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INITIAL ASSESSMENT

OF THE

COR PROPERTY

Greenwood Mining Division  
Granby River, B.C.

GEOLOGICAL SURVEY BRANCH ASSESSMENT REPORTS
DATE RECEIVED DEC 17 1996

FOR

MAMMOTH GEOLOGICAL LTD.

GEOLOGICAL SURVEY BRANCH  
ASSESSMENT REPORT

24,695

By: R. Tim Henneberry, P. Geo.  
November 29, 1996

SUMMARY

The Cor property lies within the Greenwood Mining Division, north of Grand Forks. The property is being explored as a potential source of granite dimension stone, for structural stone and possibly polished stone.

The property was acquired as part of an on-going exploration and assessment program of the southern interior plutons. A preliminary examination located a potential quarry site, a solid knob of granite. Polished sections show the stone has an appealing texture and exhibits few flaws on the finished surface. The hue is an even red-brown.

Based on these preliminary observations, a staged three phase exploration program is recommended as outlined below:

Phase I	\$3,623
Phase II	\$18,371
Phase III	\$43,183
<b>TOTAL BUDGET</b>	<b>\$65,176</b>

Phase I will consist of mapping and sampling of the claims at an estimated cost of \$3,623.

Phase II will consist of both boulder and "outcrop" testing to produce small test blocks for split stone and tile. A preliminary marketing survey will also be completed at a total phase cost of \$18,371.

Phase III, the pre-production bulk test, will include test quarrying of several rough quarry blocks, approximately 2.4m by 1.8m by 1.8m (8 ft. X 6 ft. X 6 ft) each. Phase III is estimated to cost \$43,183.

The initial prospecting and mapping program completed on the Cor property cost \$867.

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## INTRODUCTION

The purpose of this report is to document the observations made of the granite on the Cor property. A preliminary examination was made on October 14, 1995. This consisted of prospecting and mapping along a secondary road traversing the west boundary of the claim and sampling. Recommendations for further exploration have also been presented.

The term granite is a generic term in the dimension stone industry used to describe any intrusive igneous rock. In this instance, the stone on the Cor property is actually a syenite.

The Cor property was acquired as part of a regional exploration program and assessment of the southern interior plutons. This program was initiated as a result of the on-going dimension stone initiative of the British Columbia Geological Survey Branch (White, 1985; White and Hora, 1988; Page, 1991; Hora and Hancock, 1992 and 1994). The opening of two granite fabricating plants in the Lower Mainland, combined with the up-surge in the use of structural (or masonry) granite has lead to increased demand and a search for local source.

The standard exploration program for each of these dimension stone properties consists of prospecting and mapping followed by small scale quarry testing of boulders, finally followed by a large scale bulk test of the identified quarry site.

Some of the granites of the southern interior yield large 100-1000 ton boulders, ideal sites to complete small scale tests of the stone for both polished and structural stone. These boulder testing programs of small scale test quarrying, combined with marketing tests, yield a good assessment of the stone potential of each property.

The boulder testing programs entail the actual quarrying of a few of the boulders into 5-20 ton blocks. These blocks are then supplied to local processors for completion of market tests. At least 500-1000 tons has to be supplied to allow the stone to be tested in the market place, which essentially means the stone is used on a few jobs sites, especially for structural stone.

The final phase involves actual test quarrying of 1000-2000 tons from the planned quarry site to establish the consistency of color, texture and structure. This stone will again be put into the market place to complete marketing analysis, before a final production decision is made.

