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#### **SUMMARY**

The Mt Meager Pumice Project is in the final stages of starting commercial production. This report covers some surrounding claims of similar geology.

The Project Prospectus was submitted by Great Pacific Pumice Inc. on January 24th, 1994, the Application for the Mine Development Certificate was submitted on July 28th, 1994 and the Mine Development Certificate was issued on March 16th, 1995. A 60 hectare Mineral Lease (No. 333937) encompassing Great Pacific's Mineral Claims GPC 2, 3 and 4 and covering the main pumice deposit was issued on May 24th, 1995 and the Mine Permit (Q-202) was issued on June 27th, 1995. Mineral Claims GPC 1, 5, 6, 7, 8, and 9 were staked in the name of Garth Carefoot.

The Mt. Meager Pumice Project is located in the upper Lillooet River Valley, approximately 65 km northwest of Pemberton, B.C. and 160 km north of Vancouver, B.C.

The pumice deposit is related geologically to an explosive eruption of Mt. Meager in 2350 BP which produced the Bridge River Assemblage. The Assemblage has been subdivided into three 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 low-temperature pyroclastic flow.

Pumice has a wide variety of uses but the two most significant applications are as an aggregate in the manufacture of lightweight concrete products and as a natural pozzolan for use as a filler in concrete. The gradation analysis provided in this report indicates the Mt. Meager pumice should be suitable as replacement for the Oregon pumice currently used locally as an aggregate in lightweight concrete.

Using pozzolans allows for a reduction in the quantity of cement in concrete without reducing the quality of the concrete. Pozzolans also increase strength, workability, durability and reduce the heat of hydration of concrete. In the past, fly ash imported from Alberta and Centralia, Washington has been used as a pozzolan in local concrete.

During 1977-78 CANMET and MEMPR (Hora et al, 1978) sponsored a study on a number of potential sources of natural pozzolans in B.C. and identified the Mt. Meager pumice as being suitable to be used as a natural pozzolan.

Tests were carried out in the current program to evaluate the pozzolanic activity of the Mt. Meager pumice. Test results indicated the pumice did not improve the concrete characteristics.

However, users of pozzolans advise that it is not unusual for test results for pozzolanic activity to be inconclusive, particularly where there are not a numbers of trials varying mix designs and procedures. It is recommended that further testing should be undertaken.

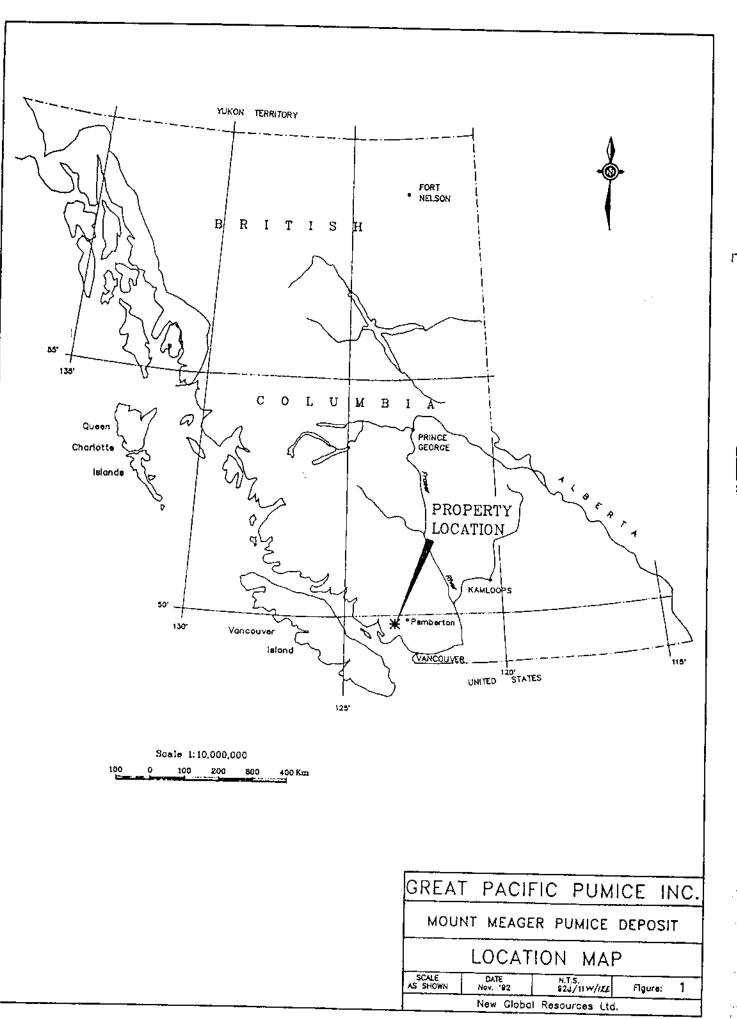
Respectfully submitted, J.T. Shearer, M.Sc., P.Geo.

#### LOCATION AND ACCESS

The Mt. Meager Pumice Project is situated about 150 km north of Vancouver, and 65 km northwest of Pemberton. The Project is accessible on paved roads through Pemberton Meadows and then by gravel logging roads along the Upper Lillooet River valley. Active logging in the area provides seasonal but well-maintained road conditions and a new bridge across the Lillooet River has given recent access to the main pumice deposit and the existing quarry. Development of the area's geothermal potential and continued logging operations will maintain and improve access to the area.

