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1995/1996 SLATE SAMPLING  
PROGRAM  
TIA PROPERTY

GEOLOGICAL SURVEY BRANCH ASSESSMENT REPORTS
DATE RECEIVED SEP 06 1996

Victoria Mining Division  
Vancouver Island, B.C.

**FILMED**

FOR  
MAMMOTH GEOLOGICAL LTD.

**GEOLOGICAL SURVEY BRANCH  
ASSESSMENT REPORT**

**24,535**

By: R.Tim Henneberry, P.Geo.  
July 10, 1996

SUMMARY

The Tia property lies within the Leech River Formation of southern Vancouver Island, a Jurassic-Cretaceous meta-sedimentary sequence. The target is "slate" for use as landscaping and decorative stone. Numerous south Island masons continue to gather "slate" from rock pits within the formation, primarily for their own use. As would be expected, little documentation of these efforts exist.

The Tia property was acquired by staking to cover an existing road ballast pit, containing a tan, rusty weathering, siltstone. The vertically dipping sediment readily breaks along convergent bedding planes in thicknesses from 1-8 cm. The stone has potential in landscaping applications and as facing stone for fireplaces.

As with most dimension stone properties, little actual exploration is required. The remaining program will consist of collecting a 20-50 ton sample and supplying the stone to end users (masons and landscapers) for marketing tests, namely for use on a few job sites.

The second step then involves a larger bulk sample of  $\pm$  500 tons. Again, this stone will be supplied to end users for marketing tests and for specification for job sites. The purpose is to ensure a consistent supply of stone can be obtained from the quarry site and to ensure the stone will meet (or exceed) the required specifications of end users.

Phase I (1/3 done)	\$4,585
Phase II	\$31,361
<b>TOTAL BUDGET</b>	<b>\$36,946</b>

Exploration in 1995/1996 consisted of picking 12 tons of random pieces of slate from the existing pit and marketing it for initial job site tests. This completed approximately 1/3 of the stage one exploration program. At the successful conclusion of stage one, stage two will commence.

The cost of completing 1/3 of the stage one exploration and marketing program was \$1,800.

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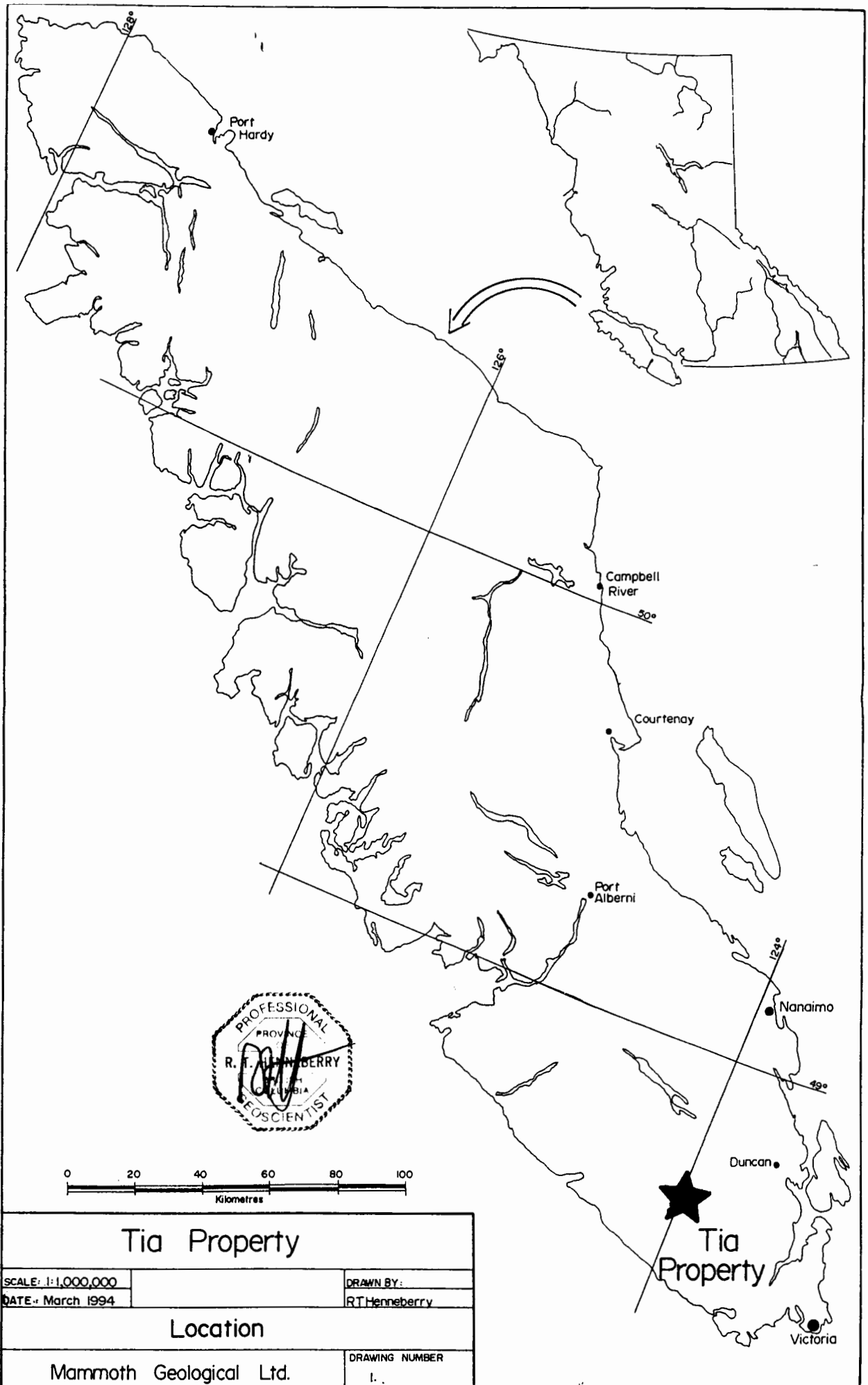
## INTRODUCTION