# Mammoth Geological Ltd.

## Southern Interior Dimension Stone Project

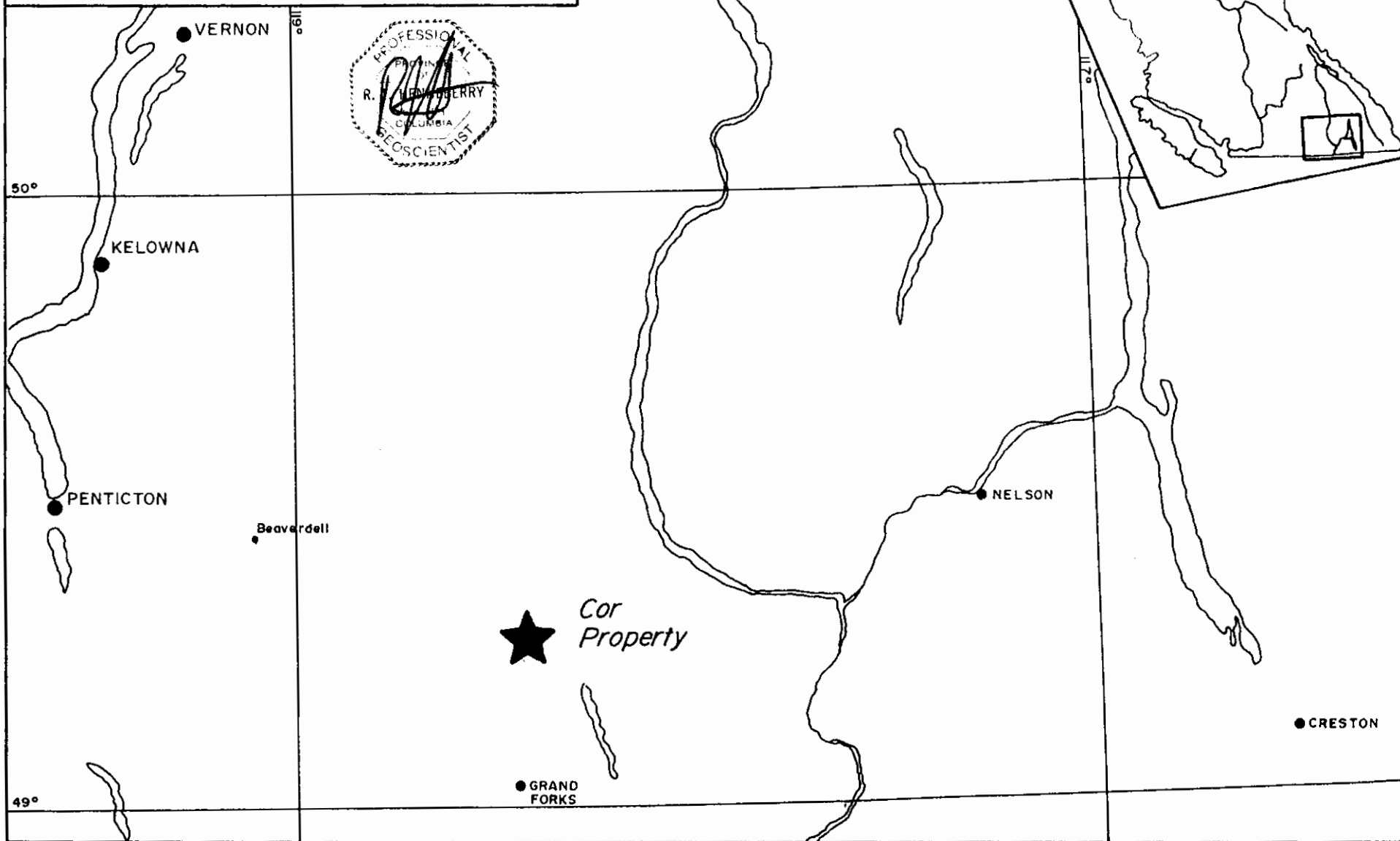
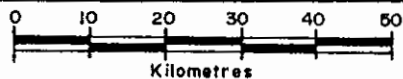
### East Southern Interior Property Locations

DRAWN BY: R. Tim Henneberry

DATE: November 1995

SCALE: 1:1,000,000

FIGURE: 1



## LOCATION, ACCESS

The southern interior is one of the more accessible areas of the province of British Columbia. It is traversed by the Trans Canada Highway in the north, Highway 6 through much of the centre, and Highway 3 in the south. Several north south highways and mainline logging roads transect the region, with secondary and tertiary logging roads providing ready access to most areas.

The topography ranges from  $\pm 450$  metres in the valleys to +1700 metres in some of the mountain passes. Some of the higher peaks are in excess of 3500 metres. Slopes are forested, with active logging on going at numerous locations.

The climate is warm and dry in the summer and cool to cold in the winter depending on elevation. Temperatures can be as low as -40 Celsius in the winter, though usually not for extended periods. Summer temperatures can reach +35 Celsius. Snow fall varies greatly throughout the region. The valleys and lower slopes are usually clear of snow in late-May to early-June and remain so until late-October to early-November.

