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ASSESSMENT REPORT

on

THE MOUNT MEAGER PUMICE DEPOSIT

(PUM 1, 7, 8, 37, 39 AND 40 CLAIMS)

LILLOOET MINING DIVISION

LATITUDE 53°41', LONGITUDE 123°28'

N.T.S. 92J/11W+12E

for

G.D. CAREFOOT (owner)

GREAT PACIFIC PUMICE INC. (operator)

790 Millbank, Vancouver, B.C., V5Z 3Z3

by

J.T. SHEARER, M.Sc., P.Geo.

NEW GLOBAL RESOURCES LTD.

548 Beatty Street, Vancouver, B.C., V6B 2L3

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

December 1, 1992

Vancouver, B.C.

22,669

Fieldwork completed between October 16, 1991 and September 11, 1992

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SUMMARY

The Mount Meager pumice deposit occurs in the upper Lillooet River Valley approximately 65 km northwest of Pemberton, B.C., (160 km north of Vancouver) accessible by an all-weather road system. It is wholly owned by G. Carefoot, with development being done through Great Pacific Pumice Inc. Small-scale production from the deposit has occurred in the recent past. Previous photo geological work suggests that the pumice resource is of multi-million-tonne size assuming approximate dimensions of 1000 m east-west, 500 m north-south by 30 m thick in a continuous elevated river terrace.

The pumice deposit is related geologically to an explosive eruption of Mount Meager in 2350 BP which produced the Bridge River Assemblage. The Bridge River Assemblage has been subdivided into three primary volcanic lithologies representing different eruptive events. The first activity is characterized by felsic block, lapilli and ash fallout deposits which in part formed the pumice deposit. Part of the pumice deposit is also related to a later, relatively non-mobile and low-temperature pyroclastic flow.

Pumice has a wide variety of uses but the main demand is currently in the area of concrete aggregate in the manufacture of light weight concrete and concrete blocks and secondarily as an abrasive for the stonewash of denim clothing. There are no current pumice producers operating in British Columbia. Tests carried out in the present program consist of:

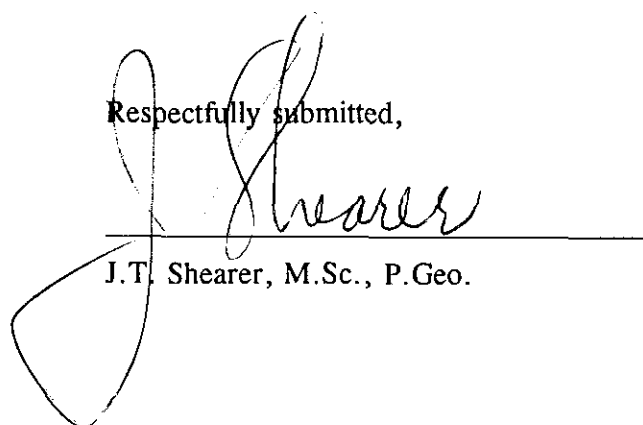
- (1) Block testing for absorption, compressive strength, density and permeability. Test results indicate similar quality to the presently used pumice source out of Bend, Oregon.
- (2) Stonewash testing included geochemical analysis, petrology, density/porosity analysis and comparison with U.S.A., Turkish and Greek specimens. Results indicate that Mount Meager pumice, with processing and conditioning would be suitable for stonewash and acidwash applications.

- (3) A number of tests were conducted on the effectiveness of various size fractions in the absorption and control of refined and crude oil spills on water. Results indicated that pulverized pumice absorbed oil on a 1.5 pumice to oil by volume.

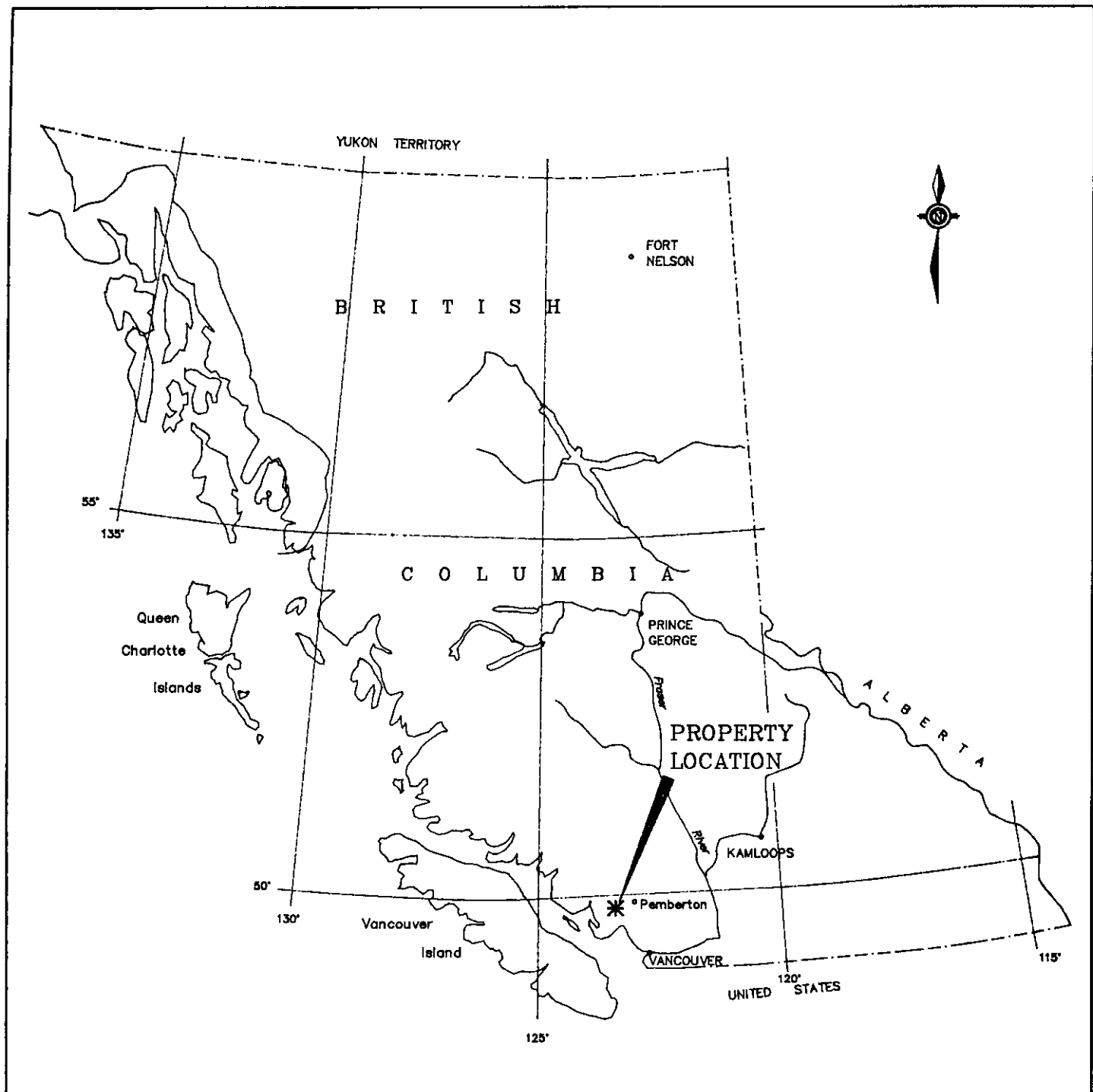
Future work should include geological mapping of all pumice outcrops and correlation of the exposed sequence throughout the claims and further down the Lillooet Valley to ensure that the pumice deposits in the present claim block are the most commercially viable.

In the spring of 1993, following the opening of the road, sufficient sample should be collected for limited production at a local block making plant. Stonewash application should be further tested by a denim product manufacturer.

Respectfully submitted,



J.T. Shearer, M.Sc., P. Geo.



Scale 1:10,000,000
 100 0 100 200 300 400 Km

GREAT PACIFIC PUMICE INC.			
MOUNT MEAGER PUMICE DEPOSIT			
LOCATION MAP			
SCALE AS SHOWN	DATE Nov. '92	N.T.S. 92j/11w/12E	Figure: 1
New Global Resources Ltd.			

INTRODUCTION

This report has been assembled at the request of G. Carefoot, President, Great Pacific Pumice Inc., to document the 1991-1992 work program, provide a summary of results to date and outline appropriate future programs. There are no current pumice producers operating in British Columbia.

Pumice is a volcanic rock composed of bubbles or vesicles in a glass matrix formed by the effervescence of gases and rapid cooling of molten material during an eruption. Pumice is characteristically frothy and lightweight, often with a density low enough to permit it to float on water. The vesicle walls form thin, sharp cutting edges when broken making pumice an effective abrasive in both lump and powder forms. These characteristics are responsible for the commercial value of pumice as absorbents, insulators, abrasives, and lightweight aggregates and fillers.

Commercial occurrences of pumice are classified by origin and include airfall, flow or surge, vesiculated domes and epiclastic deposits.

The formation and preservation of pumice requires a balance between the internal gas pressure, viscosity, and temperature of an erupting magma. Dissolved gases, primarily water, may quickly escape from a low viscosity magma without forming a rigid foam. If higher viscosity, impermeable country rocks, or a blocked vent prevent rapid escape of gases from magma as it nears the surface, an explosive eruption may occur shattering the bubble walls and generating a volcanic ash of fine glass shards rather than a vesicular pumice. If pumice is reheated, by being entrained in an ash flow for example, it may soften and collapse into non-vesicular glass.

Pumice deposits are readily susceptible to erosion and weathering, especially in humid climates. Low particle density and relatively low strength permit rapid mechanical weathering and the glassy structure and extremely large surface areas caused by vesicularity promote rapid chemical weathering.

Pumice particles are classified by size. Particles less than 4 mm are referred to as ash or pumicite. Individual particles may still be vesicular or they may be only fragments of vesicle walls. Particles between 4 mm and 64 mm are called lapilli and particles larger than 64 mm are called blocks or bombs.

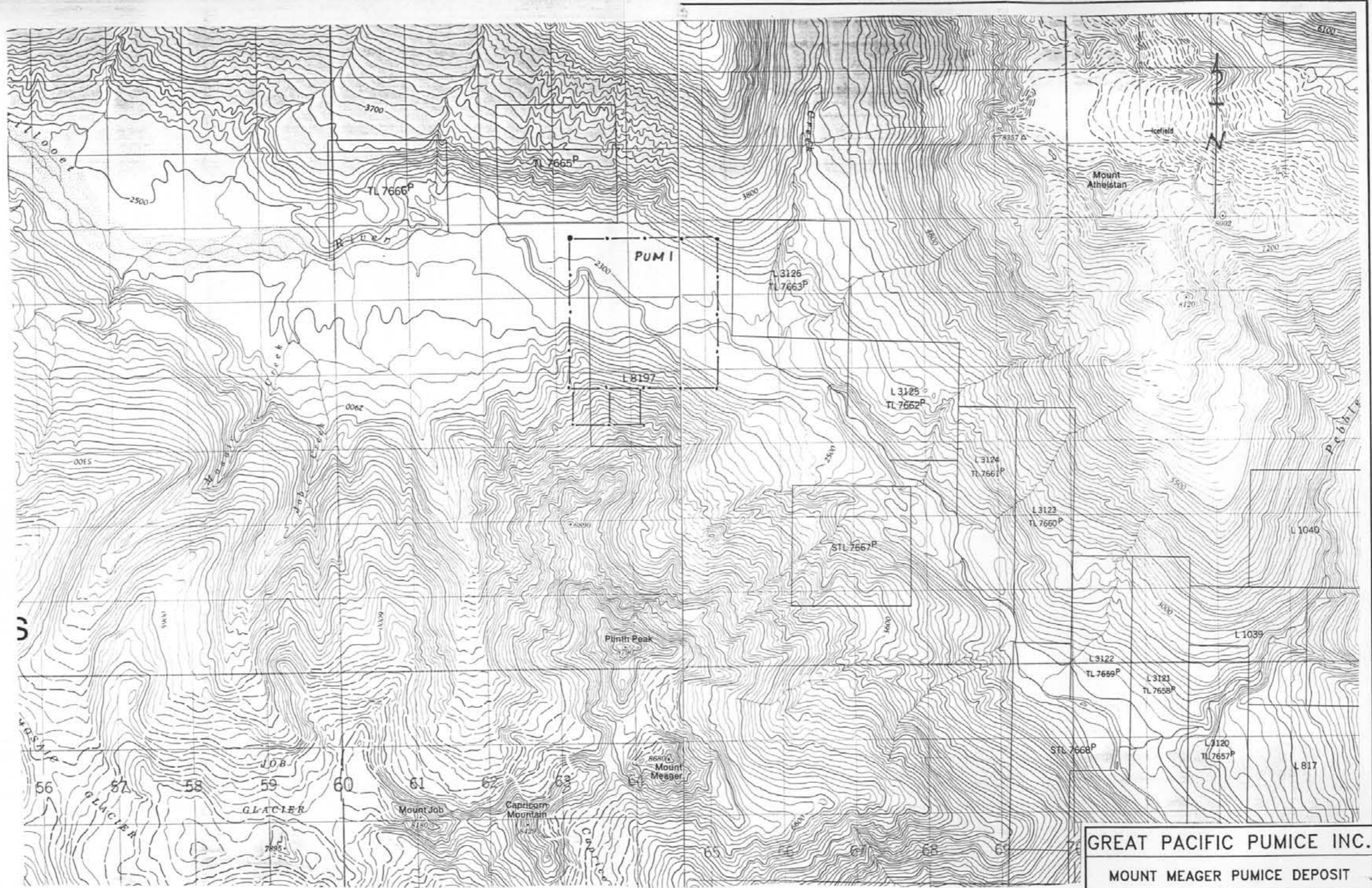
LOCATION AND ACCESS

The property is approximately 65 km northwest of Pemberton, B.C. (about 160 km north of Vancouver, B.C.), Figure 1. The pumice deposit straddles the Lillooet River at around 2,300-foot elevation and is centered at latitude 53°28'N and longitude 123°28'W in NTS mapsheet 92J/11W+12E.

The area is accessible by all-weather logging roads along the Lillooet River valley. The pumice deposit is well exposed by the main road excavations between milepost 30 and 31. Current logging activities have rehabilitated the main roads and a new major bridge across the Lillooet River has been installed.

The Lillooet River and major tributaries characteristically form wide braided stream channels. Heavy rain, at times, can cause high run-off levels. Development of the area's geothermal potential (Dickson 1992) and continued expansion of logging operations suggests that the access to the region will be further improved and maintained.

The claims are covered with douglas fir, hemlock and cedar forest between the deeply incised secondary creek valleys.



GREAT PACIFIC PUMICE INC.			
MOUNT MEAGER PUMICE DEPOSIT			
TOPOGRAPHIC MAP			
SCALE 1:50,000	DATE Nov. '92	N.T.S. 92d/11W-124	Figure: 2
New Global Resources Ltd.			

CLAIM STATUS

The property consists of one 16-unit modified grid claim and five 2-post claims as shown in Table 1 and Figure 3.

