods. Thick accumulations of snow are common during winter. It is seldom possible to begin surface geological work before July and difficult to continue past September.



### PREVIOUS EXPLORATION

The area drained by the upper reaches of the Stikine, Iskut, Unuk, Craig, and Bell-Irving Rivers has been explored for gold since the late 1800's when prospectors passed through the region on their way to the interior. In the 1970's, the porphyry copper boom again brought prospectors and companies into the area. The current gold exploration rush began in 1980 with the option of the Sulphurets property by Esso Minerals Canada and the acquisition of the Johnny Mountain claims by Skyline Explorations Ltd. The Johnny Mountain deposit was brought into production in mid-1988, and the adjacent SNIP property is slated for production in 1990.

The mineralization at Eskay Creek was discovered in 1932, and active prospecting has continued sporadically since then. Two adits are the result of limited mining activity on this prospect. In 1988, Calpine Resources Incorporated discovered high-grade gold and silver mineralization on the '21 Zone' (*Northern Miner*, November 7, 1988). A number of excellent diamond drill intersections have been obtained to date, including drill hole CA-88-06 which encountered 96 feet of 0.752 oz/ton gold and 1.13 oz/ton silver. Based on the results of 70 drill holes completed to June 1, 1989, a preliminary geological ore reserve of 2.8 million tons grading 0.23 oz/ton gold and 3.3 oz/ton silver has been calculated for the '21 Zone' (Consolidated Stikine Silver Ltd. - 1989 Annual Report).

The Unuk River area was covered by regional geological mapping in 1988 as part of the Iskut-Sulphurets project carried out by B.C. Ministry of Energy, Mines and Petroleum Resources (Britton, et al., 1989). The whole of N.T.S. 104-B is currently being mapped by R. G. Anderson of the Geological Survey of Canada (Anderson, 1989).

The results of a regional stream sediment sampling program conducted over this area were released in July 1988 (National Geochemical Reconnaissance, 1988). Britton (et al.) report that almost every known precious metal prospect in the Unuk River area is associated with high stream sediment gold values. Known gold deposits are also associated with high but variable values for such

pathfinder elements as silver, arsenic, antimony, and barium. Two stream sediment samples (#871368 and #871370) were collected from streams draining the property, exhibiting elevated values for arsenic (41 and 50 ppm respectively).

A review of the material in the B.C. Ministry of Energy, Mines and Petroleum Resources assessment report archives indicates that no work has been filed for the specific area now covered by the Mikhail West property. The files, however, do show that the entire Unuk River area was subjected to reconnaissance geological mapping and prospecting by Newmont Mines Ltd. during the period 1959 to 1962.

The eastern edge of the property coincides with a north-northwest trending cataclastic zone known as the South Unuk Zone. The Harymel Creek copper showing (Minfile #080) occurs within schist in this cataclastic zone. The Minfile mapping plots the occurrence adjacent to the east edge of the property. Field investigations indicate that it is probably located 2 km north, near the northeast corner of the Mikhail West property. Copper and sulphide mineralization located here may extend onto the MIKHAIL 3 mineral claim.

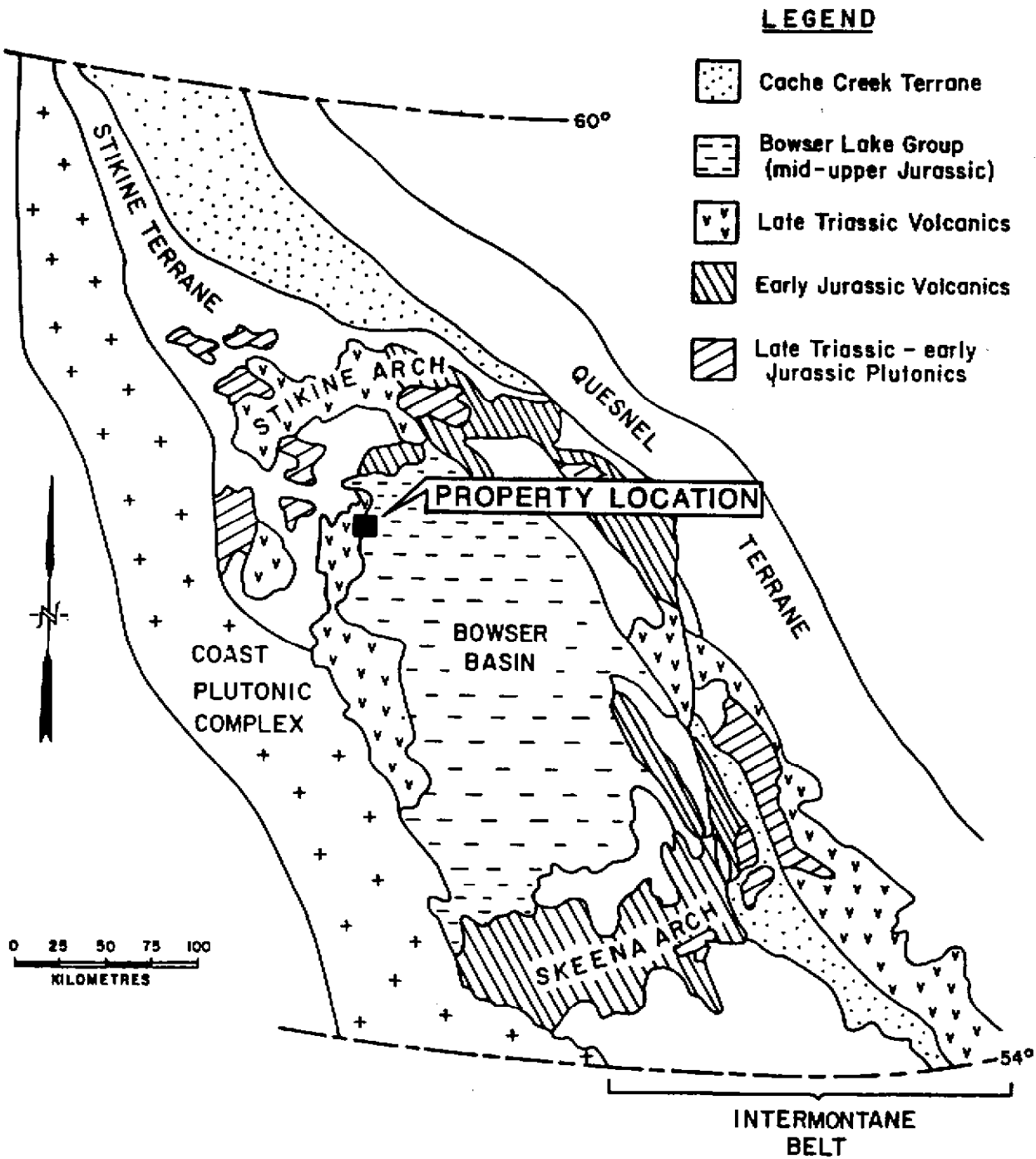
The assessment records (Korenic, 1982) indicate that Duval Corp. undertook a regional heavy mineral survey in the Unuk River area in 1981.

### REGIONAL GEOLOGY

The property lies within the Intermontane Tectono-Stratigraphic Belt, one of five parallel northwest-southeast trending belts which comprise the Canadian Cordillera (Figure 3). The Mikhail West property occurs near the contact between the Stikine Terrane, which makes up most of the western part of the Intermontane Belt, and the unmetamorphosed sediments of the Bowser Basin.