The purpose of this report is to document the on-going sampling and marketing program completed to date on the Tia property for assessment credits. The property was acquired by staking on July 6, 1994. Initially, two tons of slate were picked from the existing pit and shown to masons and landscapers for opinions and comments. Favourable comments led to the picking of a further 12 tons in 1995/1996 to begin the stage one marketing assessment.

The target on this property is "slate" for use as landscaping and rough facing stone. Though the term "slate" is used throughout this report, the stone on the Tia property and in the Leech River Formation generally, is not a true slate, in the geological sense. These rocks are more accurately described as metamorphosed mudstones, siltstones and finer sandstones. Of equal importance, the Leech River Formation meta-sediments split along convergent planes as opposed to true slates, which split along parallel planes.

The "slate" potential of the Leech River Formation is well known to local masons and landscapers, but poorly documented. Numerous residences on the south Island exhibit the "slate" in use, namely as facing stone for fireplaces and chimneys, facing stone for rock walls and home foundations, and landscape stone for patios, paths and dry-stack rock walls.

Preliminary prospecting within the Leech River Formation has located additional colors, including greens and blacks. In general, these colors seem to be friable and "chippy" along edges, severely curtailing any potential application. Follow-up in 1995/1996 failed to locate more competent sections, though over 60% of the belt has yet to be prospected by the present author.



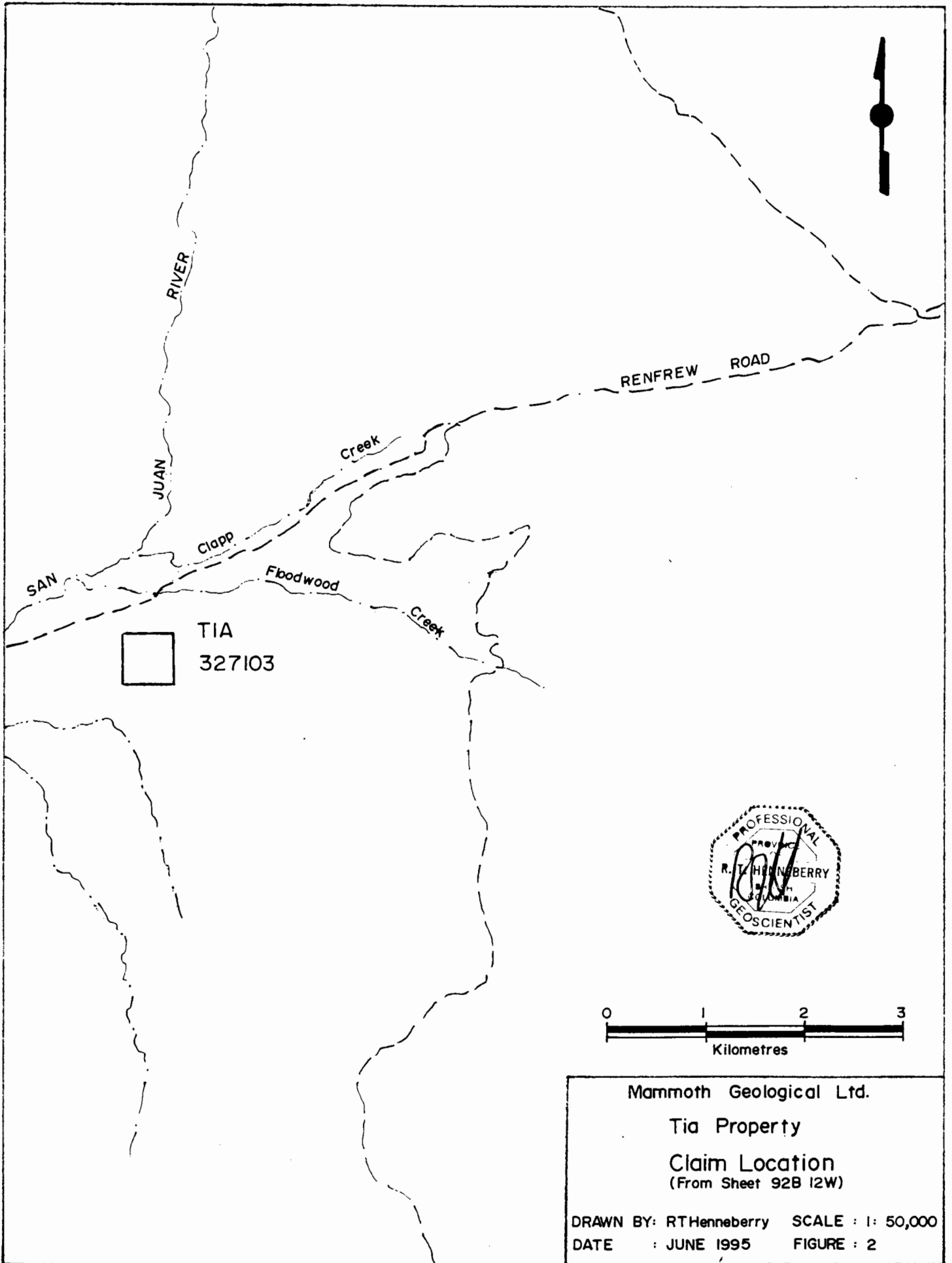
<b>Tia Property</b>	
SCALE: 1:1,000,000	DRAWN BY:
DATE: March 1994	RT Henneberry
<b>Location</b>	
Mammoth Geological Ltd.	DRAWING NUMBER 1.