**TABLE 1
LIST OF CLAIMS**

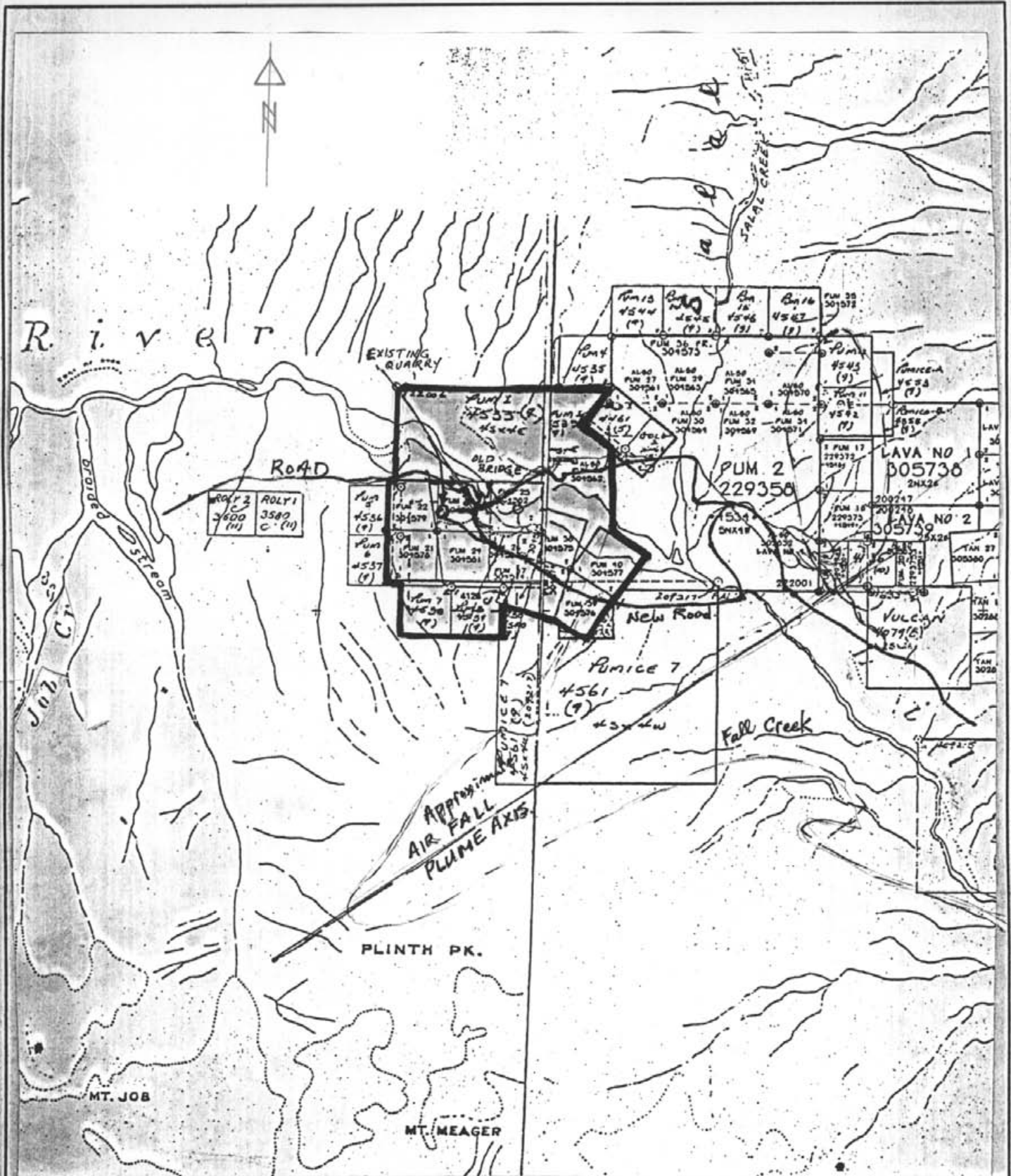
<u>Claim Name</u>	<u>Tenure No.</u>	<u>Units</u>	<u>Size</u>	<u>Current Expiry Date</u>
PUM 1	229357	16	4S 4E	September 14, 1995*
PUM 7	229362	1	Two-post	September 14, 1995
PUM 8	229363	1	Two-post	September 14, 1995
PUM 37	304574	1	Two-post	September 15, 1995
PUM 39	304576	1	Two-post	September 15, 1995
PUM 40	304577	<u>1</u>	Two-post	September 15, 1995

Total 21 units

* with application of assessment work documented in this report

Former claims PUM 21-26 and 38 have been recently included in PUM 1 by application dated September 8, 1992.

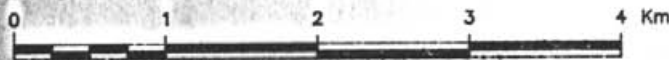
The location of the LCP of PUM 1 has not been checked in the field by the present writer or during the work program in 1991. The claims were located by well known contract stakers.



GREAT PACIFIC PUMICE INC.

MOUNT MEAGER PUMICE DEPOSIT

CLAIM MAP



SCALE
1:50,000

DATE
Nov. '92

N.T.S.
92d/11W

Figure: 3

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HISTORY

The pumice deposits and associated hot springs of the upper Lillooet Valley have been known since at least 1910 (Robertson, 1911). In mid-1970s, the pumice deposit was held as a mineral lease owned by J. MacIsaac. At this time the deposit was not yet accessible by road. Mr. MacIsaac died in the late 1970s and by 1980 the Ministry of Lands, Parks and Housing reissued the lease to Mr. W.H. Willis. During 1980-1982 a significant geothermal exploration program was undertaken by B.C. Hydro. They completed roads throughout the area and more specifically they constructed a road and built a bridge across the Lillooet River above Salal Creek, providing access to the deposit.

Concurrent with a large-scale investigation of geothermal energy by B.C. Hydro in the 1970s, limited pumice production was initiated from the southwest side of the Lillooet River near the mouth of Salal Creek. The pumice was crushed and screened, then trucked to a stockpile near Pemberton. Further processing and drying was undertaken at a site where the main road crosses the Lillooet River. Production ceased with the washout of the hydro bridge over the Lillooet River in the mid-1980s. In 1988, ten two-post claims covered the deposit in the name of L.C. Bustin.

In September 1990, the claims were staked on behalf of the present owner. A work program on the pumice deposit was conducted by B.H. Levelton & Associates in 1991 consisting of (1) preliminary geological mapping, (2) photogeological interpretation, (3) sample collection for laboratory tests which include (a) crushing for size fractions of production products, (b) gradation, (c) unit mass and absorption, (d) concrete and block trial mixes, (e) degradation, and (f) abrasion resistance.

In September 1992, a new bridge was constructed below Salal Creek but above the falls. By November 1992, this road was completed through to the original quarry which had been developed by Mr. W.H. Willis.

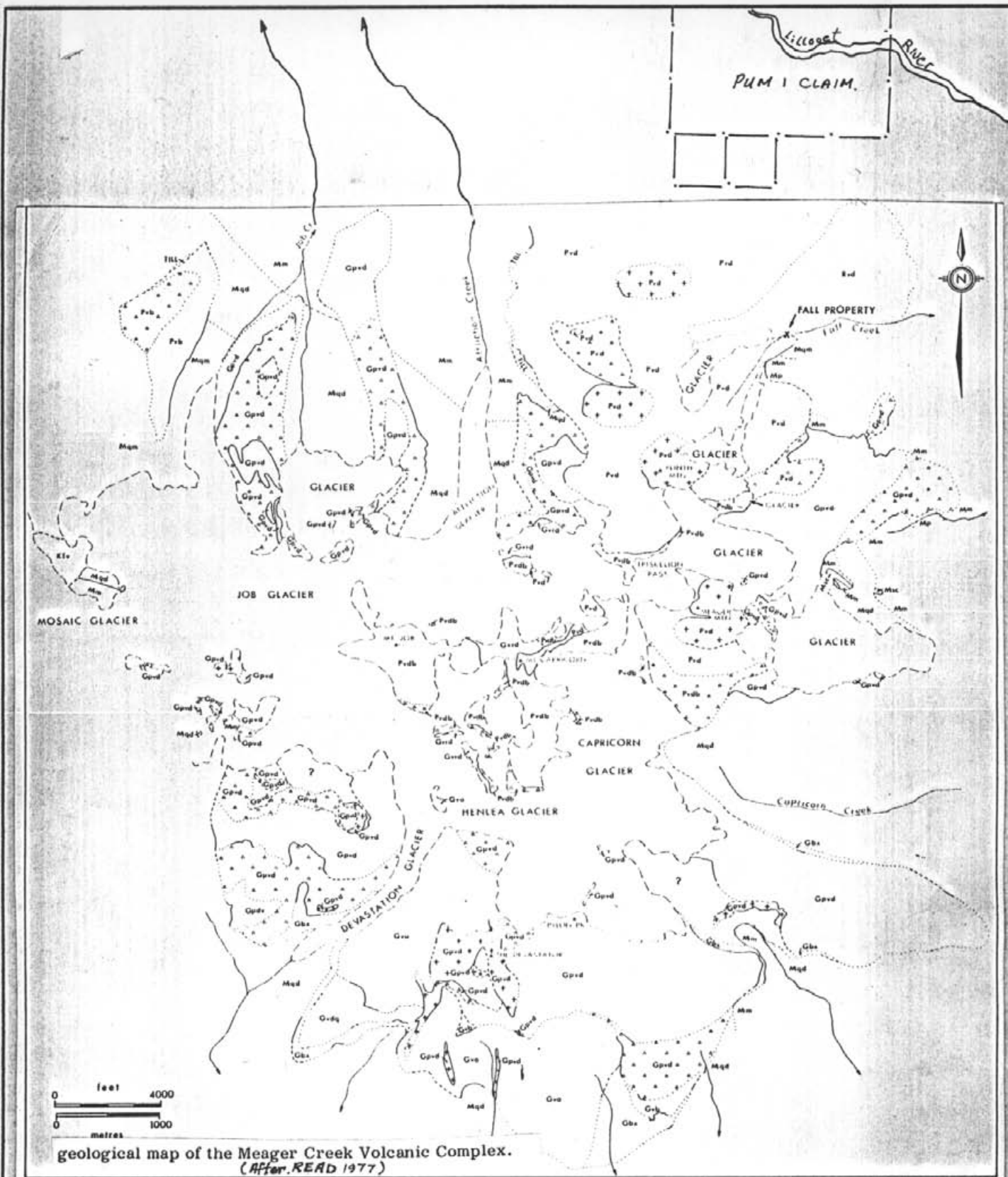
REGIONAL GEOLOGY

The Meager Mountain volcanic complex is situated at the northern end of the Garibaldi Volcanic Belt (Read, 1977). Previous regional geological studies have focused on geothermal energy potential, recent volcanic stratigraphy (Green et al, 1988) and volcanic hazard potential.

Stasiuk and Russell (1990) report that the Meager Mountain volcanic complex erupted 2350 BP to produce the Bridge River Assemblage. This assemblage comprises at least three primary volcanic lithologies representing different eruption styles. The oldest stratigraphic unit is a pyroclastic airfall produced by five discrete phases of eruption, each beginning with phreatomagmatic activity and progressing to magmatic pyroclastic eruptions. The second unit is a pyroclastic block and ashflow deposit which has entrained large, charred logs and pumice blocks and outcrops up to 7 km from the vent area. The third and youngest unit is represented by dacite lavas that form steep bluffs in the present-day Lillooet valley. Regional subdivisions by Read (1977) in order of decreasing age are as follows (Figure 4):

Meager Creek Volcanic Complex

1. Basal Breccia: Locally preserved remnants of breccia up to 300 m thick overlie basement on the south side of the complex. Clasts of granitic, grey or green aphanitic volcanic, and minor metamorphic rocks lie in a tuffaceous matrix. South of Pylon Peak, where the breccia is thickest, clasts less than 0.5 m long increase in size downwards to jumbled blocks of quartz diorite up to 20 m long with less than 10 per cent matrix. This area, where basement is lowest, may represent a partly exhumed vent.
2. Porphyritic Quartz Dacite: In the southwest corner of the map-area, a grey-green dacite with sparse phenocrysts of quartz, plagioclase and hornblende forms a remnant of subhorizontal flows up to 200 m thick. Gently dipping acid tuff and breccia overlap the older dacite along a subvertical eastern contact.
3. Acid Tuff and Breccia: On the south and west flanks of Pylon Peak and the Devastator is a cream to yellow ochre weathering assemblage up to 500 m thick of acid volcanic rocks.



geological map of the Meager Creek Volcanic Complex.
(After READ 1977)

VOLCANIC COMPLEX

- | | |
|--|--|
| [Scd] Scoriaceous dacite | [Gpd] Porphyritic (plagioclase) andesite |
| [Pfd] Porphyritic dacite | [Gpb] breccia and tuff |
| [Gpb] breccia and tuff | [Gpb] hypobysal intrusion |
| [Gpb] hypobysal intrusion | [G-b] Aphanitic flows |
| [Pob] Porphyritic (plagioclase, olivine) basalt | [G-a] Acid tuff and breccia |
| [G-a] scoriaceous bombs, breccia and tuff | [G-q] Porphyritic (quartz) dacite |
| [Pob] Porphyritic (biotite) dacite | [G-b] Basal volcanic breccia |
| [G-a] breccia and tuff | |
| [Gpd] Porphyritic (hornblende, biotite) rhyodacite | |

GREAT PACIFIC PUMICE INC.

MOUNT MEAGER PUMICE DEPOSIT

REGIONAL GEOLOGY

SCALE
AS SHOWN

DATE
Nov. '92

N.T.S.
924/11W/22E

Figure: 4

New Global Resources Ltd.

They are hydrothermally altered quartz latite with locally preserved quartz, plagioclase and biotite phenocrysts. Silicification, pyritization and the development of ubiquitous clay minerals and sporadic carbonates characterize this unit. Crudely layered tuff and breccia, dipping gently northeastward, compose all but the eastern end of the unit. Here the quartz latite is massive and may represent either flows and/or hypabyssal intrusions of a partly preserved vent.

4. Aphanitic Flows and Minor Intrusions: Medium to dark grey aphanitic flows here and there overlie the basal breccia and acid volcanic units and a few dykes less than 50 m thick cut both units. On the south-southeast ridge of The Devastator, a lens of conglomerate composed of subrounded pebbles and cobbles of this lithology overlies the acid volcanic unit.
5. Porphyritic Plagioclase Andesite: Porphyritic plagioclase andesite, the most extensive unit of the complex, forms most of the southern and western parts of the complex. Best outcrops are on Pylon Peak and The Devastator. Gently dipping flows are more extensive than basal and intercalated breccia and tuff, and dykes and plugs are restricted to The Devastator and possibly Peak 7927' at the head of Job Glacier. The maximum thickness may exceed 1,200 m of flows south of Capricorn Creek. Flows are commonly flow-layered or have a subparallel platy jointing and thin reddened breccia and tuff lenses may separate flows up to 20 m thick. Monomictic breccias up to a few hundred metres thick of porphyritic plagioclase andesite clasts lie at or within a hundred metres of the base of this sequence. The monomictic composition and differential weathering of the clasts distinguish this breccia from the basal breccia unit. Close to The Devastator, angular clasts up to several metres long are common in breccia. The concentration of hypabyssal intrusions and coarse volcanic breccia in the vicinity of The Devastator favour it as a major andesite vent. Potassium argon dates of 4.2 ± 0.3 m.y. and 2.1 ± 0.2 m.y. (Anderson, 1975) indicate a long period of andesite volcanism spanned by this unit.
6. Hornblende-Biotite Rhyodacite: Surrounding Mount Job in the centre of the complex are ochre-yellow weathering flows of porphyritic hornblende-biotite quartz rhyodacite. They are prominently flow-layered and locally have columnar jointing. At the head of Affliction Glacier, the unit attains a maximum thickness of 500 m. On the east side of the glacier, it

unconformably overlies porphyritic andesite and at the head of Affliction and Capricorn glaciers it is truncated by porphyritic biotite dacite of Mount Capricorn.

7. Porphyritic Biotite Dacite of Mounts Capricorn and Job: The final 600 vertical metres of mounts Capricorn and Job are brick red to maroon-grey weathering dacite. Coarse phenocrysts (5 mm) of plagioclase, quartz and biotite characterize this vesicular dacite. Angular clasts of dacite up to 2 m long form a basal breccia up to 100 m thick. Similar breccia is interspersed throughout the dacite. On Mount Job, local platy and columnar jointing and layering suggest that flows form the bulk of the massif, but their absence on Mount Capricorn may favour this as a source of the eruptive rocks.

8. Porphyritic Dacite of Plinth and Meager Mountains: The top 600 m of Meager Mountain and the bulk of Plinth consists of a light grey porphyritic dacite with medium-grained (2-4 mm) phenocrysts of plagioclase, quartz, minor biotite and rare hornblende. The dacite is commonly vesicular, has a glassy matrix and is distinguished from other dacites by scattered, rounded inclusions of fine-grained hornblende andesite. On Meager Mountain, the absence of flows or breccia, and development of steeply inclined flow layering suggest that it is a plug or lava dome. In contrast, Plinth Mountain consists of prominent columnar-or platy-jointed flows and widespread breccia and ash on its northern flank.

The Bridge River Ash (which in part composes the pumice deposit) incompletely blankets the area between the north and east ridges of Plinth. Within this area, crudely stratified breccia and ash deposits are up to 20 m deep on some ridges. Over 90 per cent of the clasts are cream-weathering, porphyritic (plagioclase, hornblende, pyroxene) dacite pumice. They range in maximum size from 10 cm on the summit of Plinth Mountain (Nasmith et al., 1967) through 1 m at the 6,500-foot level on the north ridge crest to 4 m blocks on the north side of the creek crossing the Fall Property at 4,965'. Two per cent of the clasts are subrounded pebbles and cobbles of a porphyritic quartz monzonite exposed along the creek. These data strongly indicate the lower part of the valley as the source of the Bridge River ash.

Fall Creek flows down the southern margin of a scoriaceous dacite flow which floors the present valley. Because Bridge River ash is absent, the flow must be younger than the ash

and probably covers the ash vent. Much of the edifice of Plinth Mountain is probably postglacial and that of Meager Mountain may be as well.

9. Olivine Basalt: A sparsely porphyritic plagioclase and olivine basalt underlies part of the ridge separating Job and Mosaic creeks. Flat-lying to southeasterly dipping flows parallel the present topography. On the northwest side of the ridge, basalt scoria and bombs comprise a breccia which overlies the flows and till.

LOCAL GEOLOGY

Detailed geological observations have been made by Stasiuk and Russell (1990) and Church and Seabrook (1991) on the Bridge River Ash.