The Unuk River area (Figure 4) is underlain by a thick succession of Upper Triassic to Lower Jurassic volcano-sedimentary arc complex lithologies capped by Middle Jurassic marine basin lithologies. This package has been intruded by a variety of plutons representing at least four intrusive episodes spanning late Triassic to Tertiary time. These include synvolcanic plugs, small stocks, dyke swarms, isolated dykes and sills, as well as batholiths belonging to the Coast Plutonic Complex.

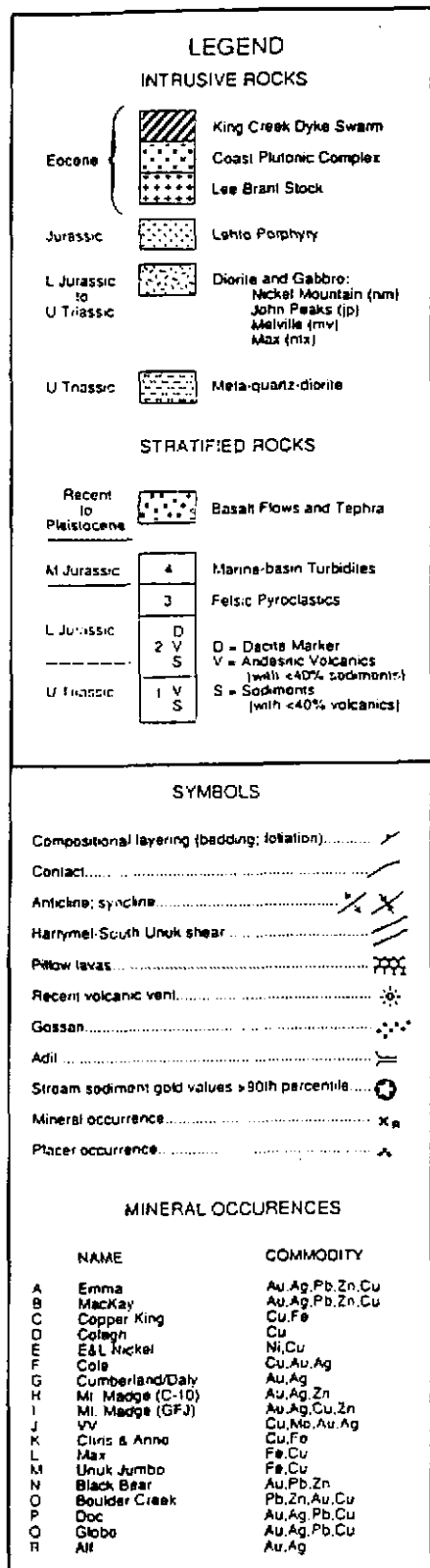
The stratigraphic sequence has been folded, faulted, and weakly metamorphosed during Cretaceous time, but some Triassic strata are polydeformed and may record an earlier deformational event. Remnants of Pleistocene to Recent basaltic flows and tephra are preserved locally.



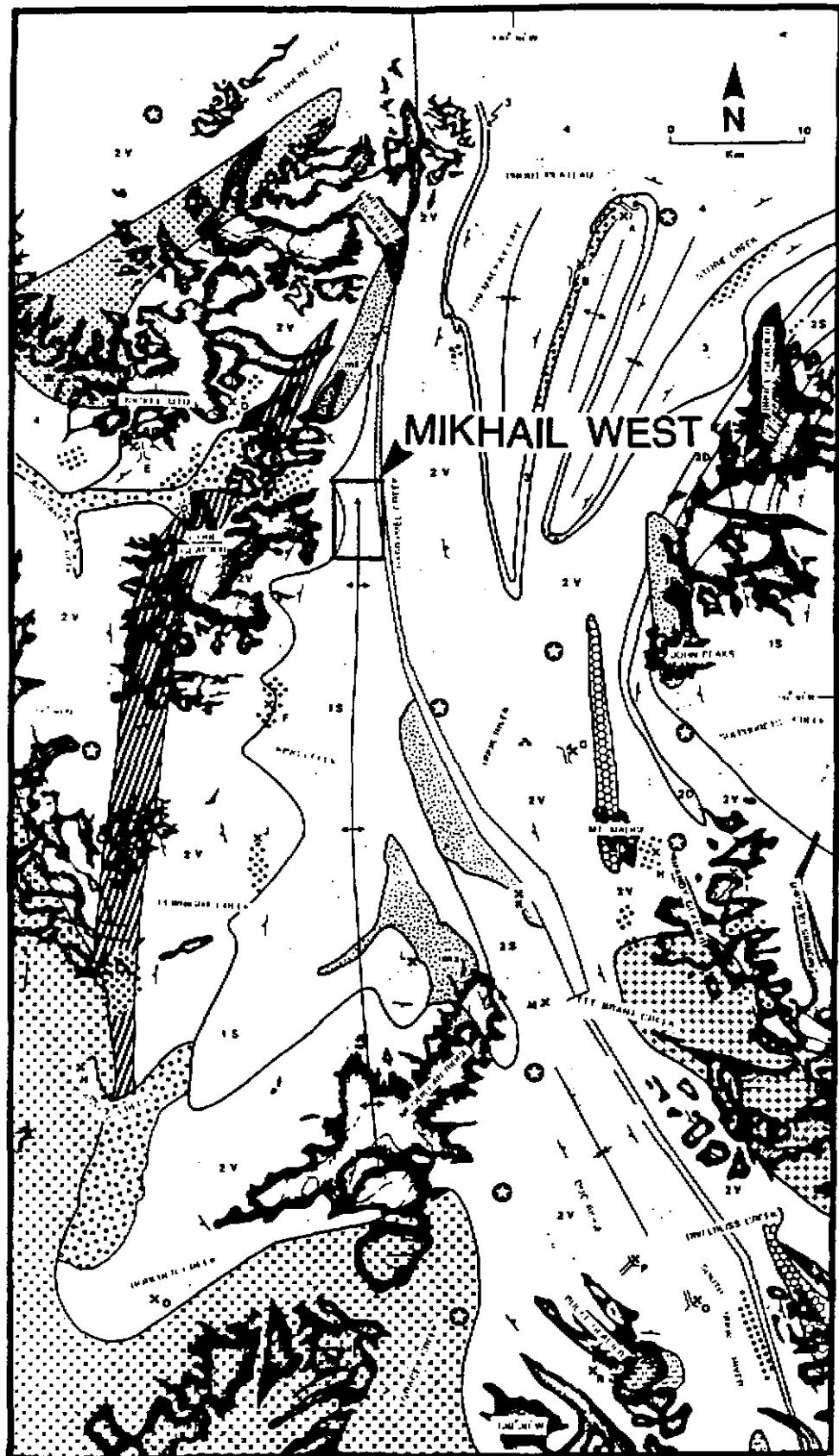
**REGIONAL GEOLOGY  
BOWSER BASIN  
NW BRITISH COLUMBIA**

(Outline of terrane boundaries and major rock groups of the Jurassic and Triassic - modified from Thomson, 1985).

Figure 3



NOTE: Not to scale



Geology and mineral deposits, Unuk map area.

Modified after Britton et. al. (1989)

**PROPERTY GEOLOGY**

Figure 4

### PROPERTY GEOLOGY

Regional geological mapping by Britton et al.(1989) shows that the property is underlain predominantly by Upper Triassic supracrustal rocks (Figure 5). The north-south trending Harrymel-South Unuk shear zone transects the eastern property boundary, and separates the Upper Triassic rocks underlying the property from the Lower Jurassic rocks east of the property. The Upper Triassic Stuhini Group sediments have been intruded by the Tertiary King Creek dyke swarm in the southwest portion of the claim.

