82 - 324 - 10384

Report on
Trenching and Sampling
on the
Kelly 1 - 5 and Trish 1 - 2
Mineral Claims

Located on Lang Creek, in the
Vancouver Mining Division
NTS 92 F/16 W
British Columbia
at
49° 48' N. Latitude
124° 25' W. Longitude

for
FARGO OIL CORPORATION
by
G. R. Hilchey, P.ENG.
May 1982

GORDON HILCHEY AND ASSOCIATES LTD.

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1. INTRODUCTION

During August 1981 a germanium metal prospect located near Lang Bay, British Columbia, approximately 15 kilometres southeast of Powell River, was sampled by the writer on behalf of Fargo Oil Corporation. The prospect had been acquired by the Company in August 1981 from a syndicate who had staked the area in April and May 1981.

Analyses of the samples displayed varying amounts of germanium. The results were encouraging enough to warrant a further sampling program, which was carried out in April 1982, the assays of which are not yet known and therefore not included in this report.

In December 1981 Fargo Oil Corporation staked three additional claims, the Zoie claims, totalling 28 units adjoining the Kelly and Trish claims acquired in August 1981.

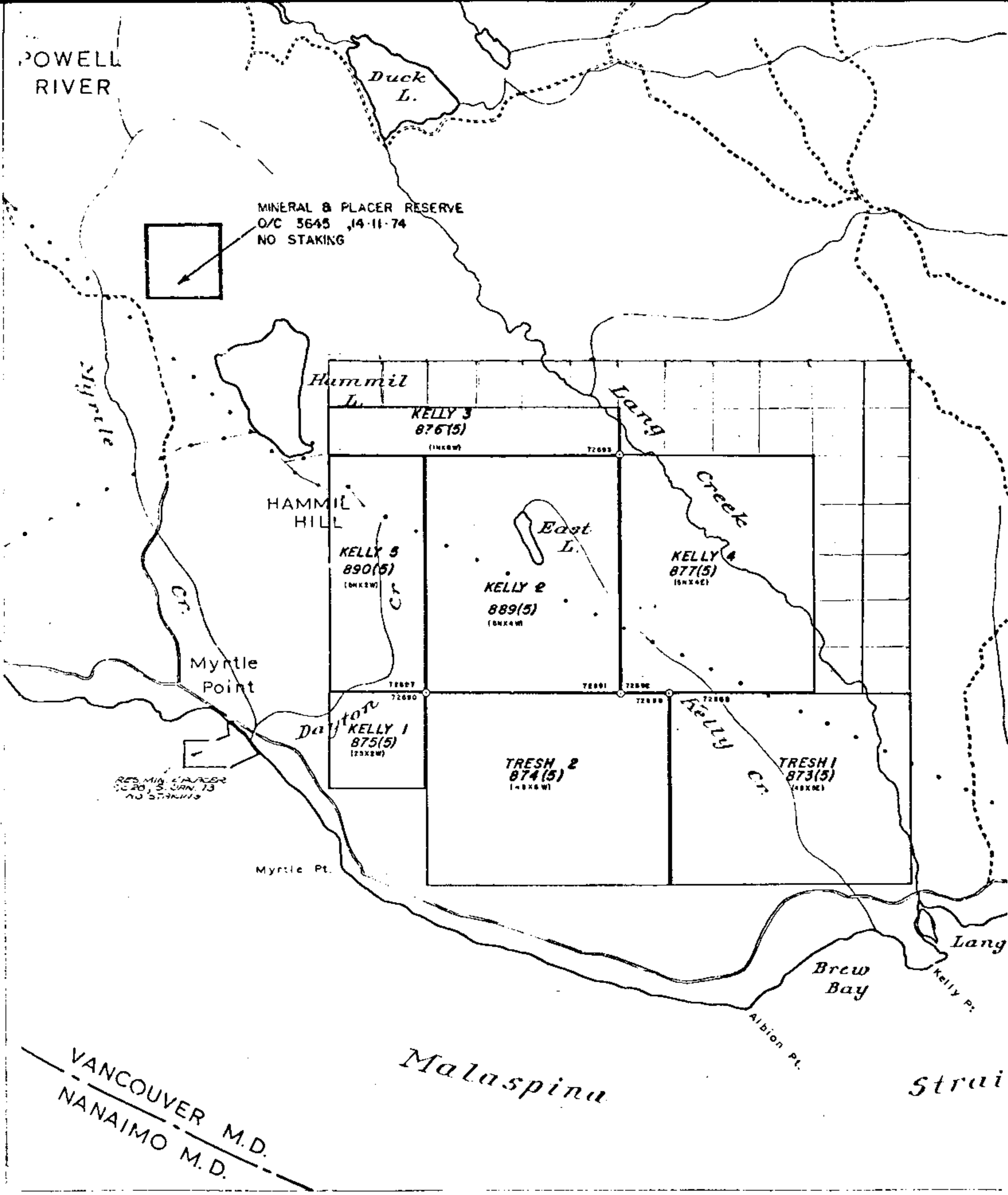
2. LIST OF CLAIMS

Examination of mineral titles registered with the British Columbia Department of Mines and Petroleum Resources indicates the existence of the following mineral claims covering the area of the Lang Creek prospect near Powell River, B.C.:

Claim Name	Record Number	Number of Units	Record Date
Trish 1	873	20	May 4, 1981
Trish 2	874	20	May 4, 1981
Kelly 1	875	04	May 4, 1981
Kelly 2	889	20	May 8, 1981
Kelly 3	876	06	May 4, 1981
Kelly 4	877	20	May 4, 1981
Kelly 5	890	10	May 8, 1981
Zoie 1	1127	06	Dec. 15, 1981
Zoie 2	1128	12	Dec. 15, 1981
Zoie 3	1129	10	Dec. 15, 1981

PROPERTY LOCATION MAP

0 100 200 MILES
0 100 200 400 KILOMETRES



124°30

TO SOUTH SEE MAP 92F/9W

For up-to-date information on claims in any area you should

DEPARTMENT OF MINES AND PETROL
VICTORIA B.C.

In summary there are 10 claims consisting of 128 units all owned by Fargo Oil Corporation.

3. LOCATION

The claim group lies 15 km southeast of the town of Powell River, B.C. centered on Lang Creek. General boundaries are Malaspina Strait between Lang Bay and Myrtle Point to the south, Myrtle Creek and Hammill Lake to the west and northwest, the eastern arm of Lang Creek to the north and Whittall Creek to the east. The approximate coordinates are 49^{o} 48' N and 124^{o} 25' W. The NTS map reference for the area is 92F/16W.

4. ACCESS

Highway 101 follows the coast from Saltery Bay to Powell River and passes very near to the southern border of the Kelly claim group. A good paved secondary road connecting to Highway 101 between Lang Creek and Kelly Creek extends north and then west where a tote road in fairly good condition after being cleared of underbrush by a bulldozer, gives access to the outcrop area where the sampling was undertaken.

5. TOPOGRAPHY

The gently rolling terrain is basically flat with an elevation of approximately 800 ft. a.s.l. in the northeast corner of the property. The ground slopes down in a gentle fashion towards Malaspina Strait to the south. Lang Bay has cut its valley about 100 ft. below the general level of the surrounding area.

The area has a thick second growth of timber consisting mainly of fir, hemlock, cedar with alder found along the stream and creek banks.

The water supply is plentiful due to the many streams and creeks, the main ones being centrally located Lang Creek and Kelly Creek, both flowing southeasterly and to the west, Deighton Creek flowing southerly into Malaspina Strait. Dissecting the property in a northwest to southeast line is a high tension power line.

The climate is mild with an annual rainfall from 40 to 50 inches and minimal snowfall in the winter.

6. HISTORY

In 1948 a spectrographic research study on the coals of British Columbia discovered high values of germanium in the carbonaceous material found in the Lang Creek area. In 1957 the mineral rights to the area were acquired by the now defunct Taiga Mines Ltd. who carried out a bulldozer trenching and a churn-and diamond drilling program throughout 1958 and 1959. There is no record of any work being done since that time.