The Project area is mountainous with Mt. Meager to the south of the deposit rising to 2850 metres. The main purice deposit lies southwest of the Lillooet River at a 750 metre elevation, draped in an apron-shaped manner on the north shoulder of Plinth Peak. Terrain over the deposit is moderate at an average slope of 20 degrees and overburden is less than two metres.

The northern edge of the deposit is marked by a cut bank on the Lillooet River. This bank is about 450 metres in length and rises from 30 to 90 metres in height. The pumice deposit lies on the upper portion of the bank at an average depth of approximately 30 metres.



#### CLAIM STATUS

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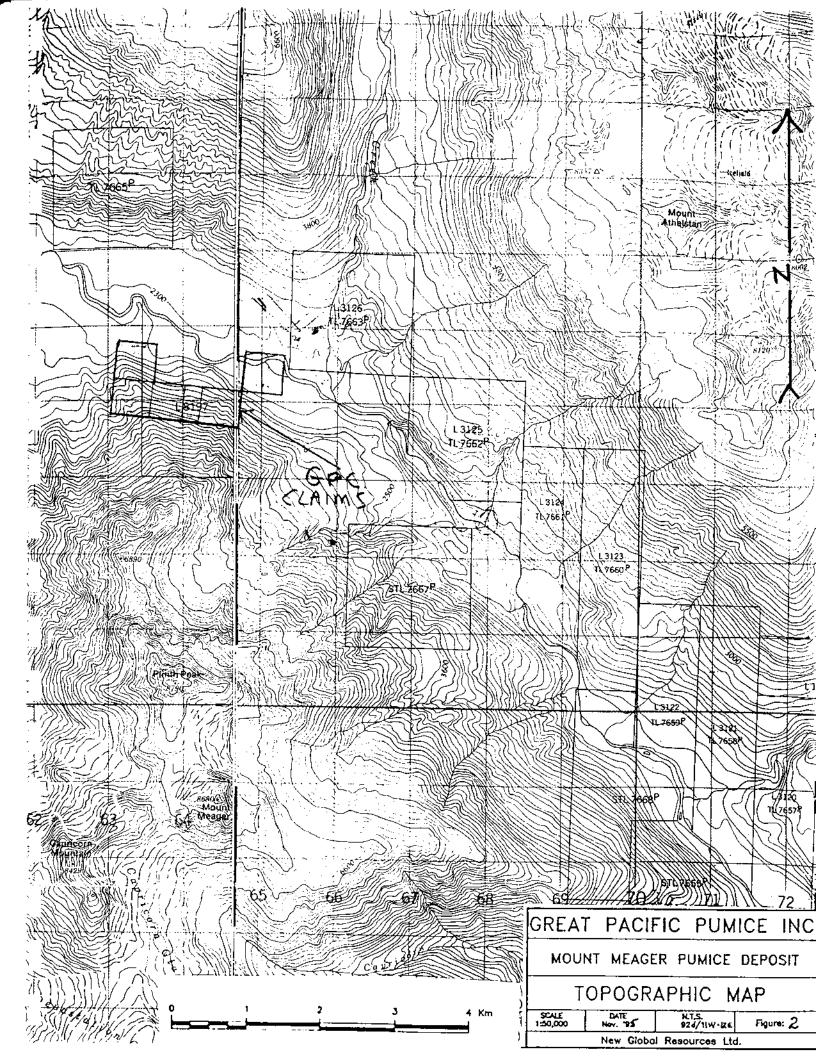
The property which is the subject of this report consists of six two-post claims as shown in Table 1 and Figure 3. Garth Carefoot owns 100% of the GPC claims.