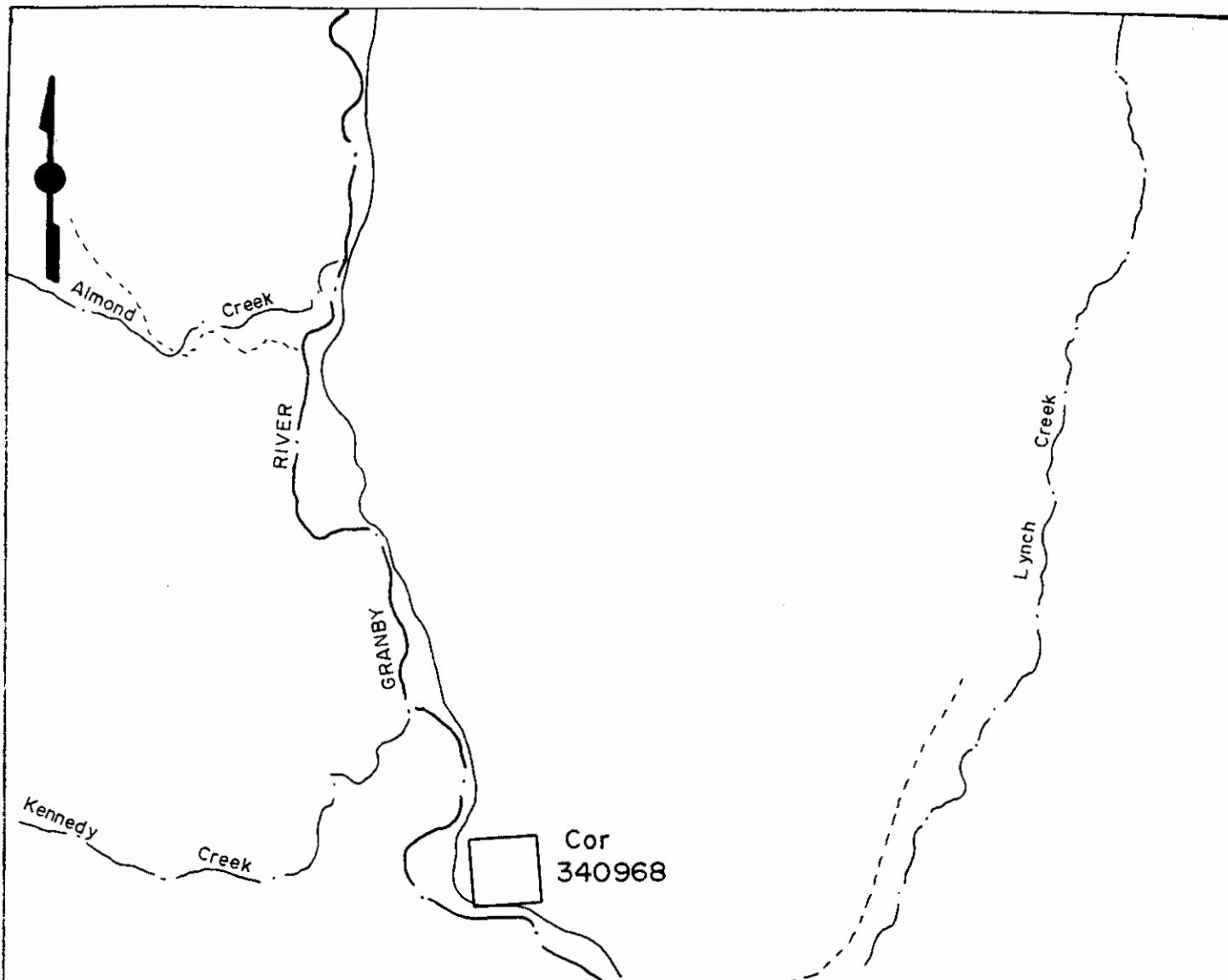
Aside from road transportation, the Trans Canada Rail Line parallels the Trans Canada Highway. Canadian Pacific also operates a railway in the south connecting its Sullivan Mine in Kimberly with its smelter in Trail, and eventually the port of Vancouver. Modern airports are located in Kelowna, Penticton and Castlegar, with daily jet service to Vancouver or Calgary. Several of the smaller communities are served by feeder airlines.

Skilled manpower is available in the numerous cities and towns throughout the region, as is heavy duty equipment (cats, excavators, loaders, etc.) Hydro-electricity is the main source of power. Water is abundant throughout the region.

The larger population centres have all of the modern amenities. Accommodation can be had in any of the major centres including: Hope, Princeton, Penticton or Grand Forks.

The Cor property lies on NTS sheet 82E/08W, 31 kilometres north of Grand Forks. Access is via the Granby River Road to kilometre 31. The Granby River Road leaves Highway 3 at Grand Forks. The status of the property is logged and reforested with immature second growth.

The Cor property lies at an elevation of 600 to 750 metres. This property can be snow bound from late October to early May.



Mammoth Geological Ltd.	
Cor Property CLAIM LOCATION	
DRAWN BY: RT Henneberry	SCALE : 1 : 50,000
DATE : April 1996	
FIGURE : 2	From claim sheet(s): 082E/08W

CLAIM OWNERSHIP

The Cor property consists of 1 two-post claim, encompassing an area 0.5 kilometre by 0.5 kilometre. The claim covers the northern, accessible part of a large granitic knob in the Granby pluton of the Coryell intrusions.

Claim	Record Number	Anniversary Date
Cor	340968	October 14, 1996

The registered owner is R. Tim Henneberry of Port Hardy, B.C.

The claim is plotted on Claim Sheet 82E/08W.



LEGEND

Tertiary		Paleozoic	
Th	Hope, Chilliwack, Needle Peak plutons	Tvs	volcanics and sediments
Tvs	volcanics and sediments	Tc	Coryell intrusions
Cretaceous		Pc	Custer gneiss
Ks	Scuzzy, Spuzzum intrusions	Ko	Okanogan intrusions
Kvs	volcanics and sediments	Age unknown	
Jurassic		Caast Plutonic Complex	
Jb	Osprey lake, Mt. Lytton intrusions	Jn	Nelson intrusions
Jvs	volcanics and sediments	di	diorite
		gd	granodiorite
		qd	quartz diorite
Triassic - Permian		Modified from: Roddick, Muller, Okulitch (1977)	
TPvs	volcanics and/or sediments	Modified from: Okulitch and Woodsworth (1977)	