7. GEOLOGY

Following is a description of the geology of the area of interest and of the germanium bearing formations as written by F. C. Buckland, P.Eng., President of the defunct Taiga Mines Ltd. in a report for the "Western Miner and Oil Review" dated September 1959:

> The low-lying plains, along the north side of the Strait of Malaspina, in the vicinity of Lang Creek southeast of Powell River, B.C. are underlain by thick sandstone-conglomerate-shale formations of Eocene age. The proven extent of this formation is about one mile by four miles and the possible extent about three miles by five. The present indicated thickness is about 1,500 feet. The sedimentary series is underlain by a weathered granite. The contact can be observed in the valley of Lang Creek.
>
> Throughout these sediments there are seams and fragments of coal. Whenever fresh bright coal from the formations has been assayed, it has been found to contain appreciable amounts of germanium. Except for the basal beds, directly overlying the granite basement, the enclosing sandstone and shale is essentially barren.
>
> Germanium-bearing coal fragments were located at that time in two different types of deposits in the series:
>
> **Sandstone-type Occurrence—**
>
> Coal was found to occur as thin, discontinuous lenses from 0.01 inch to 3 inches in thickness and, commonly, less than 10 feet in length; and in chunks and pieces of coarse coal up to 3 feet in diameter.

This type of deposit is probably the result of coalification of logs and branches, etc., deposited with the sandstone. Deposits of this type will naturally be somewhat erratic but sufficient deposition was discovered to indicate that certain areas and beds might be of ore grade.

Shale-type Occurrence--

Lenses of coal usually ⅛ inch or less thick and a few inches long occur in a grey silty shale. Large chunks of coal are found intermittently.

Basal Beds--

In April 1959, Dr. A. C. Skerl suggested an examination of the beds towards the base of the sedimentary series, these being of possible greater economic value than those at higher elevations. Immediately a discovery was made of a basal member of the series containing a high percentage of coal and containing germanium in the carbonaceous bed itself, as well as in the coal. Coal occurs on, or a few feet above, the granite basement in a brown to black carbonaceous bed of varying thickness up to perhaps 20 feet. The coal occurs in lenses and narrow beds in the formation from a few thousandths of an inch up to several inches in individual seams. This basal member has been designated as "Brown-bed" by company engineers and has now been proven to occur over a very considerable lateral extent.

8. CURRENT WORK

In August 1981 a sampling program supervised by the writer was carried out at the site of the original workings of Taiga Mines Ltd., which was also supervised by the writer, in order to up-date and verify the results obtained by Taiga in the late 1950's.

Approximately 450 lbs. of sample material was taken from the outcrop areas located close to Lang Creek and delivered to Bacon, Donaldson & Associates Ltd. where they were split and prepared for analyses as per instructions from the writer and Dr. Louis J. Cabri of the Mineral Sciences Laboratories at the Canada Centre for Mineral and Energy Technology (CANMET) in Ottawa.

In September 1981 one complete split of the samples was then shipped to the CANMET laboratories where various analyses and mineralogical studies were conducted, the results of which were received in February 1982 and are contained in the enclosed report.

In February 1982 certain sample splits were shipped to Eagle Picher Industries, Inc., the major producer of germanium in North America, for analyses under the supervision of Mr. John H. Adams, Vice-President Specialty Metals Division in Quapaw, Oklahoma. These results are enclosed also.

Following are reports of each phase of the sampling and assay as prepared by those carrying out the work. These include:

1. Summary of sampling program by the writer.

2. Summary of sample preparation by R. W. Edwards of Bacon, Donaldson & Associates Ltd., consulting engineers.

3. Report of CANMET by Dr. Louis J. Cabri.

4. Summary of Eagle Picher Industries, Inc. analyses by John H. Adams, Vice-President, Specialty Metals Division.

9. RECOMMENDATIONS

In December 1981 Wright Engineers Limited, consultants to Fargo Oil Corporation, recommended a resampling program in order to test the tendency of germanium to concentrate at the floor and roof of coal seams.

This resampling was carried out in April 1982 with the assay work currently underway.

Mr. C. Oliver Ingamells, a sampling expert recently retired from AMAX, Inc. accompanied the resampling program and has made recommendations for a drill core sampling procedure. This would involve drilling three or four holes at the same location in order to obtain a representative sample of that location since the assay results may vary sharply from one hole to the next.

Upon receiving encouraging results from these sampling programs, a two phase drilling program to learn the extent of the germanium bearing ore beds has tentatively been planned by Wright Engineers Limited. Phase I includes drilling twelve holes to an average depth of 100 feet on a 1,000 ft. grid pattern over 7.5 units and Phase II would be infill and stepout drilling of one hundred and forty-four holes to an average depth of 150 ft. on a 250 ft. grid. A timetable has not yet been established, although it is hoped the program will be started before the end of 1982.

Respectfully submitted

Gordon R. Hilchey, P.Eng.

May 14, 1982

REPORT ON SAMPLING OF

FARGO OIL CORPORATION PROPERTY

LANG CREEK - POWELL RIVER AREA, B.C.

The author supervised work on this property in 1959 when it was owned by TAIGA MINES LTD. On August 21st, 1981, he accompanied Mr. Lauch Farris and Mr. Rod Snyder to the property and was successful in finding the major workings.

On August 27th, a CAT 235 hydraulic excavator was rented and some of the old cuts were opened up sufficiently for sampling. Samples and specimens were taken from fresh, unweathered material. Each individual sample bag and specimen bag (except one) contained a numbered tag. The individual bags should be grouped to form samples according to the sample schedule shown on the attached sheet. The specimens were not crushed and are in plastic bags with a description written on the outside. All except one contain tags.

The samples described as "grab samples" were taken from the dump of excavated material. They are as representative as possible for this type of sampling.

The samples were delivered to Bacon, Donaldson and Associates Ltd. for crushing and splitting. They were crushed to minus 1/2 to 3/4 in. and split. One half of each sample was then split to yield a one pound sample which was then pulverized. The balance was bagged separately. For accurate results, the half which was split to yield a one pound sample should have been reduced further in size before splitting. Since a number of bags will be combined to form one sample, the splitting error should not be serious at this stage.

A map (copy of TAIGA MINES LTD. - GENERAL PLAN - AREAS 1-4 - NOV. 1959) showing the approximate sample locations is enclosed. The location of the AREA 3 samples is a little uncertain, but there would be no trouble in relocating it in the field for some time to come.

Respectfully submitted,

GORDON HILCHEY AND ASSOCIATES LTD.

