Geological Evaluation of Zeolitic Beds on the Kava-1 Claim

Mt. Laidlaw Area
Osoyoos Mining Division
British Columbia

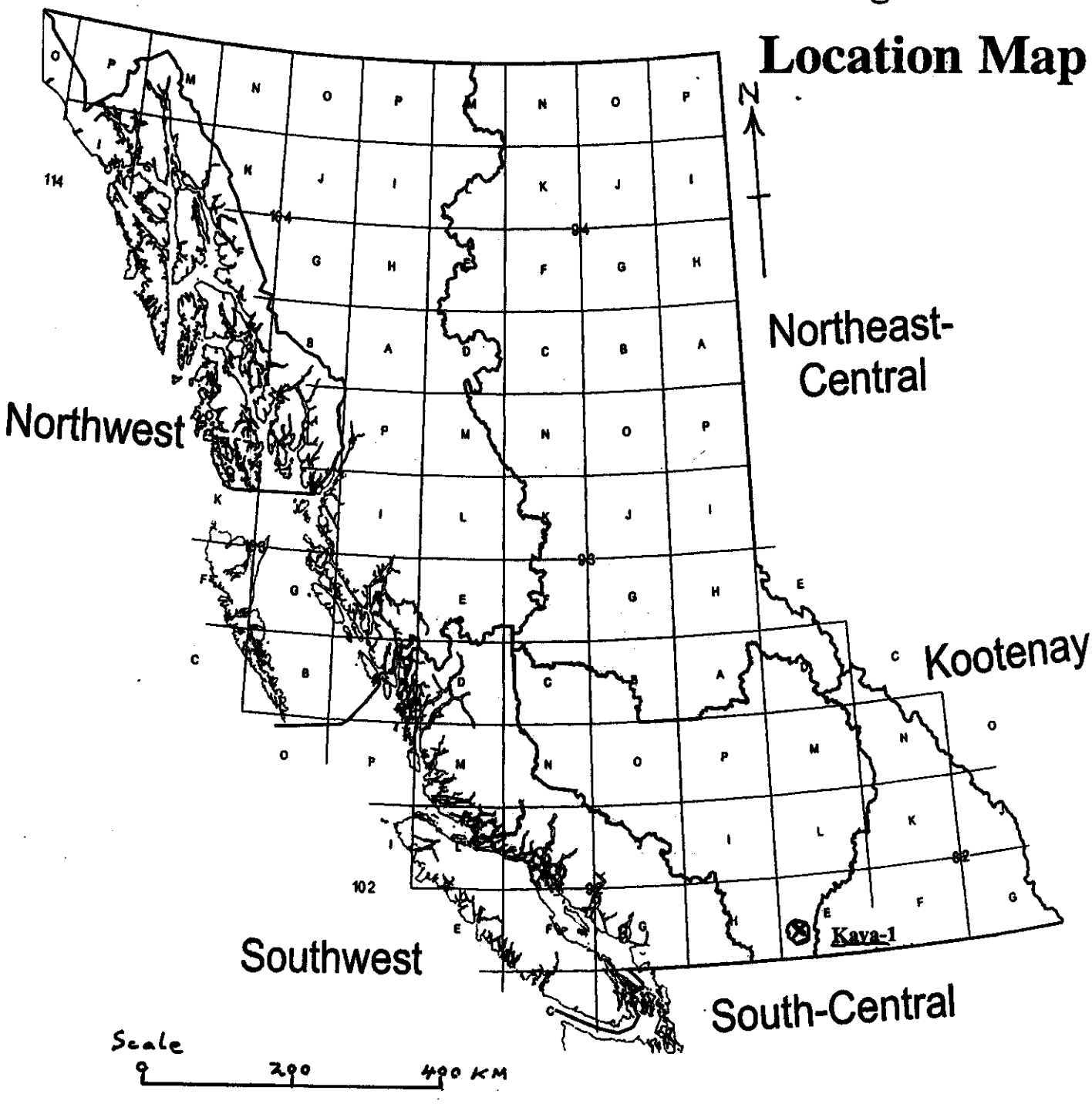
Mineral Titles Reference Map M082E032
Lat. 49° 23.05' N, Long. 119° 45.45' W