#### Upper Triassic Stuhini Group (Unit 1)

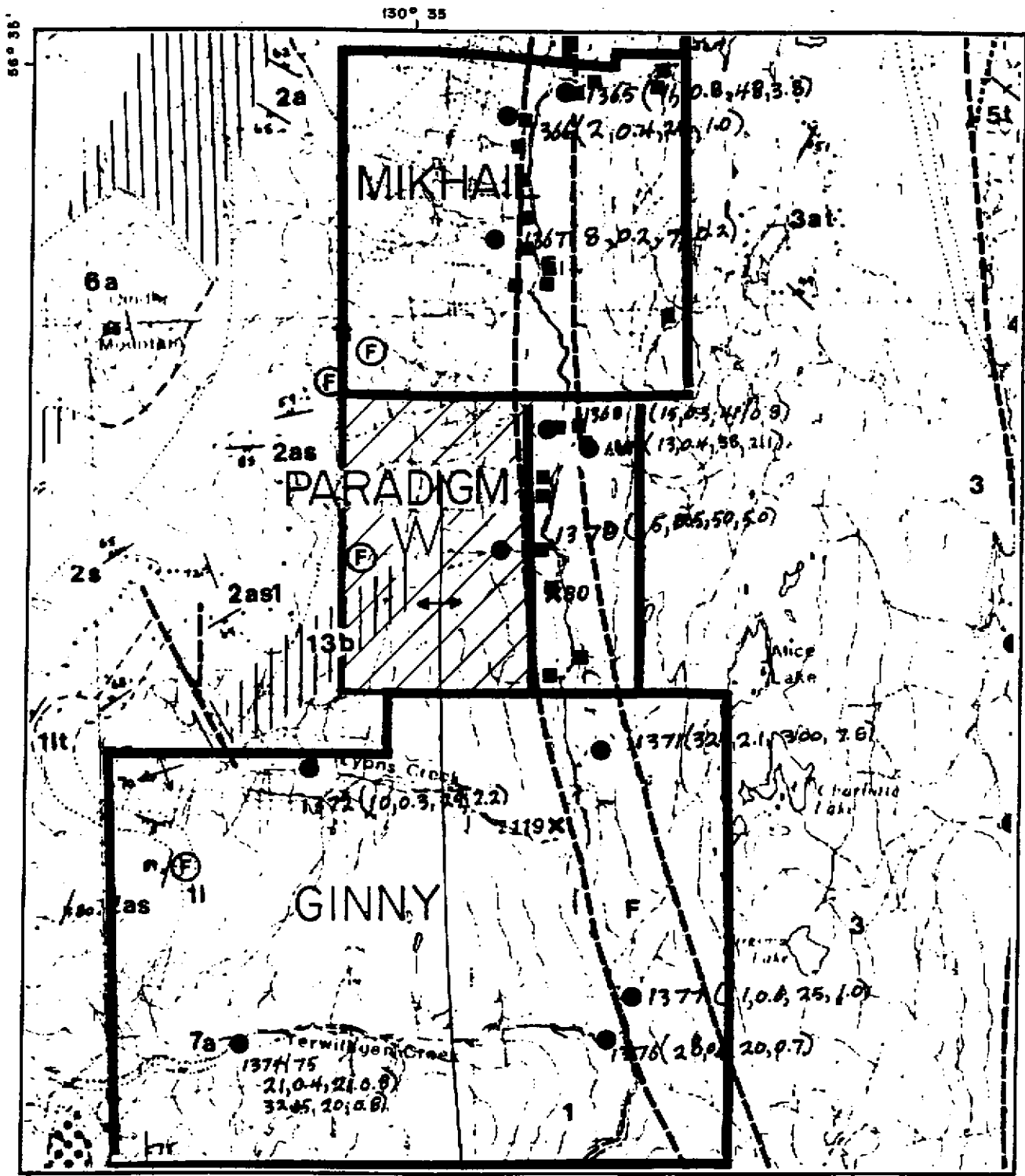
The Stuhini Group rocks occupy the nose of a north-plunging anticline, and occur as a wedge between the Harrymel-Unuk shear zone and the overlying Unuk River Formation. These rocks underlie most of the property, and consist of thin bedded siltstones, immature fine-grained wackes, chert, impure limestones, and andesitic tuffs that locally attain a considerable thickness. The tuffs may be laminated to massive, aphanitic to hornblende-feldspathic. Limestones occur as thin beds or discontinuous lenses that show extensive recrystallization and highly disrupted internal structure. Fossil evidence led Britton et al.(1989) to ascribe a Carnian to Norian age to these rocks.

#### Upper Triassic to Lower Jurassic Unuk River Formation (Unit 2)

These Norian to Sinemurian age rocks of the Unuk River Formation constitute the lowermost unit of the Hazelton Group. Britton et al.(1989) described this sequence as green and grey intermediate to mafic volcanoclastics and flows with locally thick interbeds of fine-grained immature sediments. The volcanics are reported to be dominantly massive to poorly bedded plagioclase ( $\pm$  hornblende) porphyritic andesite. The sediments are predominantly grey, brown, and green thinly bedded tuffaceous siltstone and fine-grained wacke. The basal contact with Triassic strata appears to lie near the top of a thick sequence of clastic sedimentary rocks. Neither an angular unconformity nor a widespread conglomerate marks the lower contact. Government regional geological mapping indicates this unit may underlie the western edge of the property.

#### Lower Jurassic Betty Creek Formation (Unit 3)

A Pleinsbachian to Toarcian age is assigned to this unit by Britton et al.(1989). This pyroclastic-epiclastic sequence is comprised of a sequence of westward facing but locally overturned interbedded volcanics and lesser sediments, underlying the area east of the property. The volcanics are grey and green, massive to poorly bedded units, and range in composition from basaltic andesite to dacite. Pillow lavas, breccias, and felsic pyroclastics, including



SCALE 1:50,000

Modified after Britton et al (1989)  
NTS 104 B/10

# MIKHAIL WEST PROPERTY GEOLOGY

Figure 5

INTRUSIVE ROCKS

TERTIARY

13 POST-TERTIARY DYKES

- 13a Laramide, andesite, diorite (plagioclase not shown)
- 13b Ring Creek Dyke Series: mafic gabbro dykes, andesite, diorite, quartz diorite
- 13c Altonian monzonite (fine-grained) basic-monzonite

12 COAST PLUTONIC COMPLEX

- 12a Granite
- 12b Hornblende-diorite quartz diorite
- 12c Late Great Slave A-belted gabbro, hornblende-diorite quartz monzonite

JURASSIC

11 HORN MOUNTAIN GABBRO: hornblende-diorite-quartz monzonite

10 SW TO POST-VOLCANIC PYROCLASTICS: Pyroclastic in phosporite matrix; possibly hypocrystalline equivalent of massive rock

- 10a Letha Pyroclastic: hornblende-epidiotite-hornblende pyroclastic groundmass to spherule
- 10b Ring Lake Dyke: iron- to iron-titanium-bearing hornblende spherule
- 10c Anderson-Oliver Complex: melanocratic, fine- to medium-grained spherule with abundant xenoliths of dark green meta-andesite; (possibly Triassic)

9 UPLAND GRANITE SUITE: medium- to coarse-grained, mafic to intermediate composition

- 9a Lake Peace megacrystic orthogneiss diorite
- 9b Fine grained hornblende diorite; quartz diorite
- 9c Medium hornblende-diorite diorite to quartz diorite
- 9d Late Ridge mafic monzonite

TRASSIC

8 BUCKE BLAZER DYKES: light grey, coarse to medium, medium-grained hornblende-diorite quartz diorite

METAMORPHIC ROCKS

A-F METAMORPHIC EQUIVALENTS OF UNITS 1, 2 OR 3

- A Amphibole: dark grey, calcic hornblende quartz-diorite-spherule phyllite
- B Felsic monzonite: light green, quartz-diorite-spherule-spherule phyllite; locally with deformed basal
- C Mafic to intermediate monzonite: dark green, plagioclase-spherule phyllite
- D Hornblende-plagioclase spherule; spherule meta-silt
- E Hornblende-plagioclase gneiss; spherule monzonite
- F Strongly altered mafic within the Upland-Hornblende fault zone

GOSSANOUS ALTERATION ZONES

Pyrite zone 1: white 2: brownish 3: grey; locally defined by calcareous  
Disseminated pyrite in felsic monzonite

VOLCANIC AND SEDIMENTARY ROCKS

(Note: No stratigraphic order is implied within sequences.)

