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PRELIMINARY GEOLOGICAL EXAMINATION

OF

PHOSPHATE HOLDINGS

FOR

WESTERN WARNER OILS LTD.

CALGARY, ALBERTA

Prepared By

F. A. Peel, P. Geol.

P660004

WESTERN WARNER OILS LTD.

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PHOSPHATE PROJECT

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August, 1966

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1. INTRODUCTION

In the past five years Canada has experienced a tremendous growth in the phosphate fertilizer industry. Existing fertilizer producers are expanding their plants and new ones are being built. In Western Canada the existing sulphur and natural gas needed in the production of phosphate fertilizer as well as a demand by prairie farmers has been a great stimuli. To date no significant production of phosphate rock is carried out in Canada and the increased quantities demanded by the fertilizer industry are supplied by phosphate mines of Montana and Florida. A commercial rock phosphate deposit in Western Canada would have no difficulty in finding a market.

In the summer of 1965, Western Warner Oils Limited acquired two phosphate permits in the vicinity of the Crowsnest Pass, consisting of 89,779 acres. In the spring of 1966, I was contacted by Mr. George Evans and asked to:

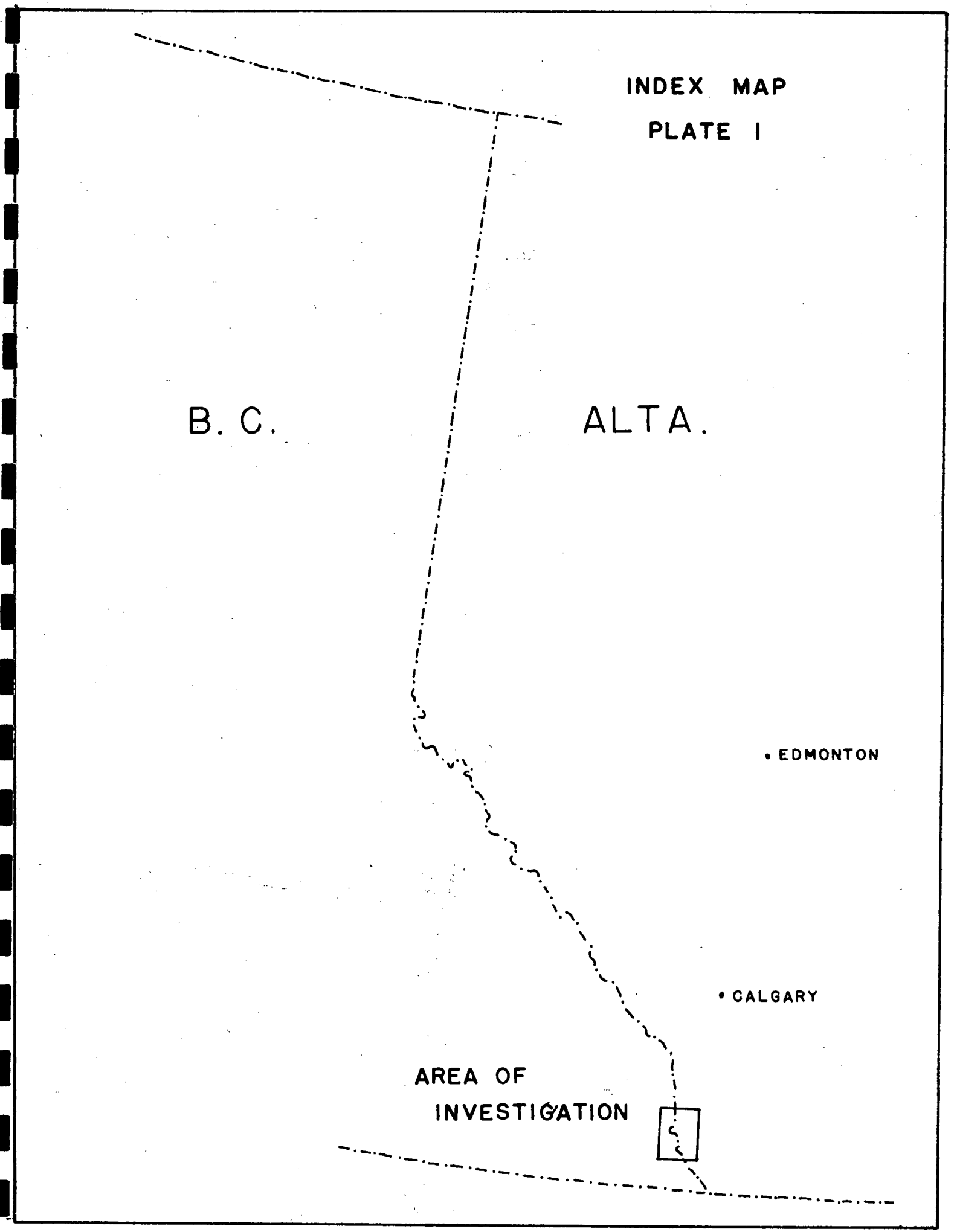
(a) carry out a preliminary geological examination of the permits and locate any occurrences of phosphate on these permits,