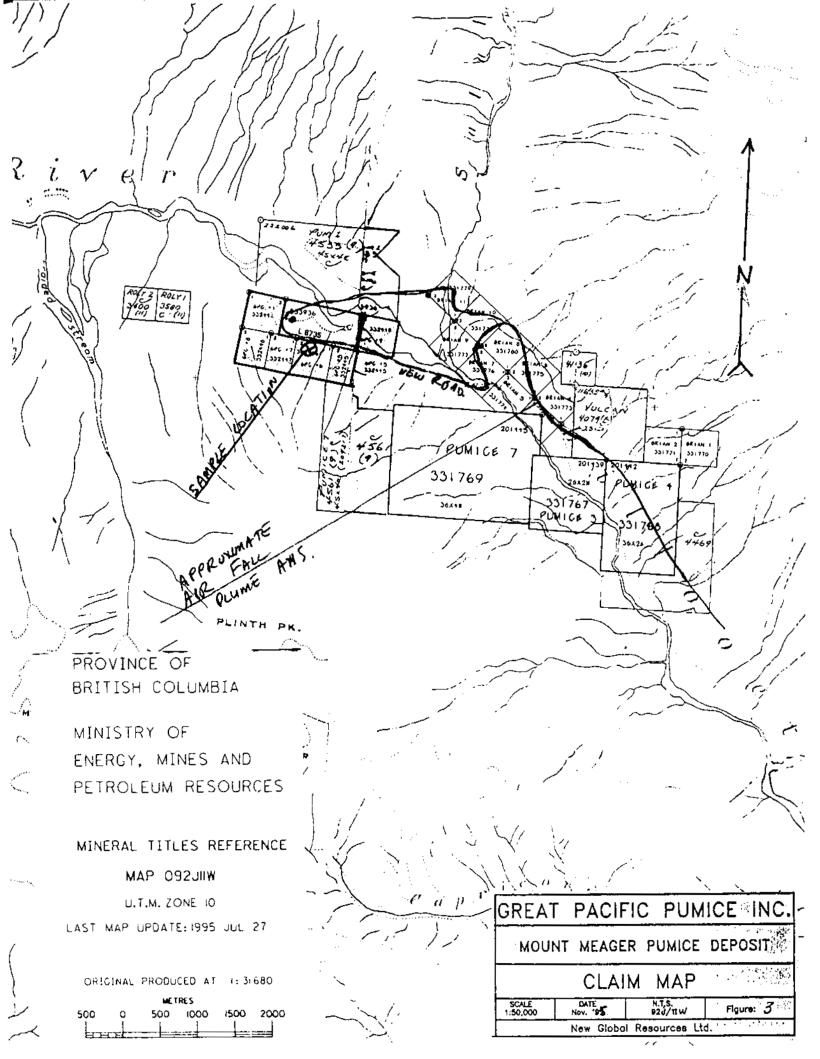
# TABLE 1CLAIM STATUS

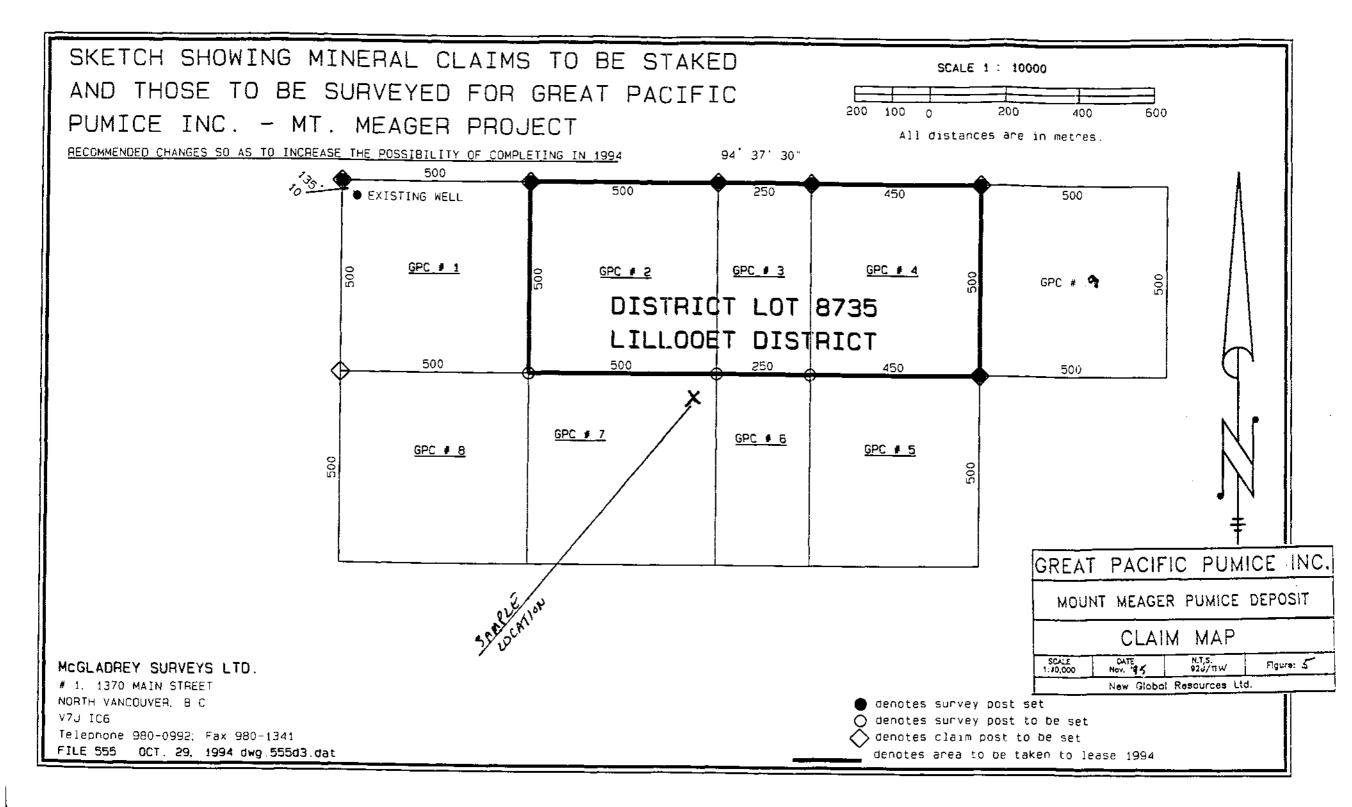
Claim Name	Tenure No.	Number of	Units Size	Location Date	Current Expiry Date
GPC 1	332441	1	Two-Post	Nov. 3/94	Nov. 2/99*
GPC 5	332445	1	Two-post	Nov. 4/94	Nov. 3/99*
GPC 6	332446	1	Two-post	Nov. 4/94	Nov. 3/99*
GPC 7	332447	1	Two-post	Nov. 4/94	Nov. 3/99*
GPC 8	332448	1	Two-post	Nov. 4/94	Nov. 3/99*
GPC 9	332449	1	Two-post	Nov. 6/94	Nov. 5/99*