QUATERNARY

RECENT UNCONSOLIDATED SEDIMENTS

- 17 Alluvial, glaciolacustrine deposits, sandstone, siltstone, claystone
- 7a Alluvial sandstone (cf. Pellysawm in River basin)
- 7b Alluvial sandstone (cf. Pellysawm in River basin)

PLEISTOCENE TO RECENT

6 BENTLEY FLOES AND TERRACE

- 6a Dark grey to black, bentley floor and terrace; siltstone-siltstone
- 6b Bentley terrace

TRASSIC TO JURASSIC

HAZELTON GROUP

MIDDLE JURASSIC (TOARCIAN TO SAJOCIAN)

5 SILTSTONE SEQUENCE (Siltstone River Formation): Dark grey, well-bedded siltstone with minor sandstone and conglomerate.

- 5a Clay partings conglomerate and siltstone
- 5b Rhyolite bedded siltstone and shale (siltstone)
- 5c Thinly bedded siltstone
- 5d Amalgam siltstone and siltstone breccia with minor siltstone lenses

LOWER JURASSIC (TOARCIAN)

4 FELSIC VOLCANIC SEQUENCE (Siltstone River Formation): Light weathering, intermediate to felsic igneous rocks, including dacite, and, rhyolite and siltstone, locally with Laramide synvolcanic (S to 15%) and postvolcanic. Minor conglomerate locally some heavy.

- 4a Well-bedded siltstone
- 4b Massive siltstone
- 4c Black and white, subvolcanic felsic volcanics; locally fine bedded and conglomerate

LOWER JURASSIC (PLEINSBACHIAN TO TOARCIAN)

3 PHYCLOASTO-EPICLASTIC SEQUENCE (Siltstone River Formation): Hornblende, grey, green, locally purple or black, massive to bedded pyroclastic and sedimentary rocks; siltstone, siltstone

- 3a Green and grey, massive to poorly bedded siltstone
- 3b Grey, green and purple siltstone, siltstone, siltstone and siltstone; massive to well bedded siltstone
- 3c Siltstone, siltstone, siltstone and siltstone with quartz pebbles
- 3d Amalgam siltstone with pink silty siltstone
- 3e Amalgam siltstone and siltstone breccia with minor siltstone lenses
- 3f Black, siltstone siltstone, siltstone and siltstone (siltstone)

UPPER TRASSIC TO LOWER JURASSIC (NORMAN TO BRYENURIAN)

2 ANDESITE SEQUENCE (Late River Formation): Green and grey, intermediate to mafic monzonite and mafic with locally thin deposits of fine-grained monzonite monzonite; minor conglomerate and limestone

- 2a Grey and green, plagioclase-spherule hornblende pyroclastic siltstone; massive to poorly bedded
- 2b Grey and green, hornblende-spherule hornblende pyroclastic siltstone and siltstone
- 2c Grey, brown and green, siltstone, siltstone, siltstone and fine grained mafic
- 2d Black, siltstone siltstone siltstone; siltstone, siltstone
- 2e Dark grey, mafic monzonite monzonite with quartz pebbles
- 2f Grey, well-bedded monzonite (discontinuously hornblende) along South Line valley

TRASSIC

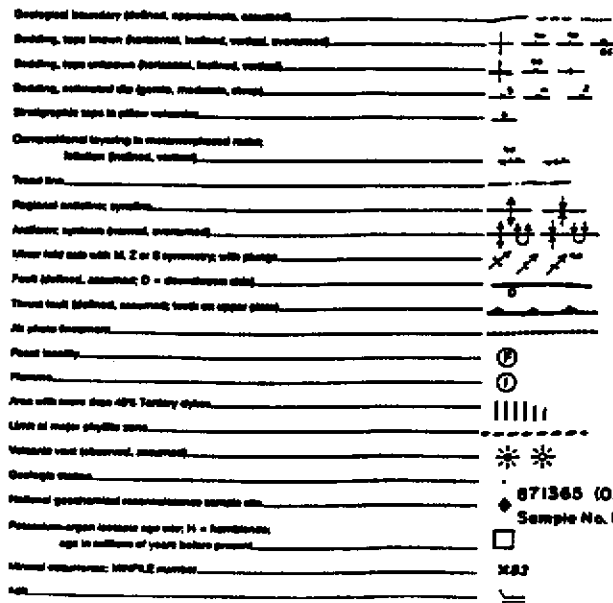
STURM GROUP

UPPER TRASSIC (CARRIAN TO NORMAN)

1 LOWER VOLCANOSEDIMENTARY SEQUENCE: Brown, black and grey, mafic sedimentary rocks interbedded with mafic to dark green, mafic to monzonite monzonite and monzonite rocks

- 1a Grey to black, siltstone siltstone, siltstone, siltstone (siltstone)
- 1b Brown and grey, fine grained siltstone mafic; minor siltstone or conglomerate
- 1c Grey, siltstone, siltstone, siltstone
- 1d Green, fine-grained, siltstone siltstone, siltstone and hornblende siltstone
- 1e Dark green mafic
- 1f Grey and green, siltstone siltstone with siltstone-hornblende-plagioclase siltstone and siltstone mafic

SYMBOLS



871365 (O.S., 48, 3.8, 11)  
Sample No. (Ag ppm, As ppm, Sb ppm, Au ppb)



AGE	GROUPS	FORMATIONS	MEMBERS	LITHOLOGIES
Bathonian	Bowser Lake	Ashman	Main Sequence Basal Conglomerate	Turbidites, wackes, intraformational conglomerates Chert pebble conglomerates
Bajocian to Toarcian	Spatsizi(?)	Salmon River	Pyjama Beds Basal Limestone	Thin bedded, alternating siltstones and mudstones Gritty, fossiliferous limestone
Toarcian	Hazelton	Mount Dilworth	Upper Lapilli Tuff Middle Welded Tuff Lower Dust Tuff	Dacitic lapilli tuff with flow-banded clasts Dacitic welded ash flow and lapilli tuff Dacitic dust tuff
Pliensbachian		Betty Creek	Sedimentary Members Volcanic Members	Hematitic volcanoclastic sediments, and turbidites Andesitic to dacitic tuffs and flows
Sinemurian to Hettangian(?)		Unuk River	Premier Porphyry Upper Andesite Upper Siltstone Middle Andesite Lower Siltstone Lower Andesite	Two feldspar + hornblende porphyritic tuffs Massive tuffs with local volcanoclastic sediments Turbidites, minor limestones Massive tuffs and minor volcanoclastic sediments Turbidites Massive to bedded ash tuffs
Norian to Carnian	Stuhini		Volcanic Members Sedimentary Members	Pyroxene porphyry flows and tuffs Turbidites, limestones, conglomerates

TABLE 1. Table of Formations Unuk River Area

spherulitic rhyolite, have been reported in the John Peaks area, but were not mapped by Britton et al.(1989) within the Mikhail West property. The sedimentary rocks are, on the whole, less abundant than the volcanic rocks, and consist of black thinly bedded siltstone, shale, and argillite. Limestones are rare or absent in the Lower Jurassic section.