(b) determine if further work, such as detailed geological mapping, trenching, sampling and drilling

should be carried out to further evaluate the property,

(c) determine if other areas may be of interest in that they could yield an economic phosphate deposit.

The area investigated is shown on Plate I, and Map 1 shows the location of each traverse.


INDEX MAP
PLATE I
B. C.
ALTA.
• EDMONTON
• CALGARY
AREA OF
INVESTIGATION

2. DISCUSSION

(a) Location and Accessibility

Western Warner's phosphate permits are located near the Crowsnest Pass in southern Alberta. Permit No. 20, extends north of the Crowsnest Pass from Twp. 8 to Twp. 11, W5M., while Permit No. 21, extends south from Twp. 6, W5M., to Twp. 3, W5M. (Map 1.) Alberta No. 3, a paved all-weather highway and the Canadian Pacific Railway both pass through the Crowsnest area. Except for the more rugged areas along the Alberta-B.C. border, numerous forestry roads and seismic trails yield fair access into the area of the two permits.

Transportation, water, sulphur and natural gas may be readily acquired in this area and therefore make it more economically suitable.

(b) Methods of Field Investigation

Three weeks were spent in the field carrying out the geological examination. During the first week a helicopter was employed to speed up reconnaissance and to examine the less accessible areas. The final two weeks were spent

examining the remainder of the area by four-wheel drive jeep.

Sections were chosen on the basis of exposure and wherever possible phosphate units were traced laterally noting any changes of thickness and grade. An attempt was made to keep traverses within 3 or 4-miles of each other.

Phosphate rock was located by visual examination and the ammonium molybdate test was used as a check. Occurrences of phosphate were described and thicker units sampled. These samples were sent to Atlas Testing Laboratories in Edmonton and assayed for P_2O_5 content.

Traverses are shown on the accompanying map and a summary of the phosphate occurrences are included in this report.

(c) Geology

Although phosphate was known to exist in Western Canada as early as 1916 (Telfer, 1933) no deposit of commercial size has been located. Since the original discovery of phosphate in the Rocky Mountain Formation, near the town of Banff, many geological papers dealing with the Front Ranges of the Canadian Rockies have noted minor occurrences of phosphate. The most comprehensive report to date is that of Telfer (1933), in which he recognizes four

phosphate horizons: -

1. Near the base of the Mississippian (Upper Exshaw)
2. Near the top of the Rocky Mountain Formation (Permian)
3. At the base of the Fernie formation (Jurasaic)
4. Near the Middle of the Fernie formation (Jurasaic)

Phosphate has also been noted to occur in the Spray River Formation (Triassic).

The area under examination is composed of a series of northerly trending fault-blocks exposing beds from Cambrian to Cretaceous in age. Plate II, is a table showing the formations and their relationship to one another. In the area of Western Warner's Alberta permits rocks of Mississippian age are the most likely to contain deposits of phosphate and therefore the geological examination centered around the Exshaw formation. In British Columbia the Fernie formation is the most potential.