Initial observations of Read (1978, 1977) and Stasiuk and Russell indicate that the first phase of eruption consisted of a single event which deposited a blanket of well-sorted, angular, rhyodacitic pumice and ash. The proximal and distal deposits define a plume which trends northeast from the proposed vent area and has a proximal plume axis of about 63° Azimuth. The exposure in the banks of the Lillooet River contains a complete section, is 1-2 m thick and exhibits neither internal bedding nor grading features. The higher elevation exposures, although incompletely preserved, were closer to the plume axis and exhibit distinct bedding and grading.

During the 1989 field season, Stasiuk and Russell (1990) found a previously undocumented exposure of the fallout deposits in the Lillooet River valley shows Bridge River pumice beds deposited upon a steep paleosloper of basement bedrock covered by soil. This exposure appears to represent a complete section of the fallout deposits developed close to the plume axis. The deposits have internal stratigraphy and graded bedding which record information on the dynamics of the pyroclastic eruption. The fallout deposits comprise approximately 6 m of loosely consolidated to unconsolidated pumice and ash and are overlain by about 4 m of pyroclastic flow deposit and up to 32 m of dense, indurated, vitroclastic breccia.

The pumice fall deposits are subdivided by Stasiuk and Russell (1990) into at least five distinct units of varying thickness. These units, from bottom to top, have vertical thicknesses of about 4 m, 0.35 m, 0.45 m, 0.30 m and 1.20 m respectively. Each unit contains reverse graded bedding, which may relate to variations in the height of the eruptive plume. On average, the basal zone of each unit is 10-20 cm thick and comprises lapilli less than 1 cm in diameter. The basal zones coarsen upwards to clasts about 5 cm across, except in the uppermost subunit. The top subunit coarsens upwards to within 30-40 cm of the top, where the pyroclastic material rapidly fines to coarse sand size, coarsens to about 1 cm diameter, fines again to sand and coarsens to 1 cm once again. These last two graded beds are lithologically distinct in that they are dominated by lithic and crystal clasts with as little as 10% felsic pumice clasts.

Church and Seabrook (1991) describe the pumice on the north side of the Lillooet River as follows:

"The pumice is commonly yellowish grey, weathering to a creamy white colour. It is light with a unit weight of approximately 54 pcf (860 kg/m³). The pumice within the study area consists of coarse-textured ellipsoidal fragments ranging from 1 to 6 inches (25 to 150 mm) in diameter. The deposit is a well-sorted rhyodacitic pumice composed of plagioclase feldspar phenocrysts in a frothy cellular groundmass. Black hornblende and flecks of biotite are present in small quantities. The pumice was pyroclastically placed upon a steep paleoslope of basement rock covered by sandy clay tills. The fallout deposit has partially been covered by lahar, slides and/or a thin soil veneer. The deposit contains some internal stratigraphy with a band of finer pumice (0.5 to 1.5 mm) in diameter some 2.6 m below the uppermost limit identified, indicating a sequenced deposition regime."

A second phase of the eruption, as discussed by Stasiuk and Russell (1990) is a low-temperature, relatively non-mobile pyroclastic flow which is found up to 7 km down from the presumed vent in the Falls Creek area. Many of the flow exposures were mapped previously (Read, 1977) as reworked tephra. Off the present claims, Stasiuk and Russell (1990) report a flow sequence averaging 6 m thick near the confluence of Lillooet River and Pebble Creek.

Mapping of all pumice exposures along the Lillooet River is recommended to correlate the origin of the deposits and define the most viable pumice zones.

WORK PROGRAM, 1991-1992

To augment the studies undertaken by B.H. Levelton & Associates in 1991, further samples were collected in 1991-1992 as illustrated on Figure 5 (in pocket), to investigate the suitability of the Meager Pumice for (a) construction material, (b) stonewash feed and (c) oil absorption. Pumice is also used for a wide variety of other industrial markets. Tonnages used are significantly less than that required for construction or stonewashing. However, the material has a higher unit value. Some of the main uses are shown below:

TABLE 2

Applications of industrial grade pumice

<i>Market</i>	<i>Application</i>	<i>Grade</i>
Agriculture	Soil substitute and additive	coarse
Metal detector	Food and chemical processing	coarse/intermediate
Paint manufacture	Non-skid coatings	coarse
	Acoustic insulating ceiling paints	coarse
	Fillers for textured paint	intermediate/coarse
	Flattening agents	extra fine
Chemical industry	Filtration media	coarse
	Chemical carriers	coarse
	Sulphur matches and strikers	intermediate
Metal and plastic finishing	Cleaning and polishing	extra fine
	Vibratory and barrel finishing	extra fine/intermediate
	Pressure blasting	intermediate
	Electro-plating	extra fine/fine
	Cleaning lithographic plates	extra fine
Compounders	Powdered hand soaps	intermediate
	Glass cleaners	extra fine
Dental and cosmetic	Polishing natural teeth and dentures	fine
	Smoothing rough skin	lump

<i>Market</i>	<i>Application</i>	<i>Grade</i>
Rubber	Erasers	intermediate
	Mould release agents	extra fine
Glass and mirror	TV tube processing, glass buffing and polishing	fine
	Bevel finishing	extra fine
	Cut glass finishing	extra fine
	Hand rubbed satin finishing	extra fine
Furniture	Piano keys	extra fine
	Picture frame gold leafing	extra fine
	Buffing	intermediate
Leather	Buffing	intermediate
Electronics	Cleaning circuit boards	extra fine
Pottery	Filler	extra fine/fine

(after McMichael 1990)

(a) **Construction Material Evaluation**

Assessment work costs are limited to a sampling trip on October 16, 1991 to obtain a 2 m³ roadside sample of pumice required by B.H. Levelton & Associates to make 20 building blocks for their testing program to complete the Geotechnical – Material Testing report commenced in the previous year's program. The report summarized tests for absorption, compressive strength, density and permeability of the material as well as similar tests for concrete and concrete blocks. The report concluded that tests of the Mount Meager pumice indicated it was comparable in quality and performance to the Bend, Oregon pumice currently used in the Lower Mainland market and that the Mount Meager material would be suitable in the manufacture of lightweight concrete building blocks.

(b) **Stonewash Evaluation**

Developments over the past decade in the manufacture of faded jean products has resulted in a significant world demand for 3/4-inch to 7-inch-sized pumice lumps which are washed with jean garments to bleach the denim material. In the Pacific Northwest, the stonewash material is currently imported from Turkey for use by the local denim industry. Hoffer (1992) notes that most of the deposits that contain pumice that is suitable for laundry use are of airfall or epiclastic origin.

Sampling and testing has gone forward in two phases since January 1992:

- (1) Small samples were taken from the roadside of the claims and analyzed for stonewash applications. Tests included geochemical analysis, petrographic work on thin sections, density/porosity analysis and comparisons with commercial U.S., Turkish and Greek samples.

A 5-kilogram hand-prepared sample was tested by Hoffer and Hoffer, Consulting Geologists, of El Paso, Texas. The lump pumice was evaluated for its suitability, both as a stonewash material and an acidwash material. Dr. Hoffer reported on moisture content, surface fines, abrasion loss, apparent and saturated density, absorption capacity and surface coloration. His test results indicate the Mount Meager pumice, with processing and conditioning, would be suitable for stonewash and acidwash applications (Appendix III). Further tests with the material are being conducted.

- (2) Following the Notice of Work (NAN – 92.0700309-90), a test pumice sample was obtained from the roadside within PUM 1. Two 125-pound (approximate) samples were prepared by hand-sorting and abrasion treatment in a 0.5-cubic-yard concrete mixer. The material was tested in two separate stonewash trials at Pimlico Holdings Ltd., the major Vancouver denim stonewash operator, under the direction of Mr. John Chow, Manager.

The first 125-pound sample test was conducted in August 1992 and indicated an abrasion loss of 45% to 50% during a standard wash cycle.

The second and subsequent trial on the Mount Meager stonewash material was run in comparison with an identical standard run using premium stonewash material from Turkey. The tests indicated the quality of the stonewash finish on the jean garments was comparable. The abrasion loss of the Mount Meager sample was 40% to 45% compared to the 20% to 25% for the Turkish stonewash material.

Hoffer (1992) summarizes the qualities of acidwash and stonewash as follows:

TABLE 3

Specifications for stonewash

	<u>Acid Wash</u>	<u>Stone Wash</u>
Moisture Content (%)	< 5	not a factor, unless purchased by weight
Surface Properties (%)	< 5 fines < 5 Fe oxides	< 5 fines
Apparent Density (g/cm ³)	0.50 - 0.75	0.70 - 0.85
Abrasion Loss (-%)	35	20 - 25
Absorption Capacity (%)	> 30 vesicles = 1-2 mm	not a factor vesicles < 1 mm
Crystals (%)	< 10	< 10
Obsidian (%)	< 5	< 5
Rock Fragments (%)	< 1	< 1

(c) **Oil Pollution Absorption Evaluation**

The application of environmental clean-up applications depend on the adhesive force of the pumice being greater than the cohesive force of the oil globules, resulting in the pumice becoming thoroughly wetted by the oil.

During 1992, a number of tests were conducted to examine the effectiveness of various sizes of Mount Meager pumice in the absorption and control of refined and crude oil spilt on water. The objective of the program was to determine if the material had possible applications for the control of small to large marine oil spills. In this regard, from samples of pumice taken at the roadside and from the existing quarry in the PUM 1 claims, three types of samples were prepared:

- unprocessed – under 1.5 inches in size
- processed – crushed and screened to minus 0.75 inch
- processed – pulverized to passing 100 mesh

The samples were tested with refined oil and crude oil in tap water and marine water. Comparative tests were performed using a Mediterranean pumice and an Oregon pumice. The tests indicated that the Mount Meager pumice, especially the pulverized pumice, absorbed the oil on a 1.5 pumice-to-oil ratio by volume and subsequently agglomerated and sunk. The result were, in part, confirmed by numerous research articles, (Reeves, 1962; Dick and Feldman, 1975), on the topic and by conversations with and reports from Environment Canada.

Reeves (1962) found that the ability of all commercial oil adsorptives could be improved by additional sizing and that optimum particle size is a diameter small enough to create maximum surface area per volume of material, yet large enough to readily immerse in the oil.

CONCLUSIONS AND RECOMMENDATIONS

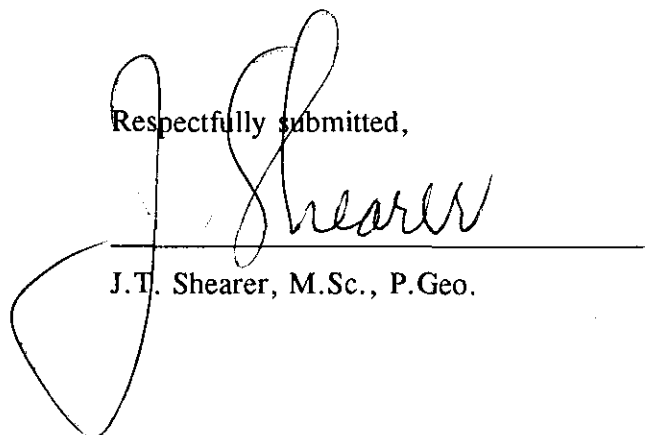
The pumice from the PUM claims appear to have commercial application, primarily as a concrete aggregate in the manufacture of lightweight concrete and concrete blocks. A secondary application is for the stonewash of denim clothing. With the completion of the new bridge and road to the main quarry, the deposit should be re-examined as to the economic viability of reopening the area for production.

During the current winter, road access to the site is not possible, however it is recommended that on reopening of the roads in the spring, that additional pumice material be sampled, processed and tested. Specifically, sufficient quantities should be prepared for limited production at a local block-making plant. In addition, stonewash-sized pumice samples should be prepared and conditioned for a rigorous test program of the material by a denim product manufacturer. Both aggregate and stonewash types of material are currently being imported and consumed in the local market.

The material should be further examined and tested for possible applications in the control of marine oil spills. This application may result in the most promising opportunity for processed pumice.

Future work should include geological mapping of all pumice outcrops and detailed correlation of the exposed sequence throughout the claims and also further down the Lillooet Valley to ensure that the subject property includes the most commercially viable pumice.

Respectfully submitted,

A handwritten signature in cursive script, reading "J.T. Shearer". The signature is written in black ink and is positioned above a horizontal line. The signature is somewhat stylized, with a large loop at the beginning and a long, sweeping tail that extends to the left and then curves back up to the right.

J.T. Shearer, M.Sc., P.Geo.

REFERENCES

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APPENDIX I

STATEMENT OF QUALIFICATIONS

J.T. Shearer, M.Sc., FGAC, P.Geo.

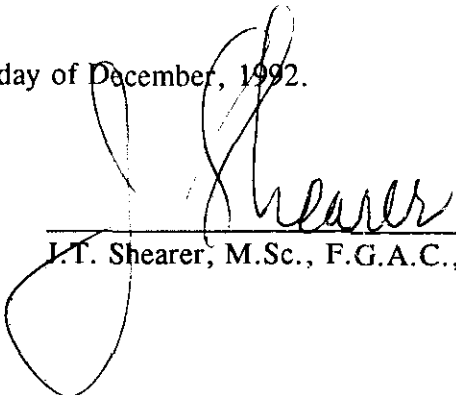
MOUNT MEAGER PUMICE DEPOSIT

STATEMENT OF QUALIFICATIONS

I. JOHAN T. SHEARER, of 1817 Greenmount Avenue, in the City of Port Coquitlam, in the Province of British Columbia, do hereby certify:

1. I am a graduate of the University of British Columbia, B.Sc. (1973) in Honours Geology and the University of London, Imperial College (M.Sc., 1977).
2. I have over 20 years of experience in exploration for base and precious metals and other commodities in the Cordillera of Western North America with such companies as McIntyre Mines Ltd., J.C. Stephen Explorations Ltd., Carolin Mines Ltd. and TRM Engineering Ltd.
3. I am a fellow in good standing of the Geological Association of Canada (Fellow No. F439) and I am a member in good standing with the Association of Professional Engineers and Geoscientists of British Columbia (Member No. 19279).
4. I am an independent consulting geologist employed since December 1986 by New Global Resources Ltd. at 548 Beatty Street, Vancouver, British Columbia.
5. I am the author of a report entitled "Assessment Report on the Mount Meager Pumice Deposit, Lillooet Mining Division, B.C., dated December 1, 1992.
6. I have not visited the property, but I have visited the area in the past during the B.C. Hydro deep geothermal diamond drilling. I am familiar with the regional geology and geology of nearby properties. I have become familiar with the previous work conducted on the Mount Meager pumice property by examining in detail the available reports plans and sections and have discussed previous work with persons knowledgeable of the area.
7. I do not own or expect to receive any interest (direct, indirect or contingent) in the property described herein nor in securities of Great Pacific Pumice Inc. in respect to services rendered in preparation of this report.
8. I consent to authorize the use of the attached report and my name in the company's Statement of Material Facts or other public documents.

Dated at Vancouver, British Columbia, this first day of December, 1992.



J.T. Shearer, M.Sc., F.G.A.C., P.Geo.

APPENDIX II

STATEMENT OF COSTS

October 16, 1991 to September 12, 1992

**PUM 1, 7, 8, 37, 39 and 40 Claims
Lillooet Mining Division**

**Prepared by G. Carefoot (owner)
Great Pacific Pumice Inc. (operator)**

VALUATION OF WORK

G.D. Carefoot (Owner)

Construction Material Program

Trip October 16, 1991

Trip to Mount Meager to obtain and transport
2 m³ of pumice for trial block-making test by
Levelton Associates

Time, 15 hours at \$60/00/hour	\$ 900.00
Mileage, 560 km at \$0.35/km	196.00
Repairs	391.44
Trailer rental	<u>35.00</u>
	<u>1,522.44</u>

Stonewash Material Program

Trip June 24, 1992

Trip with Roy Wares to inspect Mount Meager site
and accumulate samples for further analysis

Time, 13 hours at \$60.00/hour	\$ 780.00
Repairs	219.57
Mileage, 502 km at \$0.35/km	<u>175.70</u>
	<u>1,175.27</u>

Trip, Processing and Testing, July to October 1992

Trip to select and transport 100 kg of stonewash
pumice sample from PUM 1 and prepare for
delivery and testing at Pimlico/Vancouver

Time, 16 hours at \$60.00/hour – travel/work	\$ 960.00
9 hours at \$60.00/hour – processing	540.00
10 hours at \$60.00/hour – testing at plant	600.00
Repairs	97.47
Mileage, 900 km at \$0.35/km	315.00
Trailer rental	35.00
Mixer rental	<u>22.60</u>
	<u>2,570.07</u>

Oil Pollution Material Program

Trip March 13, 1992

Trip to manufacturing plant to pulverize
and prepare two samples aggregating 20 kg
for oil pollution control testing

Time, 4 hours at \$60.00/hour	\$ 240.00
Mileage, 84 km at \$0.35/km	29.40
Pulverizer rental	<u>125.00</u>
	<u>394.40</u>

March 16-30, 1992

Testing and evaluation, with M. McLaren,
of the performance of various sized pumice
material as a sinking agent for oil on water

Time, 35 hours at \$60.00/hour	<u>\$ 2,100.00</u>
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TOTAL – G. CAREFOOT COSTS	<u><u>7,762.18</u></u>
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Materials Testing

Hoffer and Hoffer invoice paid October 15, 1992 with funds transfer charges	\$ 339.50
Sample delivery costs	<u>92.00</u>
	<u>431.50</u>

Report Preparation

New Global Resources Ltd.	<u>\$ 1,070.00</u>
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TOTAL COSTS FOR ASSESSMENT	<u><u>\$ 9,263.68</u></u>
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APPENDIX III

STONEWASH TEST RESULTS

Mount Meager Pumice Deposit

1991 - 1992



HOFFER and HOFFER
Consulting Geologists
Mineral exploration and evaluation

Robin L. HOFFER, D.G.S.
8200 Antero Place
El Paso, Texas 79904

Jerry M. HOFFER, Ph.D.
Business (915) 751-3479
Home (915) 755-3268

TO: Garth Carefoot
Great Pacific Pumice, Inc.
790 Millbank
Vancouver, B. C.
Canada V5Z 3Z3

October 15, 1992

RE: Pumice test results

Moisture (%) = 0.1%

Surface Fines (%) = if present, removed during rounding

Abrasion Loss (-%) = 31.3 (tumbled for 15 minutes in rifle machine)

Apparent Density (g/cm^3) = 0.77

Absorption Capacity (%) = 21.2

Saturated Density (g/cm^3) = 0.98

Surface Coloration = light gray, less than 5% FeO

Summary: Marginal for stone-washing; average for acid-washing

GREAT PACIFIC PUMICE INC.