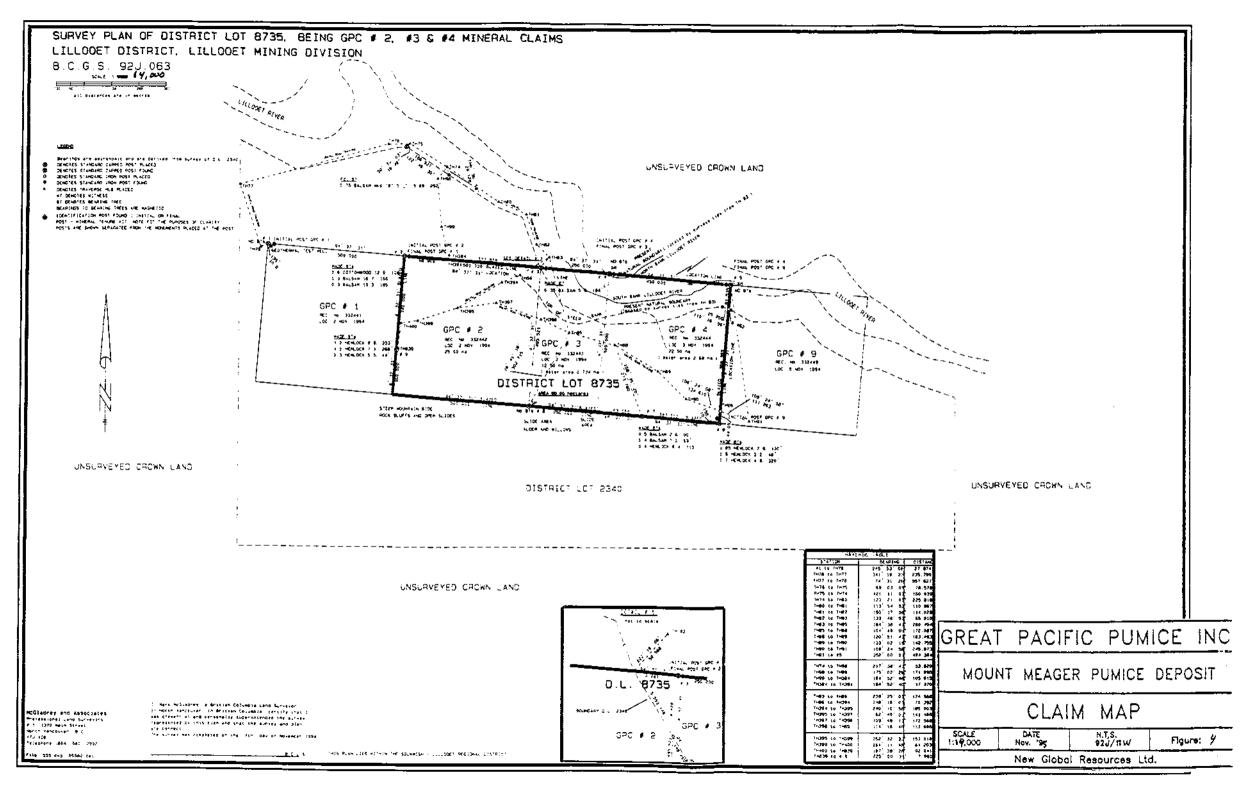
\* with application of assessment work documented in this report

The claims were located by well-known contract stakers.









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#### **HISTORY**

The pumice deposit has been known since at least 1910 (Robertson, 1911). In 1958, a mineral lease (Lot 8197 Lillooet District) covering the main pumice deposit was issued to Mr. J. MacIsaac. At that time the location was not accessible by road. Mr. MacIsaac died in the late 1970's and in 1980 the Ministry of Lands, Parks and Housing issued a new mineral lease (Lot 2340 Lillooet District) covering the deposit to Pemberton Pumice Mines Ltd., a company controlled by Mr. W.H. Willis.

From 1977 to 1983, a major geothermal exploration program was undertaken in the Mt. Meager area by B.C. Hydro. They constructed roads throughout the area and more specifically they built a bridge across the Lillooet River above Salal Creek which provided access to the subject pumice deposit.

From 1981 to 1984 quarrying of pumice from the deposit took place from the southwest side of the Lillooet River above the B.C. Hydro bridge crossing. The pumice was extracted, screened and trucked to Vancouver. A stockpile was established at the upper end of Pemberton Meadows, where further screening and processing took place. The B.C. Hydro bridge over the Lillooet River washed-out in the mid-1980's, production ceased and the lease was abandoned.

Ten two-post claims were staked over the main deposit during 1988 in the name of Mr. L.C. Bustin.