#### Tertiary King Creek Dyke Swarm (Unit 13b)

The limits of the unit, as shown on Figure 5, roughly indicate where the dykes exceed 50% of the exposed bedrock. This north trending belt of dykes range compositionally from rhyodacite to andesite, and texturally from aphanitic to holocrystalline. Britton et al.(1989) has classified individual dykes as feldspar porphyry dacites, andesite, diabases, and hornblende to quartz diorites. They are reported to be up to 10 m wide and are anastomose, cross-cutting one another at oblique angles. Most of the dykes are described as white-weathering medium-grey andesite to dacite with fine to coarse feldspar phenocrysts in an aphanitic groundmass.

#### Structure

The strata on the property define a broad northerly plunging anticline with moderately dipping limbs. East of the property, the easterly dipping strata belonging to the Betty Creek Formation occur on the western limb of a broad syncline.

The north-south trending Harrymel-South Unuk shear zone transects the eastern boundary of the property and is marked by mainly schistose rock fabrics. Britton et al.(1989) interpreted this structure as a major easterly dipping shear zone with normal offset, exposing different structural levels and stratigraphic sections.

### ECONOMIC GEOLOGY

Britton et al.(1989) list 55 mineral occurrences in the Unuk map-sheet. These showings are predominantly gold/silver occurrences and are hosted by a number of various lithologies. Most can be classified into one of four categories: stratabound, vein, skarn, and disseminations. Grove (1986) has determined that the age of the mineralizing events is variable and, notably, can be post-Triassic.

Stratabound mineralization consists almost exclusively of pyritic zones and lenses contained within a particular stratum or a restricted set of strata. The best example is the Eskay Creek prospect, currently being explored by Calpine Resources Incorporated and Consolidated Stikine Silver Ltd. Intrusive-contact (skarn) deposits show a close spatial and temporal relationship with igneous intrusions. Three deposits in this category are the E & L nickel/copper deposit (Minfile #006), the Max copper/iron skarn (Minfile #013), and the Chris-Anne copper/iron skarn (Minfile #125). Britton et al.(1989) stated:

Mineralization at the E & L occurs within two medium- to coarse-grained, olivine-pyroxene gabbro bodies. These roughly triangular plugs are each approximately 1300 square metres in area and are probably connected. They intruded a sequence of argillites, tuffaceous siltstones, and grey dacitic ash tuffs that strike northwest with moderate to steep southwesterly dips. Mineralization consists of pyrrhotite, pentlandite, and chalcopryite, with lesser amounts of pyrite and magnetite. In the northwestern gabbro, mineralization extends up to the contact with the sediments, whereas in the south-eastern gabbro, mineralization is confined to the pluton. Diamond drilling has delineated pipelike pods and disseminations of sulphides to a depth of 120 metres. Drill-indicated reserves are 2.8 million tonnes of 0.7% Ni and 0.6% Cu (Sharp, 1965).

The Max prospect lies on the northwest side of McQuillan Ridge, between the Unuk and South Unuk Rivers, at elevations between 455 and 1500 metres. Massive magnetite with lesser pyrrhotite and chalcopryite occur in skarn-altered sedimentary rocks adjacent to a diorite stock. Garnet, epidote, actinolite, and diopside characterize the skarn assemblage. Drilling has indicated a reserve of 11 million tonnes at 45% iron (Canadian Mines Handbook 1973-1974, page 432).

The Chris-Anne prospect lies approximately 3 kilometres east of the Max. Skarn mineralization is reported in limestone beds which are up to 10 metres thick and that are interbedded with volcanoclastics. Magnetite and pyrrhotite-rich layers, from 0.5 to 7 metres

thick, with minor chalcopyrite, extend over a distance of 1 km. There are minor intrusive bodies reported on the property. Grades range from 0.1% to 0.4% copper (Allan and MacQuarrie, 1981).

The gold potential of these skarn deposits does not appear to have been tested. Based on recent skarn studies (Ettlinger and Ray, 1988), this area has many features that are associated with gold-enriched skarns elsewhere in the province: sequences of calcareous and tuffaceous host rocks; structural deformation; intrusion by dioritic I-type granitoids; and contact metamorphism and recrystallization. Some auriferous skarns are enriched in cobalt, an element that may be a useful pathfinder.

High-grade precious metal quartz veins are the target of exploration programs at Mount Madge (Minfile #240 and #233) by Bighorn Development Corporation, and at the Doc prospect (Minfile #014) by Echo Bay Mines Limited. Britton et al.(1989) reported:

The Mount Madge prospects are located south of Sulphurets Creek near its confluence with Unuk River, on the east and west sides of Mandy Glacier. Two different targets are being evaluated (Kruckowski and Sinden, 1988). On the west, the C-10 prospect (Minfile #240) is a stockwork of thin quartz veinlets, locally with thicker quartz lenses, in intensely altered, fine-grained tuffaceous andesite or dacite. Quartz veinlets locally form up to 30% of the rock. The alteration assemblage consists of quartz and sericite with up to 10% pyrite. Chalcopyrite and traces of sphalerite are also present. The rocks are strongly foliated to schistose and are very similar to the broad alteration zones seen at Brucejack Plateau 12 kilometres to the northeast (Britton and Alldrick, 1988). Soil samples locally return analyses in excess of 1 ppm gold.

Two kilometres to the east, Ken Konkin discovered a massive pyrite-siderite float boulder with visible gold. Prospecting uphill led to the discovery of the GFJ veins (Minfile #233), apparently flat-lying, zoned siderite-quartz-sulphide veins that returned assays up to 121 grams per tonne gold (Kruckowski and Sinden, 1988). The veins are poorly exposed. Float blocks seen this year display symmetrical zoning from margin to core across vein widths of 10 to 15 centimetres. Vein margins are 1 to 2 centimetres of thin white quartz layers separated by hairline accumulations of very fine-grained tin-white sulphide, probably arsenopyrite. The core is a very coarse-grained intergrowth of siderite, milky quartz, and cubes and clusters of pyrite, with lesser amounts of sphalerite and chalcopyrite as crystals and irregular masses. Rare tetrahedrite and visible gold have been observed (K.Konkin, personal communication, 1988). The veins cut variably foliated andesitic ash tuffs with thin interbeds of foliated to schistose siltstones.

The Doc prospect (Minfile #014) is located at treeline on a ridge overlooking the South Unuk River, opposite the mouth of Divelbliss Creek. The prospect consists of several west-northwest trending quartz veins up to 2 metres wide that have surface strike lengths of up to 275 metres (Gewargis, 1986). The main veins (Q17, Q22) are massive white quartz with sparse sulphide mineralization (5% to 10%) consisting of galena, pyrite, chalcopyrite, and sphalerite, with associated specular hematite and magnetite. Precious metal values are mostly confined to the sheared edges of veins and immediately adjacent wallrock. Shear zones with very little quartz may also return good values. Seraphim (1948) observed that gold was associated with either specular hematite or with galena and pyrite, but not with chalcopyrite and pyrite assemblages. The veins are a true fissure type, crosscutting folded and metamorphosed andesitic tuffs and thin-bedded sediments, including marble, that have been intruded by irregular dioritic dykes or sills and small monzodioritic plugs. The veins are different from any others seen in the Sulphurets or Unuk map areas. They have very restricted wallrock alteration aureoles, no apparent zoning, and appear to be limited to a few large fluid pathways. In this, they display characteristics of mesothermal veins. Structural control of the vein sets has not been determined but may be due to fractures related to folds in the host rocks. Total mineral inventory of the Q17 and other veins is given as 426,000 tonnes with 9.26 grams per tonne gold and 44.91 grams per tonne silver (*Northern Miner*, November 7, 1988).