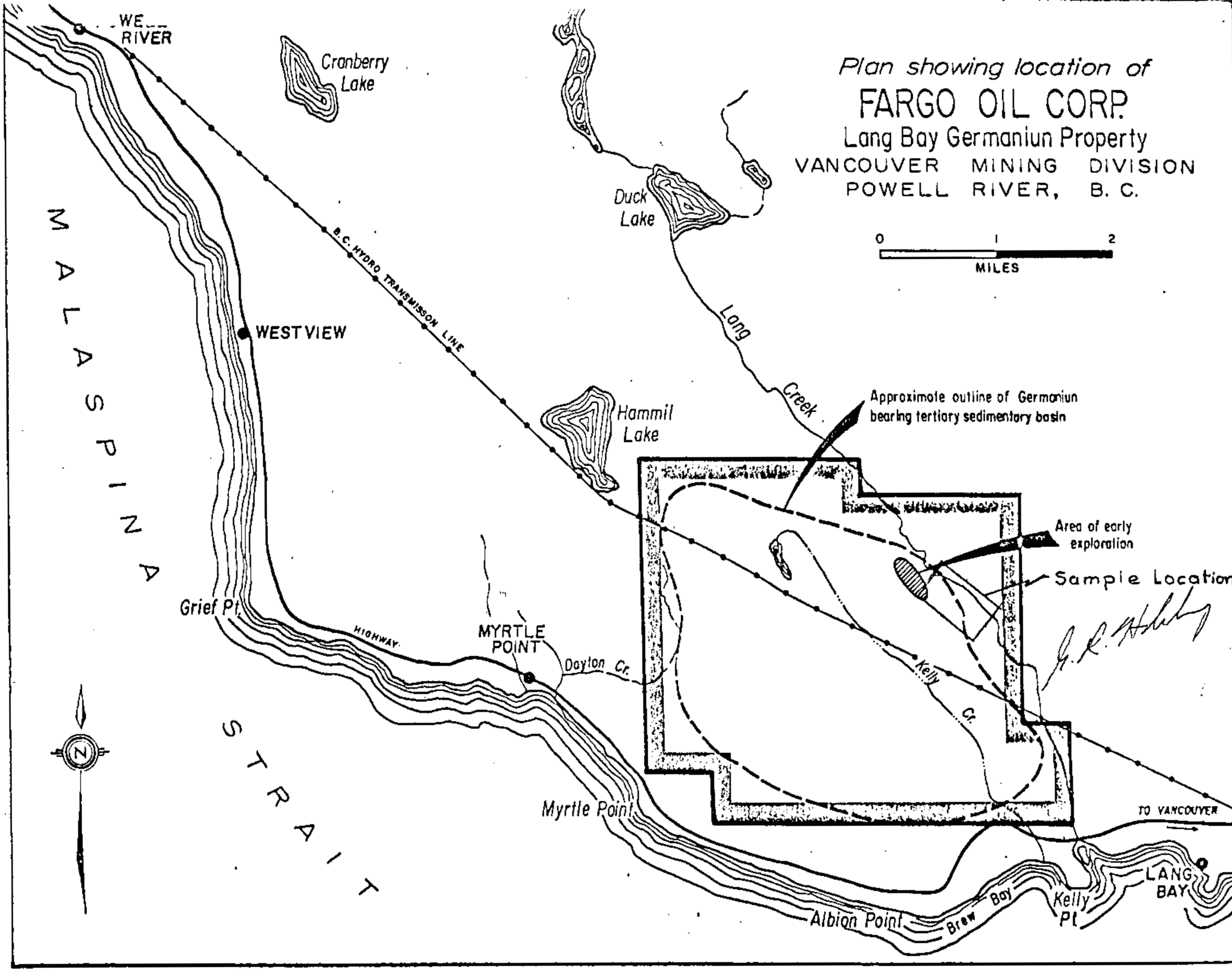
G. R. Hilchey

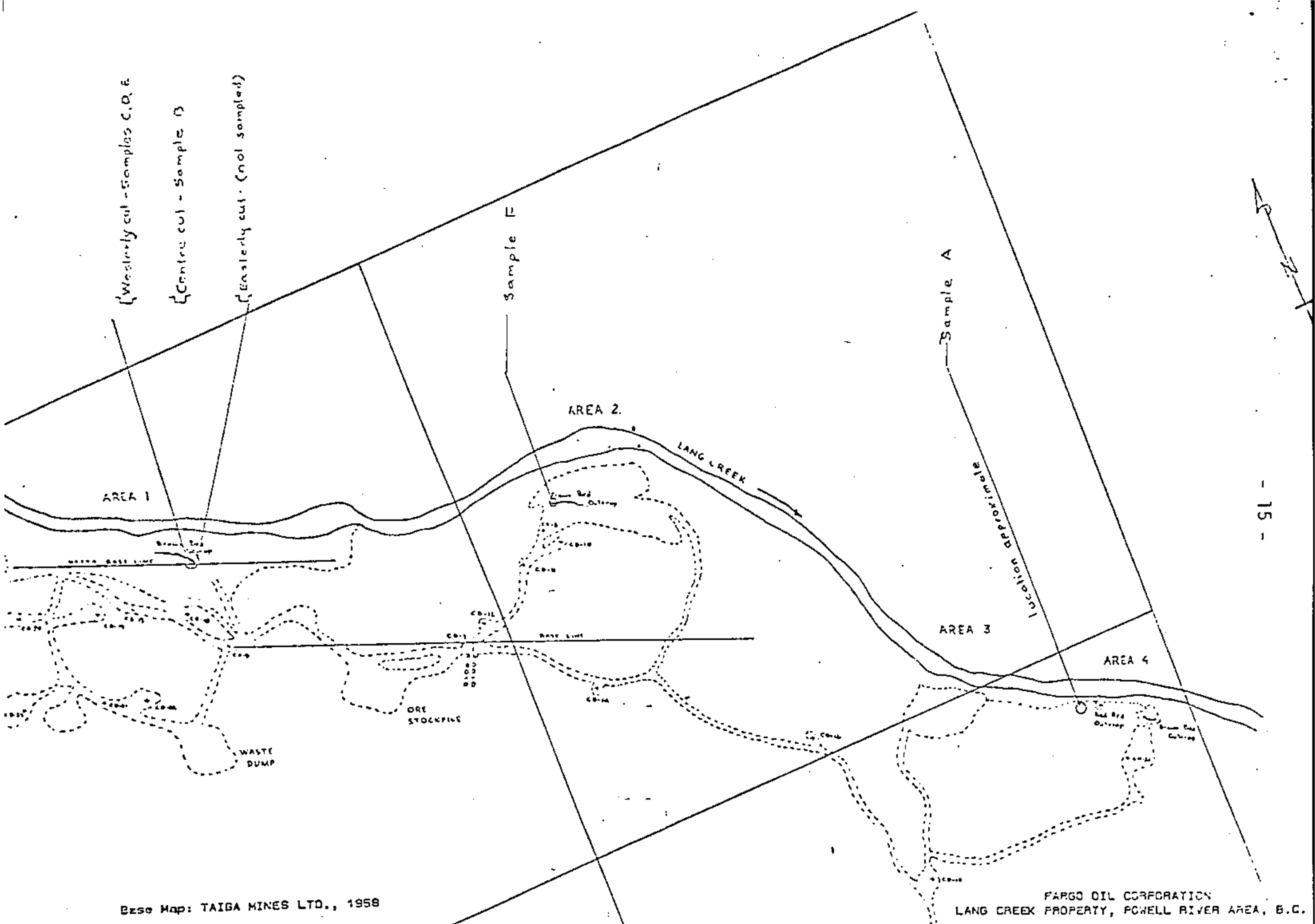
Gordon R. Hilchey, P. Eng.

September 8, 1981

SAMPLE AND SPECIMEN SCHEDULE

TYPE	AREA	TAG NO.	DESCRIPTION
Specimen	3	98801	Red-bed - upper and lower contacts
Specimen	3	98802	"Vitrain" up to 1 inch thick in grey arkosic sandstone above red bed
Sample A	3	98803-05	Red-bed - 18" thick - channel
Sample B	1	98806-08	Brown-bed - 52" thick - channel sample - centre of three cuts.
Specimen	1	98809	Typical brown-bed material (Sample B)
Sample C	1	98810-13	Brown-bed - 60" thick - channel sample - base of brown-bed not exposed - westerly of three cuts
Sample D	1	98814	Arkose overlying Sample C with thin, discontinuous coaly material - 20" channel sample
Sample E	1	98815-25	Brown-bed - same material as Sample C - Grab sample from dump
Sample F	2	98826-29	Brown-bed - grab of typical material from dump (cut was unsafe)
Specimen	2	-	Typical brown-bed material (Sample F)


Plan showing location of
FARGO OIL CORP.
Lang Bay Germaniun Property
VANCOUVER MINING DIVISION
POWELL RIVER, B. C.
0 1 2
MILES
RIVER
Cranberry Lake
Duck Lake
Lang Creek
Hammil Lake
B.C. HYDRO TRANSMISSON LINE
WESTVIEW
MALASPINA STRAIT
Approximate outline of Germaniun bearing tertiary sedimentary basin
Area of early exploration
Sample Location
Grief Pt.
HIGHWAY
MYRTLE POINT
Dayton Cr.
Kelly Cr.
Myrtle Point
TO VANCOUVER
Albion Point
Brew Bay
Kelly Pt.
LANG BAY
N



APPENDIX - LOCATION MAP OF SAMPLING

BACON, DONALDSON & ASSOCIATES LTD.
Consulting Engineers

2036 Columbia St., Vancouver, B.C. V5Y 3E1 • Tel. 879-8461, Telex 04-53437

1981 September 09 File No. 3383

Fargo Oils
9th Floor, 850 W. Hastings
Vancouver, B. C.
V6C 1E1

Attention: Rod Sneider

Dear Sir:

At your request and persuant to instructions from both yourself and the Canmet Labs in Ottawa, we prepared the submitted samples for shipping.

