

ARIS SUMMARY SHEET

District Geologist, Victoria (OBSOLETE)

Off Confidential: 92.09.13

ASSESSMENT REPORT 21854

MINING DIVISION: Lillooet

PROPERTY: Pum
LOCATION: LAT 50 40 00 LONG 123 27 00
UTM 10 5612635 468196
NTS 092J11W
CLAIM(S): Pum 1-2, Pum 4-20
OPERATOR(S): Carefoot, D.R.
AUTHOR(S): Church, D.R.
REPORT YEAR: 1991, 19 Pages
COMMODITIES
SEARCHED FOR: Pumice
KEYWORDS: Bridge River Assemblage, Pumice, Concrete mix
WORK
DONE: Prospecting
PROS 150.0 ha



**GEOTECHNICAL ASSESSMENT REPORT
OF
CLAIMS PUM 1,2,4 THROUGH 20
LILLOOET MINING DIVISION
LATITUDE: 53'-41'
LONGITUDE: 123'-28'
MAP AREA 92JE**

**EVALUATION OF MOUNT MEAGER
PUMICE DEPOSIT**

Prepared for:

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

LOG NO: SEP 17 1991 K
ACTION:
FILE NO:

**GEOLOGICAL BRANCH
ASSESSMENT REPORT**

by

B.H. Levelton & Ass
#1/12791-Clark
Richmond, B.C.
V6V 2H9

21,854

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D. Church
D. Church, B.Sc.

File: 191-656

Sept. 10, 1991

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INTRODUCTION

It has been recognized for a number of years that a substantial pumice deposit exists in the Mt. Meager area west of Pemberton. Others have explored and attempted to develop the deposit over the years but there has not been a properly organized or financed development program.

Garth Carefoot has obtained 53 leases in the area as shown in Drawing A-1. They cover approximately 1325 ha. as shown in Plate A-2. For reasons of access, the primary area of interest is in the east section of the deposits.

Mr. Carefoot intends to develop the pumice deposit both for domestic and export sake. Initial utilization will be as the traditional construction aggregate - primarily for concrete block plus some cast concrete. Subsequently other uses such as polishing compounds, floor spill absorbants and dust control may be developed.

In the Vancouver market pumice imported from Bend, Oregon, is presently being used in concrete block. Block producers advise that its performance is satisfactory. Therefore, part of this investigation will compare Mt. Meager pumice, processed by simulated crushing, with the Bend pumice.

This Report will present the results of a site investigation of the deposit to assess its size, uniformity and geological features, a laboratory qualification of the properties of Mt. Meager pumice, and an assessment of the performance of processed pumice in both concrete block and a concrete trial mix. An analysis is made of the commercial potential of the product.

General Geography

The block of claims is situated to the northeast of Plinth Peak 8936 ft (2708 m) on both side of the Lilloet River. Salal Creek bisects the claim block. The elevation of the claims ranges from approximately 2200 ft (660 m) to 4500 ft (1485 m). The claims south of the Lilloet River extend west from the Lilloet waterfall, encompassing the base of Plinth Peak and the north facing bluff located southwest of the confluence of Salal Creek. The claims on the north side of the Lilloet River and are all below the timberline in douglas fir, hemlock and cedar forest on steep southwest facing slopes with deeply incised valleys of mountain creeks. The regional topography is glacially derived. The study area's glacial drift mantle has been overlain by a pumiceous ash fall which has been partially overlain by landslide debris, lahar and organic rich overburden.

Location and Access

The claim block is located in the southwest corner of British Columbia and is centred at latitude 53°-41'N and longitude 123°-28'W as plotted by the Department of Mines subsequent to the registration of the claims. The claim block consists of an arrangement of 53 single claim units as shown on Drawing No. A-1 at a scale of 1:50000 (Index Map). The owner maintains that the plotting of the claim groups is inaccurate as recorded. The Owners maintains that the southeast corner post of claim PUM 2 is located some 4.4 miles (7 km) to the southeast. We have replotted the claim block boundary on the index map by locating the assumed field position of the corner post. We understood that the owner will file an amended sketch with the Department of Mines. We have assumed that the Owner's claim block location is correct for the purpose of our assessment report. We have also located the claims on our Geological map Drawing A-2.