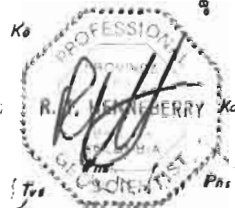
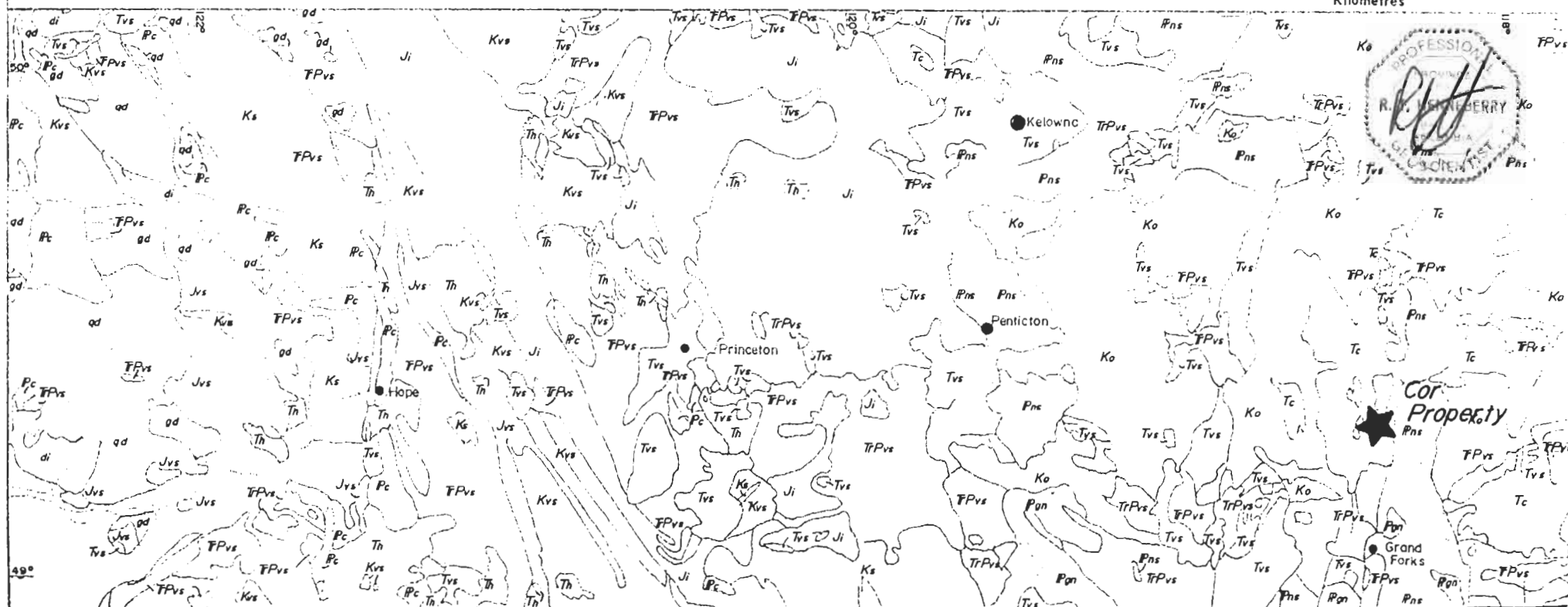
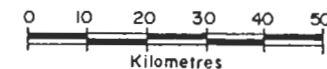
Mammoth Geological Ltd.

Southern Interior Granite Project

Simplified Regional Geology

DRAWN BY: RTHenneberry SCALE: 1:1,000,000

DATE: December 1995 FIGURE: 3



## REGIONAL GEOLOGY

The geology of the southern interior of British Columbia is characterized by three major tectonic belts; the volcano-sedimentary Intermontane belt sandwiched between the plutonic Omenica Crystalline belt on the east and the Coast Plutonic belt on the west. (McMillan, 1990).

The Omenica belt consists of a basement of the Paleozoic Okanogan and Shuswap metamorphic complexes. Remnants of volcanic and/or sedimentary sequences of Permian through to Triassic age outcrop throughout the belt. These rocks are then intruded by a series of plutonic events, concentrated in the Jurassic (Nelson intrusions), Cretaceous (Okanogan intrusions) and Tertiary (Coryell intrusions). Outliers of Tertiary mafic volcanics and related sediments outcrop throughout the map area. (Okulitch and Woodsworth, 1977).

The Intermontane belt is comprised of a series of accreted volcano-sedimentary terranes ranging in age from Permian to Triassic. These rocks are intruded by large Jurassic batholiths, including the Mt. Lytton and Osprey Lake batholiths. Tertiary outliers of mafic volcanics and sediments outcrop locally within the belt. (Roddick, Muller and Okulitch, 1979).

The Coast belt consists of intrusive rocks of many ages, including gneissic metamorphic assemblages as well as dioritic, quartz dioritic and granodioritic intrusions. Triassic and Jurassic volcano-sedimentary assemblages outcrop through the eastern margin of the belt. Two distinct plutonic events have been recognized near the eastern boundary: a Cretaceous event (Scuzzy intrusions) and a Tertiary event (Chilliwack and related intrusions). Local felsic Tertiary outliers are also mapped in the belt. (Roddick, Muller and Okulitch, 1979).

Historic dimension stone exploration and development has been undertaken within the plutonic rocks in all three belts. Southern interior dimension stone activity was concentrated in the early part of the century, essentially ceasing until a rejuvenation in the late 1980's.