We received thirty-one samples; Samples 98803 through 98829 and 4 specimen samples.

The specimen samples were left as is and packaged for shipment to Ottawa. The identification were as follows:

- Upper and Lower Contact of Red Bed - Area 3
- Area 3 - Vitrain Specimen
- Specimen Brown Bed - Area 1
- Specimen Brown Bed - Area 2

For Samples 98803 through 98829 the following procedure was followed:

- air dried at ambient temperature
- jaw crush to approx. 1/2 - 3/4 inch
- split with riffle into halves
- one half bagged - to Fargo Oils
- other half riffle split to approx. 1 pound
- 1 pound pulverized to approx. 100# - to Ottawa
- remainder bagged - to Ottawa

The outside of each bag bears the sample identification.

Yours truly,

Bacon, Donaldson & Assoc. Ltd.

R. W. Edwards, E.I.T.

RWE/pm

cc Gordon Hilchey & Assoc. Ltd.

Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

CANMET
Canada Centre for Mineral and Energy Technology
Centre canadien de la technologie des minéraux et de l'énergie

PRELIMINARY MINERALOGICAL EXAMINATION OF A GERMANIUM PROSPECT FROM LANG CREEK, POWELL RIVER AREA, BRITISH COLUMBIA

L.J. Cabri
Mineralogy Section
Mineral Processing Laboratory

February 1982

PROJECT MRP - 3.3.0.0.08
Cost Recovery Processing
Job No. 025120

MINERALS RESEARCH PROGRAM
MINERAL SCIENCES LABORATORIES
DIVISION REPORT MRP/MSL 82-5 (CF)

CONFIDENTIAL

PRELIMINARY MINERALOGICAL EXAMINATION OF A GERMANIUM PROSPECT FROM LANG CREEK, POWELL RIVER AREA, BRITISH COLUMBIA

by

L.J. Cabri*

SUMMARY

Sedimentary coal-bearing samples from near Lang Creek, Powell River area, B.C., were found to contain variable quantities of Ge and Ga. The Ge content ranged from <5 to 91 ppm and Ga from 14 to 28 ppm. Mineralogical studies showed that the Ge is most likely, but without absolute certainty, organically bound in the coal. Mass balance calculations support, but do not prove, that the Ge is entirely organically bound. One sample with 2.3% coal contains two coal varieties: a vitrinite with about 0.35 wt % Ge (range 0.18 -0.52), occurring in variably sized irregular lenses and seams up to about a cm thick, and another maceral occurring as irregular disseminations, rarely >50 microns in thickness, and containing less Ge (<0.11 to 0.38%). The finer-grained disseminated maceral may cause potential recovery problems because of intergrowths and friability.

*Research Scientist, Mineralogy Section, Mineral Sciences Laboratories, CANMET, Energy, Mines and Resources Canada, Ottawa K1A 0G1

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INTRODUCTION

Mr. Lauch F. Farris, President of Fargo Oil Corporation, 850 West Hastings Street, Vancouver, B.C. V6C 1E1, requested CANMET's help in characterizing samples (from the Lang Bay prospect, Powell River area, B.C.) by mineralogical and analytical techniques. This was necessary to establish the nature and quantities of valuable constituents as a preliminary investigation to possible eventual exploitation. Mr. Farris referred to earlier work which had indicated the presence of Ge "in the range of 100 gms per short ton" and, by qualitative analysis, of V, In, and Ga. CANMET agreed to conduct Ge, In and Ga analyses on sixteen samples and to perform a mineralogical examination of those samples showing significant values of these elements.

SAMPLES

A total of 58 bagged samples were received on the 17th September, 1981. This was in excess of what Mr. Farris had estimated (letter of Aug. 19, 1981 to W.A. Gow), i.e. "... you can expect to receive sixteen samples of 25 lbs. each for a total weight of 400 lbs. In addition, Mr. Hilchey has suggested that a fist size sample from each zone also be sent." The samples received are listed in Table 1 and a location map is given in the Appendix.

TABLE 1. Samples received

No.	Area*	Description*	Contents**
98801	3	Specimen. Red-bed-upper and lower contacts	Hand specimens
98802	3	Specimen. "Vitrain" up to 1 inch thick in grey arkosic sandstone above red bed.	Hand specimens
98803	3	Sample A. Red-bed-18" thick-channel	~½" chips
98803	3	" " " "	~100 mesh
98804	3	" " " "	~½" chips
98804	3	" " " "	~100 mesh
98805	3	" " " "	~½" chips
98805	3	" " " "	~100 mesh
98806	1	Sample B. Brown-bed-52" thick-channel sample - centre of three cuts	~½" chips
98806	1	" " " " " "	~100 mesh
98807	1	" " " " " "	~½" chips
98807	1	" " " " " "	~100 mesh
98808	1	" " " " " "	~½" chips
98808	1	" " " " " "	~100 mesh
98809	1	Specimen. Typical brown-bed material (Sample B)	Hand specimens
98809	1	- " " " "	~½" chips
98809	1	- " " " "	~100 mesh
98810	1	Sample C. Brown-bed-60" thick-channel sample base of brown-bed not exposed - westerly of three cuts	~½" chins
98810	1	" " " " " "	~100 mesh
98811	1	" " " " " "	~½" chips
98811	1	" " " " " "	~100 mesh
98812	1	" " " " " "	~½" chips
98812	1	" " " " " "	~100 mesh
98813	1	" " " " " "	~½" chips
98813	1	" " " " " "	~100 mesh
98814	1	Sample D. Arkose overlying Sample C with thin, discontinuous coaly material - 20" channel sample	~½" chips
98814	1	" " " " " "	~100 mesh
98815	1	Sample E. Brown-bed - same material as Sample C - Grab sample from dump	~½" chips
98815	1	" " " " " "	~100 mesh
98816	1	" " " " " "	~½" chips
98816	1	" " " " " "	~100 mesh
98817	1	" " " " " "	~½" chips

* Taken from report by G.R. Hilchey (8 Sept. 1981); ** General appearance on arrival.

(Table 1 - cont.)

No.	Area*	Description*	Contents**
98817	1	Sample E. Brown-bed - same material as Sample C - Grab sample from dump	∿100 mesh
98818	1	" " " " " "	∿½" chips
98818	1	" " " " " "	∿100 mesh
98819	1	" " " " " "	∿½" chips
98819	1	" " " " " "	∿100 mesh
98820	1	" " " " " "	∿½" chips
98820	1	" " " " " "	∿100 mesh
98821	1	" " " " " "	∿½" chips
98821	1	" " " " " "	∿100 mesh
98822	1	" " " " " "	∿½" chips
98822	1	" " " " " "	∿100 mesh
98823	1	" " " " " "	∿½" chips
98823	1	" " " " " "	∿100 mesh
99924	1	" " " " " "	∿½" chips
98824	1	" " " " " "	∿100 mesh
98825	1	" " " " " "	∿½" chips
98825	1	" " " " " "	∿100 mesh
98826	2	Sample F. Brown-bed- grab of typical material from dump (cut was unsafe)	∿½" chips
98826	2	" " " " " "	∿100 mesh
98827	2	" " " " " "	∿½" chips
98827	2	" " " " " "	∿100 mesh
98828	2	" " " " " "	∿½" chips
98828	2	" " " " " "	∿100 mesh
98829	2	" " " " " "	∿½" chips
98829	2	" " " " " "	∿100 mesh
-	2	Specimen. Typical brown-bed material (Sample F)	Hand specimens

* Taken from report by G.R. Hilchey (8 Sept. 1981); ** General appearance on arrival.

SAMPLE PREPARATION AND METHOD OF INVESTIGATION

The unexpected large number of samples received required consultation with Mr. Farris, who agreed to grouping of ∿ 100 mesh samples 98803-05 (=Sample A), 98806-08 (=Sample B), 98810-13 (=Sample C), 98815-25 (=Sample E), and 98826-29 (=Sample F). These combined samples, as well as the ∿100 mesh portion of sample 98814 (=Sample D), were reground to minus 200 mesh. These six samples were submitted for quantitative spectrographic analysis for Ge, Ga and In. Samples B and F had the highest values and their original uncombined ∿½" fractions were crushed and ground to minus 200 mesh: i.e. samples 98806-08 and 98826-29. These were also submitted for quantitative spectrographic analysis for the same elements plus V. The sample with the highest values was then examined mineralogically by binocular and ore microscopes, with a scanning electron microscope and analysed with an electron microprobe and by X-ray powder diffractometry. The carbon content of a sample was determined by two methods: Low Temperature Plasma Ashing (LTA) and by conventional proximate analysis.