-for-
owner/operator
F. Niddery

Prepared by
B. Neil Church, Ph.D., P.Eng.
Victoria, B.C.
August 25th, 2003

Figure 1

Location Map



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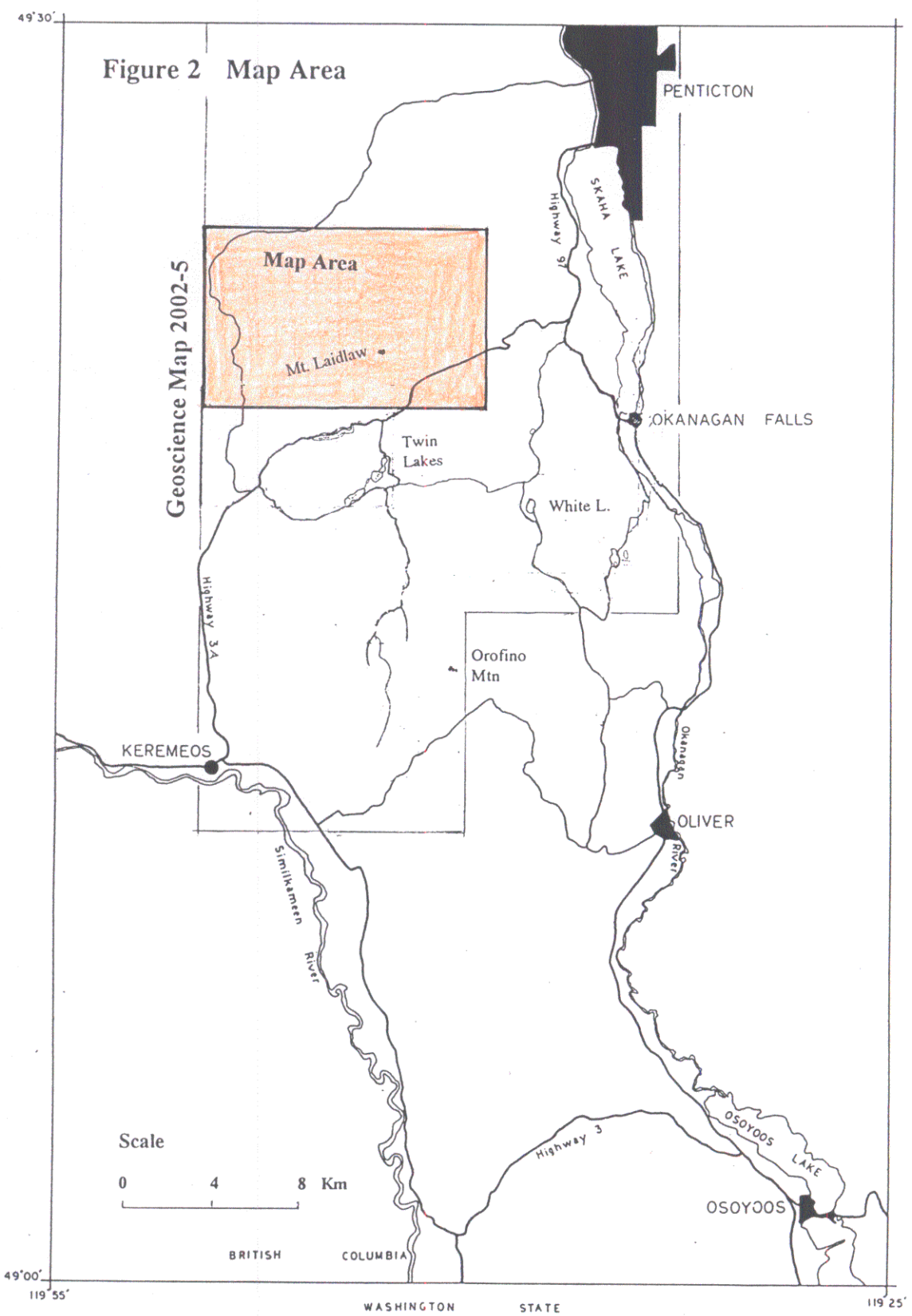


Figure 2 Map Area
Geoscience Map 2002-5
Map Area
Mt. Laidlaw
PENTICTON
SKAHA LAKE
Highway 97
OKANAGAN FALLS
Twin Lakes
White L.
Orofino Mtn
Highway 3A
KEREMEOS
Okanagan River
OLIVER
Similkameen River
Highway 3
OSOYOOS LAKE
OSOYOOS
Scale
0 4 8 Km
BRITISH COLUMBIA
WASHINGTON STATE
49°30'
49°00'
119°55'
119°25'

Summary

The Kava-1 claim is centred on a zone of zeolitized, clinoptilolite-bearing tuffaceous siltstones/ sandstones near Mt. Laidlaw in the western part of the Penticton Tertiary outlier. The zeolitized beds occur between the Kearns Creek basalt member (below) and the Nimpit Lake trachyte member (above) in the middle part of the Marron Formation in the headwater area of Yellow Creek. This report describes the discovery of significant clinoptilolite on the Kava-1 claim that is similar in geological setting to the Manuel Creek zeolite deposit 17 km to the south.

Introduction

Current exploration for zeolites in the Tertiary rocks of the Penticton area stems from previous investigations. The initial studies showed the presence of numerous zeolite species, especially analcite, natrolite and laumontite on fractures and in amygdaloidal lava in the lower part of the Penticton Group (Church, 1973). Subsequently clinoptilolite has been found at a number of localities in tuffaceous sedimentary rocks mid-section in the Pentiction Group (Hora and Church, 1986). In particular, significant clinoptilolite concentrations were delineated within a 5 km belt of dacitic tuff in the Manuel Creek area in the southern part of the Penticton Tertiary outlier (Church, 2002a, b).

This report describes the occurrence of clinoptilolite on the Kava-1 claim in the western part of the Penticton outlier. The occurrence is in tuffaceous beds between major lava units in the middle part of the Marron Formation, similar in geological setting to the Manuel Creek zeolite deposits (Minfile 082ESW 258).

The Property

The property, owned by Florence Niddery of Okanagan Falls, B.C., consists of a single two-post claim (Kava-1; tenure no. 395826) of 25 hectares located 9 km west of the village of Kaleden in the Osoyoos Mining Divison of the southern interior of British Columbia (Figs. 1 and 2). The following co-ordinates have been established for the claim using a Garmin 12 GPS receiver (Fig. 3):

Post	Co-ordinates		Elevation		UTM (NAD '83)	
	Latitude	Longitude	feet	metres	easting	northing
1	49°23.17'	119°45.35'	4160	1270	300000	5470000

Expiry date of this claim is Aug. 14th, 2003.

Location and Access

The Kava-1 claim is 2.75 km northwest of Mt. Laidlaw (elev. 1,200 to 1,300 m) at Lat. 49° 23', Long. 119° 45.5'. Access to the property is 6.6 km by dirt road north from Yellow Lake and Highway 3A via the Sheep Creek (Yellowlake Creek) road and the West Kootenay Powerline service road (Figs. 3).

Physiography and Climate

The region is characterized by low mountainous terrain that is bounded by the Okanagan valley on the east (elev. ~530m), and the Similkameen and tributary valleys on the west (elev. ~550). The concordant summits above Yellowlake Creek (rising to more than 1,500 m elev.) are remnants of a once continuous upland surface that comprises the southern extremity of the Thompson Plateau.