In September 1990, 53 claim units were staked over other areas of the deposit on behalf of the present owner. A work program was conducted by Levelton & Associates in 1991 consisting of (1) preliminary geological mapping; (2) photogeological interpretation; and (3) sample collections for laboratory tests which included (a) crushing for size fractions of production products, (b) gradation, (c) absorption, (d) density, (e) concrete and block trial mixes, (f) compressive strength, and (g) abrasion resistance.

The Bustin claims were abandoned in September, 1991 and 19 two-post claims were subsequently staked over the main deposit on behalf of Great Pacific Pumice Inc. During 1992, further sampling and testing was undertaken to evaluate the suitability of the material for stone washing denim jeans and as a marine oil spill absorptive agent.

In September, 1992 a new bridge over the Lillooet River was constructed by Terminal Forest Products at a canyon below Salal Creek and above Key Hole Falls. By November, 1992 a 1.0 km road was completed to the new bridge and 0.5 km from the new bridge through to the B.C Hydro road giving access to the quarry which had been developed by Pemberton Pumice Mines Ltd.

During 1993, with approval of the Ministry of Energy, Mines and Petroleum Resources, a 1000 tonne sample (1100 cubic metres) was extracted from the quarry by the present owner, transported to a site 12 km east of Pemberton and screened and crushed into several trial products.

Since 1993 all necessary permits have been obtained and production is planned to commence in June, 1996.

#### **REGIONAL GEOLOGY**

The Mt. Meager 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 Mt. Meager 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 disrete 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:

#### Meager Creek Volcanic Complex

- <u>Basal Breccia</u>: Locally preserved remnants of breccia up to 300 m thick overlie basement on the south side of the complex. Clasts of granite, grey or green aphanite volcanic, and minor metamorphic rocks lie in a tuffaceous matrix. South of Pylon Peak, where the brecia 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 percent matrix. This area, where basement is lowest, may represent a partly exhumed vent.
- 2. <u>Porphyritic Quartz Dacite</u>: In the southwest corner of the map-area, a grey-green dacite with sparse phenocrysts of quartz, plagioclase and horneblende forms a remnant of subhorizontal flows up to 200 m thick. Gently dipping acid tuff and brecia overlap the older dacite along a subvertical eastern contact.
- 3. <u>Acid Tuff and Breccia</u>: 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. They are hydrothermally altered quartz latite with locally preserved quartz, plagioclase and biotite phenocrysts. Silicication, pyritization and the development of ubiquitous clay minerals and sporadic carbonates characterize

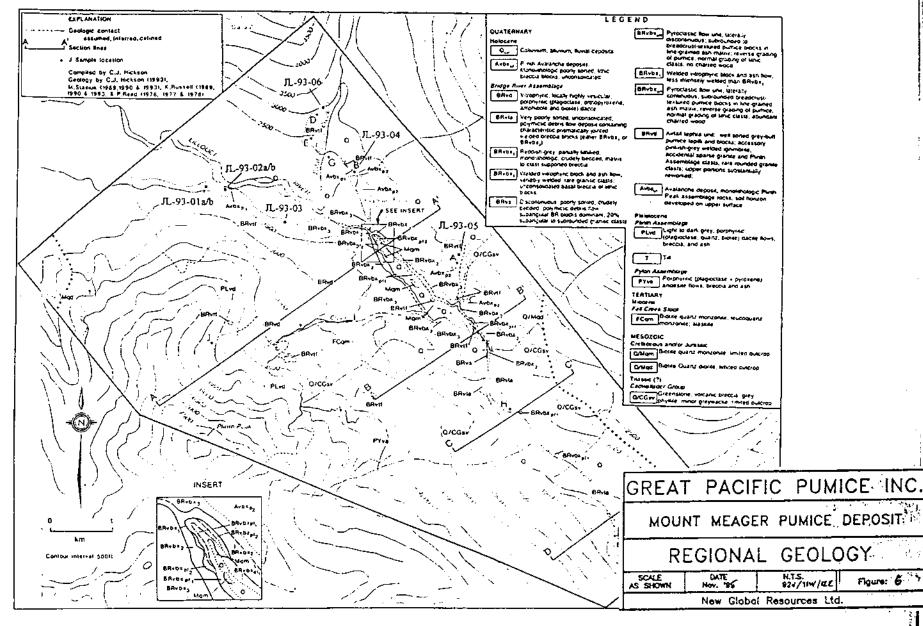


Figure 6. Local geology and sample locations (modified from Stasiuk et al., 1994)

this unit. Here the quartz latite is massive and may represent either flows and/or hypabyssal intrusions of a partly preserved vent.

- 4. <u>Aphanitic Flows and Minor Intrusions</u>: 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 Devasator, a lens of conglomerate composed of subrounded pebbles and cobbles of this lithology overlies the acid volcanic unit.
- Porphyritic Plagioclase Andesite: Porphyritic plagioclase andesite, the most 5. 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 Capricon 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 and esite vent. Potassium argon dates of  $4.2 \pm 0.3$ m.y. and 2.1 + 0.2 m.y. (Anderson, 1975) indicate a long period of andesite volcanism spanned by this unit.
- 6. <u>Horneblende-Biotite Rhyodacite</u>: Surrounding Mount Job in the centre of the complex are ochre-yellow weathering flows of porphyritic horneblende-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.
- 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. <u>Porphyritic Dacite of Plinth and Meager Mountains</u>: 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 horneblende. The dacite is commonly vesicular, has a glassy matrix and is distinguished from other dacites by scattered, rounded inclusions of fine-grained horneblende anesite. On Meager Mountain, the absence of flows or breccia, and the 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 percent of the clasts are cream-weathering, porphyritic (plagioclase, horneblende, pyroxene) dacite pumice. They range in maximum size from 100 mm 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 4965'. Two percent of the clasts are subrounded pebbles and cobbles of a porphyritic quartz monozonite exposed along the creek. These data stongly 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 ediface of Plinth Mountain is probably postglacial and that of Meager Mountain may be as well.