## LOCATION, ACCESS

The Leech River Formation outcrops on southern Vancouver Island between the Leech and San Juan Rivers. The latitudinal boundaries are  $48^{\circ} 30'$  to  $48^{\circ} 35'$  while the longitudinal boundaries are  $123^{\circ} 45'$  and  $124^{\circ} 35'$ . Topography is quite rugged ranging from Sea Level on the west coast to 1020 metres. Access is generally fair to good as the area is transected by a myriad of logging roads, originating in Victoria, Shawnigan Lake and Lake Cowichan.

The climate on the south island is relatively mild. The summers are warm and generally dry, while the winters are cool and wet. Snow will accumulate on the higher peaks, but generally the valley bottoms and lower hills are clear for year round work. Access into the area is presently over mountain passes, limiting work to a period from May to November.

The Tia property lies on NTS Sheet 92B/12W, approximately 32 kilometres west of Shawnigan Lake. Access to the property is via SSJ Main logging road leaving Renfrew Road 32 kilometres west of Shawnigan Lake. The property lies 2 kilometres along SSJ Main. The property is covered by mature second generation forest. Elevations range from 240 to 480 metres, with the topography of the property generally considered quite steep.



SAN JUAN RIVER

RENFREW ROAD

Creek

Clapp

Floodwood

Creek

TIA  
327103



Mammoth Geological Ltd.  
Tia Property  
Claim Location  
(From Sheet 92B 12W)  
DRAWN BY: RTHenneberry    SCALE : 1: 50,000  
DATE : JUNE 1995    FIGURE : 2