**790 MILLBANK
VANCOUVER, B.C.
CANADA
V5Z 3Z3**

**TEL: (604) 250-2750
FAX: (604) 879-6411**

**TO: ASSESSMENT REPORTS UNIT
GEOLOGICAL SURVEY BRANCH
MINISTRY OF ENERGY, MINES AND
PETROLEUM RESOURCES**

DATE: JANUARY 17TH, 1994

FAX: 952-0381

FROM: GARTH CAREFOOT

ATTENTION: TALIS KALNINS

**RE: FILE NO. 24500-03-AME
ASSESSMENT REPORT 22669**

Thank you for your letter and enclosures received this date. As discussed on the telephone, we provide the following information.

- 1. "Blocking" - on page 12 the Report references the work done in the previous year for the 1991 Assessment Report which was approved by your Unit on February 10, 1992. The assessment costs for the 1992 Report were limited to one sampling trip on October 16th, 1992.***
- 2. "Washing" - the lump pumice was tested as a stone wash material by Dr. Jerry Hoffer, Department of Geological Sciences, University of Texas at El Paso. El Paso is referred to as the Capital of Stone Washing in North America because of the large volume of stone washing completed there and Dr. Hoffer is reported to be the leading expert on stone wash pumice and the testing thereof. Dr. Hoffer has provided us with a copy of a three page article he wrote for the Textile Chemist and Colorist periodical in 1993 which provides detail on the test methods used for his report.***
- 3. "Absorption" - the tests were carried as described in the Report in 1991 in conjunction with Mr. Murray McLaren. Crude oil and several types of refined oil were floated in varying depths on the surface of one litre samples of tap water and saline marine water. Different volumes of various pumice samples were applied to the surface of the oil. The oil was agglomerated with the pumice and the agglomerations were observed over a period of several months to confirm the hydrocarbons were not released back through the water columns.***

Should the foregoing meet your requirements, please advise the undersigned and we shall return the amended Assessment Report.

As discussed, we were somewhat distressed to realize the Report had not been approved. At this time, we have provided a draft copy of our Prospectus for the Mine Development Steering Committee to Eric Beresford for his comments prior to completion. As you fully appreciate we would like to obtain your approval of our Assessment Report as soon as possible, to avoid any delays in the Mine Development Assessment Process.

Please do not hesitate to call me if you have any questions or require further information.

I thank you in advance for your cooperation in this matter.

I look forward to your response.

Yours truly,

A handwritten signature in black ink, appearing to read "Paul Handford". The signature is written in a cursive style with a large initial "P" and "H".

Price vs. Quality

Identifying Acid Wash, Stone Wash Pumice

By JERRY M. HOFFER, University of Texas at El Paso

Pumice is one of the more important ingredients in the production of acid and stonewashed denim, and yet very little quality control exists to insure the use of a consistent quality rock. Most processing costs—chemicals, labor, contract prices, etc.—are relatively fixed. But for many processors, the use of "cheap" pumice is a way to cut costs. Unfortunately, there exists a negative correlation with pumice price and quality finishes. Each pumice has to be evaluated on the basis of its physical properties and intended use, not on price alone.

Prior to about 1988, pumice was frequently evaluated for a specific "look" by trial and error. The major factor in the selection of pumice was usually its price. Few records were kept on the properties of pumice used to obtain a specific effect. The next time the same effect was needed again, perhaps months or even years later, the trial and error selection process had to be repeated.

In 1988, the author initiated a program to identify, test and evaluate those physical properties of pumice that control the effectiveness of the rock in stone washing. The purpose of the program is to eliminate unsuitable pumices without having to test them on the goods in process. Subsequent testing of several hundred pumices over a

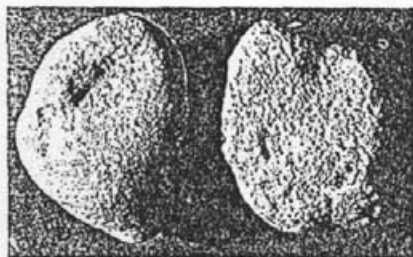


Fig. 1. Pumice surface fines. Surface on left is covered by powdered coating of glass and clay; right, surface fines removed exposing abundant vesicles. Each sample is ca. 3 cm wide.

period of four years has resulted in the development of an evaluation method that can be very useful in selecting the proper acid washing and stone washing pumices for specific physical properties.

Pumice Origin and Distribution

Pumice can be loosely defined as highly vesicular glass foam which will float on water (1). A common product of explosive volcanic eruptions, it forms from the rapid vesiculation of gas during ascent and expulsion of a silica-rich, viscous, high temperature melt (magma) at the earth's surface.

The world's major pumice deposits currently are found in areas that have had active volcanos recently. These include areas that border the Pacific Ocean (North, Central and South America), the southwest Pacific (New Zealand and Indonesia), the western and northern Pacific (Japan, Russia) and the mid-Atlantic region (Iceland). In Europe and Asia major pumice deposits are found in Turkey, Greece, Italy and Germany. U.S. deposits of laundry grade rock are found in California, Arizona and New Mexico.

Commercial grade pumice is classified by origin and by airfall, flow or surge, vesiculated domes and epiclastic deposits. Airfall deposits are produced by nearly vertical volcanic eruptions in which the pumiceous materials are ejected into the atmosphere, fall to earth and accumulate in layers outward from the volcano. Flow or surge deposits are produced from nearly horizontal volcanic blasts that produce high velocity clouds of gas and particles that travel near the surface of the earth. Dome deposits, which contain large blocks of pumice, are produced from rapid vesic-

ulation of a highly viscosity magma during extrusion. Secondary deposits, termed epiclastic, result from the reworking of any of the above deposits by running water. Most of the deposits that contain pumice suitable for acid washing and stone washing are of airfall or epiclastic origin.

Domestic Pumice Production

Pumice is usually quarried by simple mining methods. First the overburden is removed by a bulldozer. Then the pumice is extracted by a front-end loader, dumped into trucks and hauled to the processing facility. Trucks dump the pumice into a separator where the large rock and pumice fragments are removed. The pumice is next moved by conveyor through a water trough where heavier rock and obsidian fragments sink. The lighter pumice floats to the surface where it is collected, sorted by size and bagged for shipment.

In 1991 nearly 70% of the U.S. production of pumice was used in manufacturing lightweight building blocks (2). The fastest growing use of pumice today is in the laundry industry. Laundry grade pumice sold or used by U.S. producers totaled 38,000 metric tons (\$3.6 million pounds) in 1991. This represents 9% of domestic consumption (2).

To supply the increasing demand for laundry grade pumice, a study is in progress to locate and evaluate additional deposits in the U.S. The factors that determine the viability of a laundry grade pumice deposit include: (1) 10% or more of three-quarter inch pumice fragments, (2) adequate physical properties of the pumice for either acid washing or stonewashing, (3) reserves of at least 20 million pounds, and (4) little or no overburden.

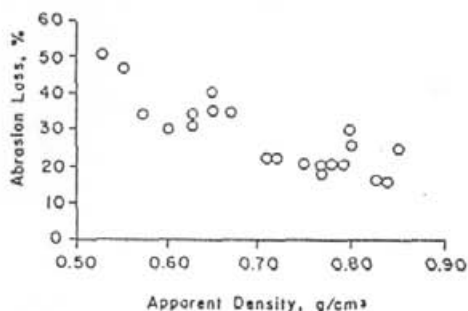


Fig. 2. Pumice abrasion loss vs. apparent density.

ABSTRACT

Pumiceous rocks possess a number of properties that should be evaluated to predict their suitability for acid or stone washing. These properties include moisture content, surface properties, apparent density, absorption capacity, abrasion loss and the amount of impurities. For acid wash pumice, high absorption and moderate abrasion loss are desired. Stone wash pumice should possess moderately high apparent density and low abrasion loss.

KEY TERMS

Acid Washing
Denim
Pumice
Stone Washing

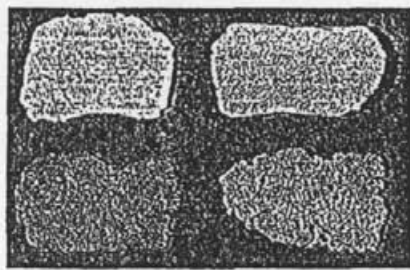


Fig. 3. Examples of pumice absorption capacities. Pumice slices, ca. 3 cm wide, with absorption capacity of 12% (small elongated vesicles, upper left), 23% (small oval vesicles, upper right), 30% (medium irregular vesicles, lower left) and 43% (medium oval to circular vesicles, lower right).

At present less than 14% of the laundry-grade U.S. deposits of pumice are being mined. The output is now confined to Arizona, California and New Mexico, but excellent deposits have also been identified in Idaho and Oregon.

Pumice Physical Properties

Moisture Content

A common problem with pumice is its moisture content (3). Pumice absorbs moisture during periods of precipitation. The amount of moisture entering the rock depends on the size of the vesicles and the amount of time in contact with the water.

Moisture in pumice, which has been measured as high as 30% by weight, can affect processing in two ways:

- If pumice is to be impregnated with an oxidizing chemical for acid washing, moisture will dilute the concentration of the chemical.

- If pumice is purchased by weight, the buyer is paying for water not rock. The ideal pumice should contain not more than 5% moisture by weight.

Pumice moisture can be eliminated by heat drying, but this is relatively expensive. It can be reduced by air drying, but this is time consuming and generally ineffective for fragments greater than 1.5 inches in diameter.

Surface Properties

Fines and Coloration

Surface fines include fine grained glass fragments or clay minerals that adhere to the outer surface of the pumice (Fig. 1). The glass fragments result from fragmentation of the vesicle walls. If there are enough of them, they can plug the vesicles and reduce the amount of absorbed chemical for acid washing. Alteration products such as smectite clay minerals occasionally form on the outer surface of the pumice. The clay not only reduces pumice absorption, but during acid washing it will absorb and release the oxidizing chemical faster than pumice, resulting in a bleach streak across the fabric. If surface fines exceed 5%, they should be removed prior

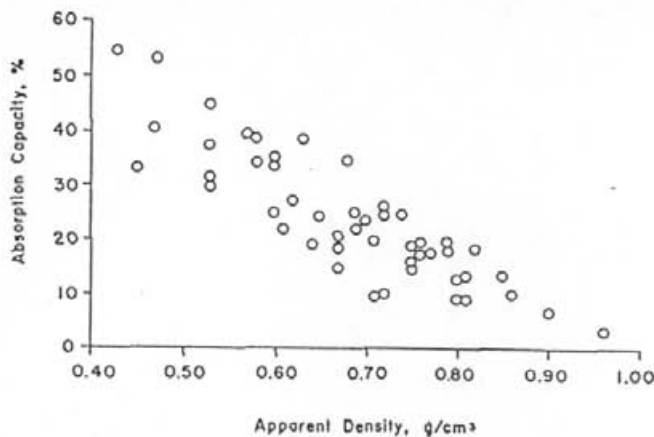


Fig. 4. Pumice absorption capacity vs. apparent density.

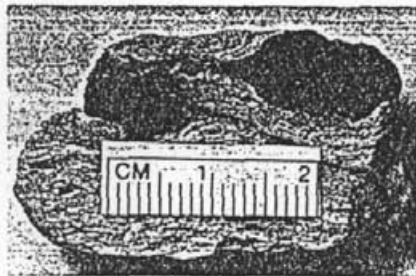


Fig. 5. Dark dense obsidian clots in pumice.

to use or the pumice should not be used.

Pumice that contains 5-10% yellowish or reddish-brown iron oxides should be avoided. The oxides can be mobilized by the oxidizing chemicals in the acid wash and subsequently deposited on the garment during tumbling. The result is a light yellow or brown color on the finished garment which may cause it to be rejected.

Apparent Density

Although the true density of pumice is about 2.5 g/cm³, its cellular structure gives it an apparent density of generally less than 1.0 g/cm³. The apparent density can be determined by the method of water displacement and measured values range from 0.39 to 1.14 g/cm³; the average is approximately 0.70 g/cm³ (3,4).

A wide range of apparent densities can be tolerated in the washing process, but the most acceptable are those between 0.50 to

0.85 g/cm³. Pumice densities greater than 0.85 g/cm³ have low absorption capacity and are unsuitable for acid washing. Low apparent density pumices, below 0.50 g/cm³, will generally produce only a small amount of abrasion and are therefore undesirable for stonewashing.

Abrasion Loss

The rate of disintegration of the pumice during tumbling is referred to as abrasion loss. The pumice fragments are weighed before and after 15 minutes of tumbling in a rifle machine and the loss of weight is reported as a percentage. Low abrasion loss pumices, less than 25%, indicate slow disintegration and are most desirable for stonewashing. In addition, these pumices generally possess high apparent densities, greater than 0.70 g/cm³, and low absorption capacity, less than 25%. There appears to be a relationship between abrasion loss and apparent density as the pumices apparent density increases its abrasion loss decreases (Fig. 2).

Absorption Capacity

The absorption capacity of pumice is defined as the percentage of liquid that can be taken up during submergence of the pumice in a liquid for five minutes. Factors that influence absorption include the size, shape, amount of vesicles and their degree of connectedness. Absorption is very important in acid washing because it determines the amount of oxidizing chemical

Table I. Specifications for Stone Wash

	Acid Wash	Stone Wash
Moisture Content	<5%	Not a factor unless purchased by weight
Surface Properties	<5% Fines <5% Fe Oxides	<5% Fines
Apparent Density (g/cm)	0.50-0.75%	0.70-0.85
Abrasion Loss	35%	20-25
Absorption Capacity	>30% Vesicles = 1-2 mm	Not a factor Vesicles = <1 mm
Crystals	<10%	<10
Obsidian	<5%	<5
Rock Fragments	<1%	<1

that can be carried and released onto the garment by the pumice.

Measured absorption values, based on more than 250 samples, range from 1 to 56%. The average value is 23% (Fig. 3). Absorption values of 30% and above are preferred for acid washing. Such pumices are easily identified because they are lightweight; i.e., low apparent densities (Fig. 4). For stonewashing, pumice absorption capacity is not a factor.

Pumice Impurities

Mineral crystals are commonly found in pumice. They are generally sparse but when they exceed 10%, they increase the apparent density so that it exceeds 1.0 g/cm³ and the pumice will not float during stonewashing.

Black clots and streaks of dense volcanic glass (obsidian) will also increase the apparent density of the pumice (Fig. 5). In addition, the obsidian fragments will shatter during tumbling, producing razor sharp edges that can damage the goods being processed.

Probably the most common impurity associated with pumice is rock fragments. The fragments are generally all crystalline and possess densities greater than 2.5 g/cm³. They are incorporated within the pumice deposit during its origin, but are generally removed during the mining process. However, pumice has been observed that contained nearly 30% rock fragments.