9. <u>Olivine Basalt</u>: 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

The Bridge River Assemblage consists of three primary lithologies (in order of depositition): airfall pumice; pyroclastic block and ash flow; and dacite lavas. The eruption is believed to have originated from the northeastern shoulder of Plinth Peak at an elevation of approximately 1500 metres.

As the eruption occurred, the pumice was carried away from the vent to form a plume that trends to the northeast with an axial direction of approximately 63 degrees Azimuth. The pumice was deposited in a thick mantle on the existing topography overlying a rock avalanche. Much of the airfall pumice was deposited on near vertical rock faces and subsequent effects of creep and sliding has resulted in small scale laminations within the pumice deposit. The upper layer of pumice overlays a reworked layer of pumice and clay.

The pumice deposit can be described as being composed of angular, well-sorted pumice clasts forming a matrix free, open framework. The pumice itself is light in colour, usually white to reddish/orange and fibrous in texture. Large pumice clasts often display 'breadcrust' texture. The pumice also contains accidental clasts of Plinth Assemblage volcanic rocks, quartz monzonite, and soil. Pumice clasts of up to 40 cm have been observed.

Accidental lithic clasts compose approximately 2 percent of the deposit and include clasts of Plinth Assemblage lavas, breadcrusted grey clasts petrographically identical to the pumice, rounded granite cobbles, and rare baked to charred, clay-rich soil clasts.

All rocks of the Bridge River Assemblage share a common mineralogy. Glass is a major constituent and comprises 80-90 percent of the rocks and is generally colourless. Plagioclase is the most common mineral with other minerals including orthopyroxene, amphibole, and biotite.

In 1994, two reports added significantly to the understanding of the Mt. Meager Volcanic Complex. Stasiuk et al (1994) mapped the Bridge River Volcanic Assemblage identifying new deposits and stratigraphic relationships for 10 km along the Lillooet River above Meager Creek. Luty (1994) investigated the characteristics of the Mt. Meager airfall pumice in regard to the eruption, layering and sorting of the pumice.

#### 1995 WORK PROGRAM

The 1995 Work Program was in part intended to augment "The Study of Natural Pozzolans in Southern British Columbia" (Hora et al., 1978) which reported:

"In Canada, fly ash produced from the burning of coal in electricity-generating stations is used in concrete as a pozzolan. Since there are presently no coal-fired generating stations in British Columbia, a source of natural pozzolans is desirable in order to effect significant energy savings. (Page 2)

...Pozzolans generally include those materials, in finely divided form, incorporating a high percentage of silica and alumina which have been sintered either artificially or naturally. (Page 3)

...The natural materials having pozzolanic properties include acid volcanic ash and tuffs, diatomite and diatomaceous earth. (Page 3) ...Chemical analyses and physical testing were done in accordance with CSA Standard CAN3 - A266.3 - M78, "Pozzolanic Mineral Admixtures for Use in Portland Concrete Cement" and ASTM Standard C311-77, "Standard Methods of Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete". Requirements are outlined in the CSA Standard and in ASTM Standard C618-78, "Fly Ash and Raw or Calcined Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete". (Page 8)

...Only three of the ten samples selected from target locations in southern B.C. met all the chemical and physical requirements for natural pozzolans. (Page 12)

The Meager Creek pumice deposit, which is 5 km from a good logging road and 150 km from Vancouver indicates a good potential for further detailed technical and commercial study because of its relatively easy access. (Page 13 - Conclusions)

...This paper...identifies three possible sites of natural pozzolanic material deemed suitable for more intensive investigation. One of those three sites - Mt. Meager, a pumice source, indicates an immediate potential for commercial development." (Abstract)

During August, 1995 a 100 kg sample of pumice was extracted from the GPC mineral claims and transported to Great Pacific Pumice Inc.'s processing facility in North Vancouver. The sample was split into a 20 kg portion for gradation testing as a lightweight aggregate and a 80 kg portion for testing as a pozzolan

Gradation tests of the 20 kg Mt. Meager pumice sample indicate the material meets the CSA and ASTM gradation requirements for a lightweight aggregate and that it is very comparable to the Bend, Oregon pumice currently being supplied to local companies manufacturing concrete products.

The 80 kg sample was oven-dried and, when cooled, the pumice was pulverized in an attrition crusher from OMNICAD Services, who had been engaged to handle preliminary feasibility and market analysis. The prepared sample was delivered to AGRA Earth and Environmental Limited for testing. Their report is provided in Appendix III.

#### **CONCLUSIONS AND RECOMMENDATIONS**

AGRA's test program did not duplicate the conclusions of the Hora et al (1978) results.