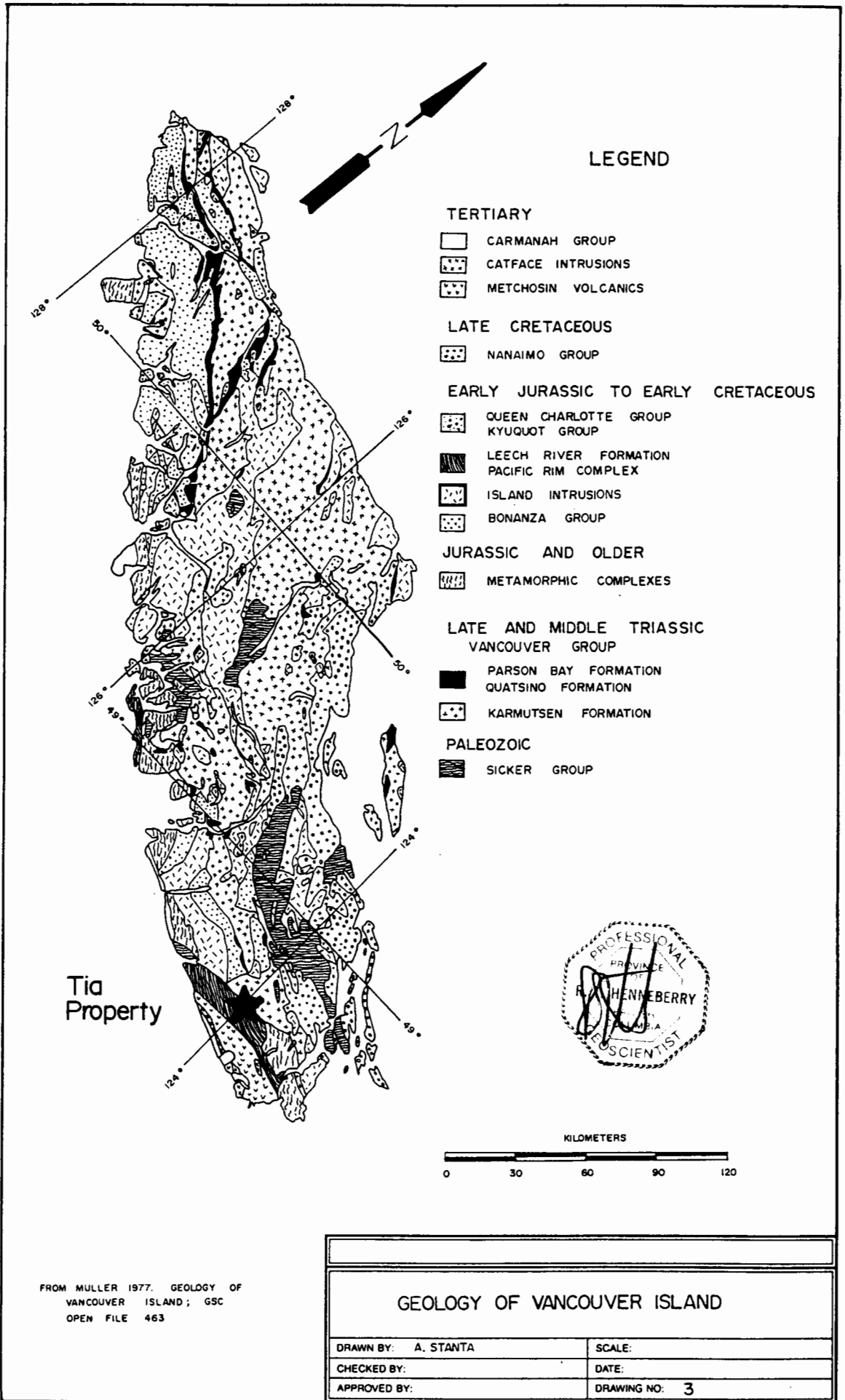
CLAIM HOLDINGS

The Tia property consists of 1 two-post mineral claims encompassing an area 500 metres by 500 metres, including the main showing area.

<b>Name</b>	<b>Record Number</b>	<b>Anniversary Date</b>
Tia	327103	July 6, 1997

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





FROM MULLER 1977. GEOLOGY OF  
VANCOUVER ISLAND; GSC  
OPEN FILE 463

**GEOLOGY OF VANCOUVER ISLAND**

DRAWN BY: A. STANTA	SCALE:
CHECKED BY:	DATE:
APPROVED BY:	DRAWING NO: 3

## REGIONAL GEOLOGY

The geology of the south end of Vancouver Island has been described by Muller (1975, 1976, 1977). The Island lies in the Insular Belt of the Canadian Cordillera, within the Wrangellia terrane which on Vancouver Island comprises three thick volcano-sedimentary cycles (Paleozoic Sicker Group, Upper Triassic Vancouver Group and Jurassic Bonanza Group). These cycles are intruded by the Jurassic Island Intrusions and overlain by epiclastic sediments of the Jurassic-Cretaceous Leech River Formation and Upper Cretaceous Nanaimo Group. The youngest rocks in the south Island are the Tertiary Metchosin and Sooke Formations and intrusions. Typical of Vancouver Island the south Island has been heavily faulted.

The oldest rocks in the area are the Paleozoic Colquitz Gneiss and Wark Diorite, speculated by Muller (1975) to be recrystallized Sicker and also possibly Vancouver volcanics. The Paleozoic Sicker Group consists of basaltic to rhyolitic volcanics and volcanoclastic sediments overlain by epiclastic sediments and limestones. The Sicker Group defines three broad geosynclines in the south and central Vancouver Island.

The Sicker Group is overlain by the Triassic Vancouver Group, comprised of the lower Karmutsen Formation, middle Quatsino Formation and upper Parson Bay Formation. The Karmutsen Formation, the thickest and most widespread of the Vancouver Group formations, consists of basaltic pillow lavas, pillow breccias and lava flows with minor interbedded limestones, primarily in the upper part of the formation. Coeval mafic sills and dykes intrude the Sicker Group units. The Quatsino Formation Limestones and Parson Bay Formation calcareous sediments overlie the Karmutsen volcanics, though through erosion they are limited in extent on the southern Island. The one exception is the Gordon River area, where 300 metres of dark grey to black Quatsino limestones have been mapped by Muller (1976).

The Bonanza Group overlies the Vancouver Group. Bonanza Group rocks are primarily a Jurassic assemblage of interbedded lava, breccia and tuff with compositions ranging from basalt through andesite and dacite to rhyolite, deposited in a volcanic island arc environment. The Bonanza Group outcrop primarily on the west side of southern Vancouver Island.

The Westcoast Complex is a heterogeneous assemblage of amphibolite and basic migmatite with minor metasedimentary and metavolcanic rocks of greenschist metamorphic grade. The Westcoast Complex outcrops in a loosely defined belt on the west coast of Vancouver Island.