The area is accessible along the logging road on the northside of the Lillooet River at the northwest corner of the Pemberton Valley. The claims are first encountered at approximately mile 28.0. An arterial logging road rises in a series of switchbacks at this location with a series of pumice exposures evident in the roadcuts. The upper portion of the road is within claim PUM 20. At Mile 29.5 the road rises in a series of switchbacks to Mile 31 passing through pumice exposures from Mile 30 to 31. The road remains within the claims and crosses Salal Creek at approximately Mile 32.8, terminating at the washed out B.C. Hydro bridge across the Lillooet River at Mile 33.6. The westernmost boundary of the claims south of Lillooet River extend some 0.60 km to the west requiring the fording of the Lillooet River.

APPROACH

The site was accessed by all wheel drive on August 29 and Sept. 6, 1991 by the writer and Mr. G. Carefoot. On the initial visit the pumice exposures from Mile 30 west to the crossing point on the Lillooet River were examined. Logging roads on the southwest facing slopes within the claimed area were also driven with pumice exposures being recorded. Due to heavy precipitation, high waters in the Lillooet and subsequent flooding in the Pemberton Valley no sampling or traverses were conducted. The Sept. 6 visit concentrated on Area #1 within the claim block. Area 1 encompasses claims PUM 11,12,17,18,19 and the eastern portion of PUM 2. The area was targeted due to the accessibility of known

pumice exposures. The area was envisaged as the source of initial production and hence quantity calculation were required of proven or probable reserves. As an excavator was not available for test pitting within the area, deposit thicknesses were to be extrapolated from exposures and traverses. It is understood that minimum reserves of approximately 10' metric tonnes are required for initial production.

The exposures of pumice at Mile 30, 30.5 and 32.5 were sampled. Traverses were made along the south boundary of the claims westward from Mile 29 to a point approximately 1 km from the Lillooet waterfalls, and northeast from Mile 31 to a point some 1.5 km (1.0 mile) north of the pumice exposure between Mile 30 to 31 and then southward to that exposure. The second traverse was to confirm the presence of pumice within Area 1 for the quantity calculation while the first traverse located the south claim boundary of the PUM 2 claim and the southeast corner post plus noted the absence of pumice showings in the canyon below the falls on the Lillooet River. Access to the claims to the south of the Lillooet River was hampered by the washout of the Salaal Creek bridge and continued high water levels in the Lillooet. Pumice reserves in this area were to be determined by photogeological interpretation. The screened product from the abandoned quarry shown on Drawing A-2 was viewed in the Pemberton Valley to Squamish Mills Ltd. yard.

PROPERTY DESCRIPTION

The recent volcanic rocks of the area were first mapped by Robertson in 1911. Interest in the potential of geothermally generated energy led B.C. Hydro to construct a bridge across the Lillooet River. This access allowed for the exploitation of the pumice deposits on the southwest side of the confluence of the Lillooet River and Salal Creek by Willes from the late 70's to mid 80's. The mined pumice was crushed/screened and stockpiled near Pemberton. Production ceased with the washout of the bridge. In October 1990 the current owner purchased the claims from Marc Beaupre and Brian Chore. The legal description of the claims all within the Lillooet Mining Division are as follows:

Claim Name	Title Number	Claim or Lease
PUM 1	4533	Claim
2	4534	Claim
4	4535	Claim
5	4536	Claim
6	4537	Claim
7	4538	Claim
8	4539	Claim
9	4540	Claim
10	4541	Claim
11	4542	Claim
12	4543	Claim
13	4544	Claim
14	4545	Claim
15	4546	Claim
16	4547	Claim
17	4548	Claim
18	4549	Claim
19	4550	Claim
20	4551	Claim

GEOLOGICAL SURVEY

The geological survey consisted of photogeological interpretation, the review of pertinent published papers and foot/vehicle traverses within the claimed area. Sampling and mapping was restricted to visible exposures. No test pitting was undertaken to confirm the continuity of pumice depths. Geological mapping is on a scale 1:20000.