However, reviewing the test results with other operations using or familar with pozzolans, it can be concluded that water demand will increase with the use of pumice and the sample tested may have been too coarse. Any future testing program should be broader in scope to include a variety of mix designs, more rigorous laboratory procedures and a comprehensive test strategy.

It is recommended that the company continue testing processed pumice as a source of pozzolan.

Test results on the gradation requirements of the Mt. Meager pumice were very encouraging and the company should begin working with a local manufacturer of lightweight concrete products to confirm the material can replace the Bend, Oregon pumice.

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

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# **APPENDIX I**

## STATEMENT OF QUALIFICATIONS

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

## **MOUNT MEAGER PUMICE PROJECT**

#### 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 at the University of London, Imperial College (M.Sc., 1977).
- 2. I have over 25 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.
- 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 Homegold Resources Ltd.
- 5. I am the author of a report entitled "Assessment Report on the Mount Meager Pumice Project, Lillooet Mining Division, B.C.", dated January 30, 1996.
- 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 familar with the regional geology and geology of nearby properties. I have become familar 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 prepartion 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 30th day of January, 1996.

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

## **APPENDIX II**

## STATEMENT OF COSTS

August 1, 1995 to October 27, 1995

GPC 1, 5, 6, 7, 8 and 9 Claims Lillooet Mining Division

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

### VALUATION OF WORK

#### SAMPLING

.

Trip to Mt. Meager to obtain 100 kg sample from GPC Claims (Carefoot, August 1, 1995)	
Time: 12 hours @ \$20.00/hour	<b>\$240.00</b>
Mileage: 560 km @ \$0.35/ km	<u>196.00</u>
	<u>\$436.00</u>
POZZOLAN TESTING	
Crusher set-up and sample preparation - dry,	
sort and pulverize 80 kg sample to minus 100 mesh	
(Carefoot & Shannon, August 2 - 4, 1995)	
Time: 2 persons - 8 hours @ \$20.00/hour	\$320.00
Impact crusher and genset rental - one day	500.00
Crusher delivery and return GST and PST	180.00 95.20
USI alle FSI	95.20
Sample delivery to AGRA (Shannon, August 4, 1995)	
Time: 1 hour @ \$20.00/hour	20.00
Milelage: 40 km @ \$0.35/km	12.00
Testing program at AGPA (August 9 - September 12, 1995)	
Testing program at AGRA (August 9 - September 12, 1995)	
Cost (Letter dated August 2, 1995)	640.00
GST and PST	<u>89.60</u>
	<u>\$1,856.80</u>
GRADATION TESTING	
Crusher and genset set-up and testing and one day operations for 20 kg sample (Carefoot, August 23 and 24, 1995)	
Equipment use	\$500.00
Equipment set-up, testing and operations: 8 hours @\$20.00/hour	160.00
Drying and sieving two 800 gram samples and report preparation	
5 hours @\$20.00/hour	<u>100,00</u>
	<u>\$760.00</u>

## TOTAL COSTS FOR ASSESSMENT

### <u>\$3052,80</u>

## **APPENDIX III**

## **TEST RESULTS**

## AGRA EARTH & ENVIRONMENTAL LIMITED

**EVALUATION OF THE POZZOLANIC QUALITY OF MT. MEAGER PUMICE** 



2 August 1995

95-1727

AGRA Farib & Environmental Limited 2227 Douglas Road Burnaby, B.C. Canada VSC 5A9 Tel. (604) 294 5817 Fax (604) 294-4664

**OMNICAD** Services Unit 104 - 318 East Kent Ave. Vancouver, BC, V5X 4N6

#### Attention: Mr. Dick Shannon

Dear Sir:

#### Re: Evaluation of Pozzolanic Activity of Pumice

As requested, AGRA Earth and Environmental is pleased to provide a cost proposal for the evaluation of the pozzolanic activity of the sample of pumice submitted to our laboratory for testing. The testing would involve the following:

1. Splitting the sample over a #200 sieve to separate the finer and generally more reactive material for testing.

\$100 Estimated cost

- 2. Producing and testing mortar mixes in accordance with ASTM C311 except that the water content will remain constant and the change in flow will be measured. Four mixes are suggested.
  - A control mix using Portland cement;
  - A test mix using 20% fly ash replacement;
  - A test mix using 20% pumice replacement;
  - A test mix using 20% less Portland comont.

Water content of each of the above mixtures would remain the same and the consistency of "flow" would be measured. The change in flow would provide information with respect to relative effect the pumice has on water demand. The strength testing would provide information with respect to the pozzolanic activity of the pumice compared to Type 10 Portland cement and Centralia fly ash. Testing for strength would be carried out at 7 and 28 days.

Estimated cost \$\$40

Engineering & Environmental Services



We trust that this proposal meets with your approval. If you wish us to proceed, please initial the bottom of this proposal and return it to us.