RESULTS

1. Mineralogy

Examination of the hand specimens under a binocular microscope revealed that the samples are carbonaceous sedimentary rocks. The "Brown Beds" appear to be a dark-grey carbonaceous argillaceous sandstone with variable clay/quartz ratio. The carbonaceous material is irregularly distributed in the sandstone matrix in the form of millimetre to over one centimetre-thick seams of vitrinite, but these are discontinuous along strike and in the planar dimension (Fig . 2 and 3).

The vitrinite is typically bright in appearance and breaks easily with a concoidal fracture (Fig. 3) indicating relatively easy liberation from the matrix. In polished section the vitrinite generally has a low to nil pyrite content, but some grains have a moderate quantity (est. ∿5%) of pyrite inclusions (Fig . 4, 5 and 6). Dispersed throughout this sandstone-clay matrix there occur thiner micro-seams (Fig. 7) of a less bright coaly substance which also wraps itself around the individual minerals. This coal is also softer and does not have a conchoidal fracture.

The "Upper and lower contact of Red Bed" from Area 3 appears, under the binocular microscope, to consist of dense blue-gray clay with yellow and brown ochre colouration. The specimen labelled "Vitrain" from Area 4, under the binocular microscope, appears to be similar to the "Brown Bed" sample from Area 1 but crumbles easily and maybe contains more vitrinite.

Semi-quantitative X-ray diffraction analysis of minus 40 mesh material from sample 98807 (see Table 1) indicated major quartz, minor kaolinite and possible trace of calcite. Similar analyses of minus 200 mesh material from samples A and D (see Table 1) gave: Sample A major kaolinite, minor quartz, trace feldspar; Sample D major quartz, moderate kaolinite and minor feldspar. This suggests that the field descriptions of "Brown Bed" represent an argillaceous and carbonaceous sandstone and that "Red Bed" may represent a more argillaceous member grading to kaolinite clay at the upper and lower contacts. The sample described as arkose is probably that and no carbonaceous matter was seen in it.

2. Bulk analysis

The combined samples (A,B,C,D,E, and F) were first submitted for quantitative spectrochemical analysis and the subsamples for the two highest in Ge (B and F) were resubmitted for analysis. The analyses are detailed in Table 2, below, and include analyses for Ga, In and V. The precision is estimated to be ±15%.

TABLE 2. Spectrographic analyses

Sample	Ge	Ga	In	V
	Elements (ppm*)			
A (Red Bed)	<5	25	<10	nd**
B (Brown Bed)	57	28	<10	nd
C (U. Brown Bed)	<5	26	<10	nd
D (Arkose)	<5	15	<10	nd
E (Brown Bed dump)	<5	28	<10	nd
F (Brown Bed dump)	51	25	<10	nd
98806 Sample B	41	17	<10	107
98807 Sample B	91	23	<10	108
98808 Sample B	77	20	<10	118
98826 Sample F	34	19	<10	72
98827 Sample F	85	14	<10	66
98828 Sample F	30	16	<10	64
98829 Sample F	38	16	<10	75

*ppm = micrograms metal per gram of sample, 10^{-6} g/g;
1 ppm is equivalent to 0.03215 troy ounce per tonne.
**nd = not determined

3. Ore microscopy and in situ analyses

Sample 98807 was selected for more detailed mineralogical examination under reflected light because it had the highest Ge content. Sedimentary fragments were found to contain thin (usually <50 μm) discontinuous sinuous lenses of coal, usually in a clay matrix (Fig. 8). These were difficult to analyse with the electron probe because the expanded beam (~25 μm) required for such analyses had to be fit within the individual seams. The Ge content of this coal variety varied between less than the Minimum Detection Limit (MDL), calculated to be 0.11 wt %, to a high value of 0.38% (Table 3). The average for this type of coal, however, is probably less than 0.15 wt. % Ge. Occasional grains of pyrite and, more rarely, tennantite [$(Cu,Fe)_{12}As_4S_{13}$] were found included in the quartz or clay, but no Ge could be detected in either sulphide (MDL for Ge in pyrite was 0.03 wt %).

Vitrinite from sample 98807 was handpicked and mounted separately for examination with the ore microscope. While many grains were entirely free of pyrite inclusions (Fig. 4), others had a variable quantity (Fig.. 5 and 6) with an estimated maximum content of about 5%.

Germanium analyses of the vitrinite ranged from 0.18 wt % to 0.52 wt % with an arithmetic average of 0.35 wt % Ge for the ten grains analysed (Table 3). Determination of carbon content by two methods (LTA and proximate analysis) gave very similar results of 2.36 and 2.25%, respectively (Table 4). The LTA determination is arrived at by weight loss after removal of adsorbed moisture. A coal content of 2.1% is therefore a reasonable figure for sample 98807.

TABLE 3

Electron-probe analyses for Ge in coal

Grain	No. spots*	Average wt %	Range**
Thin interstitial coal			
A	8	0.12	<MDL† to 0.26
B	4	0.17	0.11 to 0.23
D	5	<MDL	<MDL
E	8	0.15	<MDL to 0.27
6	5	0.15	<MDL to 0.25
1	10	0.10	<MDL to 0.18
2A	5	<MDL	<MDL
2B	3	0.11	-
3	2	0.38	-
4	2	0.13	-
Vitrinite			
A	8	0.18	<MDL to 0.36
B	8	0.37	0.28 to 0.46
C	8	0.24	0.15 to 0.30
D	8	0.29	0.18 to 0.45
E	8	0.41	0.30 to 0.49
F	8	0.39	0.26 to 0.48
G	8	0.37	0.35 to 0.43
H	8	0.44	0.33 to 0.54
I	8	0.35	0.24 to 0.44
J	8	0.52	0.43 to 0.59

* No. spots = number of spot analyses
** range could not be determined for 3 or less spot analyses
† MDL = Minimum Detection Limit of 0.11 wt % Ge. Note values for MDL were taken as zero when averaging.

TABLE 4

Results of LTA and proximate analysis

Carbon Content	LTA*	2.36%
Carbon Content	Proximate	2.25%
Hydrogen	"	0.7%
Nitrogen	"	0.2%

*After 24 hours in a vacuum dessicator with a loss of 0.41% adsorbed moisture. Temperatures monitored at 60-75°C for total 66 hours.

DISCUSSION

The two elements of potential economic interest (as determined by quantitative spectrographic analyses) are Ge and Ga, but the values obtained for the latter did not justify further study in the present investigation. The literature on germanium in coal is voluminous and there appears to be much evidence that germanium is organically bound in coal, though Ge has also been found in some of the mineral inclusions (e.g. sphalerite, pyrite, clay minerals). There also appears to be general agreement in the literature that much of the germanium in coal is of secondary origin such as produced by a process of absorption from percolating solutions. This has resulted in the common occurrence of germanium concentrations at the tops and bottoms of coal beds.

In situ analyses of coal by electron probe indicated organically bound Ge with variable Ge content, apparently dependent on the type of coal. The Ge values obtained by these in situ analyses appear to be qualitatively consistent with the presumption that all, if not most of the Ge, is organically bound. A search for inorganic mineral hosts for Ge was unsuccessful, but this was not exhaustive in view of the apparent reasonableness of results obtained from the in situ electron-probe analyses.

It is not possible at this time to determine the proportion of the vitrinite with the high Ge content relative to the coal with low Ge content. Bulk analysis of sample 98807 gave 91 ppm ± 15% Ge (or 0.009%) and, therefore, based on a carbon content of 2.3%, the average Ge content of both coal varieties should be about 0.40%, with a range between 0.33 and 0.45%. This appears to be reasonable in view of the fact that the electron-probe analyses for vitrinite averaged 0.35% and ranged between 0.18 and 0.52%. The other coal variety had a range of values from less than 0.11 to 0.38%.