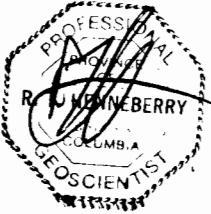
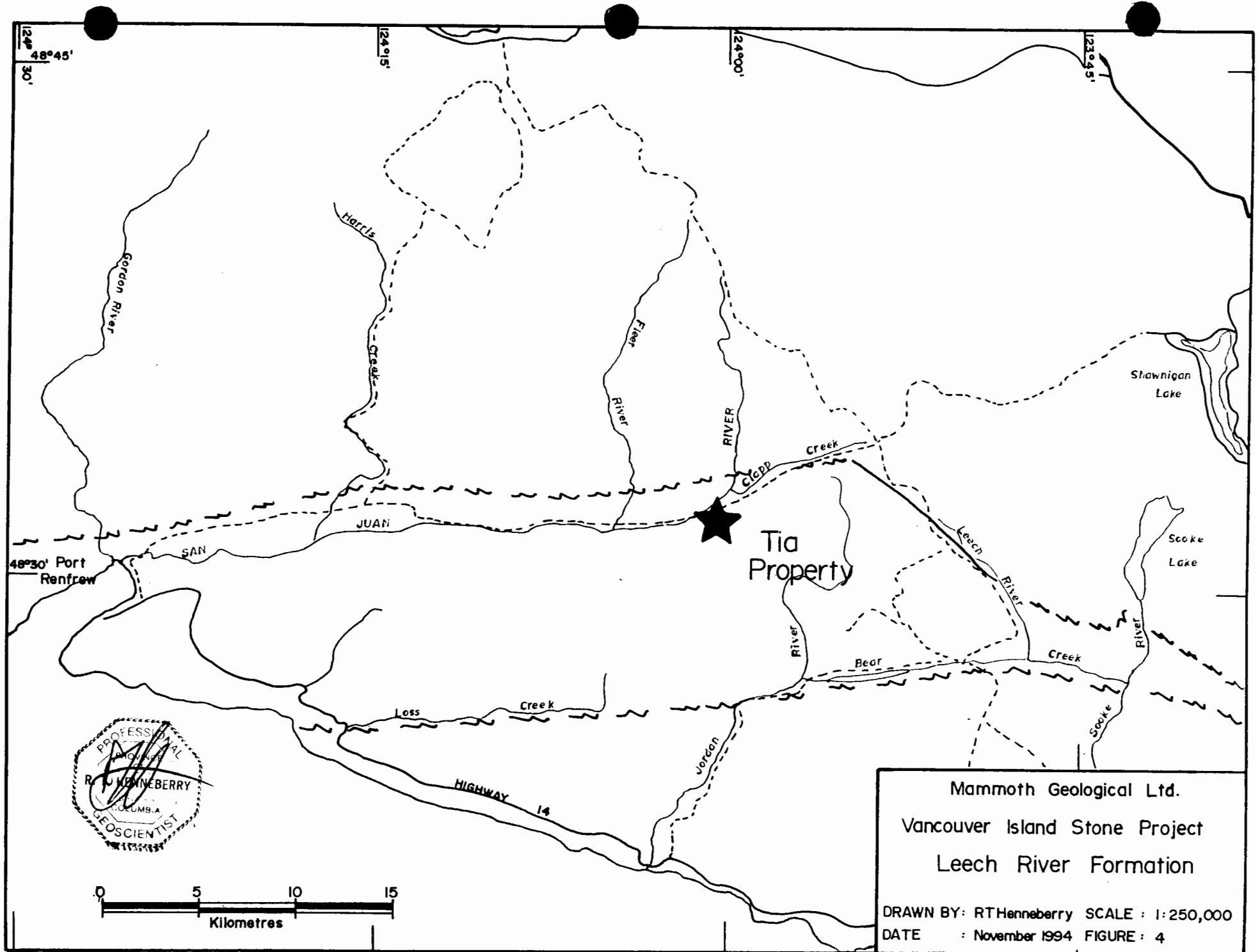
Granitoid batholiths and stocks of the Island Intrusions underlie large parts of Vancouver Island. These intrusions range in composition from quartz diorite and tonalite to granodiorite and granite. Island Intrusions outcrop in a belt through the central section of Vancouver Island.

The Leech River Formation of suspected late-Jurassic, early-Cretaceous age is exposed in a wide, eastward narrowing belt of uplands between the San Juan and Leech River Faults. The Formation consists of turbiditic greywacke-argillite sequences that have been metamorphosed to schist and slate.

The Cretaceous Nanaimo Group epiclastic sediments outcrop throughout the eastern side of south Island. The group consist of cyclical successions of sandstone, conglomerate and shale, with interbedded coal.

Eocene basic volcanics of the Metchosin volcanics and basic intrusive rocks of the Sooke Intrusions underlie the entire area south of the Leech River Fault. These units are overlain by epiclastic sediments of the Sooke Formation.