Pumice Specifications

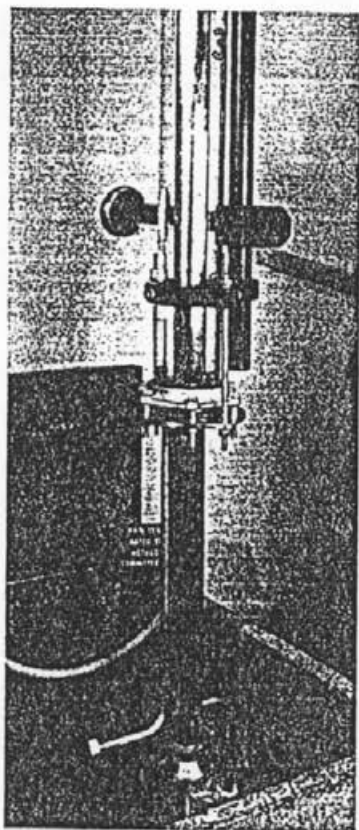
Recommended specifications for acid and stone wash pumice are summarized in Table I. In general, the absorption capacity, abrasion loss and surface properties are most important for acid wash pumice whereas abrasion loss and apparent density are most critical for stone wash rock.

It is strongly recommended that at least a modest quality control program be implemented to monitor pumice quality. Most processors can adapt to a variety of pumices if they are consistent day after day. Problems arise when the pumice properties change abruptly, such as a 50% increase in moisture. An on-going quality control program can identify these variations before they cause problems. ☺

References

- (1) Fisher, R. V. and H. N. Schmincke, *Pyroclastic Rocks*, Springer-Verlag, New York, 1984.
- (2) Bolen, W. P., 1991, *Mineral Commodity Summaries: Pumice and Pumicite*, U.S. Bureau of Mines, 1992, p4.
- (3) Hoffer, J. M., *Pumice and Pumicite in Arizona*, Arizona Department of Mines and Mineral Resources, Report 91-8, 1991.
- (4) Hoffer, J. M., *Pumice and Pumicite in New Mexico*: 1993, New Mexico Bureau Mines and Mineral Resources, Bulletin 134 (in press).

AATCC Rain Tester



Used primarily to predict the probable rain penetration resistance of fabrics which may or may not have been given a water-resistant or water-repellent finish. The complete rain tester assembly includes specimen holder, nozzle, polycarbonate tube, stand, lower support bracket, valve stem bracket, and assembly instruction. Order No. 8728.

Replacement parts:

Rain Tester Nozzle Order No. 8728a

Specimen Holder Order No. 8728b

For order and inquiries, please contact:

AATCC

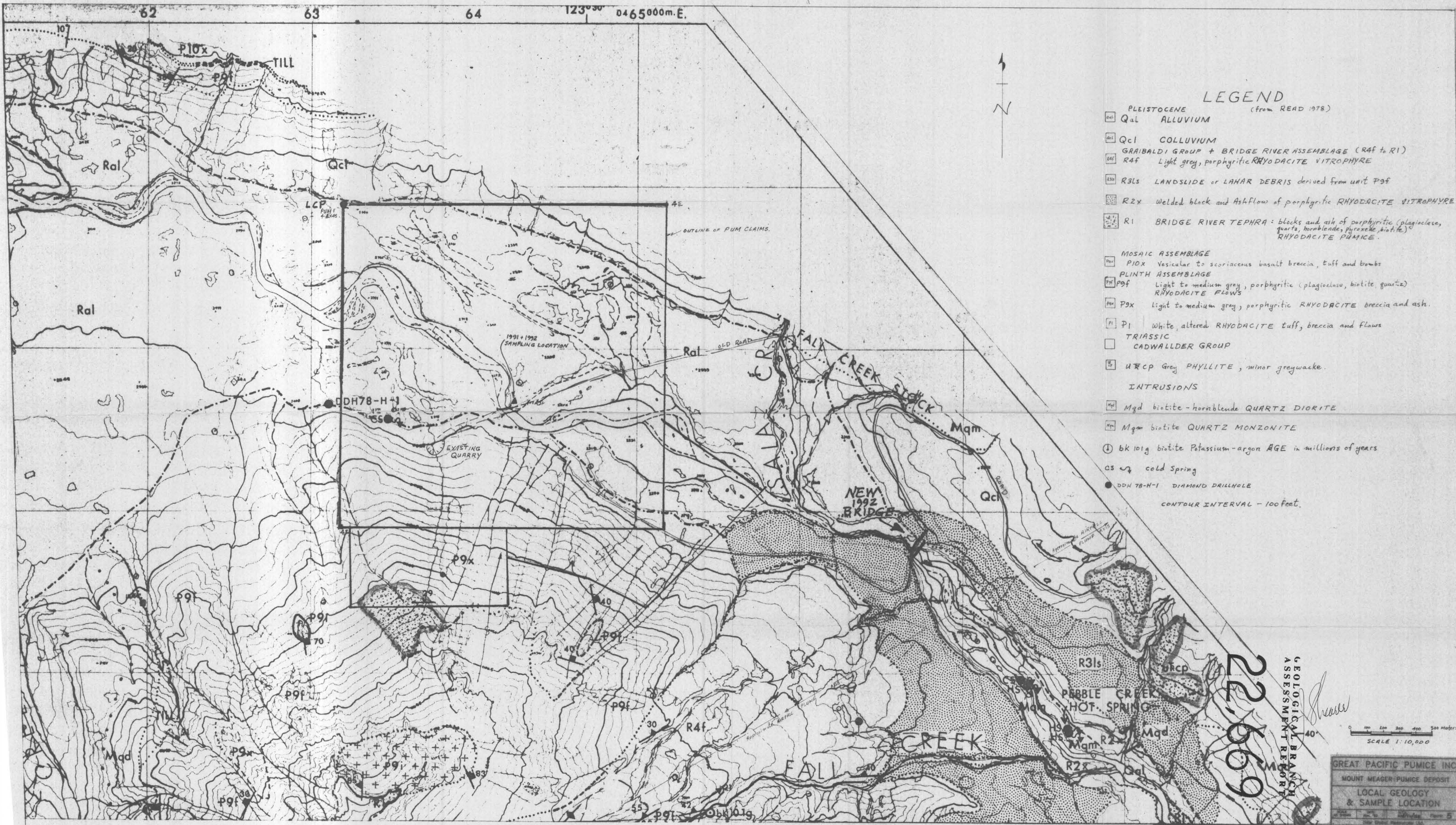
P.O. Box 12215

Research Triangle Park, NC 27709

Tel: 919/549-8141

Fax: 919/549-8933

VISA OR MASTERCARD ACCEPTED



LEGEND

- PLEISTOCENE (from READ 1978)
- Qal ALLUVIUM
 - Qcl COLLUVIUM
 - GRAIBALDI GROUP + BRIDGE RIVER ASSEMBLAGE (R4f to R1)
 - R4f Light grey, porphyritic RHYODACITE VITROPHYRE
 - R3ls LANDSLIDE or LAHAR DEBRIS derived from unit P9f
 - R2x Welded block and Ashflow of porphyritic RHYODACITE VITROPHYRE
 - R1 BRIDGE RIVER TEPHRA: blocks and ash of porphyritic (plagioclase, quartz, hornblende, pyroxene, biotite) RHYODACITE PUMICE.
- MOSAIC ASSEMBLAGE
- P10x Vesicular to scoriaceous basalt breccia, tuff and bombs
- PLINTH ASSEMBLAGE
- P9f Light to medium grey, porphyritic (plagioclase, biotite, quartz) RHYODACITE FLOWS
 - P9x Light to medium grey, porphyritic RHYODACITE breccia and ash.
- PI White, altered RHYODACITE tuff, breccia and flows
- TRIASSIC
- CADWALLDER GROUP
 - URCP Grey PHYLLITE, minor greywacke.
- INTRUSIONS
- Mgd biotite-hornblende QUARTZ DIORITE
 - Mqm biotite QUARTZ MONZONITE
- ① bk 101g biotite Potassium-argon AGE in millions of years
- cs cold Spring
- DDH 78-H-1 DIAMOND DRILLHOLE
- CONTOUR INTERVAL - 100 feet.

0 100 200 300 400 500 Meters
SCALE 1:10,000

GREAT PACIFIC PUMICE INC.
MOUNT MEAGER-PUMICE DEPOSIT
LOCAL GEOLOGY
& SAMPLE LOCATION

22,669

GEOLOGICAL BRANCH
ASSESSMENT REPORT

LOG NO:	DEC 23 1992	RD.
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PETROGRAPHIC AND SAMPLING REPORT

MT. MEAGHER PUMICE DEPOSIT

PUM CLAIMS

NTS 092J/11W/12E

LILLOOET MINING DIVISION

LAT: 50° 41' N

LONG: 123° 30' W

OWNER: Garth Carefoot
790 Millbank
Vancouver, B.C. V5Z 3Z3

AUTHOR Roy Wares, P.Eng.
1522 West 62 Avenue
Vancouver, BC V6P 2E9

DATE OF WORK June to September, 1992

FILE 14675-20, MEMPR, Nanaimo

WORK APPROVAL NAN-92-0700309-90

DATE OF REPORT SEPTEMBER 11, 1992

2 of 2

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1: GENERAL

1:1 Location

The Mt. Meagher pumice deposit is located in the Lillooet Mining Division (NTS 092J 11W/12E), about 55 kms north west of Pemberton, B.C.. (fig 1). The property is located at $123^{\circ} 30'W$, $50^{\circ} 41'N$.

1:2 Access

Access to the property is from Pemberton via the Lillooet River Road. The property is located to the west of the junction of Salal Creek and Lillooet River. Access to the north side of the river is by logging road. Access to the south side of the river is presently limited (the BC Hydro bridge was washed out in 1983). Current logging plans in the area call for construction of a bridge across the Lillooet River gorge some 2 kms east of the property. Road access to the new bridge site was complete at the date of site visit (June 21, 1992). Bridge construction had not commenced at September 10, 1992 (according to the property owner).

The Mt. Meagher area is in the general area of a park proposal under evaluation by the BC government. The Upper Lillooet proposal has ill-defined boundaries and it is not known whether the study area includes the project area.

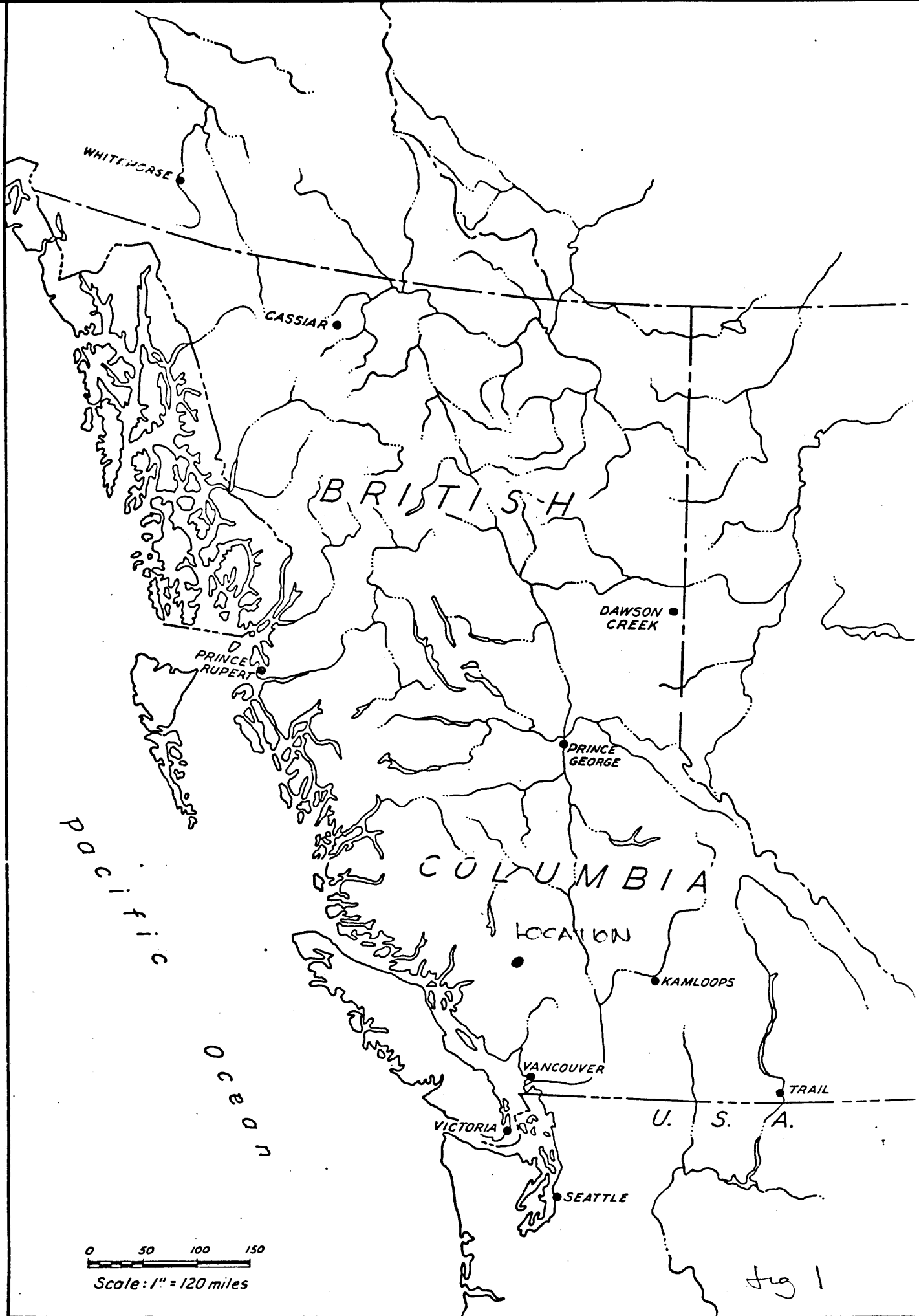
1:3 Topography

The property is located at elevations from 700m to 1700 m ASL. Relief is moderate north of Lillooet River. A steep slope rises from the Lillooet River to Plinth Peak, with an average slope of 28° . The alluvial plain west of the Salal Creek/Lillooet River junction formed during impoundment of the Lillooet River in the Bridge River volcanic episode. Impoundment was caused by an ignimbrite flow down Fall Creek which temporarily blocked Lillooet River.

The slope to the south of Lillooet River, on the property, was identified by Read as a potential land slide area. Previous land slides in the project area are not dated. Snow avalanche scars are evident on the same slope.

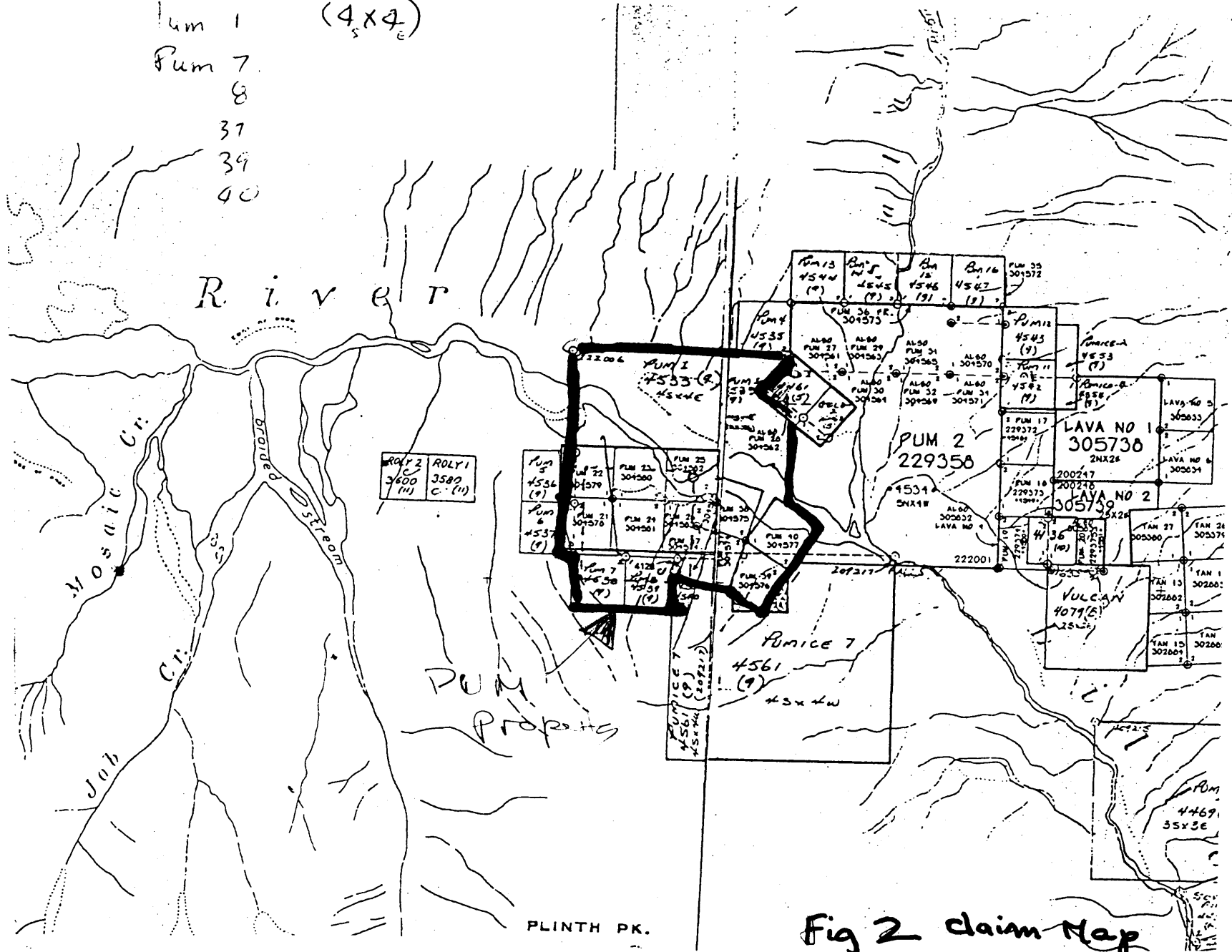
1:4 Claim Status

The property consists of contiguous unit and 2-post claims. The 16 claim units are Pum # 1 and the 5, 2-post claims (Pum # 7, 8, 37, 39 and 40). The present claim block is a reduction of a



Plum 1 (4x4)
C

Plum 7
8
37
39
40



PLINTH PK.