The coal content in sample 98807 is less than for the sample studied by Farand and Puddington (1969) in their oil-phase agglomeration tests (10% coal). They also reported that "The composition of the ore varies considerably, but it would appear from data available that the carbonaceous material, whether massive or scattered throughout the sandstone matrix, comprises about 10% of the ore and contains up to 0.4 per cent germanium, although concentrations of about 0.06 per cent are more common."

The present samples were not identified as to their exact stratigraphic location, and neither was the relation described between channel samples taken at each individual sample site. For example, it is not known whether samples 98806, 98807, and 98808 represent different stratigraphic sections of the 52" thick "Brown Bed", and if so, which specific ones. Maybe this information is known to the company. On the other hand, if this deposit was considered for exploitation, while it is not likely that the mining width be less than a metre it may be important to know more precisely the stratigraphic distribution of the germanium concentration.

Without regard for the economics of extraction of germanium metal and marketability there are two potential problems for exploitation. This preliminary investigation has shown that some of the germanium is finely disseminated in the form of a coal variety that may be difficult to liberate from the host matrix and, even if liberated, may have a tendency to slime when using conventional mineral dressing techniques. The second potential problem, considered to be of lesser probability, requires that a more exhaustive study be made to confirm that all the germanium is organically bound.

The technical assistance of J.M. Beaulne, P. Carrière, R. Horton, J.H.G. Laflamme and E. Murray of MSL and L. Janke of ERL is gratefully acknowledged.

REFERENCE

Farand, J.R. and Puddington, I.E. "Oil-phase agglomeration of germanium-bearing vitrain coal in a shaly sandstone deposit"; Canadian Mining and Metallurgical Bulletin; 62:683:267-271; 1969.

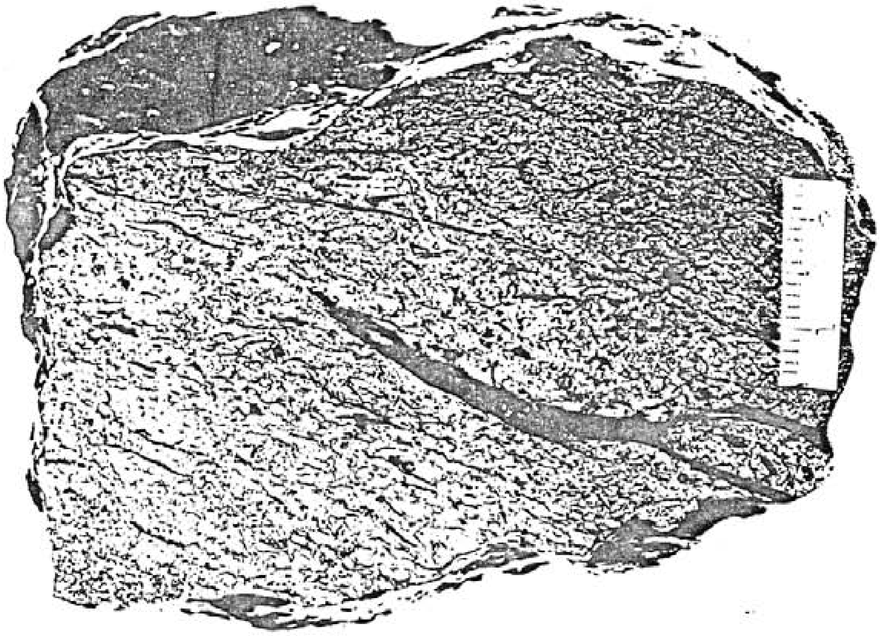

Figure 1. Photograph of polished piece of "Brown-bed" hand specimen from Area 1. The more continuous, and generally thicker coal seams are vitrinite. Scale = cm.

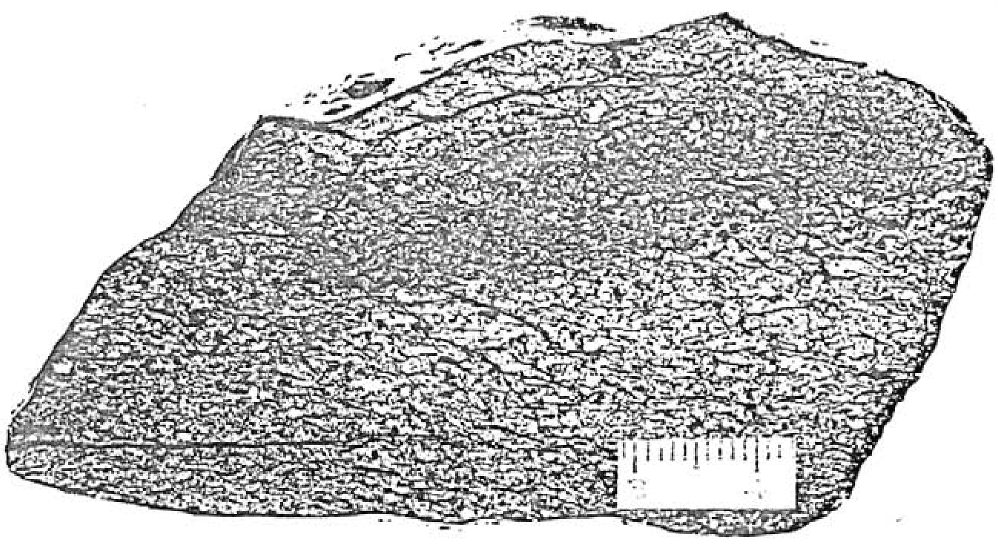

Figure 2. Another hand specimen from the same sample bag as in Figure 1. Scale = cm.

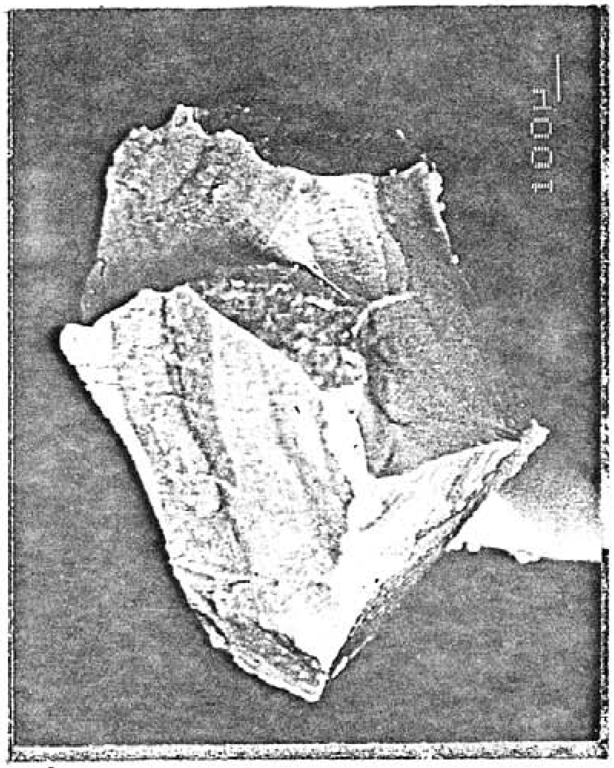

Figure 3. Fragment of easily liberated vitrinite showing conchoidal fracture. SEM micrograph.

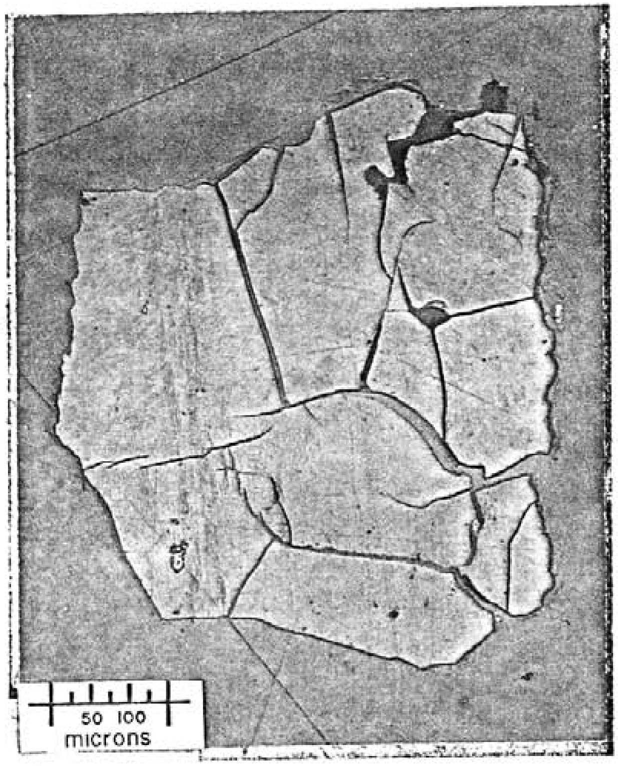

Figure 4. Photomicrograph of polished section and vitrinite free of mineral inclusions.