The pumice deposit is volcanic ejecta of recent age known as the Bridge River Ash assemblage. It is assumed that the vent was within the Lillooet Valley on the north side of Plinth Peak with depositional distribution towards the northeast as unmetamorphised and unconsolidated volcanics. The pumice exposure on the northeast scarp face on the Lillooet below Plinth Peak supports this hypothesis as the ash is some 100 ft (30 m) thick. Significant deposits exist on the west facing slopes and valleys along the Lillooet River.

The pumice is 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 in (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.

Our geological observations follow. They can be cross referenced for location to the geological map drawing No. A-2.

Mile 28-28.5

- north side Lillooet River to approximately elevation 3960 ft (1200 m)
- no exposure at main road only when ascending new logging road
- pumice exposure 15 ft (4.5 m), 3 in (75 mm) minus clean, under less than 2 ft (0.6 m) overburden over clayey silt till
- finer lithograph noted at 9 ft (2.7 m) frame top
- in switchbacks 5-10 ft thick (1.5 - 3.0 m) over brown clay till under 1 ft (0.3 m) overburden.

Mile 29

- review location of clients corner post (PUM 2 southeast corner post) and previous claims
- traverse towards Lillooet River falls
- no pumice occurrences, eroded away in this area south of main road

Mile 30

- pumice 15 ft (4.5 m) depth on orange brown sand till under 2 ft overburden
- 6 in (150 mm) diameter maximum, average 1-2 in (25-50 mm) unconsolidated with inclusions of dacate and possibly basement rock < 5%.
- finer lithography 8 ft (2.6 m) below top
- faces sampled

Mile 30.5

- similar size and texture, maximum 4 in (100 mm) diameter
- 1 ft (0.3 m) overburden
- finer lithograph 6 ft (1.8 m) below top
- face sampled

Mile 31

- greater than 15 ft (4.5 m) consistent size and texture
- under less than 2 ft (0.6 m) overburden

Mile 31-32.2

- generally pumice absent/buried under excessive thickness of overburden
- occasional exposure 5-8 ft (1.5-2.6 m) thick mixed with sand and clay under 4 ft (1.2 m) of overburden

Mile 32.2-32.7

- less than 15 ft (4.5 m) similar consistence
- thin overburden

Mile 33.6 (Lillooet River)

- exposure on bank at bridge site of 3 ft (1 m) of similar sized pumice

Mile 31 (Loop to northeast and then southward traverse to Mile 30.5 Exposure (traverse shown on geological map Dwg. A-2)

1. Road Cut:

- pumice exposure > 8ft (2.6 m) and 3-4 ft (1-1.2 m) overburden
- nominal 1 in (25 mm) bomb sizes, less fines occasional 6 in (150 mm) sizes
- similar texture

2. Continuous Pumice Showing:

- exposures in creek crossings approximately 10 ft (3.3 m) minimum under 1-4 ft overburden
- consistent quality
- no showings to east

3. Continous Pumice Showing:

- similar pumice showing depth > 3 ft (1.0 m)

4. Southward Traverse Through Forest and Logged Off Area:

- continuous pumice showings at surface, very thin veneer of overburden
- similar consistency of pumice