Porphyry-type disseminated pyrite, chalcopyrite, and molybdenite mineralization occurs immediately north and south of King Creek, west of Harrymel Creek. Two properties have been worked: the VV to the south and the Cole to the north.

The VV property (Minfile #079) is the site of a heavily weathered monzonitic intrusive body in fault contact, on the east and west, with layered andesitic lapilli tuffs and tuff breccias with minor siltstone and calcareous sandstone interbeds. The stock is 250 metres wide, at least 6 kilometres long, strikes northerly, and dips steeply to the west, parallel to the country rocks. Chalcopyrite occurs in quartz stockworks and as fine disseminations within the monzonite. Molybdenite, sphalerite, malachite, and azurite have also been reported (Winter and McInnis, 1975; Mawer et al., 1977). Representative assays give 0.34% copper, 0.003% molybdenum, 2.1 grams per tonne silver, and 0.8 gram per tonne gold. Maximum gold and silver values obtained were 8.65 grams per tonne gold and 19.54 grams per tonne silver (Mawer et al., 1977).

The Cole prospect (Minfile #209) is situated approximately 4 kilometres north of the VV claims; it appears to be on strike with the same fault system and has similar intrusive and country rocks. Mineralization consists of up to 10% pyrite as disseminations and fracture fillings. Minor chalcopyrite and malachite have been reported but the bedrock source of the gold/silver soil anomalies has not been located (Korenic, 1982; Gareau, 1983). Reported assays range up to 0.43% copper, 7.12 grams per tonne gold, and 13.03 grams

per tonne silver. Gold and copper values show a positive correlation on both properties.

At this time, the Eskay Creek prospect, located 10 km northeast of the Mikhail West property, is the most significant showing in the area. This prospect comprises at least eight mineralized zones occurring over a strike length of 1800 m within a sequence of felsic volcanics (Mount Dilworth Formation). This property is currently being explored by Calpine and Consolidated Stikine Silver. Preliminary drilling on the '21 Zone' intersected 96 feet assaying 0.752 oz/ton gold and 1.13 oz/ton silver including 52.5 feet grading 1.330 oz/ton gold and 1.99 oz/ton silver (*Northern Miner*, November 7, 1988).

The drilling results obtained to date indicate that the '21 Zone' extends over 335 m and is open along strike and at depth. Based on the results of 70 drill holes completed to June 1, 1989, a preliminary geological reserve of 2.8 million tons grading 0.23 oz/ton gold and 3.3 oz/ton silver was calculated for the '21 Zone' (Consolidated Stikine Silver, 1989 Annual Report). These deposits have been variously described as silicified shear zones (Harris, 1985) or as volcanogenic deposits (Donnelly, 1976). The mineralization is associated with disseminated sulphides in felsic volcanic breccias and graphitic argillites in contact with overlying intermediate volcanic rocks.

A review of all the available information (Minfile, assessment reports, geological maps, reports, etc.) indicates that no mineralized occurrences are known within the area currently covered by the MIKHAIL 3 claim.

### 1989 EXPLORATION PROGRAM

The 1989 property exploration program, completed between September 9 and October 16, consisted of helicopter-supported heavy mineral sampling. Seven heavy mineral samples were forwarded to Bondar-Clegg & Company in Vancouver for multi-element analyses; Au by fire assay-AA and the remaining 29 elements by I.C.P. (results are presented in the Appendix).

The accompanying map depicts the property geology (modified after Britton et al., 1989), with sample locations and Au/Ag/As/Sb analytical results. Descriptions of the exploration completed and the results follow.

### HEAVY MINERAL SAMPLING

A heavy mineral stream sediment sampling survey was conducted on the property as part of the current exploration program. Heavy mineral samples were collected in parts of a creek where there is a sudden transition from high to low energy, if present, moss mat was used. Samples were sieved to -20 mesh and a 3 to 5 kg sample of sieved material was collected.

The samples were forwarded to Bondar-Clegg and Company in Vancouver for multi-element analyses: Au by fire assay-AA and the remaining 29 elements by I.C.P. The heavy mineral separation consists of floating off the light (<3.3) minerals using methylene-iodine followed by magnetic separation. A sample weight of 0.5 grams is taken for the I.C.P. and the remainder used for fire assay.

The heavy mineral sampling survey was conducted by Mr. M. Waskett-Myers of Keewatin Engineering Inc. which company has done a considerable amount of work in the Unuk River area, and in the process, has assembled a fairly substantial data base. These data were used to assess the values obtained on the property.

Heavy mineral sampling is a good first-pass tool and should be considered as a micro-prospecting approach to evaluating an area.

A total of seven heavy mineral samples were collected from creeks draining the property area. Ag, As, Ba, Cr, Cu, and Zn are sporadically elevated but with no obvious correlation. Sample KWH-56 also yielded an elevated gold value of 300 ppb.

Additional exploration work is required on this claim to fully evaluate the property's mineral potential. This should consist of reconnaissance prospecting, geological mapping, and stream silt sampling (at regular intervals along all creeks draining the claim area).



### SUMMARY AND RECOMMENDATIONS

The 1989 exploration program consisted of helicopter-supported heavy mineral sampling, with the objective of evaluating the property's potential for hosting economic precious metals deposits and for the purpose of fulfilling the assessment requirements. Seven heavy mineral samples were collected from creeks draining the property, and yielded sporadically elevated Ag, As, Ba, Cr, Cu, and Zn values. One sample yielded an elevated gold value of 300 ppb.

Copper and sulphide mineralization located directly north of the MIKHAIL 3 claim may extend onto the eastern edge of the property.

Considering the limited amount of exploration completed on the claim, additional work is required in order to fully evaluate the property's mineral potential. This work should consist of extensive reconnaissance prospecting, combined with geological mapping, lithochemical sampling, and stream silt sampling. Stream silt samples should be collected at regular intervals along all creeks draining the claim area.


CERTIFICATE - C. H. Aussant

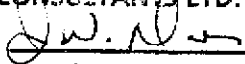
I, Claude Henry Aussant, of 31 Templebow Way N.E. in the City of Calgary in the Province of Alberta, do hereby certify that:

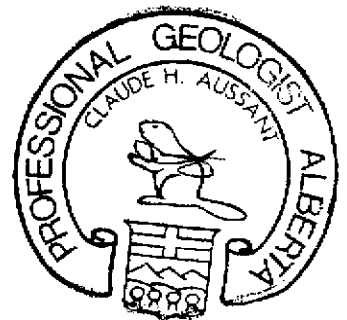
1. I am a Consulting Geologist with the firm of Taiga Consultants Ltd. with offices at Suite 400, 534 - 17th Avenue S.W., Calgary, Alberta.
2. I am a graduate of the University of Calgary, B.Sc.Geology (1976), and I have practised my profession continuously since graduation.
3. I am a member in good standing of the Association of Professional Engineers, Geologists and Geophysicists of Alberta; and I am a Fellow of the Geological Association of Canada.
4. I am the author of the report entitled "Geological, Prospecting, and Geochemical Report on the Mikhail West Property, MIKHAIL 3 Claim, Skeena Mining Division, British Columbia", dated November 6, 1989. I personally worked on the property during the program described herein.
5. I do not own or expect to receive any interest (direct, indirect, or contingent) in the property described herein nor in the securities of Indo-Alta Oil Ltd. or Winslow Gold Corp., in respect of services rendered in the preparation of this report.