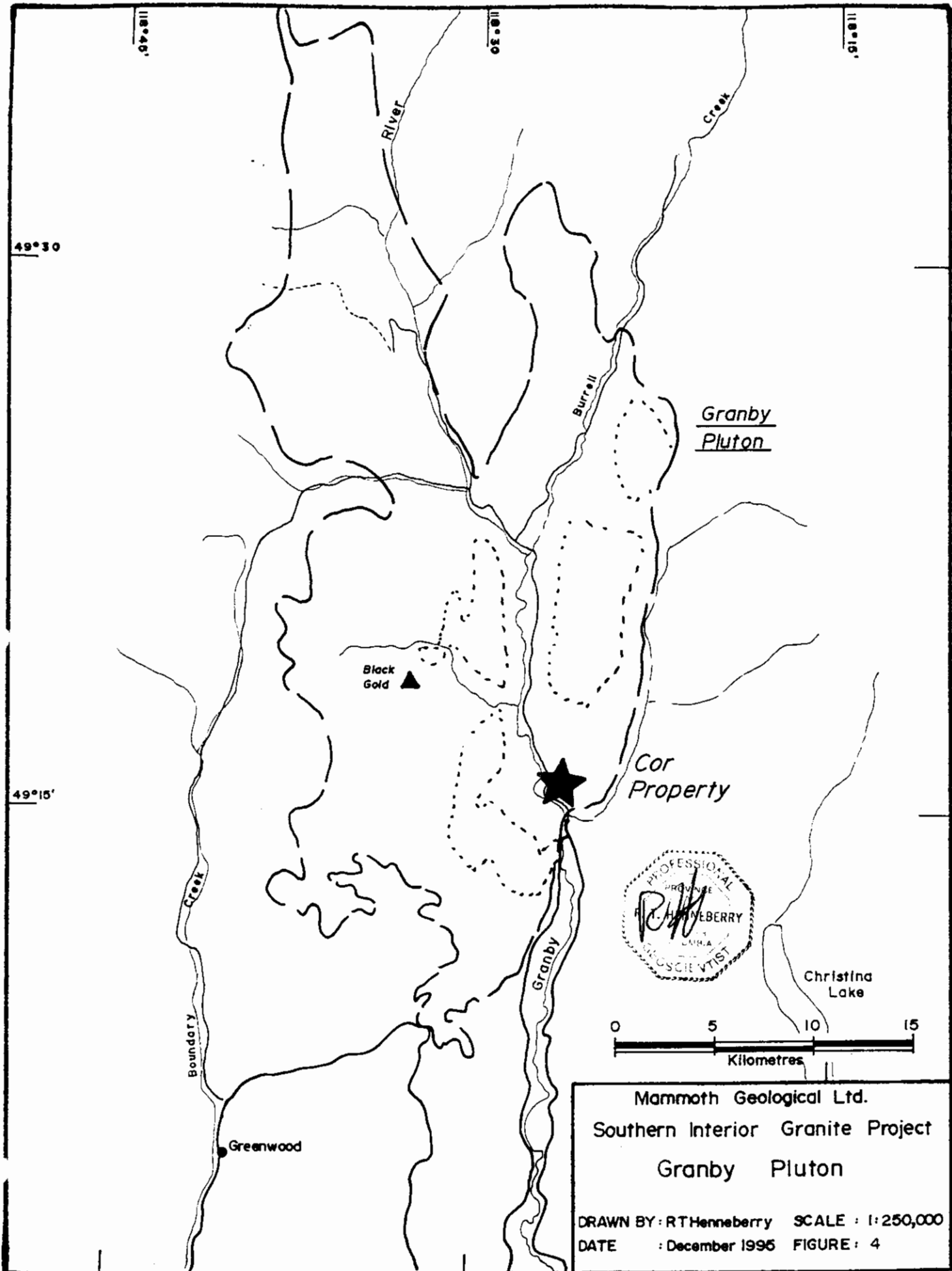
### **Omenica Crystalline belt**

Dimension stone targets in this belt include the Nelson, Okanogan and Coryell intrusions. Historic production was concentrated in the Nelson and Coryell intrusions. Present production is concentrated in the Okanogan intrusions, though exploration and development is being undertaken in all three intrusive groups.

The **Nelson intrusions** outcrop to the east of the present map area. Cairnes (1934) described these intrusions as massive, generally moderately foliated, medium grey weathering, medium- to coarse-grained, equigranular, hornblende-biotite granodiorite, quartz diorite and granite. The intrusions were quarried at three locations on Kootenay Lake with only limited success, due primarily to knots and sulfides.

Though the **Okanogan intrusions** historically received little attention for dimension stone, most of the present production from the southern interior is concentrated within these plutons. These intrusions outcrop throughout the eastern half of the present map area. The Okanogan intrusions are predominantly massive, light grey weathering, medium- to coarse-grained, equigranular to porphyritic, unfoliated to weakly foliated, fresh biotite granodiorite and granite (Templeman-Kluit, 1989).

The **Coryell intrusions** outcrop in a confined area on the eastern side of the present map area. As with the Nelson intrusions, these intrusions were quarried in the early part of the century, with little present exploration taking place. Most of the early quarrying was completed for structural stone for railway bridges and abutments. These intrusions are alkalic to calc-alkalic, high level, pink and buff syenite and quartz monzonite and trachytic pink feldspar porphyry dykes (Templeman-Kluit, 1989).



### **Intermontane belt**

The dimension stone targets in this belt are the Jurassic batholiths. No historic exploration or development has been undertaken in these rocks. Recent exploration has been confined to the Osprey Lake batholith.