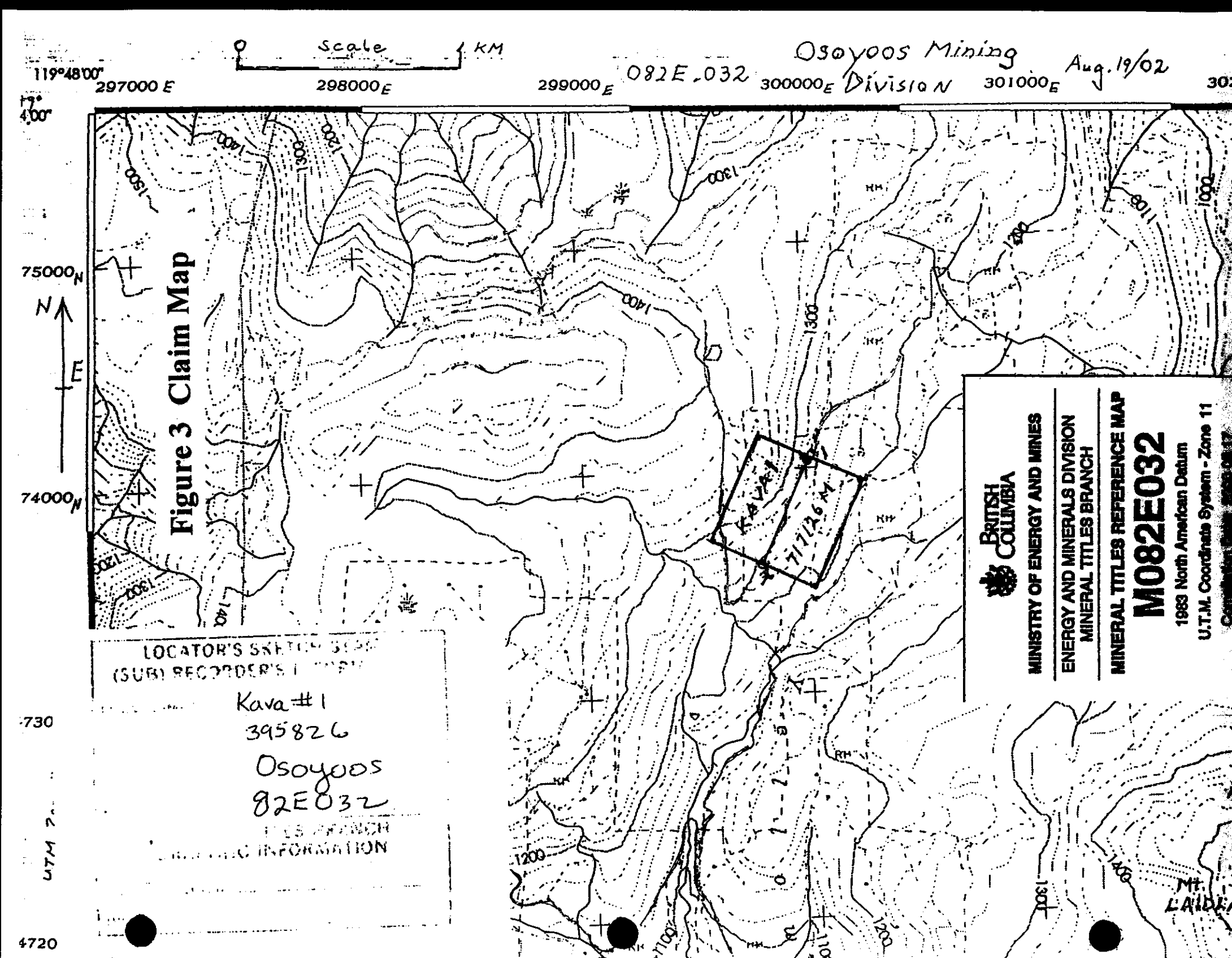
The low parts of the region and south-facing slopes are generally open ranch lands with plentiful grasses, sage-brush and cactus. The summits and north-facing slopes have pine, spruce and fir of sufficient density to support intermittent logging operations.

Climatic conditions are generally warm and dry during the summer months. The total annual precipitation of combined rain and equivalent snow is about 28 cm.

Background

The word zeolite is derived from a Greek phrase meaning 'boiling stones' in reference to the visible loss of water on heating. Zeolite minerals are hydrated aluminosilicates of alkaline and alkaline earth elements such as sodium, potassium, magnesium, lithium, barium and calcium. They form naturally from the reaction between volcanic ash and alkaline water. The commercial application of zeolite stems from the mineral's capacity for adsorption, catalysis and ion exchange (Griffiths, 1987).

Manufactured 'synthetic' zeolites are also used for ion exchange and molecular sieves in the purification of gases and liquids, but at much higher cost than naturally occurring zeolites. Chabazite and clinoptilolite are the two most common members of this mineral group used in commercial operations. Generally they may be described as having a framework or honeycomb structure. The pores within their structure range in size from 2 to 12 angstroms. The cations within the structure are loosely bound and can be readily exchanged. Therefore, zeolites may be used for ion exchange, filtering, odour removal, chemical sieving, and gas absorption. Zeolites can be used to remove odour, toxins and metals from both air and water. They are commonly used as human and animal waste adsorbents. In addition to other uses, zeolite has been used for soil amendment and hydroponics, water filtration in fish farms, enhancement of livestock feed and even storage of solar and waste energy (Mannion and Kline, 1996; Mumpton, 1999; Leggo and Ledesert, 2001; Chaw, 2002).