Block faulting of the crystalline and volcanic rocks is dominant. The network of faults displayed on the south end of Vancouver Island appears to be the super position of two or more fracture patterns, each with a characteristic directions and of different age and origin.



Mammoth Geological Ltd.  
 Vancouver Island Stone Project  
 Leech River Formation

DRAWN BY: RTHenneberry SCALE : 1:250,000  
 DATE : November 1994 FIGURE : 4

### **Quatsino Formation**

Quatsino limestone outcrops in the Gordon River area, south of Cowichan Lake, thinning eastward. Typically, the rock is a dark grey to black, blue grey weathering fine crystalline limestone. Where the formation is thin bedding is commonly obscure, but thick sections exhibit distinct beds of 1 to 10 cm separated by calcarenitic layers. Muller (1976) speculated this limestone was probably algal reefs with limited extent suggesting they may have been atoll-like structures or seamounts rather than the basin deposits typical of the north Island.

Matrix Marble Corporation of Duncan, B.C. is presently bulk testing these limestones for their marble potential, processing the test blocks at their Duncan plant.

### **Leech River Formation**

The Leech River Formation is exposed in a belt, 2 to 12 kilometres wide, between San Juan and Leech River Faults. The rocks are greywacke, argillite and minor chert and volcanic rocks largely metamorphosed to schist and slate. Axial plane cleavage and rodding in the direction of fold axes are generally distinct, and their attitudes vary only gradually over large areas.

Metamorphic grade increases from phyllite in the north to garnet-biotite schist with andalusite porphyroblasts near Leech River Fault in the south.

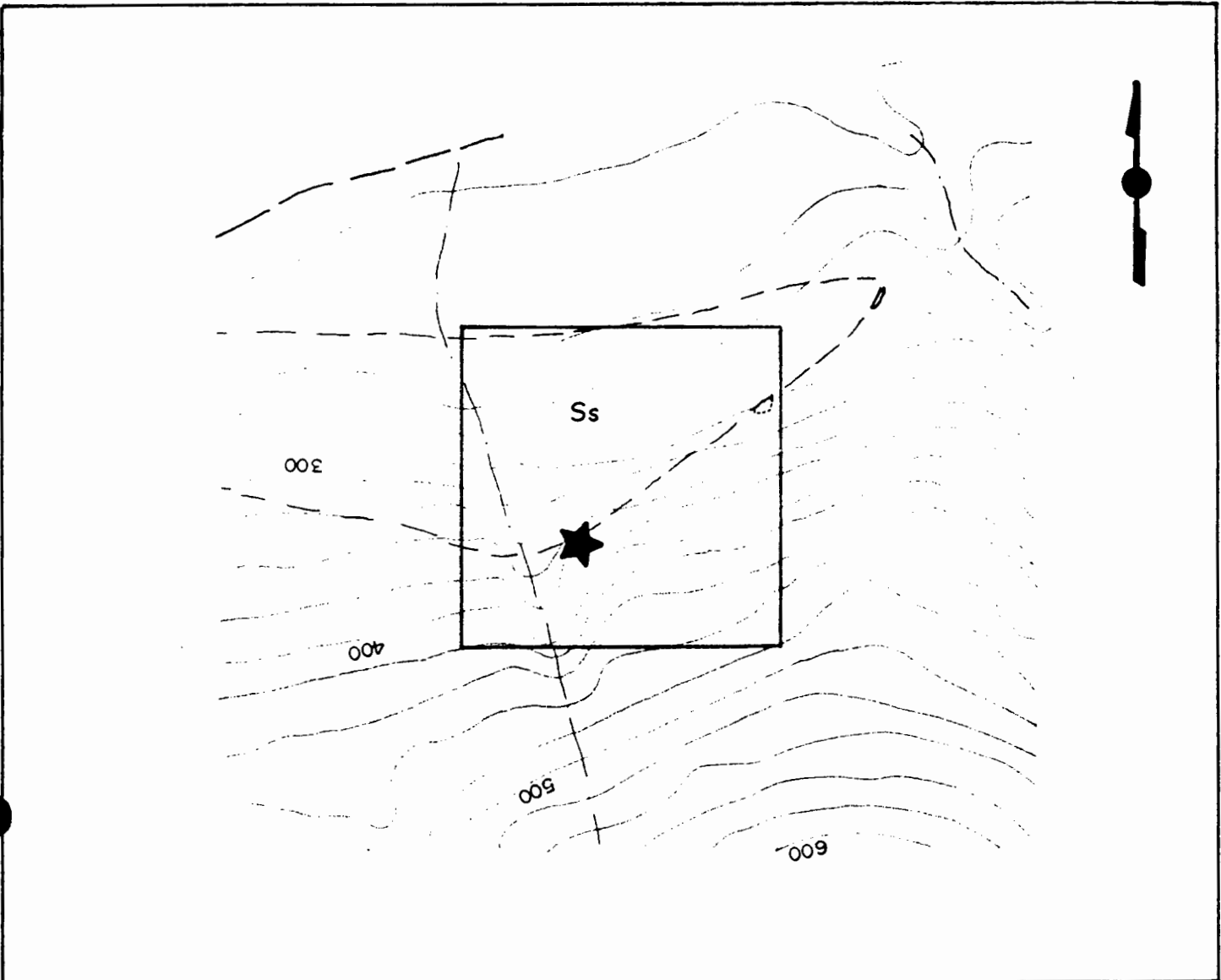
Muller (1975) stated the difference between the Sicker schists and Leech River schists is much greater consolidation, mainly by silicification in the Sicker. Sicker schists are hard, with block fracture and with smooth joint planes perpendicular to bedding and schistosity, whereas Leech River schists are platy to flaky, poorly jointed and friable.