The **Osprey Lake intrusion** outcrops through the centre of the map area, lying west of Okanogan Lake. Recently, very limited production has taken place within the intrusion. The body is described as a coarse-grained, porphyritic, pink-red granite (Rice, 1960).

### **Coast Plutonic belt**

The *Scuzzy and Chilliwack intrusions* are the main dimension stone targets within this belt, along with some of the quartz dioritic intrusions. Limited historic exploration and development has taken place in these rocks. Present quarry production is sourced from several of the Chilliwack intrusions.

The main body of undifferentiated **quartz diorite** outcrops on the western boundary of the map area. The intrusion is described as a medium-grained, quartz diorite, with 10% mafic minerals, with hornblende slightly more abundant than biotite (Roddick, 1965).

The **Scuzzy intrusions** outcrop along the western boundary of the Coast belt. Surprisingly, no exploration or development for dimension stone is documented, though there has been mention of "granite" in the area of Spuzzum being used for bridges and abutments for the railway lines in the Fraser Canyon. The stone is described as massive granodiorite, with coarse-grained quartz and feldspar and much finer grained biotite. (Monger, 1970).

The **Chilliwack intrusions** outcrop in a confined area on the western side of the map area. Though no historic exploration or development has been documented, these intrusions are presently being quarried at three locations, the Needle Peak pluton in the north, the Hope pluton in the centre and the *Chilliwack batholith* in the south. These intrusions are generally massive in outcrop and range in composition from granite to granodiorite (Monger, 1970).

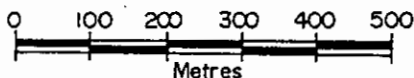
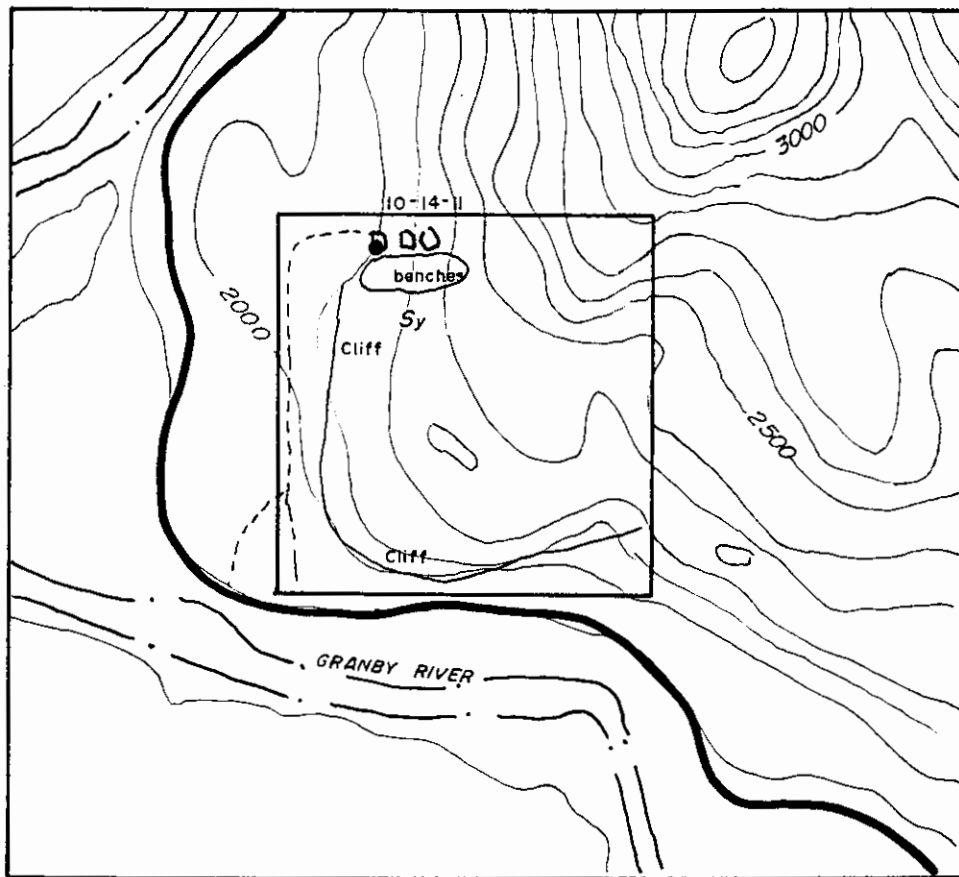
### **Coryell Intrusions - Granby Pluton**

The Tertiary Coryell intrusions outcrop as four distinct plutons and several lesser plugs, predominantly between Kettle River and Lower Arrow Lake. The *Coryell Intrusions* are alkalic to calc-alkalic, high level, pink and buff syenite and quartz monzonite and trachytic pink feldspar porphyry dykes (Templeman-Kluit, 1989). For the most part, the four plutons have not been officially named, other than the southeasternmost Coryell Batholith. The largest pluton, centred on the Granby River is the main target for dimension stone, and has been given the name Granby Pluton for this report.

The Granby Pluton lies to the west of the other three plutons and is dissected by the Granby River. The southern part of the pluton is a coarse-grained pink feldspar biotite granite with minor white clays (Little, 1983). The northern part of the pluton is a coarse-grained porphyritic syenite with euhedral phenocrysts of pink feldspar (Carr and Parkinson, 1989).