DATED at Calgary, Alberta, this 6th day of November, A.D. 1989.

Respectfully submitted,

  
 C. H. Aussant, B.Sc., P.Geol., F.GAC

<b>PERMIT TO PRACTICE          TAIGA CONSULTANTS LTD.</b>	
Signature	
Date	January 17, 1990
<b>PERMIT NUMBER: P 2399</b>	
The Association of Professional Engineers, Geologists and Geophysicists of Alberta	




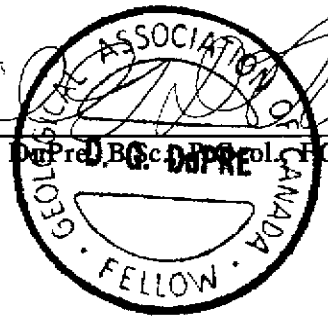
**CERTIFICATE**

I, DAVID GEORGE DuPRE, of 56 Parkgrove Crescent in the Municipality of Delta in the Province of British Columbia, do hereby certify that:

- 1) I am a graduate of the University of Calgary, B.Sc. Geology (1969), and have practised my profession continuously since graduation.
- 2) I am a member in good standing of the Association of Professional Engineers, Geologists and Geophysicists of Alberta; and I am a Fellow of the Geological Association of Canada.
- 3) I am a consulting geologist with the firm of Keewatin Engineering Inc. with offices at Suite 800 - 900 West Hastings Street, Vancouver, British Columbia.
- 4) I am the co-author of the report entitled "Geological, Prospecting, and Geochemical Report on the Mikhail West Property, MIKHAIL 3 Claims, Skeena Mining Division, British Columbia", dated November 6, 1989. I personally supervised the work on the property and visited the site on two occasions between September 6 and October 15, 1989.
- 5) I do not own or expect to receive any interest (direct, indirect or contingent) in the property described herein nor in the securities of Indo-Alta Oil Ltd. or Winslow Gold Corp., in respect of services rendered in the preparation of this report.

Dated at Vancouver, British Columbia this 6th day of November, A.D. 1989.

Respectfully submitted,

  
\_\_\_\_\_  
David G. DuPRE, B.Sc., P.Eng., P. Geol., F.G.A.C.  


**BIBLIOGRAPHY**

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A P P E N D I X

Summary of Personnel  
Certificates of Analysis  
Analytical Techniques

\*\*\*\*\*

SUMMARY OF PERSONNEL

<u>Name / Address</u>	<u>Position</u>	<u>Dates</u>	<u>Man Days</u>
M. Waskett-Myers Vancouver, B.C.	Geochemist	Sep.9-Oct.16	1.25
B. McIntyre Vancouver, B.C.	Senior Prospector	Sep.9-Oct.16	1.25
C. Oevermann Smithers, B.C.	Cook	Sep.9-Oct.16	0.25
		TOTAL	<u>2.75</u>

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-06781.0 ( COMPLETE )

REFERENCE INFO:

CLIENT: KEEMATIN ENGINEERING INC.  
 PROJECT: PARADIGM

SUBMITTED BY: TERRAMIN RES. LAB  
 DATE PRINTED: 4-OCT-89

ORDFR	ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au Gold Fire Assay	93	5 PPB	FIRE-ASSAY	Fire Assay AA
2	Ag Silver	93	0.2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
3	As Arsenic	93	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
4	Ba Barium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
5	Be Beryllium	93	0.5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
6	Bi Bismuth	93	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
7	Cd Cadmium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
8	Ce Cerium	93	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
9	Co Cobalt	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
10	Cr Chromium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
11	Cu Copper	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
12	Ga Gallium	93	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
13	La Lanthanum	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
14	Li Lithium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
15	Mo Molybdenum	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
16	Nb Niobium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
17	Ni Nickel	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
18	Pb Lead	93	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
19	Rb Rubidium	93	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
20	Sb Antimony	93	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
21	Sc Scandium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
22	Sn Tin	93	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
23	Sr Strontium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
24	Ta Tantalum	93	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
25	Te Tellurium	93	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
26	V Vanadium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
27	W Tungsten	93	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
28	Y Yttrium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
29	Zn Zinc	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
30	Zr Zirconium	93	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma

Bondar-Clegg & Company Ltd.  
130 Pemberton Ave.  
North Vancouver, B.C.  
V7P 2R5  
(604) 985-0681 Telex 04-352667



# Geochemical Lab Report

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-06781.0 ( COMPLETE )

REFERENCE INFO:

CLIENT: KEEWATIN ENGINEERING INC.  
PROJECT: PARADIGM

SUBMITTED BY: TERRAMIN RES. LAB  
DATE PRINTED: 4-OCT-89

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
T STREAM SEDIMENT, SILT	41	1 -80	41	DRY, SIEVE -80	41
R ROCK OR BED ROCK	52	2 -150	52	CRUSH, PULVERIZE -150	52

REPORT COPIES TO: KEEWATIN ENGINEERING INC.  
TATGA CONSULTANTS LTD.

INVOICE TO: KEEWATIN ENGINEERING INC.