The slates under investigation are targeted for use in low end applications, namely landscaping and fireplaces. These slates are not suitable for high end uses as gauged slates or roofing slates. The targeted low end use is a function of the nature of the Leech River deposits.

Dimensional slate should split along parallel planes in consistent thicknesses down to 1 cm. The Leech River slates are more accurately described as siltstones. Generally these stones split along convergent planes, leaving most pieces with a wedge shape in profile.

The Leech River Formation has been the source of slate for local masons since the turn of the century. Most acquired small sites for their own personal use. No records were found to indicate these slates have ever been quarried on a larger or commercial scale.

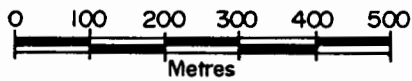
A preliminary reconnaissance of the general area identified colors ranging from black, through brown to green. The Tia property is underlain by the brown siltstone. This slate weathers a rusty brown color on fracture surfaces yielding interesting patterns on the individual pieces.



**LEGEND**

- Ss Siltstone
- Creek
- Outcrop
- Quarry site
- Road

20 metre contour interval



Mammoth Geological Ltd.

Tia Property

Geology

DRAWN BY : RTHenneberry      SCALE : 1 : 10,000  
 DATE : June 1995              FIGURE : 5

## PRELIMINARY PROPERTY GEOLOGY

The Tia Property is located in the northeastern section of the Leech River Formation Belt. The property lies along the steep, north-facing slope of the valley of the San Juan River. The stone outcrops in a large "pit" used as a source for road fill during construction of the logging roads.

The 1995/1996 exploration program consisted of continued collecting of loose slate for the on-going marketing assessment. Approximately 12 tons was hand picked from the pit over a 3 day period.

### **Tan-Brown Siltstone**

The stone of interest is best described as a schist, likely originally a siltstone. The color ranges from blue-grey to tan-brown with the brown being dominant. Weathering has penetrated well into the mass of stone along bedding-plane fractures, creating the attractive "rusting" patterns evident when the stone is actually split, especially along the eastern end of the quarry. The schist is cleaner toward the western half of the quarry. The slate itself is steeply dipping with a strike parallel to the hillside. This geology will provide a face from which the slate can easily be peeled, requiring minimum site development.

Bedding plane fracturing ranges from 5 to 15 cm. The schist can be readily split into sheets ranging in thickness from 2-5 cm (1-2 inches). The patterned schist can be readily removed in sheets up to 100 by 50 centimetres (3-5 square feet). The problem with the patterned schist is the bedding planes are not parallel, so the schist has a wedge shape in profile.

The cleaner schist can be taken out in sheets in excess of 150-200 centimetres (5-10 square feet) in thickness of 2-5 centimetres (1-2 inches). The bedding planes are more defined, allowing the stone to split more along parallel planes.

The pit itself is approximately 60 metres long by 20 metres wide, with the present face in excess of 15 metres high. There is 200-300 tons of loose material lying on the sill and against the sides of the face.

### **Marketing**

Marketing carries almost an equal importance to geology for any industrial mineral property. The two key aspects of marketing 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 south Island "slate" is a three step process. The first step involves acquiring and prospecting a property, resulting in the identification of a potential quarry site. A few tons of "slate" is then quarried and shown to masons and landscapers, to assess the potential of the "slate".

In the next step a small amount (20 to 50 tons) of "slate", is produced. This stone is then shown to end users, namely masons and landscapers, for opinions and general comments. The most important function of this phase of the marketing is to get some of the end users to agree to try the stone on a few job sites.

The final step is to produce a small volume,  $\pm$  500 tons to be supplied to a few job sites. This will provide frank opinions of the stone and allow the initial compilation of a photo portfolio for future marketing and eventual sales. A sample of this size should allow an accurate assessment of the potential of the quarry site to produce consistent product.

The other key aspect to be completed by this time is to establish firm numbers for transportation. The "slate" will be quarried and loaded onto 1 or 2 ton pallets for shipment on either 20 ton hiab trucks or 46 ton super "B" trains to Island markets.

During 1995/1996, approximately 12 tons was picked from the pit, completing approximately 1/3 of the stage one program. The initial slate picked in 1994/1995 and the 12 tons picked in 1995/1996 is being marketed primarily for use as cover for fish ponds, with the larger pieces destined for garden paths.