Scale KM
Osoyoos Mining Division
082E.032
Aug. 19/02
119°48'00"
297000 E
298000 E
299000 E
300000 E
301000 E
75000 N
74000 N
N
E
Figure 3 Claim Map
KAVA 1
717.26 M
BRITISH COLUMBIA
MINISTRY OF ENERGY AND MINES
ENERGY AND MINERALS DIVISION
MINERAL TITLES BRANCH
MINERAL TITLES REFERENCE MAP
M082E032
1983 North American Datum
U.T.M. Coordinate System - Zone 11
LOCATOR'S SKETCH
(SUB) RECORDER'S
Kava #1
395826
Osoyoos
82E032
TITLES BRANCH
GRAPHIC INFORMATION
Mt. LAIDLAW
UTM
4720

Geological Setting

Zeolites are most commonly preserved in the Tertiary volcanic rocks because of the usual low grade of regional metamorphism of these formations (Hora and Church, 1986). The interior plateau area of British Columbia is underlain by deeply dissected early Tertiary lava, associated pyroclastic rocks and interbedded sedimentary units. These rocks occur within a northwesterly-trending belt about 150 km wide, extending 800 km from the Republic Mining District in Washington State to the Babine Lake area of central British Columbia. The thickness of these rocks ranges from less than 100 m to more than 1,200 m. The base of the succession where best developed is composed of fluvial sandstone and conglomerate. The upper boundary of these rocks is generally coincident with a gently rolling upland surface that is locally unconformably covered by a veneer of Miocene and younger 'plateau lavas' of the Chilcotin Group.

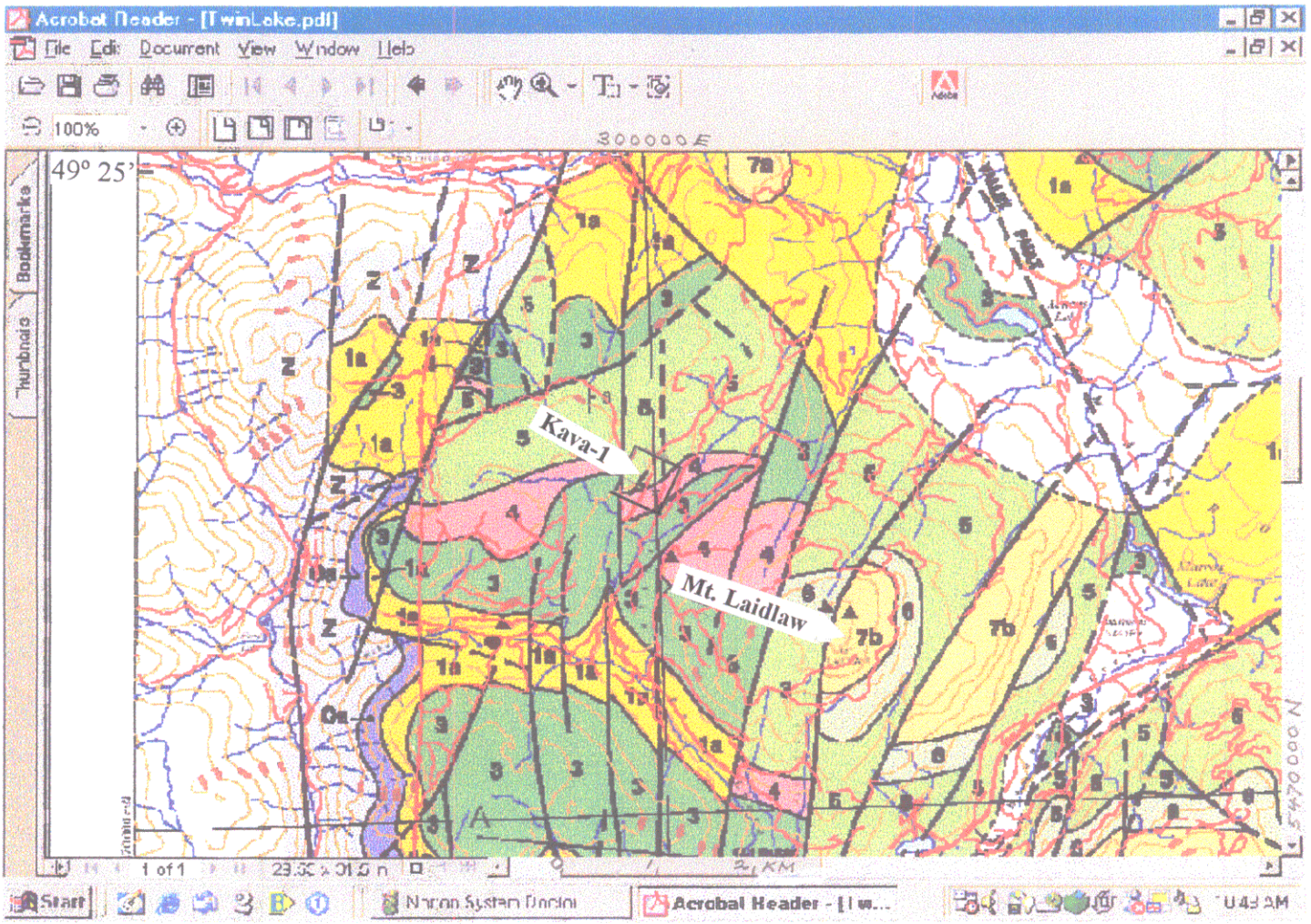
The Penticton Tertiary outlier, the type area of the (Eocene) Penticton Group, covers an area of approximately 430 km^2 between the town of Penticton and Okanagan Falls in the Okanagan Valley and village of Keremeos to the southwest in the Similkameen Valley (Church, 2002b). The Springbrook Formation, at the base of the group, is a polymictic conglomerate containing clasts derived by stream erosion of a geologically diverse pre-Tertiary metamorphic terrane. In the Twin Lakes area this unit is overlain by the Marron Formation (1,700 m thick) consisting of phonolite, trachyte, andesite, and basalt lava flows, tuff and breccia deposits. Above this sequence, the Marama Formation comprises an array of dacitic lava domes that are scattered across the area (Fig. 4). In the east part of the Penticton outlier the White Lake Formation (1000 m thick) is a succession of fluvial, lacustrine, lahar and volcanic breccias developed unconformably on the Marron and Marama Formations. Completing the Penticton Group, the Skaha Formation is a mainly chaotic landslide breccia at the top of the Eocene succession.