CLAIMS ON THE SOUTHWEST SIDE LILLOOET RIVER

- no access, geological interpretation from air photo, previous mapping and stockpiled material
- extensive pumice deposit on northeast flank of Plinth Peak
- exposure of approximately 100 ft (30 m) vertical were cut by Lillooet River
- abandoned quarry workings to west of scarp face, similar colour and texture noted in remnants of stockpiles in Pemberton to exposures of pumice previously noted.
- Read (1976-78) indicates that the volcanics consist of light to medium grey, porphyritic rhyodacite breccia and ash (Unit P9x)

CLAIMS SURVEYED:

1. Geological Traverses (foot & vehicular)
Claims PUM 1,2,11,12,17,18,19,20
2. Sampling:
Claims PUM 2,18
3. Photogeological Interpretation
Claims PUM 1,2,5,6,7,8,9,10

RELATED TECHNICAL REPORTS:

Levelton Associates laboratories in Vancouver are currently performing tests on samples of the pumice. The sampling was performed at two location between Mile 30 and 30.5, Mile 30.8 and Mile 32.5 from southwest facing pumice exposures at roadcuts. The weathered surface material and overburden was removed and a representative sample obtained for the full vertical exposure. As the material was essentially homogeneous at all sampling locations, the samples were blended to a single composite sample.

Tests in progress include:

- crushing to simulate production and assessment of both recovery and reject sizes
- gradation
- unit mass and absorption
- concrete and black trial mixes
- degradation
- abrasion resistance.

An assessment will be made of the quality and commercial acceptability of this pumice and comparisons developed to the properties of the Bend pumice.

BIBLIOGRAPHY

The following geological papers were reviewed:

ANDERSON, R.G. 1975 - The Geology of the Volcanics of the Meager Creek map area, southwestern B.C., B.Sc. Thesis UBC.

READ, P.B. 1972 - Meager Creek Volcanic Complex, southwestern B.C. CSC, open file 603.

RODDICK, J.A. and
HUTCHINSON, W.W. 1973- Pemberton (east half) map area B.C. 92JE
1/2.

STASIUKM, M.V and
RUSSELL, J.K. 1990 - "The Bridge River Assemblage in Meager
Mountain Volcanic Complex, southwest
B.C."

GSC paper 90-1E.

RESULTS/INTERPRETATIONS

The quantity estimates of mineable pumice in Area 1 are based on foot and vehicle traverse, as previously reported, to ascertain the lateral extent of pumice deposits within the claim areas. Thickness estimates are based on the mapping of existing exposures. The quantity estimates on the claims to the south of Salal Creek are based on the single exposure on the scarp face (30 m), air photo and previous geological mapping.

QUANTITY ESTIMATES

Area 1: Claims PUM 11,12,17,18,19 and the eastern part of PUM 2. Based on a unit mass of 862 kg/m³ we estimate that the average proven quantity of pumice is 3x10⁶ metric tonnes. It is probable that reserves of less than or equal to 6.5x10⁶ metric tonnes are present.

Area 2: Claims PUM 4,13,14,15,16 northeast portion PUM 1 and northwest part PUM 2

- insufficient exposure to formulate quantity calculations
- precise exposure <15 ft (4.5 m) face mile 32.2 - 32.7
- overburden appears to thicken which may limit economical exploitability.
- test pitting program required to determine quantities.

Area 3: Southshore of Lilloet River
Claims PUM 1 (S.W.) PUM 2 (S.W.), 5,6,7,8,9,10

- repositioning of claims as owner maintains positions claims PUM 5 and part of PUM 1 over pumice deposite inferred from photogeological interpretation.
- estimate that majority of deposit in claims may be located on slopes excessively steep to mine.
- assuming northwest corner of PUM 1 mineable (1 km E-W x 0.5 km N-S x 30 m continuous thickness in terrace structure) then potential reserves of 12.9 million metric tonnes are indicated.

CONCLUSIONS

1. Significant pumice deposits exist on both sides of the Lilloet River. Recent road construction has exposed favourable deposits north of mile 28 and 30 previously thought to be Lahar.
2. Laboratory analysis in progress will determine the suitability of the product as a construction aggregate.
3. Subsequent to verification of claim locations a test pit program using an excavator supplement with additional geological mapping should be considered to "firm-up" the quantity estimates.