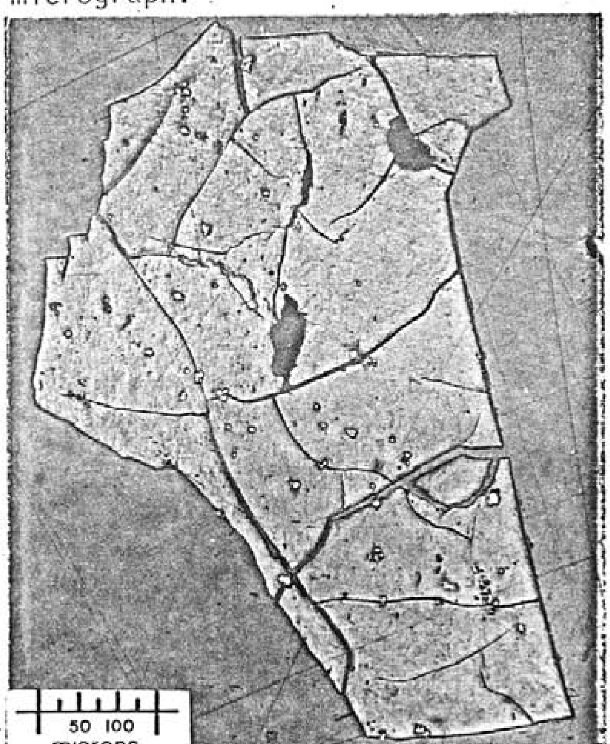

Figure 5. Photomicrograph of polished section of vitrinite with sparse pyrite inclusions.

Figure 6. Photomicrograph of polished section of vitrinite with most abundant pyrite inclusions encountered.

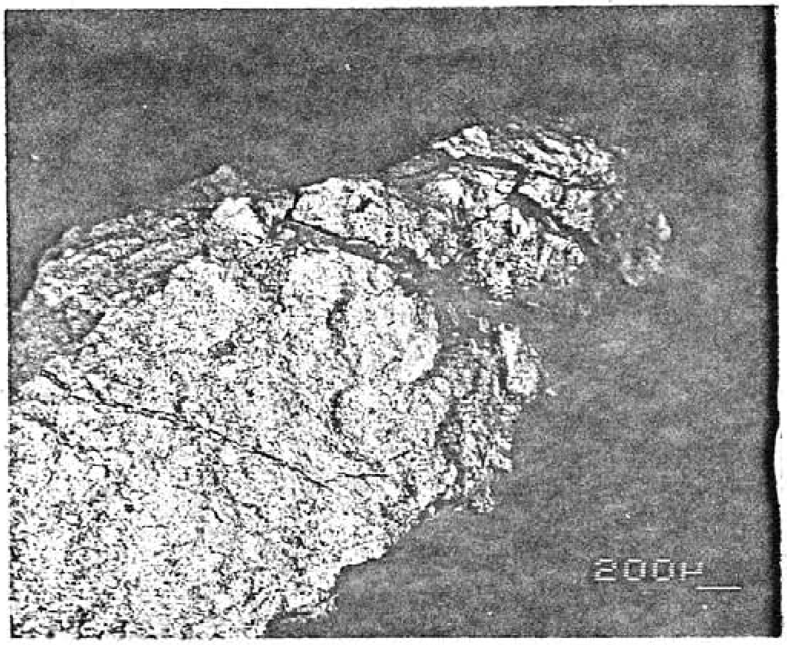

Figure 7. Sedimentary fragment with thin coal seams. SEM micrograph.

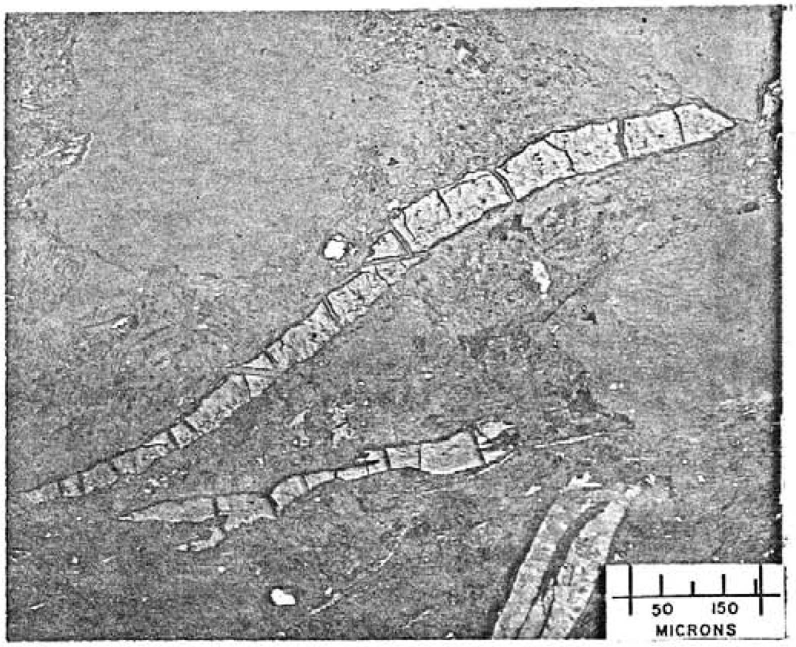

Figure 8. Photomicrograph of polished section showing thin coal seams and streaky lenses in clayey matrix.

RECEIVED ... 13 1982

EAGLE-PICHER INDUSTRIES, INC.

ELECTRO-OPTIC MATERIALS DEPARTMENT

P. O. Box 737
Quapaw, Oklahoma 74363

Phone 918-673-1650
TWX 910-840-3271

March 30, 1982

Fargo Oil Corporation
9th Floor
850 W. Hastings Street
Vancouver, B. C. VGC 1E1
Canada

ATTENTION: Mr. L. F. Farris

Dear Lauch:

We have completed our analyses of the vitrain sample you sent us, and the results are as follows:

Sample No.	1	2	98807	98808	98827
Ge content (ppm)	190	180	190	180	180
Ga content (ppm)	80	70	70	70	60

The Ge data were quite consistent with multiple analyses, and we feel confident of them. The Ga analyses were somewhat more erratic and did not duplicate themselves too well. Therefore, we are not as confident of the Ga results as we are the Ge.

We look forward to further sampling of your property and will be happy to run further analyses if it would be of any help to you. Attached is a copy of the E/MJ article we discussed.

Sincerely,

J. H. Adams
Plant Manager

JHA/cr

Enclosure

GERMANIUM

CLIMBING PRICES SHOW SIGNS OF LEVELING OFF BY YEAR END

J.H. Adams, vice president, Specialty Materials Div.
Eagle-Picher Industries Inc.

Germanium consumers began to feel more comfortable at the end of 1981, as producers indicated that supplies were loosening and that informal allocation systems were being relaxed. The two major causes of the supply increase were increases in germanium prices to levels that made recovery from low-grade residues economical and long-awaited production of germanium from residues of Jersey Miniere's Tennessee zinc smelter.

Production. Residues produced from mid-1979 to mid-1980 containing about 16 mt of germanium were shipped from the Jersey Miniere Zinc Co. (JMZ) smelter to Metallurgie Hoboken-Overpelt (MHO) of Belgium during the summer of 1981, and JMZ will continue to ship all subsequent residue production through mid-1982. Thereafter, the 40% share belonging to Union Miniere is expected to go to MHO. Disposition of Gulf + Western's 60% share of future JMZ residues is uncertain. JMZ announced its intention to open its Gordonsville mine early in 1982. The mine's germanium content is expected to be about the same as that of the Elmwood mine, and production is expected to be at about the same rate. Germanium residue output should, therefore, about double by mid-1982.