Outcrops on both sides of the Granby River valley consist of large knobs (of kilometre scale dimensions) in the south and ridges and benches in on larger mountains in the north. Large scree or talus slopes are associated with the southern knobs.

Exploration for dimension stone is being undertaken on the southwestern side of the pluton by San Pedro Stone Inc. The stone being developed at this location is a black gabbro phase of the pluton. (Kim, 1995). *Panorama Natural Stone Ltd.* staked and prospected the Jones Group, in the southeastern sections of the pluton (Henneberry, 1994). The property has subsequently been dropped.



**LEGEND**

**Tertiary  
CORYELL INTRUSIONS**

Sy - Coarse-grained, red-brown syenite

- Boulder
- Creek
- Road
- Outcrop
- Sample location

100 foot contour interval



**Mammoth Geological Ltd.  
Southern Interior Granite Project**

**Cor Property**

Drawn by: R.T.Henneberry  
Date: November 1996

Scale: 1:10,000  
Figure: 5

## PRELIMINARY PROPERTY GEOLOGY

The Cor property is underlain by the Granby Pluton of the Tertiary Coryell Intrusions, informally named for the Granby River dissecting the pluton. The stone outcrops as a solid knob more than 1 kilometre in diameter. The southern end of the knob is shear cliffs, while the northern end consists of a series of benches progressing up the slope to the top of the knob. These benches are the main target area for dimension stone.

Prospecting and preliminary mapping and sampling was undertaken. The mapping was confined to the benches. Samples were taken from the main southern most exposure.

Access to the Cor property is good. The Granby River Road provides access to a short secondary road along the base of the west and northern edge of the knob. The property has been logged and replanted, with immature second growth.

### **Red-Brown Syenite**

The stone of interest is best described as a red-brown, medium- to coarse-grained syenite. The constituents are: 80% red-brown, anhedral to subhedral (2-10mm) K-feldspar; 10% clear to white, anhedral (2-10mm) plagioclase; 5% glassy grey, anhedral (2-5mm) quartz; and 5% black, anhedral (2-5mm) mafics, both biotite and hornblende. No sulfides were noted in the sample.

The stone takes a good polish and shows a "radiance" when rolled. The sample is microfractured, both interstitially and across the crystal.

The stone has a clean, fresh appearance on natural break. The stone seems to weather well on glacial or long exposed faces, as no rusting or other deleterious substances were noted. No sulfides were noted in any of the samples, or on the weathered surfaces of any outcrops. No xenoliths were noted in the outcrop exposures.

The stone is massive and regularly fractured in outcrop, as the benches progress up the slope. Sustained quarry block production may be possible from this location.

The property was staked as a potential source for dimension stone, both polished and structural.

## MARKETING

Marketing carries almost an equal importance to geology for any industrial mineral property. The two key aspects of marketing for the southern interior dimension stone project are: acceptability of the stone in the marketplace and transportation of the stone from quarry to fabrication or job site.

The marketing assessment of the southern interior granite is a two step process. After the property has been acquired and prospected, resulting in the identification of a potential quarry site, a small (50 to 200 ton) amount of the desired end product, in this instance 5 ton block, is produced. This stone is then cut into tiles and shown to end users, namely fabricators, wholesale distributors and architects, for opinions and general comments. The purpose of this phase is to obtain frank opinions as to the suitability of the stone for entry into the marketplace.

Transportation is straight forward for this southern interior property. Road accessibility will allow Super "B" Trains direct access to the quarry site. The blocks can easily be delivered to Lower Mainland fabricators and/or port.

The second stage in the marketing process is to establish the quarry bench and produce a bulk test of 20 ton block in the range of 1000 to 2000 tons. The 20 ton block is supplied to fabricators to produce the end products for distribution to potential purchasers. Fabricators and purchasers of 20 ton block for polished dimension stone will demand to see the quarry site and actual **quarry bench** before they will consider block purchases. They want to verify consistency of color, grain and texture and ensure sufficient reserves are in place for continued supply.

Masonry or structural applications should also be considered for every granite property. An attempt should be made to split some of the initial 5 ton block to assess its suitability as split stone. If the stone splits readily a small (+20 ton) volume should be made into 4 inch split face and shown to masons and landscapers for opinions and comments. Every attempt should be made to get the stone tried on a few job sites. This will allow the completion of a photo portfolio for future marketing and eventual sales.

The marketing program cannot be initiated until the boulder testing program commences to provide sufficient material. As such, no marketing has been undertaken on the Cor property to date.

## DISCUSSION

The red-brown syenite of the Cor property is interesting. The polished appearance is attractive, with an even hue. The polished surface is smooth with little pitting. The split face nature of this stone has yet to be assessed.

The massive knob and semi-continuous benches suggests structural competency and somewhat simplified quarrying. The lack of xenoliths, rusting and other deleterious substances further enhance the property's potential. Road access to the ridge is already in place.

Based on the preliminary results to date, the Cor property warrants further work. The first stage of the proposed program will entail rudimentary geological mapping and initial boulder testing. Boulders should be split into 5 ton block for polished stone testing. The purpose is to complete a detailed marketing assessment.

An attempt should also be made to split the granite to test the suitability for structural stone.