VALUATION OF WORK

G.D. Carefoot (Owner)Trip 1 Sept 13-15, 1990

Site visit	16 hrs @ \$55.00/hr	\$ 880.00
Mileage	590 km @ \$0.28/km	171.10
Trailer		55.00
Misc. Expenses		<u>30.00</u>
Subtotal		\$1136.10

Trip 2 Aug 29-30, 1991

Geological/Technical Work	17 hrs @ \$60.00/hr	\$1020.00
Mileage	656 km @ \$0.31/km	203.36
Zodiac Rental		150.00
Lodging and meals		<u>175.20</u>
Subtotal		\$1548.56

Trip 3 Sept 5-6, 1991

Geological Review/Technical Work	14 hrs @ \$60.00/hr	\$ 840.00
Mileage	595 km @ \$0.31/km	184.45
Lodging, meals + misc. expenses		<u>276.93</u>
Subtotal		\$1301.38
Total Field Expenses		\$3986.04

B.H. Levelton and Associates

1. Geological Assessment Report
including site visits (2) report preparation
and filing

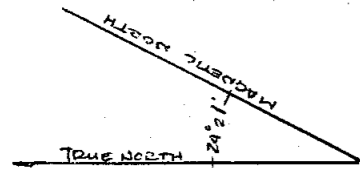
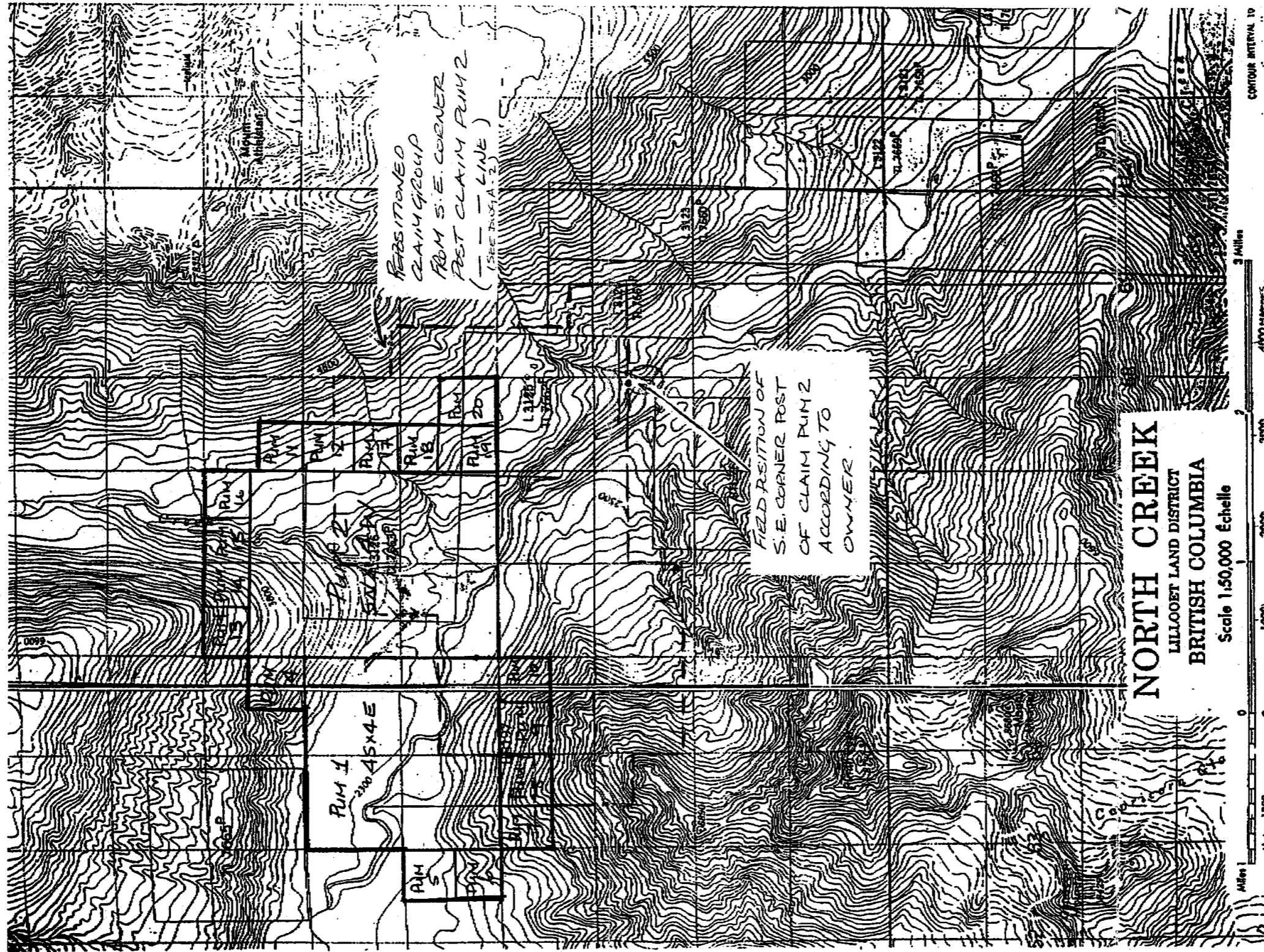
2. Materials evaluation program