There seems to be little demand for Tia slate as patio stone, a situation expected due to its convergent foliation planes. As of yet, no applications as facing stone have been reported.

## DISCUSSION

The on-going preliminary results from the Tia property are encouraging. The "slate" seems to be receiving a positive initial market assessment with favourable responses in color, texture and overall appearance. The wedge shaped nature of the individual "slate" pieces appears to be only a minor impediment to the projected end uses as rough facing and landscape stone.

As part of last years discussion (Henneberry, 1995), a suggestion was made to explore for new deposits. Two days were spent in exploring parts of the Leech River Formation "slate" belt, one day along the northern boundary and one day along the eastern side of the belt. Little of significance was noted in either location, a disappointment given the positive marketing responses for the green and black slates.

The next step, approximately 1/3 finished, of the Tia property program is to quarry 20 to 50 tons of the "slate". This stone will then be aggressively marketed to secure its use on a few job sites. The purpose of this stage is to get the stone known and used, as well as provide documentation for further marketing programs.

The final step will be to quarry approximately 500 tons of slate. The first purpose is to ensure the stone is consistent in appearance throughout the 500 tons. The second purpose is to ensure the stone will be accepted in the marketplace, before a final production decision is made.



## CONCLUSIONS AND RECOMMENDATIONS

The exploration and marketing program appears to confirm the slate on the Tia property will have a small market as rough facing stone and landscape stone. Further sampling, first on a smaller scale then a larger scale, to supply material for market tests is required.

The first stage as proposed (Henneberry, 1995) is approximately one third completed. Another 20 to 30 tons will be picked and marketed for use on a few job sites.

The second stage then involves a larger bulk sample of  $\pm$  500 tons. Again, this stone will be supplied to end users for marketing tests and for specification for job sites. The purpose is to ensure a consistent supply of stone can be obtained from the quarry site and to ensure the stone will meet (or exceed) the specifications of end users.

Phase I (1/3 done)	\$4,585
Phase II	\$31,361
<b>TOTAL BUDGET</b>	<b>\$35,946</b>

The cost of the stage on exploration completed to this date (approximately 1/3 of program) is \$1,800.

REFERENCES

Henneberry, R.T. (1995). Initial Assessment of the Tia Property. Victoria Mining Division, Vancouver Island, B.C. British Columbia Ministry of Energy, Mines and Petroleum Resources Assessment Report 23962. 21p.

Muller, J.E. (1975). Victoria Map-Area, British Columbia (92B). Geological Survey of Canada Paper 75-1A. pp.21-26.

Muller, J.E. (1976). Cape Flattery Map-Area, British Columbia (92C). Geological Survey of Canada Paper 76-1A. pp.107-112.

Muller, J.E. (1977). Geology of Vancouver Island. Geological Survey of Canada Open File 463.

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. VON 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.

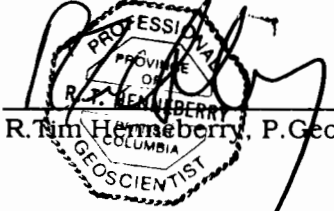
I am registered with the Association of Professional Engineers and Geoscientists in the Province of British Columbia as a Professional Geoscientist. I am also a Fellow of the Geological Association of Canada.

I undertook the sampling program on the Tia Property on June 29, 30 and July 1, 1996. I am presently the owner of the Tia mineral claim.

I am the principle of Mammoth Geological Ltd.

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 19<sup>th</sup> day of August in the Town of Port Hardy, British Columbia.

  
R. Tim Henneberry, P. Geo

STATEMENT OF COST

The only costs to be applied are the actual property exploration costs, as the results of the marketing survey will remain confidential. Hence, the costs associated with the survey will not be included.

Tia Property

Exploration dates: Jun 29, 30, Jul 1  
Report dates: Jul 9, Jul 10

Project Manager	3 days @	300.00 /day	\$900.00
Vehicles	3 days @	50.00 /day	\$150.00
Support	3 days @	50.00 /day	\$150.00
Documentation	2 days @	300.00 /day	\$600.00

**Tia Property Costs**

**\$1,800.00**

COST ESTIMATES

Phase I - Initial Sampling (3 days)	
Quarrying Costs (Equipment)	\$900
Manpower Costs (Quarrier and Helper)	\$1,350
Support Costs (Room and Board, Vehicles)	\$600
Market Assessment	\$1,600
Documentation (Reports)	\$1,500
Contingency (15%)	\$892
<b>Phase I Subtotal</b>	<b>\$6,843</b>
Phase II - Bulk Test (20 days)	
Contractor Cost (Cat or Hoe)	\$2,120
Quarrying Cost (Equipment)	\$10,650
Manpower Cost (Quarrier and Helper)	\$9,000
Support Costs (Room and Board, Vehicles)	\$4,000
Documentation (Reports)	\$1,500
Contingency (15%)	\$4,091
<b>Phase II Subtotal</b>	<b>\$31,361</b>
<b>TOTAL BUDGET FOR TIA PROPERTY</b>	<b>\$38,204</b>