Structural control of these rocks is a north-south stress scheme related to the oblique subduction of the Pacific plate under the North American craton (Dostal et al. 2003). This stress engine was active throughout the Cordillera during the early Tertiary. The result is a complex inter-relationship of shears, tension faults and folds and the simultaneous development of grabens, folding and thrusting. In overall scheme the rocks of the Penticton Tertiary outlier dip easterly towards major gravity faulting in the Okanagan Valley to form a trap-door-like half graben structure.

The zeolitic beds on the Kava-1 claim are exposed intermittantly over a distance of about 300 m in road cuts (Table 1, Fig. 5, stas. 1 and 5) and in a cat trench above the road to the north (sta. 2). The beds are gently easterly and southeasterly-dipping, beige/ brown tuffaceous siltstones/ sandstones containing minor cabonaceous wood and leaf fossils. These beds are apparently overlain by Nimpit Lake tan trachyte lava flows exposed on the ridge north of the claim (stas. 3 and 6); the beds are underlain by Kearns Creek pyroxene phyric basalt exposed near the south boundary of the claim (sta. 4).

Figure 4 Geology of the Mt. Laidlaw Area

http://www.em.gov.bc.ca/Mining/Geolsurv/Publications/catalog/catmaps.htm#GeoSciMap



Legend

Eocene

Penticton Group

7 Marama Formation

Marron Formation

6 Park Rill Member

5 Nimpit Lake Member

4 Kearns Creek Member

3 Kitley Lake Member

1 Yellow Lake Member

0a Springbrook Formation

Z **Pre-Tertiary Rocks**

Mineralization and Geochemistry

The occurrence of zeolites in the Tertiary volcanic rocks of the Penticton area was first described by Church (1973) and Hora and Church (1986). Similar discoveries were later made in the Princeton and Cache Creek areas (see Minfile nos. 092HSE 165, 168, 243 and 092INW095). These are the most significant natural zeolite deposits in Western Canada.

In the Okanagan area zeolites are abundant in the lower part of the Penticton Group (possibly partly as the result of load metamorphism, although the composition of the host rocks was no doubt a controlling factor). There is a close association of natrolite and secondary analcite with calcite in amygdale fillings in the phonolite lavas of the Yellow Lake member of the Marron Formation. The growth of these minerals was favoured by the alkali and alumina-rich lavas in a closed hydrothermal system at the time, or shortly after volcanic eruption.. The association of clinoptilolite with tuffaceous sedimentary rocks in the middle part of the Marron Formation suggests that some of the mineralization is authigenic or early diagenetic origin.

X-Ray diffraction (XRD) results on two grab samples of tuffaceous siltstone/sandstone determined by Hora and Church (1986) from the vicinity of Mt. Laidlaw shows 10 to 20% clinoptilolite and a trace to 30% analcite.

The age of the Marron Formation is Eocene (53.1 ± 1.8 Ma) according to K/Ar determination of the biotite from trachyandesite lava east of Yellow Lake.

Age Data

Sample No.	Latitude	Longitude	K %	Ar40*	Ar40* /K40	Ma
BNC-1	49°20.4'	119°44.3'	5.927	0.0223	0.0222 / 7.090	53.1 ±1.8
			5.951	0.0220		

Work Done

Prospecting in the Mt. Laidlaw area in August 2002 followed a partnership arrangement with the B.C. Geological Survey Branch to produce a digitized coloured map entitled 'Geology of the Penticton Tertiary Outlier' at 1:50,000 scale (GSB Geoscience Map 2002-5). During the fieldwork phase of this project zeolitic tuffaceous beds were discovered underlying trachyte lavas of the Nimpit Lake Member mid-section in the Marron Formation in the headwater area of Yellowlake Creek, north of Mt. Laidlaw. The setting appeared to be not unlike the Manuel Creek zeolite occurrence located 17 km to the south (Church, 2002a). At total of 12 field stations were required to delineate the zeolitic beds within the Marron F. Subsequently a two-post claim (Kava-1) was staked to cover the exposed mineralized zone.

Potential

The mineral potential of the Twin-1 claim is unknown because of extensive alluvium and glacial debris cover and the need for additional sampling and analytical work. Nevertheless, the preliminary mineralogical results combined with the apparent significant thickness and continuity of the tuffaceous beds across the claim are encouraging factors for the development of a major zeolite deposit.

Markets

Natural zeolite has a wide range of industrial applications including uses as dimension stone and construction aggregate, human and animal waste absorbents, soil amendments, animal feed, chemical sieving and filtering of toxins from air and water.

The search for natural zeolite deposits is usually carried out near major markets to minimize transportation costs. The largest market for these resources is the southern part of the province, especially the Vancouver area, and adjacent parts of Alberta and the U.S.A. The most important deposits occur in the belt of young felsic volcanic rocks in south-central British Columbia. The Ranchlands property is an example of a producing zeolite deposits in the Cache Creek areas.

The Ranchlands deposits (Minfile 09INW095) are centred 4.5 km northeast of Cache Creek, in an area underlain by volcanic and sedimentary rocks of the (Eocene) Kamloops Group. The 'Z-1' deposit of Highwood Resources Ltd. consists of two seams, each 5 to 8 m thick, of zeolitized vitric tuff having a 50-67 CEC rating. The production, amounting to about 2,000 tonnes per year, is used mainly as a cattle feed amendment in Alberta. The nearby McAbee deposit owned by C2C Mining Corp. is a 10 m thick heulandite and clinoptilolite bearing rhyolite tephra (CEC rating of 46-64) within a 50-70 m thick shale/siltstone lens. A processing plant at Ashcroft produces cat litter, feed binder and industrial absorbents.