Lump Sum		<u>5800.00</u>
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TOTAL EXPENSES		\$9786.04
=====		=====

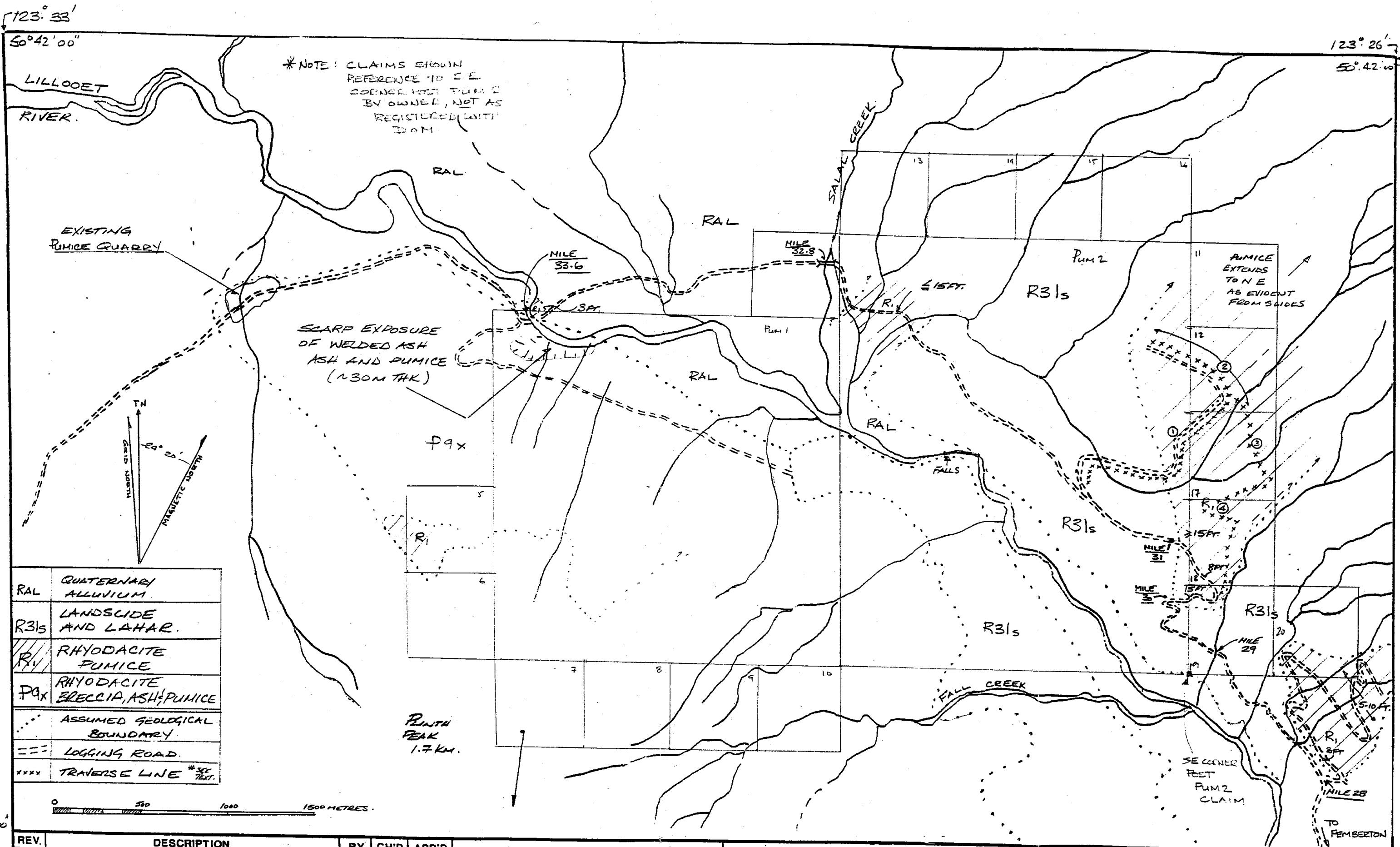
APPENDIX

92J.063



REV.	DESCRIPTION	BY	CH'D	APP'D	TITLE	DWN. BY	DWG. NO.
					GREAT PACIFIC PUMICE INC. INDEX MAP OF PUM 1, 2 & THRU 20 CLAIMS	JRC	A-1
							SCALE 1:50000
							DATE SEPT 11/91

B. H. LEVELTON & ASSOC. LTD.
CONSULTING ENGINEERS



RAL	QUATERNARY ALLUVIUM
R31s	LANDSLIDE AND LAHAR.
R1	RHYODACITE PUMICE
Pox	RHYODACITE BRECCIA, ASH & PUMICE
---	ASSUMED GEOLOGICAL BOUNDARY
---	LOGGING ROAD.
xxxx	TRAVERSE LINE *SEE TEXT.

REV.	DESCRIPTION	BY	CH'D	APP'D
	FROM FOREST COVER MAP SERIES.			
	92J 063 NE PORTION.			

TITLE **GEOLOGICAL MAP OF RHYODACITIC PUMICE DEPOSITS.**

DWN. BY DRC DWG. NO. A-2
 CHECKED _____ SCALE 1:20000
 APPROVED _____ DATE SEPT 11/91

B. H. LEVELTON & ASSOC. LTD.
 CONSULTING ENGINEERS

50° 39' 00"

R E S U M E

CHURCH, Donald R.

Born: 1950Education:1973 B.Sc. (Geology and Geophysics)
University of TorontoSubsequent Professional Improvement
Courses:1983-1984 - Canadian Building Code; Computer
Applications for Building TechnologistsExperience:

1982-Present Building Scientist
B.H. Levelton and Associates Ltd.
Victoria and Vancouver Offices

- roofing & waterproofing inspections and design
- condition surveys
- restoration technology
- roof evaluations and design
- water ingress investigations (VGH, ICBC, and B.C. Hydro and Power Authority)
- Airseal filtration in building construction (B.C. Place Stadium)
- CSA certification (field and laboratory) A283
- analysis of soil, mortar, grout, cement and asphalt
- sealants: selection and application
- pressure testing (manometer)

1980-1982 Chef de Chantier (Superintendant of Construction
General Maconerie, Nouvelle
Caledonie, France

Superintendent on a variety of commercial, residential and government projects; including Brewers Retail Store, Ontario, P.T.T. Building, France and residential Sydney, Australia.