NIKHAİL WEST PROPERTY

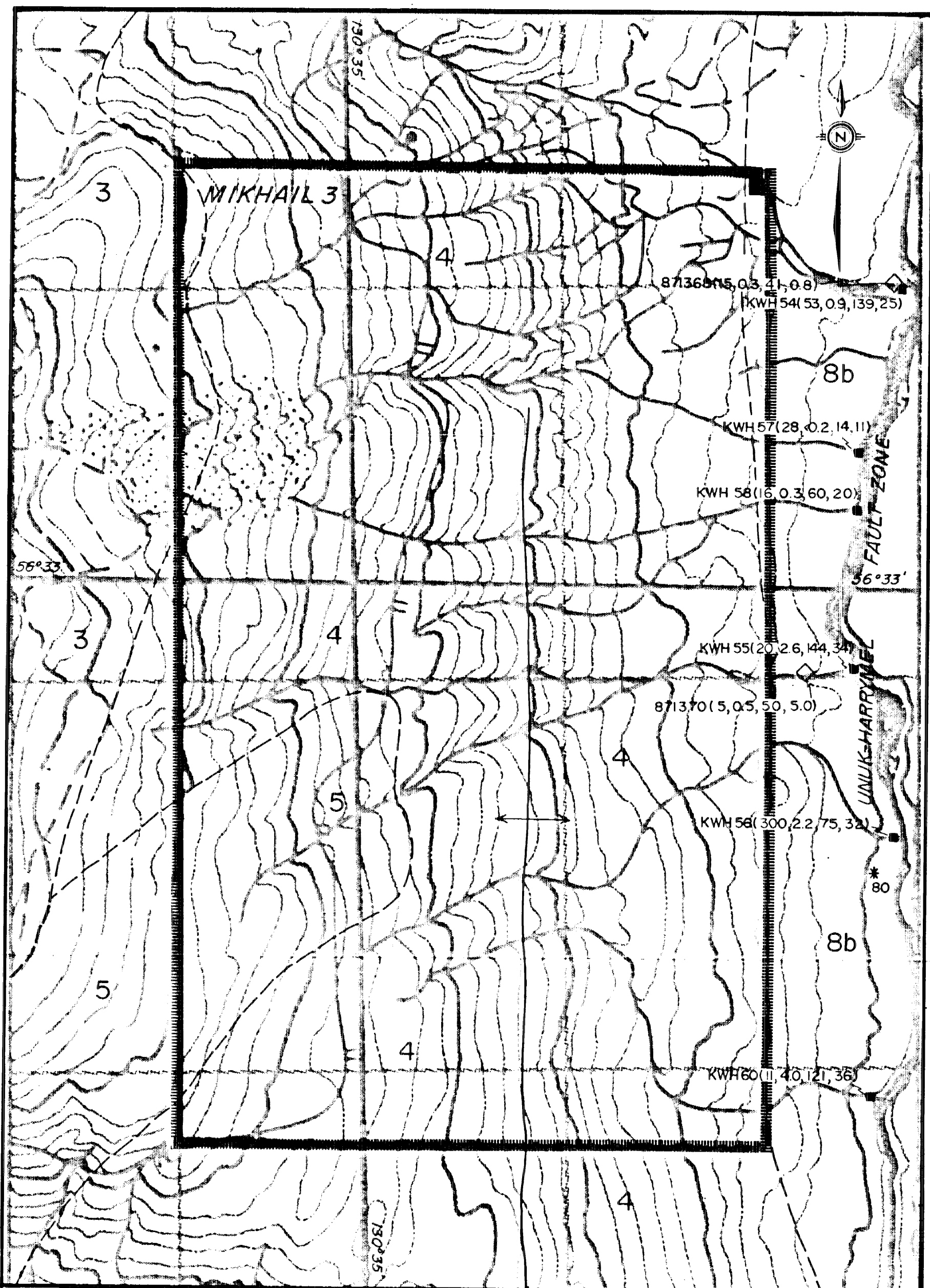
HEAVY MINERAL RESULTS

LAB NUMBER	FIELD NUMBER	LOCATI	Au(30g)	Ag	As	Be	Be	Bi	Cd	Ce	Co	Cr	Cu	Ga	La	Li	Mo	Nb	Ni	Pb	Rb	Sb	Sc	Sn	Sr	Ta	Te	V	W	Y	Zn	Zr
			(ppb)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
75770044	89 K UN54	NIK	53	0.9	139	98	-0.5	13	4	9	79	334	170	12	8	6	6	165	85	43	25	5	-20	71	-10	-10	168	-10	5	609	9	
75770045	89 K UN55	NIK	20	2.6	144	251	-0.5	12	3	9	50	65	241	12	9	5	25	6	85	57	-20	34	6	-20	66	-10	-10	73	-10	13	320	5
75770046	89 K UN56	NIK	300	2.2	75	642	-0.5	13	3	12	45	131	186	14	11	6	37	7	106	30	-20	32	5	-20	123	19	-10	109	-10	13	326	9
75770047	89 K UN57	NIK	28	-0.2	14	206	-0.5	9	-1	-5	20	372	46	12	3	8	-1	6	219	13	33	11	3	-20	59	-10	13	45	-10	3	44	6
75770048	89 K UN58	NIK	16	0.3	60	1093	-0.5	12	-1	9	36	290	110	14	8	6	8	7	141	28	27	20	6	-20	110	-10	11	90	-10	8	123	7
75770050	89 K UN60	NIK	11	4	121	325	-0.5	17	2	11	51	132	318	11	10	6	19	5	109	34	-20	36	6	-20	73	20	-10	86	-10	11	263	11



**SUMMARY OF EXPENDITURES****Mikhail #3**

Personnel and Crew	\$ 1,133.35
Transportation - helicopter/fixed wing/fuel	1,182.32
Camp - food/accommodation	201.75
Assay/Report/Drafting/Secretarial	<u>322.44</u>
<b>TOTAL EXPENDITURES:</b>	<b><u>\$ 2,839.86</u></b>



**LEGEND**

**Volcanic Sedimentary Rocks**

- 1** Pleistocene to Recent  
Basalt flows and tephra: dark brown to black, minor pillow lavas
- 2** Lower Jurassic (Pliensbachian to Toarcian)  
Betty Creek Formation: pyroclastic-epiclastic sequence, heterogeneous, grey-green, massive to bedded, pyroclastics and sedimentary rocks (black, thinly bedded siltstone, shale, and argillite)
- 3** Upper Triassic to Lower Jurassic (Norian to Sinemurian)  
Unuk River Formation: andesite sequence, green and grey, intermediate to mafic volcanics and flows, with locally thick interbeds of fine-grained immature sediments, minor conglomerates, and limestone
- 4** Upper Triassic (Carnian to Norian)  
Stuhini Group: brown, black, grey; mixed sedimentary rocks (siltstone, shale, argillite, limestone, chert), with minor mafic to intermediate volcanics and volcaniclastic rocks

**Intrusive Rocks**

- 5** Tertiary  
Post-Tectonic Dykes  
King Creek Dyke Swarm: feldspar porphyry dacite, andesite, diabase, and hornblende to quartz diorite; limits of the unit shown indicate where the dykes exceed 50% of the exposed bedrock
- 9** Hawikson Monzonite - fine grained monzonite
- 6** Coast Plutonic Complex: hornblende-biotite-quartz diorite to granodiorite.
- 7** Jurassic  
Unuk River Diorite Suite:  
a) Max: biotite-hornblende diorite, quartz diorite, granodiorite  
b) Melville: hornblende-biotite diorite, quartz diorite

**Metamorphic Rocks**

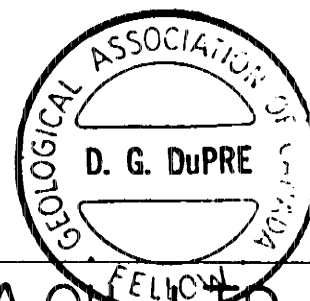
- 8** Metamorphic equivalents of Units 1, 2, or 3  
a) hornblende, mylonite gneiss, mylonite  
b) Unuk-Harrymel Fault Zone, strongly sheared rock within fault zone

**SYMBOLS**

- Geological contact (observed, assumed)
- Bedding with dip
- Foliation
- Regional anticline
- ~ ~ ~ Fault (defined, assumed)
- Airphoto lineament
- ◇ Regional stream silt sample site (Au ppb, Ag ppm, As ppm, Sb ppm)
- \* Minfile mineral occurrence (Cu ppm, Pb ppm, Zn ppm, Au ppb, Ag ppm)
- x Rock sample - outcrop (Au ppb, Ag ppm, As ppm, Sb ppm)
- ▲ Rock sample - float (Au ppb, Ag ppm, As ppm, Sb ppm)
- Stream silt sample (Au ppb, Ag ppm, As ppm, Sb ppm)
- Heavy mineral sample (Au ppb, Ag ppm, As ppm, Sb ppm)
- Trench
- ▨ AREA OF PROSPECTING COVERAGE

**GEOLOGICAL BRANCH ASSESSMENT REPORT**

**19,665**



INDO-ALTA OIL LTD.

**MIKHAIL WEST GEOLOGY & 1989 EXPLORATION LOCATIONS & RESULTS**

DATE: NOV. 1989	NTS: 104 B/10
PROJECT: MIKHAIL WEST	
SCALE: 1:10,000	0 100 200 300 400 500 METRES
KEEWATIN ENGINEERING INC.	MAP No. 1