Fig 2 claim Map

previous larger, contiguous claim block. The legal corner post of Pum # 1 was not examined during the site visit. It has not been legally surveyed.

Claim	Units	Record #	Expiry Date
Pum # 1	16	4533	Sept. 14/92
Pum # 7	1	4538	Sept. 15/92
Pum # 8	1	4539	Sept. 15/92
Pum # 37	1	304574	Sept. 15/92
Pum # 39	1	304576	Sept. 15/92
Pum # 40	1	304577	Sept. 15/92

1:5 Previous Work

The area has an intermittent history of mineral exploration. Evaluation of geothermal resources in the area has been in abeyance since 1982. Several claim blocks staked in the area adjacent to Pum # 1 were staked to cover other pumice deposits.

At some time in early 1982 (apparently), a small pit on the westside of Pum # 1 was used as a source of pumice for test sampling, with material stockpiled about 30 kms east of the property. Results of the test sampling in 1982 or any detailed evaluation of results have not been identified. The quarry site was not accessible at the time of visit. On the basis of location, geology and samples examined off-site, the material is part of the Plinth Peak Assemblage, whereas, it appears that much of the pumice north of the Lillooet River, is Bridge River tephra.

Objectives of the present owner have been to identify commercial uses of the Mt. Meagher pumice for light weight aggregates, for decorative purposes and for uses within the garment industry.

The present owner commissioned a geological evaluation in 1991, with ancilliary block making tests. Results of the evaluation were apparently filed as assessment work. Results of block making tests were not appended with the draft text of the geological evaluation. Results were not disclosed to the author.

Work carried out by, and on behalf of the present owner in the period September 14, 1991 to September 10, 1992, as claimed by the owner are-

(*author's note : the filing affidavit was not provided to the author by the owner)

- a) collection of a bulk sample (2 m³) for block making tests (October 1991)
- b) collection of a suite of samples and detailed evaluation of a specific site (June 1992)
- c) collection of a bulk sample (1 m³) for testing for stone-wash capacity (July 1992)
- d) collection of a sample of screened pumice (0.5 m³) for examination and comparison with commercial supplies of pumice (August 1992)
- e) examination and petrographic comparison of Mt. Meagher samples with commercially available pumice for suitability as stone-wash material.
- f) test run of pumice material in a mixer to determine abrasion characteristics in a stone-wash environment (there is no industry-wide standard for stone-wash testing or an ASTM specification); the test procedures and specifications were not carried out under the author's direction. It is not known whether the test stone-wash procedures were carried out under controlled conditions.

** AUTHOR'S NOTE

The author has personal knowledge only of items b) and e);

The location of samples in a), c) and d) is not known with any certainty.

Stone-wash tests conducted by the owner were problematic, according to the owner. It is not known whether these tests were conducted in a controlled, reproducible environment. A high loss rate was reported and cause of loss was not determined.

Petrographic work was carried out to compare Mt. Meagher samples with commercially available material to identify possible cause of aberrant results.

2: GEOLOGY

2:1 Regional Geology

The general geology of the area has been outlined by Read (1978),¹ and Seabrook and Church (1991).²

Essentially, the area comprises volcanic assemblages of the Garibaldi Group overlying a basement assemblage of metamorphic and plutonic rocks. The Meagher Creek Volcanic Complex, as described by Read, comprises andesitic to rhyodacite flows, ash and tephra. At least nine volcanic assemblages were identified. Rocks of andesitic affinity comprise the older part of the complex, which is intruded by, and overlain by younger dacite and rhyodacite units.

The oldest dated andesitic units have a K-Ar date of 4.2 ± 0.3 m.y. The youngest unit, the Bridge River tephra has an age of 2,440 ± 140 y. B.P. (Read, 1972).

2:2 Property Geology

The geology of the property has been described in some detail by Seabrook and Church (1991).

The description however fails to differentiate among volcanic stratigraphies present in the area, in particular, the Plinth Peak Assemblage and the Bridge River Assemblage, which differ in age and distribution.

Mapping by Read (1972) shows that within the property boundary, reworked alluvium (Unit Ra1) is present below an elevation of 730m ASL. To the north of the valley fill, Quaternary alluvium overlies quartz monzonite of the Fall Creek Stock.

To the south of Lillooet River, the steep southern slope is underlain by units of the Plinth Peak Assemblage, essentially a rhyodacite ash and pumice unit. Plinth Peak Assemblage material is exposed on the south bank of Lillooet River in a 150 m section with a vertical exposure of 50m. The morphology of the exposure clearly indicates there has been extensive downslope movement of material down steepened slopes of Plinth Peak.

Visual examination from the north bank of the river, shows at least five crude stratigraphic units. Block and ash units are present but no evidence of vertical gradation. The upper unit does not, at the present level of examination, show apparent evidence of water sorting.

Several sections north of the river were examined. The best exposed section, on Pum # 1, is exposed in a road cut over a section 30m

by 6.0m. Material has been used by forest companies for road fill.

The sampled section shows a dual stratigraphy. The lower unit, exposed over a thickness of 2.5m, shows a pale grey to cream, heterogeneous distribution, with no evidence of sorting. Angular blocks of pumice with largest dimension above 5cm represent about 5% of the unit. Draped over this unit, and exposed over a vertical height of 2.5 m, is a pumice unit that is less heterogeneous than the lower unit. The upper 1.0 m has clear bedding present with fine silty intercalations. Bedding dips at 15° to the east. Colluvial material overlies the pumice zone. Some erratic iron staining is evident in the upper 0.5m of the upper pumice section. Some seasonal water-logging is probable, despite the well drained character of the exposure.

Though different in grain size and distribution, the upper and lower units appear to have composition and characteristics of the Bridge River Assemblage.

On the basis of stratigraphy, the lower unit appears to be a near-source primary air fall while the upper unit is a secondary water washed pumice unit.

Other units examined, in intermittent road exposures, show characteristics of the water washed pumice seen in the major exposure.

3: PUMICE CHARACTERISTICS

3:1 Geology

Pumice is a light coloured, highly vesicular volcanic glass. It is formed from silicic lavas rich in dissolved volatiles, particularly water vapour. (Geology of Non-Metallics, 1984)³, Where the volatile content is high during explosive eruption, the pumaceous froth may be shattered into fine fragments. This material is termed pumicite. Pumice and ash flows derive from an eruption column collapse or, what is termed 'boiling -over'.

Characteristically, pumice and pumice-related units exhibit vertical variation and, particularly, lateral variations. The basal unit, is characteristically a ground surge deposit, overlain by a pyroclastic flow unit, which grades upwards into an ash cloud surge deposit and at the top, an air fall ash deposit (Mathison, 1991)⁴. The air fall ash deposit is characteristically areally widespread.

Air fall pumice is characteristically better sorted and has a smaller range of sizes than pumice flows.

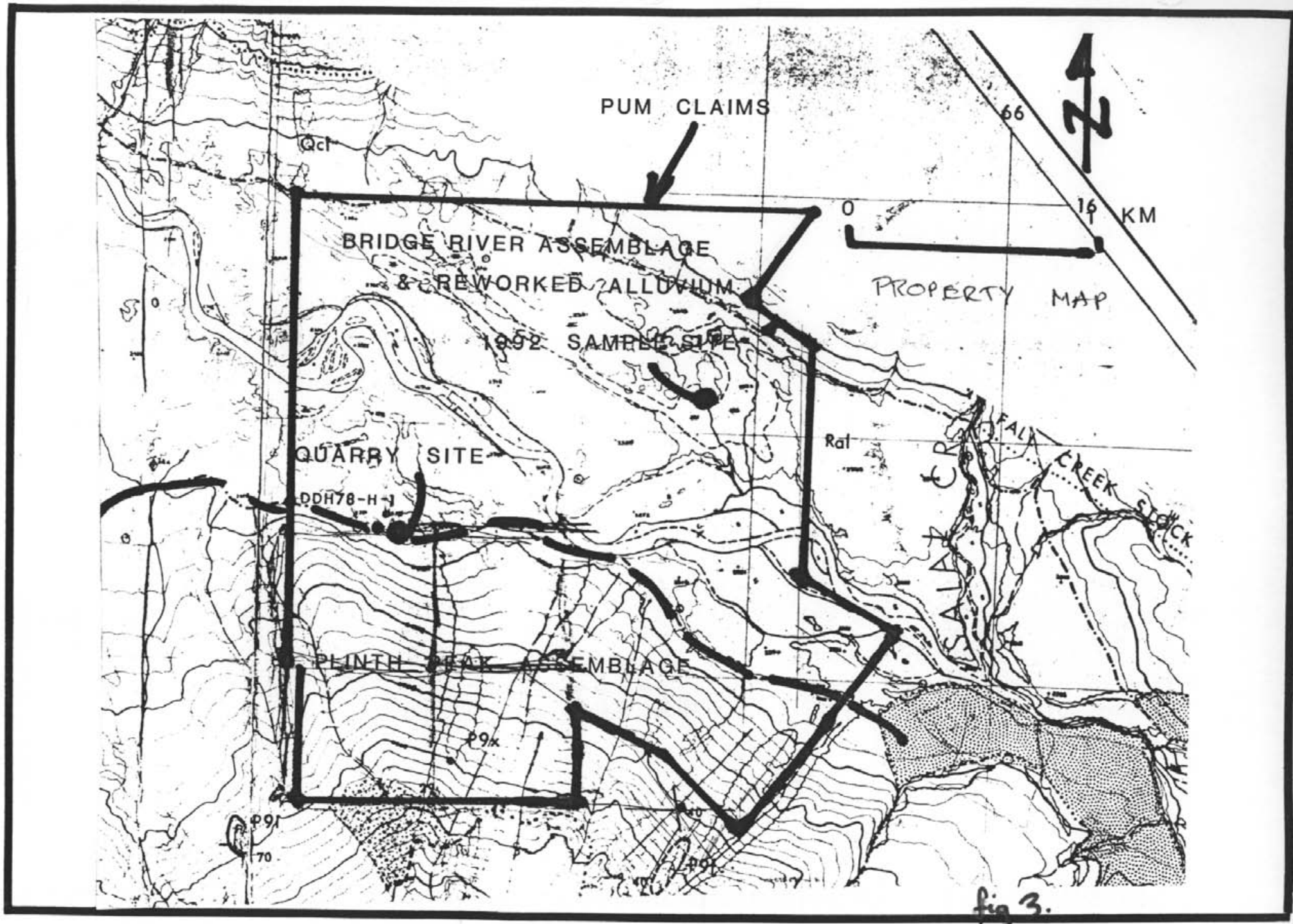


fig 3.

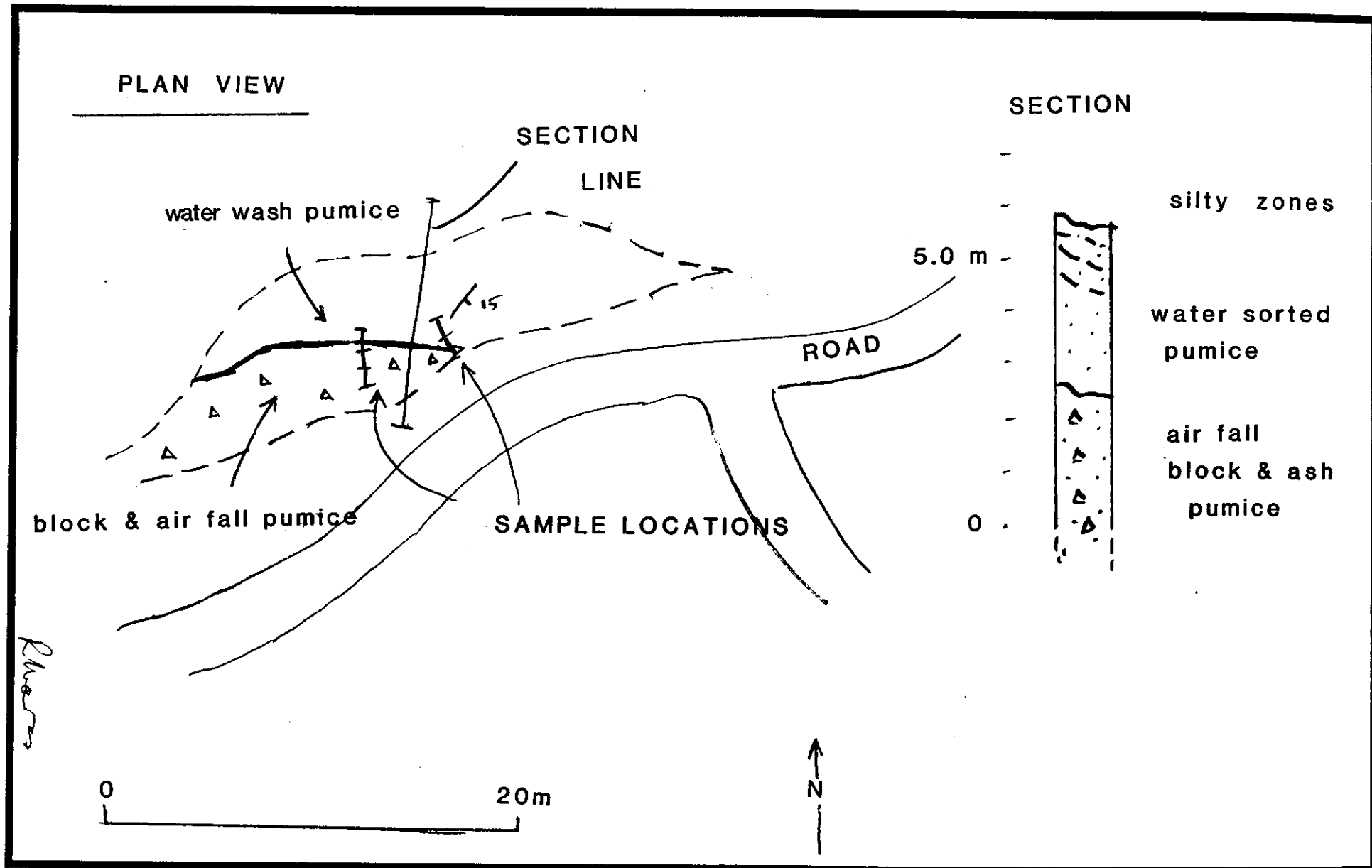


fig. 4

For descriptive purposes pumice deposits are typified by-

- a) near source primary air-fall
- b) distant primary air fall
- c) near source primary block and ash flow
- d) near source secondary alluvium and slope wash
- e) distant secondary alluvium

The Meagher Peak area exhibits some of this characteristic stratigraphy, especially the Bridge River Assemblage. The welded pyroclastic flow unit (P2x, Read's category) blocked Lillooet River, producing a temporary impoundment above its flow path (Read, 1977). The reworked alluvial assemblage (Ral) includes reworked pumice within the property boundary.

The Plinth Peak units in the project area comprise elements of unit d), intermixed with unit c). The Bridge River assemblage is, to the extent of the examination, primary air fall that has been winnowed by water action and covered with secondary alluvium and slope wash, though to a lesser extent than the Plinth Peak Assemblage.

Samples from the Plinth Peak Assemblage were examined under a binocular microscope. The samples had been previously screened and stockpiled 30 kms east of the Pum property. Samples were compared with the Bridge River Assemblage.

Compositionally, both pumice units are rhyodacite ash and pumice.

Significant differences are that Bridge River samples have a higher porosity than the Plinth Peak samples. It is not clear whether these differences are fundamental or whether this is a sampling artifact. Within the sampled exposure, there is little difference in porosity between fragments of different size, whereas there is a subtle but recognisable difference between the Plinth peak Assemblage and the material identified as Bridge River Assemblage.