CHURCH, Donald R.

/2

1973-1979

Manager and Field Engineer
The Trow Group Limited
Elliot Lake and Toronto
(Sabbatical 1976 and 1977)

- soil investigations
- foundation inspections (caissons, piles, rafts and spread footings)
- roadbase, earthworks, slope stability, French drains
- density (compaction) testing
- Projects include:
T. Eaton Centre, Toronto
Expansion of Town of Elliot Lake

Affiliations:

- Member Roofing Inspectors and Consultants Association of B.C.
- Member of A.P.T. (Association of Preservation Technology)
- Approved Inspector - R.C.A.B.C. (Roofing Contractors Association of B.C.)

RESUME

SEABROOK, Philip T., P.Eng.

Education:

1961 M.Sc. Civil Engineering, University of Alberta
1959 B.Sc. Civil Engineering, University of Alberta

Experience:

Consulting materials engineer specializing in the fields of concrete technology including inspection, testing and design of materials system.

1989 - Present President
B.H. Levelton & Associates Ltd.
Vancouver, B.C.

1969 - 1989 Vice President
B.H. Levelton & Associates Ltd.
Vancouver, B.C.

Responsible for Construction Materials Division

1964 - 1969 Materials Engineer
Warnock Hersey
Coast Eldridge Professional Services Division
Vancouver, B.C.

1962 - 1964 Manager
Eternacrete Products
Edmonton, Alberta

1961 - 1962 Chief Engineer
EDCON Concrete Block Co.
Edmonton, Alberta

Affiliations:

Professional

Registered Professional Engineer
Province of British Columbia, Province of Saskatchewan and State of Washington.

Canadian Society of Civil Engineering, and Engineering Institute of Canada. Appointed Fellow, 1981.

Member of

Council of Association of Professional Engineers of B.C., 1975 through 1978. Executive Committee 1976 to 1982. Elected Vice President in 1979. President in 1980.

Advisory Committee on Civil and Structural Technology, BCIT - 1981 to 1985.

Appointed Member of National Advisory Committee on Mining and Metallurgical Research, Materials and Utilization Subcommittee, 1984.

Vice Chairman Engineering Centennial Board, 1985.

Board of Directors, Special Education Endowment Fund, 1985.

Board of Directors, Canadian Council of Professional Engineers, 1982 and 1983.

Technical

1975

Sessional Lecturer, University of British Columbia

Member of ACI Committees

President of B.C. Chapter, 1970
506 Shotcrete. Chairman 1983
228 Nondestructive Testing of Concrete, 1985
555 Concrete Removal
548A Polymer Concrete

Member of Canadian Standards Association

1972 - Present

A23.1, A23.2 "Concrete Materials and Methods of Concrete Construction," "Methods of Test for Concrete". Chairman 1982 to 1989.
A233 "Qualification Code for Concrete Testing Laboratories".
A256.5 "Guide to the Use of Superplasticizers".
S474 "Task Force of Offshore Structures".

1978 - 1981

1980 - 1983

1984 - Present

International Standards Organization (Standards Council of Canada)

1980 - Present

Committee on Concrete

Director, High Performance Concrete Network of Centres of Excellence

Authorship and Research

Papers presented at technical conference on:

- Shotcrete Properties of Underground Support
- In-Place Testing
- Superplasticizers, Effects of Fly Ash and Accelerated Curing
- Architectural Concrete
- Lightweight Aggregate
- Supplementary Cementing Materials
- Concrete Durability in Marine Environments
- Grout
- Use of High Volume Fly Ash Shotcrete for Acid Mine Drainage Abatement, CANMET Conference, Calgary, October 1990