Sincercly,

AGRA Earth and Environmental

Reviewed by:

N. McAskill, A.Sc.T., Manager, Materials Division

#### AGRA Earth & Environmental

September 12, 1995 VA-03541

OMNICAD Services #104-318 East Kent Ave. South Vancouver, BC V5X 4N5

#### ATTENTION: Mr. Dick Shannon

#### Re: Evaluation of Pozzolanic Activity of Pumico

As requested, AGRA Earth & Environmental Limited recently conducted a test program to evaluate the pozzolanic activity of a sample of pumice submitted to our laboratory. The work conducted was based upon ASTM C311: "Strength Activity Index with Portland Cement". The test method was modified to maintain a constant water demand.

The attached technical report summarizes our test data and results. The pumice was found to increase the water demand of the mortar mixes and have a negligible effect on their strength. Because of these characteristics, we do not recommend the use of this type of pumice in concrete products.

Sincerely,

AGRA Earth & Environmental Limited,

Marte

Materials Engineering Division

Attch.

Reviewed by:

Neil McAskill, A.Sc.T. Manager, Materiala Division







Engineering & Environmental Services

AGRA Earth & Environmental Limited 2227 Douglas Road Burnaby, B.C. Canada VSC 5A9 Tel. (604) 294-3811 Fax (604) 294-4664

# AGRA Earth & Environmental

**TECHNICAL REPORT** 

AGRA Earth & Environmental Limited 2227 Douglas Fload Burnaby, B.C. Canada V5C 5A9 Tol. (604) 294-3811 Fax (804) 294-4664

PROJECT: DATE:

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VA-03541 September 12, 1995

**OMNICAD Services** #104-318 East Kent Ave. South Vancouver, BC V5X 4N6

ATTENTION: Mr. Dick Shannon

FROJECT: Evaluation of Pumica

SUBJECT: Pozzolanic Activity Index with Portland Cament (ASTM C311)

	Mix 1 (Control)	Mix 2 (Control)	Mix 3	Mix 4 (Control)
Type 10 Lafarge Cement (g)	500	400	400	400
Graded Standard Sand (g)	1375	1375	1375	1375
Centralia Fly Ash (g)		100	•	· ·
Pumice (g)	-	•	100	•
Water (g)	242	242	242	242
Water/Cemenultious ratio	0.484	0.484	0.484	0.605
Flow (%)	108±5	718±5	86±5	115±5
	inesni arsu	LTS and Aller		
Compressive Strength (MPa) Strength Activity Index @ 7 days	38.5 1.00	29.3 0.80	22.9 0.63	25.0 0.88
Compressive Strength (MPa) Strength Activity Index @ 28 days	44,2 1,00	38.7 0.88	30.1 0.69	29.6 0.67

COMMENTS:

- Test method was modified to maintain a constant water content.

CERTIFIED BY

Neil McAskill, A.Sc.T. Manager, Materials Engineering Division TESTED BY: Marte Juhasz, EIT, B.A.Sc

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Engineering & Environmental Services

## **APPENDIX IV**

## **TEST RESULTS**

### **GREAT PACIFIC PUMICE INC.**

# GRADATION TESTS FOR PUMICE AS A LIGHTWEIGHT AGGREGATE FOR CONCRETE

#### Gradation Tests - Mt. Meager Pumice

A critical requirement of lightweight aggregates in concrete applications is meeting the fine aggregate grading requirements of CSA A23.1 and ASTM C330, C331 and C332 Standard Specifications for Lightweight Aggregates for Structural Concrete, Concrete Masonry Units and Insulating Concrete respectively.

On August 23 and 24, 1995, Garth Carefoot prepared, crushed and tested a 20 kg sample of pumice from the GPC Claims at Mt. Meager for comparison to:

- a) the CSA/ASTM gradation standard for fine lightweight aggregates
- b) test results as reported by the current suppliers of pumice to lightweight concrete producers in British Columbia - Cascade Pumice Company of Bend, Oregon (#4 Truck Crusher) and
- c) a sample taken by Great Pacific Pumice from the Lafarge Concrete stockpile in Richmond (Bend # 3)

The Lafarge and Mt. Meager sieve samples were approximately 800 grams each.

The Mt. Meager sample was passed through a 12 inch by 24 inch jaw crusher to reduce the gradation to minus 3/4 inch. A 6" by 9" roll crusher was set-up with a three phase power genset at Great Pacific's North Vancouver facility. After several trials to establish the appropriate settings of the roll crusher, the 20 kg sample was processed. An 800 gram sample was taken, dried and sieved in accordance with ASTM C136 Method for Sieve Analysis of Fine and Coarse Aggregates. A 800 gram sample from Lafarge's stockpile was dried and tested at the same time.

Results are reported in Table 2. Pumice from the Mt. Meager deposit and processed as described was found to be in compliance with CSA/ASTM grading requirement and comparable to the Bend, Oregon pumice used locally.

#### SIEVE TEST RESULTS

Grain Size	CSA/ASTM	Cascade #4 (1)	Larfarge #3 (2)	Mt. Meager
3/8 inch		100	100	100
#4 mesh	85-100	95	95	94
#8		69	71	61
#16	<b>40-8</b> 0	47	48	44
#30		33	32	33
#50	10-35	24	24	26
#100	5-25	19	17	10
#200		15	8	8
Finess Modu	lus	3.13	3.13	3.30

Note (1) Cascade Pumice Company, Bend, Oregon, #4 Truck Crusher (2) Cascade Pumice Company, Bend, Oregon. #3 Fast