3:2 Physical Characteristics

Uses of pumice and pumicite stem principally from two main properties, which are, light weight and insulating ability.

Coarse pumice aggregate is used in production of light weight aggregate, reducing the bulk to meet thermal and acoustic standards, as well as the bulk or foundations for multi-story buildings. Other uses are addition of pumice and pumicite to portland cement for pozzolan material.

Pumice and pumicite is also used as an abrasive in hand soaps, household cleaners and polishing powders. An increasing use is in stone-wash in the garment trade (to produce a "washed" look to designer jeans and denim products). This market is of increasing

importance but viability is determined by both transport requirements and location of demand centres of the garment industries.

Other uses are as filtration material and as a non-skid coating in paint.

The owner of the Pum claims previously commissioned a study of the block making properties of the Mt. Meagher pumice. The current focus of the owner is towards use in stone-wash.

Work previously carried out by Seabrook (1991) was -

- a) crushing tests
- b) gradation tests
- c) unit mass and absorption
- d) concrete and block trial mixes
- e) degradation tests
- f) abrasion resistance

Only items b), c) were made available for examination.

The unit mass determined by Seabrook, was 811 kgs/m^3

Tests carried out by Seabrook show that the Mt. Meagher pumice has a higher absorption capacity than the Bend pumice.

A chemical analysis was carried out on a sub-sample from the Mt. Meagher (Bridge River Assemblage) sample suite. Analysis was carried out by Chemex Labs of Vancouver.

The sample was analysed for major and trace elements, CO_2 , H_2O^+ and H_2O^- , S. The H_2O^+ content was 3.40% and H_2O^- , 0.23%. S content was 0.013%. No unusual trace elements were detected in the sample.

Sample result was plotted in a Cox variation diagram for volcanic rocks. The sample (Appendix A:2) plots in the dacite field close to the dacite/rhyolite boundary.

An attempt was made to measure specific gravity, on an oven-dry basis, and determine the bulk density value (to compare with the Seabrook value). Both sample efforts were incomplete and not performed in the assessment period.

The bulk density value determined by Seabrook is equivalent to a

density (dry basis) of 0.811gms/cc.

A regression equation was developed from information in the literature for the Astra tuff, believed to be compositionally similar to the Mt. Meagher samples. If 0.811 is the specific gravity, then it would indicate, for that sample a porosity of 58-62%. A survey of the literature, indicates porosities of 45% to 70% for most air fall pumice deposits. (Appendix A:2)

4 SAMPLE DESCRIPTION

4:1 HAND SAMPLES

Hand samples were examined from Mt Meagher, from thin section locations, and from commercially available samples from Greece (Yali) and Bend, Oregon. Pumice from Bend, Oregon is imported into the Lower Mainland as light-weight aggregate.

The two sample sets from Mt. Meagher come from the location sampled above and screened samples from the quarry on the south side of the Lillooet River. This quarry was not accessible (because of high stream flow) at the time of the site visit.

Samples from the location on Pum # 1 were collected by the author. All others were provided by the property owner.

The quarry samples are compositionally similar to the north sample set. Binocular microscope examination of the 20 lb. sample reveals that, allowing for the limited sample size, this sample suite has a lower percentage of vesicles than the north set, with vesicles more uniform in size than the north set, which has an irregular distribution of vesicles.

It has not been determined whether this contrast is a function of previous screening of the quarry material.

The Bend material is compositionally similar to the Mt Meagher material. It has a lower mafic content (approx 10%) and approximately the same percentage of vesicles. In contrast to Mt. Meagher, there is an orientation of vesicles, imparting a platy texture under the microscope. The samples appear to come from a flattened part of an ash flow column, but not from a welded tuff.

Megascopic characteristics of the bulk sample (approx 20 lbs) of Greek (Yali) pumice are essentially similar to the sample described under thin section.

4:2 PETROGRAPHIC DESCRIPTION

Representative samples of pumice were examined under thin section to provide comparison with Mt. Meagher samples. The pumice samples come from sources in commercial production and widely used for light weight aggregate and stone-wash abrasives.

Physical data (eg bulk density, abrasion tests, absorption rates) are not known with any uncertainty. According to the property owner, the Turkish sample is particularly suitable for stone-wash abrasion, the Greek sample less suitable but with some stone-wash use. California and New Mexico samples are believed to have a limited use for stone-wash purposes. It is not clear, at this stage, whether this is a function of transport costs or specific physical attributes.

4:2:1 Mt Meagher

The Mt. Meagher sample examined is believed, because of its field position to be part of the Bridge River Assemblage, not the Plinth Peak Assemblage.

The sample examined has a higher percentage vesicles than other samples, or, in another expression, higher porosity than the other samples. A petrographic description is appended (Appendix A)

The Mt Meagher sample has two phenocryst sizes. One is large phenocrysts (approx 1mm diameter) and the other, broken shards, crystals set in a crypto-crystalline matrix. Factors that distinguish the Mt Meagher sample from others, is the higher percentage vesicles, zonation within phenocrysts and crystal fragments, higher percentage of amphiboles and biotite than other samples. Samples visually give an impression of incipient clay alteration.

4:2:2 North American examples

The North American samples come from New Mexico, California.

The New Mexico sample, a rhyo-dacite ash, has 45% vesicles but sparse phenocrysts. The surface presents aspects of sericite rather than clay. A fine dusty appearance in thin section appears to represent incipient sericitic alteration. Evidently, some post depositional alteration, at moderate temperatures, has generated sericite rather than kaolinite/bentonite (?).

The California sample is a rhyodacite ash, compositionally similar to Mt Meagher, but does not have the contrasting phenocrysts sizes evident in the Mt. Meagher samples. In contrast to Mt. Meagher, there is a higher percentage of biotite present. Matrix alteration is less prevalent than in the Mt. Meagher sample.

4:2:3 European Examples

The Turkish sample is believed by the property owner, to be highly suitable for stone-wash use. The Turkish sample is an alkaline rhyolite ash flow with 35% vesicles and a welded texture. The surface does not have the 'flour' aspect evident in Mt. Meagher. Matrix alteration is insignificant. The sample has a distinctive orientation of vesicles but is not a welded texture in the classic sense. It is more akin to incipient welding. The sample, an alkaline rhyolite ash is not a welded tuff but has incipient welding.

The Greek sample, from Yali, is an alkaline rhyolite ash, with a lower percentage of vesicles than Mt. Meagher. There is no orientation of vesicles. Mafic content, in comparison with Mt. Meagher, is lower, as is the phenocryst content. Matrix alteration is weak.

4:4 Summary

There are fewer similarities than there are differences between the Mt. Meagher sample and the commercially available samples of pumice.

Information supplied by the property owner suggest that the Turkish sample is suitable for stone-wash purposes.

On that basis, the distinguishing characteristic of suitable stone-wash material is the presence of incipient textural welding, a higher silica content, and lower vesicle content.

Mt Meagher samples, if this correlation is correct, may not meet these textural criteria, since it has higher, variable size vesicle content, a lack of incipient welding and a higher presence of matrix alteration. Other factors of an economic nature, may influence acceptability, but this is beyond the scope of this report. Of the Mt. Meagher samples, the Plinth Peak facies may have a better potential, since some post depositional induration and alteration may be present. This should be carefully evaluated by more detailed surface sampling and tightly controlled stone-wash test procedures.

Of the other samples, the Bend material is the closest to the Turkish material in textural and alteration criteria. It is not known whether the Bend material has any use for stone-wash purposes.

On this limited basis, and subject to other variables, the most suitable stone-wash material would appear to be a near-source block and ash fall pumice that has undergone some incipient welding but

is not a welded tuff in the strictest sense. Vesicle orientation and incipient welding may be present in the project area but, with the limited sample set, has not been recognised as such.

In the absence of confirmatory X-ray diffraction studies, definitive description of alteration is not possible. Based solely on thin sections, a distinguishing characteristic of suitable stone-wash abrasives, might be a low level of clay alteration of the cryptocrystalline matrix of pumice samples. The Mt. Meagher samples appear to have a higher level of alteration than other samples.

Sample location appears to be critical for effective evaluation. It is possible that some of the earlier sample sites are in fact water washed debris from the Bridge River episode and that water action may have selectively winnowed material of contrasting characteristics. The material sampled by the writer is from the Bridge River episode.

5 FUTURE WORK

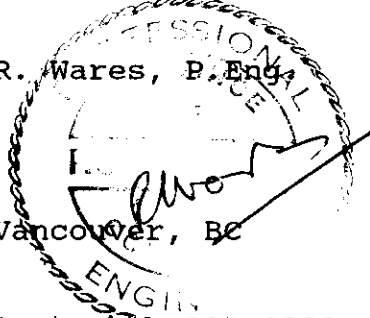
Examination of the sample sites and sample material from Mt. Meagher and a comparison with other commercially available material, suggests that Mt Meagher may not, from textural criteria only, be entirely suitable for stone-wash abrasion purposes.

The field and sample examination suggest that there are two contrasting pumice resources at the Mt. Meagher site. One is an air fall desposit, overlain by an alluvial, winnowed facies. This is the Bridge River Assemblage. The other resource, part of the Plinth Peak Assemblage is (apparently) a secondary block and ash flow that has been reworked by down slope movement into a secondary debris fan. Textural and compositional variations within the debris fan is not known.

Any future work on the Mt. Meagher claims to evaluate suitability for stone-wash abrasion purposes will require -

- a) tightly controlled surface sampling and trenching from both pumice facies.
- b) thin section and X-ray diffraction to define textural and alteration influences on stone-wash use
- c) careful, scientifically sound stone-wash tests to determine losses and better define economic acceptability.

R. Wares, P. Eng.
Vancouver, BC
September 11, 1992

A circular professional seal for a Professional Engineer in British Columbia. The seal contains the text "PROFESSIONAL ENGINEER" around the top and "BRITISH COLUMBIA" around the bottom. In the center, there is a signature and the number "12345".

APPENDICES

- A:1 Petrographic Descriptions
- A:2 Chemical Analysis and Other
- A:3 Statement of Costs
- A:4 Statement of Qualifications
- A:5 References Cited

A:1 Petrographic Descriptions

Mt Meager Sample

Megascopic

Pale cream, vesicular rhyodacite pumice. It is a microcrystalline crystal tuff with scattered microphenocrysts of quartz, plagioclase, biotite and hornblende. Phenocrysts total 25-28%. Abundant vesicular texture but with no alignment of vesicles. Close examination of the vesicles indicates possible fine clay alteration in the margin of the vesicles.

Microscopic

Two generations of phenocrysts set in a cryptocrystalline matrix. The larger set of phenocrysts (> 1 mm) comprise quartz (5%), plagioclase (7%), orthoclase (5%), hornblende (5%) Quartz grains are characteristically broken crystals, with zoned fine inclusions and shadowy extinction. Quartz does not exhibit, megascopically and microscopically, any preferred orientation.

Orthoclase is likewise characteristically broken phenocrysts, has fine inclusions but these are not preferentially oriented. Marginal zonation is ubiquitous in the phenocrysts. Plagioclase (An 10) exhibit abundant micro-inclusions, occasionally forming a pseudo-myrmekitic sub-texture. Some phenocrysts exhibit incipient clay alteration.

Plagioclase and amphibole occasionally reveal remnant sub-ophitic textures in broken phenocrysts. Abundant minute oxide grains present in the amphiboles, which are frequently, but not invariably uralitised. Alteration appears more concentrated along grain margins. Few biotite crystals are present in the larger generation of crystals. One grain of pyrite and one magnetite grain recognised in the section but less than 2%.

Microphenocrysts, (0.2mm to 1.0mm) amount to 20% of the sample, are composed of broken crystal shards of plagioclase, orthoclase and fine shards of biotite, They do not exhibit any textural alignment megascopically and microscopically. Broken hornblende crystals are present, generally but not uniformly altered to uralitic aggregates. Possible fine clay alteration is present in the matrix in fine feldspar shards.

The microcrystalline matrix appears to have fine incipient clay alteration and about 45% vesicles. There is no orientation of vesicles.

Turkish Sample

Megascopeic

Pale cream, aphanitic to microcrystalline alkaline rhyolite pumice, with 35-40% vesicles, exhibiting a marked orientation. Sample does not have the fine flour associated with Mt. Meagher samples (* this may be because of sample handling at source)

Microscopic

Microcrystalline matrix with rare microphenocrysts of hornblende, feldspar (> 1mm). No quartz grains recognised. Incipient clay alteration evident but is generally poorly developed.

Texture is transitional to a welded texture.

Microphenocrysts of albite generally but not ubiquitously oriented parallel to the orientation of vesicles. Matrix occasionally resembles a micro-spherulitic texture but this is not uniform in distribution.

This sample appears to come from a partially welded air fall pumice deposit.

New Mexico Sample

Megascopeic

Pale cream to white, aphanitic to microcrystalline rhyodacite pumice with partial orientation of vesicles. Sparse phenocrysts of plagioclase amount to 15%. Vesicular content is about 45%. Surface appearance suggests that sericite rather than clay alteration is present.

Microscopic

Two styles of phenocrysts present in this sample with 15% broken plagioclase phenocrysts (> 1mm) and a smaller set of broken shards of plagioclase (0.2 mm to 1.0mm)

Quartz (5%) shows broken grains, shadowy extinction and irregularly distributed micro-inclusions. Plagioclase (5%) phenocrysts (An 10) has incipient clay alteration present and occasional marginal zonation.

Orthoclase (10%) shows patchy extinction, occasional trains of inclusions and broken phenocrysts

Rare larger biotite crystals (2%) present but subordinate to sub-equant to broken hornblende crystals (8%) that are generally altered to uraltitic aggregates

Fine microcrystal (0.2-0.4mm) shards present in the matrix reflecting the proportion of larger phenocrysts with the exception of a higher proportion of biotite. Microspherulitic texture occasionally present in the matrix with fine unidentified grains with a clay halo. Also present are small clots of disaggregated grains.

The microcrystalline matrix amounts to 45% of the pumice and has a fine, dusty appearance, apparently caused by microvesicles. Incipient alteration evident with fine microphenocrysts altered to a sericite rather than clay matrix. Partial orientation of vesicles is evident.

California Sample

Megascopic

Pale cream to pale grey, aphanitic to microcrystalline rhyodacite pumice, with 30% microphenocrysts set in a cream matrix. The pumice has a sparsely vesicular texture with shards of biotite, amphibole, feldspar.

Microscopic

There is one set of phenocrysts present. Phenocryst size is 0.2 to 0.4mm size.

Quartz is sparse (<5%) and exhibits strain shadows and occasional minute micro-inclusion trails.

Orthoclase and plagioclase (An 15) sub-equal in amount in broken and occasionally complete grains. Micro-inclusions present in the feldspars, but more pronounced in plagioclase. Oscillatory zoning only present in orthoclase. Phenocrysts form 35% of the rock, with vesicles about 35%.

Biotite to hornblende ratio about 4:1. Biotite is largely unaltered but hornblende forms small euhedra which are mildly uraltitised.

No orientation of vesicles present. A microlitic texture is occasionally present. However the matrix is dominated by a predominance of small micro-phenocrysts

Clay alteration is sparse.

Greek Sample

Megascopeic

A cream to grey, aphanitic to microcrystalline alkaline rhyolite pumice with sparse phenocrysts of quartz, orthoclase with no evidence of vesicle orientation. Texture is irregular in appearance.

Microscopic

The pumice has about 20% phenocrysts > 1.0mm and 20% microphenocrysts in the range 0.2mm to 1.0 mm. There is a distinct size differentiation between the larger and smaller phenocrysts.

Orthoclase phenocrysts (> 1.0mm) total 15% and have occasional but localised marginal zonation. It is generally fresh, has few inclusions. Alteration is restricted to small ophitic aggregations of orthoclase micro-crystals

Small euhedral hornblende is mildly uralitised

Sparse biotite is present with the ratio of biotite to hornblende approx 8:1. Traces of magnetite are present.

Mafic minerals predominate in the smaller microphenocryst range.

Alteration of both phenocrysts and the matrix appears subdued.

A:2 Chemical Analysis and Other

An analysis of major and minor elements of a 5 kg sample of pumice from the June sampling was carried out by Chemex Labs, Vancouver, using ICP analytical methods.

The sample falls in the dacite field. At and close to the rhyolite\dacite boundary. The petrographic description was that the sample was a rhyodacite, confirmed by the analysis.

An attempt to measure the bulk density value was unsuccessful in the report period.

A literature search (Geol. Soc. America. Paper 221, Ash Flow Tuffs, 1990) produced information on density variations within ash flow columns from welded sections through to air fall pumice. A regression equation for one sample suite (the Astra tuff from Greece) indicated some comparability to the Mt. Meagher suite.

Based on the regression equation (enclosed) and the above bulk density value, indicates that the Mt. Meagher sample has a porosity in the range of 58-62%. Pumice samples have porosity ranges, as determined from a literature search, of 45% to 75%.



Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
 212 Brooksbank Ave., North Vancouver
 British Columbia, Canada V7J 2C1
 PHONE: 604-984-0221

WARES, ROY
 1522 W. 62ND AVE.
 VANCOUVER, BC
 V6P 2E9

A9220982

Comments:

CERTIFICATE

A9220982

WARES, ROY

Project:
 P.O. # :

Samples submitted to our lab in Vancouver, BC.
 This report was printed on 23-SEP-92.

SAMPLE PREPARATION

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION
225	1	Run as received
205	1	Geochem ring to approx 150 mesh
226	1	0-5 lb crush and split
200	1	Whole rock fusion
238	1	Nitric-aqua-regia digestion

ANALYTICAL PROCEDURES

CHEMEX CODE	NUMBER SAMPLES	DESCRIPTION	METHOD	DETECTION LIMIT	UPPER LIMIT
594	1	Al2O3 %: Whole rock	ICP-AES	0.01	99.99
588	1	CaO %: Whole rock	ICP-AES	0.01	99.99
590	1	Cr2O3 %: Whole Rock	ICP-AES	0.01	100.00
586	1	Fe2O3(total) %: Whole rock	ICP-AES	0.01	99.99
821	1	K2O %: Whole rock	ICP-AES	0.01	99.99
593	1	MgO %: Whole rock	ICP-AES	0.01	99.99
596	1	MnO %: Whole rock	ICP-AES	0.01	99.99
599	1	Na2O %: Whole rock	ICP-AES	0.01	99.99
597	1	P2O5 %: Whole rock	ICP-AES	0.01	99.99
592	1	SiO2 %: Whole rock	ICP-AES	0.01	99.99
595	1	TiO2 %: Whole rock	ICP-AES	0.01	99.99
475	1	L.O.I. %: Loss on ignition	FURNACE	0.01	99.99
540	1	Total %	CALCULATION	0.01	105.00
891	1	Ba ppm		10	10000
973	1	Nb ppm	ICP	10	10000
1067	1	Rb ppm		10	10000
898	1	Sr ppm		10	10000
974	1	Y ppm	ICP	10	10000
978	1	Zr ppm	ICP	10	10000
1929	1	Co ppm: 9 element, soil & rock	ICP-AES	1	10000
1931	1	Cu ppm: 9 element, soil & rock	ICP-AES	1	10000
1938	1	Mo ppm: 9 element, soil & rock	ICP-AES	1	10000
1940	1	Ni ppm: 9 element, soil & rock	ICP-AES	1	10000
1004	1	Pb ppm: 9 element, soil and rock	ICP-AES	5	10000
1950	1	Zn ppm: 9 element, soil & rock	ICP-AES	2	10000
368	1	CO2 %: Inorganic	LECO-GASOMETRIC	0.2	100.0
380	1	S %: Leco induction furnace	LECO-IR DETECTOR	0.001	100.0
818	1	Crystalline water	Leco RMC100	0.01	100.0
819	1	Surface moisture	Leco RMC100	0.01	100.0



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to: WARES, ROY
1522 W. 62ND AVE.
VANCOUVER, BC
V6P 2E9

Project :
Comments:

Page Number : 1-A
Total Pages : 1
Certificate Date: 23-SEP-92
Invoice No. : 19220982
P.O. Number :
Account : JNT

CERTIFICATE OF ANALYSIS

A9220982

SAMPLE	PREP CODE	Al2O3 %	CaO %	Cr2O3 %	Fe2O3 %	K2O %	MgO %	MnO %	Na2O %	P2O5 %	SiO2 %	TiO2 %	LOI %	TOTAL %	Ba ppm	Nb ppm	Rb ppm	Sr ppm	Y ppm	Zr ppm	
PUM 1 AS IS	225	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
PUM 1 GROUND	205 226	15.27	3.26	< 0.01	3.37	2.55	1.31	0.07	4.59	0.18	67.16	0.48	2.75	101.00	720	10	55	480	30	120	

CERTIFICATION:

Yhai D Ma



Chemex Labs Ltd.

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o: WARES, ROY
1522 W. 62ND AVE.
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V6P 2E9

Project :
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Page Number : 1-B
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Certificate Date: 23-SEP-92
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P.O. Number :
Account : JNT

CERTIFICATE OF ANALYSIS

A9220982

SAMPLE	PREP CODE		Co	Cu	Mo	Ni	Pb	Zn	CO2 %	S %	+H2O	-H2O
			ppm	ppm	ppm	ppm	ppm	ppm	inorg	Total	%	%
PUM 1 AS IS	225	--										
PUM 1 GROUND	205	226	3	35	< 1	6	< 2	22	< 0.2	0.013	3.40	0.23

CERTIFICATION:

Yhai J Ma

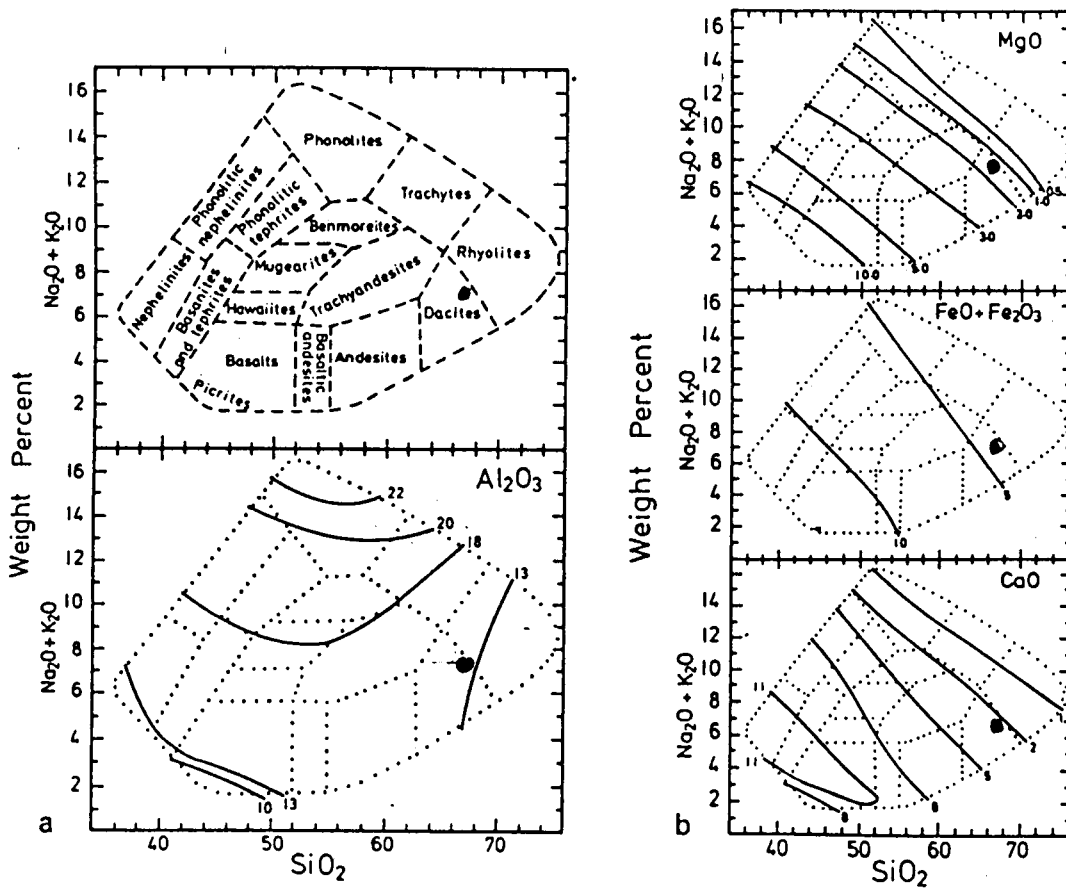
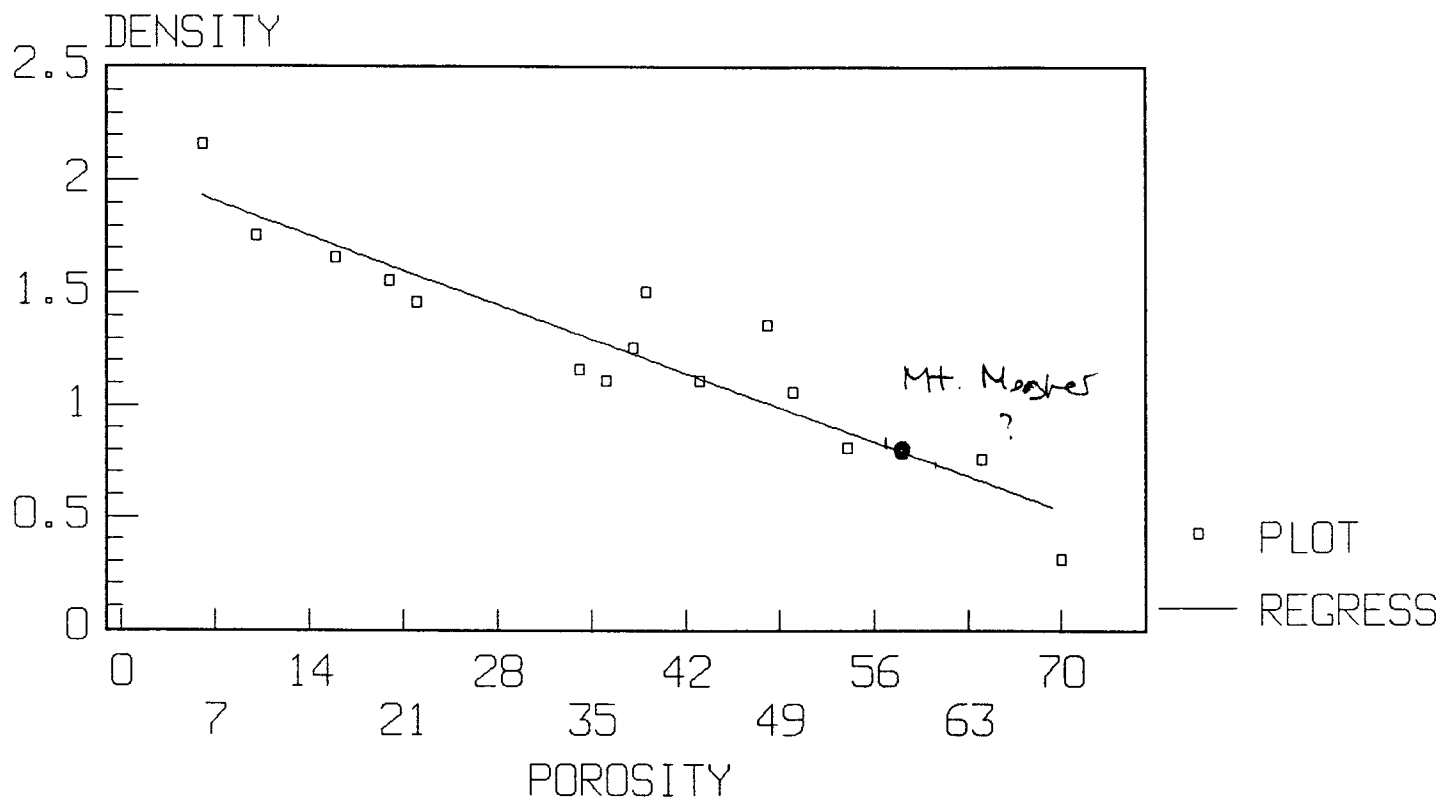


Fig. 2-3 a, b. Classification of major groups of volcanic rocks in alkali-silica variation diagrams showing weight percent concentrations of the oxides Al_2O_3 , MgO , CaO and $\text{FeO} + \text{Fe}_2\text{O}_3$. (After Cox et al., 1979)

• Mt. Meagher Pumice

ASTRA TUFF

$$Y=2.0652-0.022*X \quad (r=-0.925)$$



Schedule

Prior to the anniversary date, the owner provided a valuation of work done by him on the Pum claims. This is the valuation that he places on the work but is not an itemised statement of costs. The valuation was provided in early September 1992.

The owner, G, Carefoot, has declined to review certain valuation items and provide a statement of costs.

- a) the dates of collection of material by the owner on his own account were not independently confirmed. I have no reason to doubt the dates indicated.
- b) location of sample sites where the owner collected samples are not identified. It is not entirely clear whether all the sample sites were on the project area
- c) (deemed) owner wage costs are high by industry standards and exceed, by a large margin, current commercial rates for unqualified personnel.
- d) the owner neither reviewed these deemed wage rates or provided any explanation to the author for such a high rate in comparison to mineral industry standards
- e) the owner declined to provide any information on the total costs claimed under the statement of expenditures, filed September 11, 1991 and explain why the total of Schedule B (uncorrected) and Schedule C do not match totals claimed

R. Wares, P. Eng.

December 10, 1992

ROYAL
BRITISH
COLUMBIA
ENGINEER

VALUATION OF WORK

G.D. Carefoot (Owner)

Trip 1 October 16, 1991

Trip to obtain and transport 2 M3 of pumice for trial block-making test by Levelton Associates

Time	15 hours at \$60.00/hour	\$ 900.00
Mileage	569 km at \$0.35/km	196.00
Trailer rental		<u>35.00</u>
		<u>\$1131.00</u>

Trip 2 June 24, 1992

Trip with Roy Wares to inspect site and accumulate samples for further analysis

Time	13 hours at \$63.00/hour	\$819.00
Mileage	502 km at \$0.35/km	<u>175.70</u>
		<u>\$994.70</u>

Trip 3 July 15-16, 1992

Trip to select and transport 1 M3 of stonewash pumice from Pum 1

Time	16 hours at \$63.00/hour - travel/work	\$1008.00
	9 hours at \$63.00/hour - processing	567.00
Mileage	816 km at \$0.35/km	285.60
Trailer rental		35.00
Mixer rental		<u>22.60</u>
		<u>\$1918.20</u>

Trip 4 August 11, 1992

Trip to obtain and transport 0.5 M3 of processed minus 3/4 inch pumice for testing under Roy Wares program

Time	12 hours at \$63.00/hour	\$756.00
Mileage	496 km at \$0.35/km	<u>173.60</u>
		<u>\$929.60</u>

TOTAL G.D. CAREFOOT FIELD EXPENSES

\$4973.50

Schedule

Author Incurred Costs

- 1) Sampling and evaluation of pumice deposit;
R.Wares, June 24, 1992, 1 day @ 400/day

Sub-Total \$ 400.00 \$ 400.00

- 2) Examination and measurement of samples from
Mt Meagher, August 25, 1992, 0.75 day @ \$400/day

Sub-Total \$ 300.00 \$ 300.00

- 3) Thin Section examination and description,
0.5 day @ 400/day, September 6, 1992

Sub-Total \$ 200.00 \$ 200.00

- 4) Report Preparation, 0.5 day @ \$ 400/day
September 8, 1992

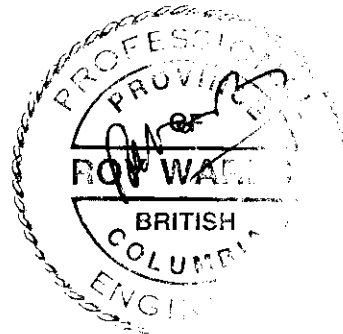
Sub-Total \$ 200.00

- 5) Disbursements
 - a) Transport of samples, 145 kms \$ 60.90
@ 0.42/km
 - b) Thin Section Preparation \$ 97.10
 - c) Geochemical Analysis \$ 67.14

Sub-Total \$ 225.14

TOTAL \$ 1,325.14

R.Wares, P.Eng.



A:4 Statement of Qualifications

I, Roy Wares, with a business address in the city of Vancouver, British Columbia, do hereby certify that -

- a) I am a professional engineer (geological) registered in the Province of British Columbia.
- b) I have been engaged in my profession for over twenty five years in mineral exploration, development and environmental assessment.
- c) I am a graduate of Aberdeen University with a B.Sc. (Hons) in Geology and a graduate of Queen 's University, Kingston, Ontario, with an M.Sc., Geology
- d) I personally visited the Mt. Meagher site on June 24, 1992 and sampled and evaluated several pumice locations
- e) I examined and described thin sections of Mt. Meagher pumice and compared them with thin sections and hand samples of commercially available pumice material from other locations
- f) I have no personal knowledge of all costs outlined in Schedule B.
- g) Cost, date and type of work outlined in Schedule C were carried out under my personal direction.

R.Wares, P.Eng.

Dated: December 10, 1992



A:5 References Cited

1. Read, P.B. Meagher Creek Volcanic Complex; GSC Open File # 603, (1972)
2. Seabrook, P. and Church, D. Geotechnical Assessment Report, prepared for G. Carefoot, Sept., 1991 (no assessment work number known)
3. Geology of the Non-Metallics, Elsevier Publishing, 1984
4. Mathison, M.E. Volcaniclastics and Hydrocarbon Exploration; Volcaniclastic Sedimentary Processes, SEPG Memoir 44, p 26, 1991