A successful conclusion to this phase will result in a larger testing program, where an actual quarry bench will be established, yielding 10-20 rough (twenty ton) quarry blocks. These blocks will be fabricated into polished slabs and tiles, leading to a detailed market assessment.

A production decision can be made at the conclusion of this phase.



## CONCLUSIONS AND RECOMMENDATIONS

The Cor property was identified and staked as part of the regional exploration and assessment program of the southern interior plutons. The red-brown syenite from this property is projected to have use as polished dimension stone.

Exploration to date has been minimal with only preliminary prospecting completed. One potential quarry site has been preliminarily located.

Initial tests suggest the stone has potential as polished stone, warranting further exploration.

The next stage of exploration is a program of rudimentary geological mapping, combined with a boulder testing program. Several of the boulders will be cut into 5 ton block for further processing and market assessments. The estimated cost of this phase is \$21,993.

Upon successful completion of the boulder testing program, a bulk testing program in the order of 1000-2000 tons is recommended. This program will establish a quarry bench on the property and provide initial 20 ton quarry blocks for further testing and market analysis. Cost estimate of this stage is \$43,183.

Successful completion of the second phase will result in a positive production decision.

The initial prospecting and mapping program on the Cor property cost \$867.

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STATEMENT OF QUALIFICATIONS

I, R. Tim Henneberry, am the principle of Mammoth Geological Ltd., a geological consulting firm with offices at 9250 Carnarvon Road, Port Hardy, B.C. The mailing address is Box 5250, Port Hardy, B.C. V0N 2P0

I earned a Bachelor of Science Degree majoring in geology from Dalhousie University, graduating in May 1980.


I have practiced my profession continuously since graduation.

I am registered with the Association of Professional Engineers and Geoscientists in the Province of British Columbia as a Professional Geoscientist. I am also a Fellow of the Geological Association of Canada.

I staked and prospected the Cor property on October 14, 1995. I am the registered owner of the Cor mineral claim (#340968).

This report may be used for any purpose normal to the business of Mammoth Geological Ltd., provided no part is used in such a manner to convey a meaning different than that set out in the whole.

Dated this 29<sup>th</sup> day of November in the Town of Port Hardy, British Columbia.

  
R. Tim Henneberry, P. Geo

STATEMENT OF COST

Cor Property

Project Manager	0.3 days	@	300.00 /day	\$100.00
Assistant	0.3 days	@	200.00 /day	\$67.00
Room and Board	0.3 days	@	100.00 /day	\$33.00
Vehicles	0.3 days	@	50.00 /day	\$17.00
Analysis	1 samp	@	50.00 /sample	\$50.00
Documentation	2 days	@	300.00 /day	\$600.00

**Cor Property Costs**

**\$867.00**

COST ESTIMATES

Phase I - Mapping and Sampling (2 days)		
Field Costs (Geological and Supervision)	\$1,600	
Support Costs (Room and Board, Vehicles)	\$400	
Analysis Costs (Polished/Thin Sections)	\$250	
Documentation (Reports)	\$900	
Contingency (15%)	\$473	\$3,623
Phase II - Boulder Testing (5 days)		
Quarrying Costs (Personnel and Equipment)	\$3,375	
Field Costs (Geological and Supervision)	\$2,250	
Support Costs (Room and Board, Vehicles)	\$1,625	
Market Assessment	\$4,225	
Documentation (Reports)	\$4,500	
Contingency (15%)	\$2,396	\$18,371
Phase III - Pre-production Bulk Test (10 days)		
Contractor Cost (Machinery)	\$8,000	
Quarrying Equipment Cost	\$2,300	
Quarrying Personnel Cost	\$5,000	
Field Costs (Geological and Supervision)	\$4,500	
Support Costs (Room and Board, Vehicles)	\$3,250	
Sample Preparation	\$10,000	
Documentation (Reports)	\$4,500	
Contingency (15%)	\$5,633	\$43,183
Phase I - Property Mapping	\$3,623	
Phase II - Boulder Testing	\$18,371	
Phase III - Bulk Test	\$43,183	
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<b>TOTAL BUDGET FOR COR PROPERTY</b>	<b>\$65,176</b>	

SAMPLE DESCRIPTIONS

Sample 10-14-11 - Coarse-grained, red-brown syenite. The constituents are: 80% red-brown, anhedral to subhedral (2-10mm) K-feldspar; 10% clear to white, anhedral (2-10mm) plagioclase; 5% glassy grey, anhedral (2-5mm) quartz; and 5% black, anhedral (2-5mm) mafics, both biotite and hornblende. No sulfides were noted in the sample.

The stone takes a good polish and shows a "radiance" when rolled. The sample is micro-fractured, both interstitially and across the crystal.

Outcrop - The sample came from the outcrop. Unlike the plutons further to the east, few boulders were noted on the property.

The stone outcrops as a series of benches, progressing up slope toward a solid bluff knob. The benches are devoid of vegetation. Few xenoliths or other deleterious materials were noted.

Benches are 2-5 metres thick. Vertical fractures are spaced at three to five metre intervals. The fracture pattern should allow for significantly easier quarrying of larger (100-200 ton) blocks.

A small access road will be required to reach the base of the benches from the existing secondary road.