During 1981, Prayon, a Belgian zinc and chemical producer, stopped converting renierite concentrates from Zaire into germanium concentrates for MHO. This may signal the end of MHO's stockpile of renierite, held since Zaire stopped shipments to Belgium in 1975. Zaire resumed treatment of germanium-rich renierite ore in 1980 and continued production through 1981. Since this production remains in Zaire, no net increase in recovery from Zaire has yet resulted.

Germanium was produced during the year by Penarroya (France), Eagle-Picher (US), Metallurgie Hoboken-Overpelt (Belgium), Soc. Mineraria e Metallurgica di Pertusola (Italy), Bleiburger Bergwerks Union AG (Austria), Preussag (Germany), and by state-owned facilities in the USSR and the People's Republic of China. Pertusola concentrates were converted to oxide and marketed by Penarroya, its parent company. The KBI Div. of Cabot Corp. operated a secondary plant in the US. China became a major exporter of germanium during 1981, with most sales going to Japan. USSR exports dropped to near zero. World production remained at about the 100-mt level.

US supply. Although US germanium production remained unchanged during the year, US supplies were up sharply due to imports. Metal imports during the first 10 months of 1981 totaled about 12.2 mt, up from 2.3 mt in 1980. Most growth in imports was in optical blanks, scrap, and unrefined metal. Significant imports came from Belgium, the People's Republic of China, West Germany, and the UK.

Prices. Germanium prices continued their upward climb during the year but showed signs of stabilizing by year end (see table). Merchant activity continued, but merchant price premiums dropped from 25-35% to 5-20% at year end, reflecting the increase in producer supplies. Buying by investors, who recognized germanium as a strategic metal, slowed considerably during the year.

Germanium price changes during 1981

	Electronic-Grade Ge dioxide	Intrinsic Ge metal
Eagle-Picher:		
Start of 1981	$487.00	$ 784.00
2-27-81	575.00	923.00
12-4-81	660.00	1,060.00
Met. Hoboken-Overpelt:		
Start of 1981	BF13,100	BF22,275
4-1-81	18,350	31,200
9-1-81	23,350	38,900

BF = Belgian francs.

Consumption. Infrared optics applications continued to grow during 1981 and remained the largest market. Most military systems requiring germanium remained firm, in spite of high prices, with no suitable substitutes available. Use in IR intrusion alarms decreased due to higher prices, but net IR usage of germanium was up. The semiconductor and detector fields remained steady, with price increases expected to have little effect on these uses.

The use of germanium in polyester condensation catalysis continued strong during the year, with bottle applications growing and fibers off slightly. Consumption by phosphor makers remained good. Production of optical fibers containing germanium increased significantly during the year, although not quite as sharply as predicted. Fiber optics remained the fastest growing application, however, and optimism remained firm for this application in the future.

Research. Significant progress was made in detector crystal applications research. Interesting developments were also noted in work being done in the field of electro-optic crystals. Research continued in the fields of superconductors, medicine, and glasses.

Outlook. The future of germanium looks good, since few applications have been lost due to higher prices. Although there can be future market losses, the expected continued growth in the fields of infrared, fiber optics, and detectors should more than offset them. New supplies and more stable prices have forced many consumers to use their supplies more efficiently, and this has helped hold their total costs down and has helped keep germanium cost-effective.■

Author's Note: Last sentence should read: "New supplies and more stable prices should reassure consumers about future availability. High prices have forced many consumers to use their Ge supplies more efficiently, and this has helped hold their total Ge costs down and has helped keep Ge cost-effective." - JHA

REFERENCES

Gordon R. Hilchey, P.Eng. — Progress Report On The Taiga Mines Limited Property, Powell River Area, B.C. May 2, 1959

Dr. A. C. Skerl, ARSM, Ph.D., P.Eng. — Report On The Germanium Property of Taiga Mines Limited, Lang Creek, Powell River Area, British Columbia September 1, 1959

F. C. Buckland, P.Eng. President, Taiga Mines Ltd. — Germanium In British Columbia September 1959

C. Oliver Ingamells — Memorandum of Preliminary Observations and Subsampling Procedures at Lang Bay, British Columbia

ITEMIZED COST STATEMENT

1.	Professional Fees & Services				
	G. R. Hilchey,: P.Eng.	Meeting	2 hrs. @	$ 75.00	
		1 day in field (Aug.21)	@	500.00	
		1 day in field (Aug.27)	@	500.00	
		Preparation of Report	2 hrs. @	75.00	
					$ 1,300.00
	J. E. Labrecque,: P.Eng.	4 days in field - (Aug. 24-27)	@	275.00	
					1,100.00
2.	Equipment				
	Best Bulldozing	- D-7 Cat (Aug. 26)		$637.50	
		- Cat 235 (Aug. 27)		990.00	
	Rollins Machinery	- Rock Drill		284.00	
	Deakin Equipment	- Sample bags, ties, pick		49.98	
					1,961.48
3.	Food & Accommodation				1,054.52
4.	Transportation				
	Truck Rental (4 Days)			$654.86	
	Air B.C. (Aug. 21)			418.05	
	Powell Air (3 Tickets-Aug. 26, 27)			139.60	
	B.C. Ferries (Aug. 24, 27)			39.00	
	Car Rental (Aug. 21)			31.78	
	Gasoline			42.31	
	Taxi (Aug. 28)			4.50	
			1,330 X 20% =		266.02
5.	Mapwork				
	Drafting			180.00	
	Reproduction			5.89	
					$ 185.89
6.	Sample Preparation				
	Bacon, Donaldson & Associates Ltd.				$ 1,796.56

7.	Freight	
	- Shipment of samples to CANMET (Ottawa)	$ 149.78
8.	Mineralogical Analyses	$ 2,888.35
9.	Miscellaneous	
	- Map of Powell River	$ 1.50
		$10,704.10

SECTION A-A'
C.D.13
300'
200'
GLACIAL OVERBURDEN
ORE
SECTION B-B'
C.D.3
C.D.12
C.D.11
C.D.5
GLACIAL OVERBURDEN
ORE
RED BED
Glacial striae
wall of cut
Coal fragments in overburden
No sediments in place
LANG
CREEK
A'
A
B'
B
N
Ft. GeO2 gms/ton
6.0' 120
8.3' 180
7.0' 257
7.0' 167
5.5' 257
10° H.W.
C.D.19
C.D.13 (R9)
307'
ORE {248' 240' 4.7'/68gm
BASE 255'
C.D.18
260'
Arkose 1/4% coal
Shale floor
Shale and sandy shale
15°
12' with 5% coal
5' Arkose with
5' shale (1/4% coal) above
6' Arkose (1/2% coal) below
testing on granite
INSUFFICIENT EXPLORATION
240'
220'
200'
C.D.9 (R4)
311'
BASE 214'
BASE LINE 113°
Ft. GeO2 gms/ton
4.3' 180 + 2.5' 167
3.0' 193
4.0' 167
Ore exposed for 100'
4 - 6' thick 10% coal
15°
C.D.5
307'
ORE {244' 238'
BASE 235'
C.D.11 (R7)
312'
ORE {228' 226' 2'/139gm
BASE 214'
C.D.10 (R6)
310'
ORE {240' 236' 4.3'/48gm.
BASE 220'
180'
160'
C.D.12 (R5)
C.D.3 (R2)
315'
RED BED {172' 169' 3.3'/90gm
C.D.14 (R10)
318'
BASE 152'
WORK CARRIED OUT IN 1958-1959
200' Contour lines on base of ore bed
Wall of excavations
Elevations are in feet above sea level
Drill holes and base lines surveyed by G.R Hilchey P.Eng.
Assays in grams of GeO2 / ton
N.B. 0.01% Ge = 0.014% GeO2 = 90gms Ge / ton = 129gms GeO2 / ton
& Gross Value @ 35¢/gm Ge = $31.50/ton
LEGEND
AUGUST, 1981 SAMPLING
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
10,384
NO.
FARGO OIL CORPORATION
LANG BAY PROPERTY
1981 SAMPLING PROGRAM
SCALE IN FEET
50 0 50 100
SEPTEMBER, 1981