Conclusions and Recommendations

The main result of this project is the partial delineation of clinoptilolite-bearing tuffaceous sedmentary rocks located between the Kearns Creek and Kitley Lake lava members of the Marron Formation on the Kava-1 claim. Preliminary evaluations suggest that the mineralized beds are a few 10's of meters thick and continuous on strike for several hundred metres.

The following recommendations are proposed towards developing the perceived zeolite resources:

1 - A rock sampling program is recommended to cover the tuffaceous beds underlying the Nimpit Member.

2 – XRD testing of tuffaceous beds for zeolites (esp. clinoptilolite).

3 - Lithogeochemical testing (CEC) is recommended clinoptilolite bearing samples.

4 - Expand claim holdings pending the results of the above program.

5 – An orthophotographic map of the property and surrounding area is needed in preparation for a detailed geological survey.

6 - Prepare a detailed geological outcrop map of the claim area at 1:5,000 scale.

7 – This should be followed by trenching and/or drilling to determine the exact thickness and lateral extent of the zeolitized beds.

References

Chaw, D. (2002): Evaluation of Zeolite Based Fertilizers for Reclamation of Mine Tailings; Olds College Centre for Innovation; Final Report prepared for Bioterra Inc., Calgary, Alberta; 20 pages.

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Leggo, P.J. and Ledesert (2001): Use of Organo-Zeolite Fertilizer to Sustain Plant Growth and Stabilize Metallurgical and Mine Waste Sites; Summer issue, Mineralogical Magazine.

Mannion, W.A. and Kline, A.S. (1996): Gold dust for golf greens? Mines in the western United States yield a soil amendment that can outperform sand; Golf Course Management, January issue, 3 pages.

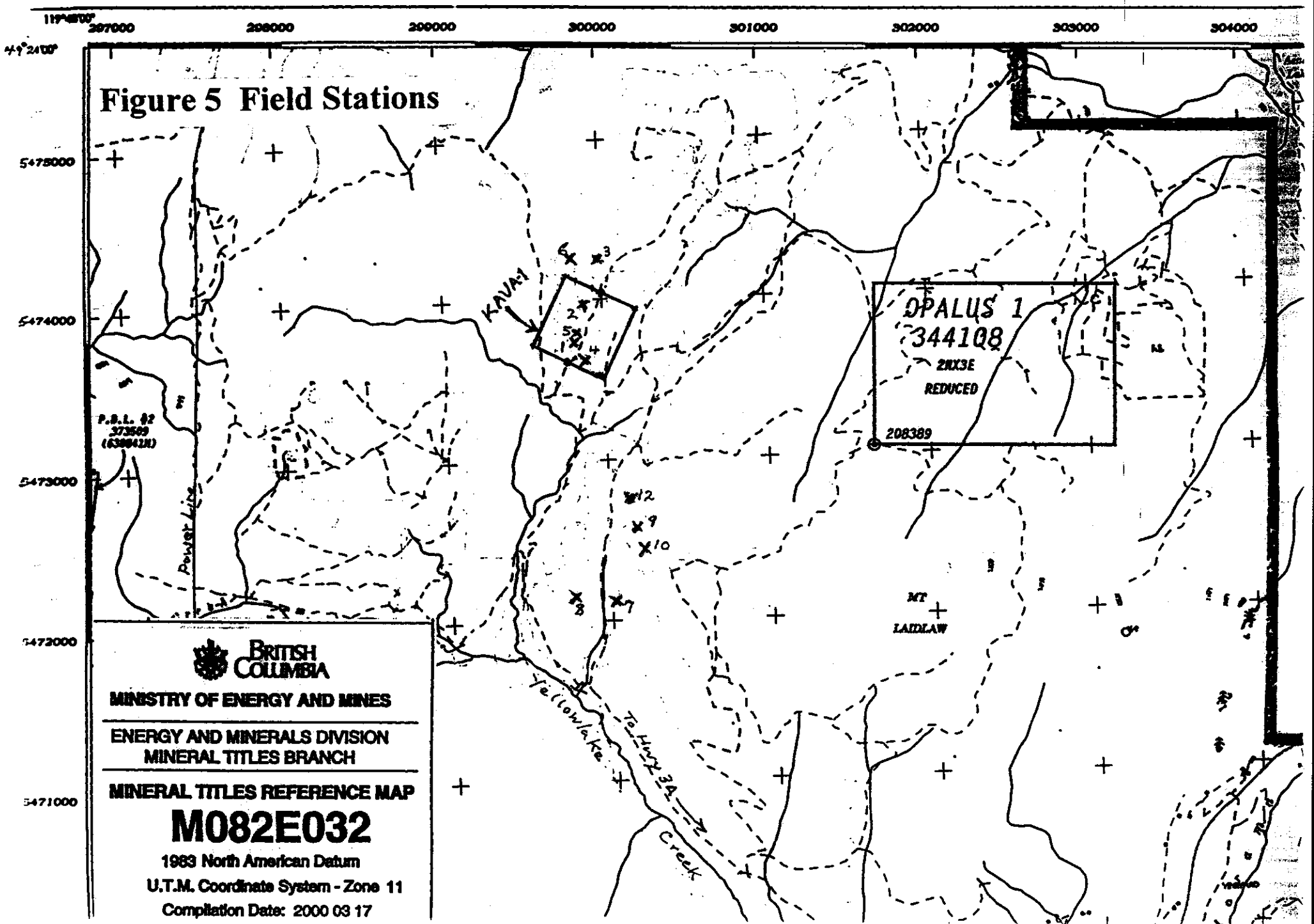
Marcille, V.V. (1989): Industrial Zeolites in the Princeton Basin; B.C. Ministry of Energy and Mines, Geological Fieldwork 1988, pages 511-514.

Mumpton, F.A. (1999): La Roca Magica; Uses of Natural Zeolites in Agriculture and Industry. Proceedings; National Acad. Sci. USA, Vol. 96, pages 3463-3470.

Table 1 Notes to Accompany Figure 5

Sta.	No.	Lat.	Long.	Unit	Description
ECO	1	49° 23.0'	119° 45.5'		buff coloured tuff and silty sandstone with leaves
ECO	2	49° 23.1'	119° 45.5'		buff/brown flaggy silty standstone, beds 165°/15°E
ECO	3	49° 23.3'	119° 45.4'		Nimpit Lake Mbr., tan trachyte
ECO	4	49° 22.9'	119° 45.4'		Kearns Creek Mbr., dark brown vesicular basalt
IR	5	49° 23.0'	119° 45.5'		brown zeolitic silty sandstone, beds 036°/6°SE
IR	6	49° 23.3'	119° 45.5'		Nimpit Lake Mbr., tan trachyte
IR	7	49° 22.1'	119° 45.3'		Kitley Lake Mbr., trachyandesite with pl + cpx
IR	8	49° 22.1'	119° 45.5'		Kitley Lake Mbr., massive brown porphyritic lava
IR	9	49° 22.4'	119° 45.2'		Kearns Creek Mbr., vesicular, pyroxene-rich lava
IR	10	49° 22.3'	119° 45.1'		Kearns Creek Mbr., dark brown pyroxene phyric lava
IR	11	49° 22.6'	119° 45.3'		Kitley Lake Mbr., pl + cpx trachyandesite lava
IR	12	49° 22.5'	119° 45.2'		Kitley Lake Mbr., brown plagioclase porphyritic lava

Figure 5 Field Stations



Appendix A
Statement of Costs

Labour: - geological engineer, B.N. Church, P.Eng. August 13-15th, 2002; 3 days @ 500/day		1,500.00
Accomodation/Meals: - self (3x100/day)		600.00
Vehicle costs: - @ 0.40/km		360.00
Office and field supplies: -		100.00
Report preparation: -		800.00
	Total	$ 3,360.00

Appendix B
Statement of Technical Support

Prospecting in the Mt. Laidlaw area in August 2002 followed a partnership arrangement with the B.C. Geological Survey Branch to produce a digitized coloured map entitled 'Geology of the Penticton Tertiary Outlier' at 1:50,000 scale (GSB Geoscience Map 2002-5). This map is downloadable directly from the B.C. Energy and Mines Ministry web site or may be purchased in hard copy format from Crown Publications Inc. (item GM02-5 @ $10.00 ea.). The cost of preparation of this map ($1,560.07) is to be applied eslewhere towards PAC credits as per the partnership agreement.

Appendix C
Statement of Qualifications

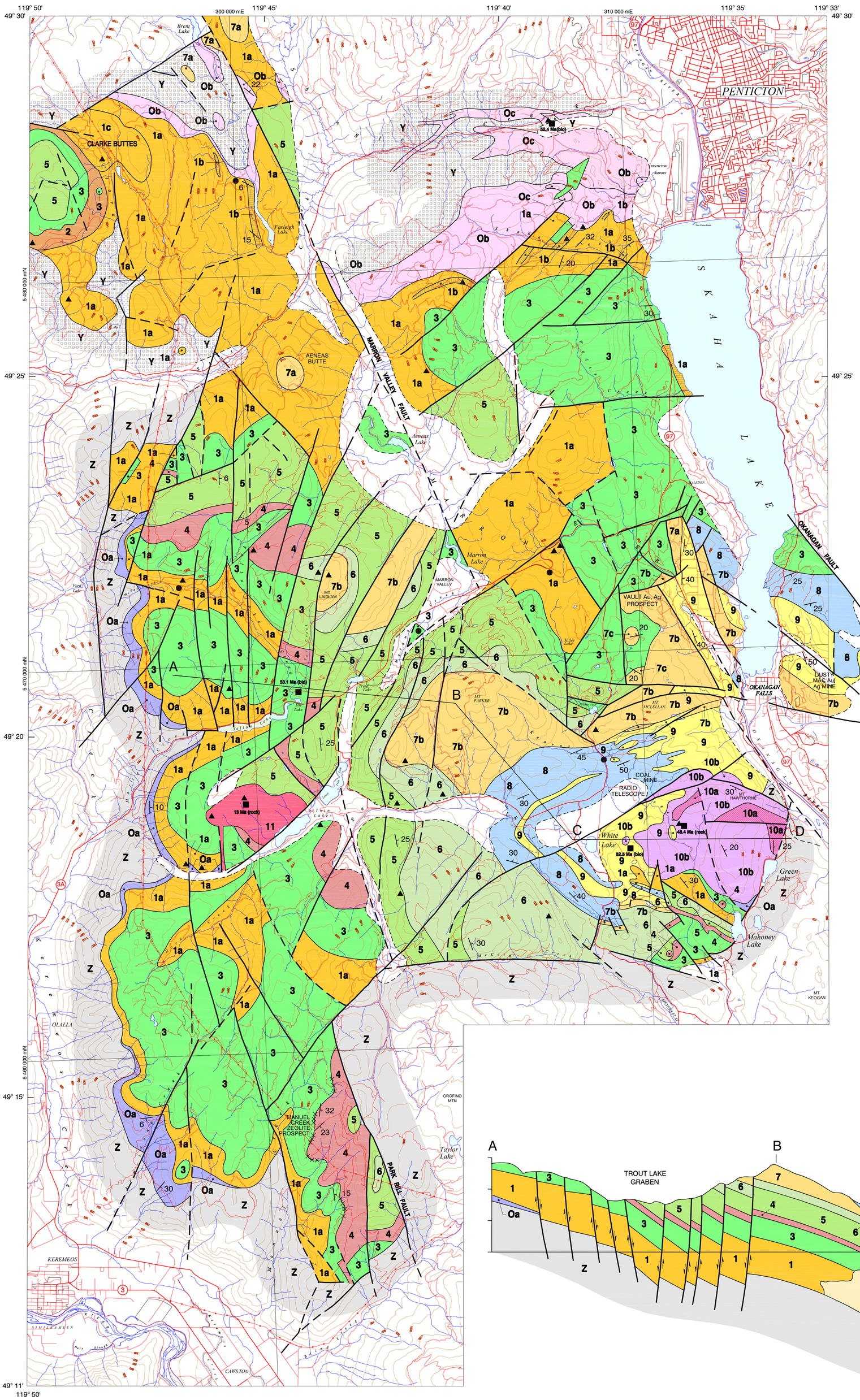
I, Barry Neil Church, do hereby certify that:

I am a member of the Association of Professional Engineers and Geoscientists of British Columbia (membership number #8172) with offices at 600 Parkridge St., Victoria, B.C.
I am a graduate of the University of British Columbia (1967) with a Ph.D. in geology. I have practiced my profession continuously since graduation.
I am familiar with the district. This report is based on my personal examination of the property during August, 2002. I am the author of this report and verify the costs as reported to be true.
Florence Niddery (of Okanagan Falls, B.C.) is the owner of the property.

Dated at Victoria, B.C., the 25th day of August, 2003.

Submitted by:

B. Neil Church, Ph.D., P. Eng.
August 25th, 2003



BRITISH COLUMBIA
Ministry of Energy and Mines
Minerals Division

GEOSCIENCE MAP 2002-5

Geology of the Penticton Tertiary Outlier

By B. N. Church

NTS 82E5

SCALE 1:50 000

0 1 2 3 4 5
kilometres

LEGEND

MIOCENE

OLALLA RHYOLITE

11 MOSTLY RHYOLITE BRECCIA, SOME MASSIVE OBSIDIAN, AND ASSOCIATED DYKES

EOCENE

PENTICTON GROUP

SKAHA FORMATION

10a CHANNEL DEPOSIT OF GRANITE BOULDER CONGLOMERATE AND BRECCIA AND ARKOSIC SANDSTONES

10b MOSTLY CHERT AND GREENSTONE SLIDE BRECCIA AND SOME TEPHRITE LAVA OVERLAIN BY POLYMICTIC FANGLOMERATE

WHITE LAKE FORMATION

9 MOSTLY VOLCANIC BRECCIAS INCLUDING PYROCLASTIC ROCKS AND LAHARS, MINOR TRACHYTIC AND ANDESITIC LAVAS

8 VOLCANIC CONGLOMERATE, SANDSTONES, AND SHALES

MARAMA FORMATION

7a AENEAS BUTTE FELDSPATHIC DACITE

7b MASSIVE APHANITIC DACITE LAVA AND SOME BRECCIA FORMING MOSTLY REMNANTS OF VOLCANIC DOMES

7c VOLCANIC CONGLOMERATE WITH CLASTS FROM THE MARRON FORMATION

MARRON FORMATION (**UNDIVIDED)**

6 **PARK RILL MEMBER:** MEROCRYSTALLINE ANDESITE LAVA AND MINOR BRECCIA

5 **NIMPIT LAKE MEMBER:** TAN TRACHYTE AND TRACHYANDESITE LAVA AND MINOR BRECCIA

4 **KEARNS CREEK MEMBER:** VESICULAR PYROXENE-RICH BASALTIC ANDESITE LAVA

MANUEL CREEK DACITIC TUFF (WITH LOCAL ZEOLITIZATION)

3 **KITLEY LAKE MEMBER:** TRACHYANDESITE LAVA WITH CONSPICUOUS GLOMEROPHENOCRYSTIC CLOTS OF FELDSPAR

2 **SHATFORD CREEK MEMBER:** LOCAL DEPOSIT OF BROWN ANDESITE LAVA AND BRECCIA WITH SOME QUARTZ-FILLED AMYGDALES

YELLOW LAKE MEMBER:

1a MOSTLY PYROXENE-RICH MAFIC PHONOLITE LAVA WITH LOCAL WELL-DEVELOPED PHENOCRYSTS OF RHOMB-ANORTHOCLASE AND SOME PRIMARY ANALCITE, ABUNDANT ZEOLITE FILLINGS IN CRACKS AND AMYGDALES

1b PURPLE AND GREY VOLCANIC WACKE FROM EROSION OF 1a AND PINK RADIOACTIVE FELDSPATHIC TRACHYTIC ASH FLOW, SANDSTONE, AND CONGLOMERATE

1c **CLARK CREEK PORPHYRY:** A SILL-LIKE BODY RELATED TO 1a WITH LARGE FELDSPAR PHENOCRYSTS

SPRINGBROOK FORMATION

Oa POLYMICTIC CONGLOMERATE AND BRECCIA WITH CLASTS DERIVED MAINLY FROM PRE-TERTIARY BEDDED ROCKS

KETTLE RIVER FORMATION

Ob MAINLY GRANITE BOULDER CONGLOMERATES, ARKOSE, VOLCANIC WACKE, AND RHYOLITE BRECCIA

Oc **SHINGLE CREEK PORPHYRY:** A COARSE SANIDINE QUARTZ PORPHYRY INTRUSION FEEDER TO THE RHYOLITE VOLCANIC ROCKS OF Ob

PRE-TERTIARY ROCKS

Y MAINLY GRANITIC INTRUSIONS

Z MAINLY CHERTS, GREENSTONES, SCHISTOSE ROCKS, AND MINOR INTRUSIONS

SYMBOLS

DRIFT COVERED AREA

GEOLOGICAL BOUNDARY APPROXIMATE

BEDDING: HORIZONTAL, INCLINED

FAULT: APPROXIMATE, ASSUMED

TOPOGRAPHICAL CONTOUR (INTERVAL, 100 METRES)

STRUCTURE SECTION A B

CHEMICAL ANALYSIS STATION

K/Ar SPECIMEN LOCALITY

POWER LINE

ROAD, HIGHWAY 3

DIAMOND DRILL HOLE