During the investigation of the Exshaw formation on Western Warner's Phosphate Permits it was found that in the vicinity of Deadman's Pass, two phosphate units were present. These two phosphatic units are separated by 11-feet of thin bedded cherty shales. At this point the lower less phosphatic unit is 1.5-feet thick, dark gray to

PLATE II

TABLE OF FORMATIONS

ERA	PERIOD	FORMATION
Cenozoic	Eocene and/or Oligocene	Kishenehn
	Paleocene	Porcupine Hills
Mesozoic	Paleocene and Upper Cretaceous	Willow Creek
	Upper Cretaceous	St. Mary River Bearpaw Belly River Wapiabi Cardium Black Stone
		Disconformity (?)
	Upper Cretaceous (?)	Crowsnest
		Intrusive Contact
	Lower Cretaceous	Blairmore
	Lower Cretaceous and Jurassic	Kootenay
	Jurassic	Fernie
		Disconformity
	Triassic	Spray River
		Unconformity
Palaeozoic	Penn. and Permian	Rocky Mountain
	Mississippian	Etherington Mount Head Livingstone Banff Exshaw
		Disconformity

PLATE II (cont'd)

TABLE OF FORMATION

ERA	PERIOD	FORMATION
	Devonian	Palliser
		Alexo
		Unconformity
		Fairholme
		Unconformity
	Cambrian	Elko
		Flathead

black, cherty and massive. Assays of samples were 8.7% and 6.9% P_2O_5.

The upper unit is 2.0-feet thick, dark gray to black, pelletal, siliceous in part, with a small amount of flourite present, and weathers to a rusty brown. A bluish white phosphate blume is nearly always present. The upper unit assayed 22.21% and 19.24% P_2O_5. Both units were traced for some distance north (from traverse #2 to traverse #3) and found to be fairly consistant in thickness and grade. Although at this point the grade tends to decrease slightly as shown by assays. The upper unit assayed 15.9% P_2O_5, while the lower unit assayed 4.52% P_2O_5.

North of traverse #3 at Race Horse Pass (traverse #4) there are thin, somewhat lenticular phosphatic units. Here it appears as though the two phosphate units seen to the south have shaled out.

To the north of Race Horse Pass only the upper phosphate unit is present and it has thinned to a few inches in thickness and has become lenticular. In the occasional outcrop it was found to be altogether absent.

On Crowsnest Mountain (traverse #14) the upper unit was found to be only a few inches in thickness and

although the lower unit was not found in outcrop samples of "float" indicate it to be of low grade and very nodular in texture.

Outcrops in the southern permit indicate the phosphate units have become very thin and lenticular. The major deposition seen to the north has become masked by shale deposition.

Fernie (Jurassic) does outcrop in a few places near the southern end of Permit No. 21, but only in a thin fault slice and no evidence of phosphate was found. (Traverse #15 and traverse #16).

In British Columbia all investigations were centered around the basal Fernie formation which is known to contain phosphate of fairly high grade and thickness. Thicknesses of this magnitude are generally due to repitition of the phosphate beds through faulting. (Telfer, 1933)

The Fernie formation, however, being for the most part a recessive shale, lies along the dip slopes and extends into the valley. In most cases it is covered by alluvium and talus varying from a few feet to many feet and good outcrops were not found. The Fernie-Spray River contact was walked at its outcrop through most of the area

under examination, and sporatic indications of phosphate were located.

In the Crowsnest Pass approximately 1-mile north of the Alberta Gas Trunk pumping station, about 9-feet of phosphate is seen outcroping in an old exploration trench. The phosphate rock is dark gray to black, pelletal, slightly silty and would run about 22% + P_2O_5. The weathered surfaces show the characteristic bluish white phosphate blume. Here at the Crow Mine, Telfer (1933) reports that repeating of the beds 4 or 5 times is not uncommon and reports widths up to twenty and thirty feet in the Crow Mine.

Phosphate was found on the dump at an old exploration adit about 6-miles south of McGillivary, (traverse #19). Assays were extremely encouraging in that they ran 29.9% and 35.6% P_2O_5.

In the area of Limestone Ridge, approximately six miles south of traverse #19, this same zone of phosphate was covered but small samples of pelletal phosphate were found in the "float rock" and assays ran 15% P_2O_5. The thickness of this phosphate unit was not determined but Price (1965) reports a minimum of 3-feet near the northern end of Limestone Ridge.

3. CONCLUSIONS

Of Western Warner's Alberta holdings the Exshaw "deposit" between Deadman's Pass and Racehorse Pass were the most encouraging seen during their preliminary investigation. At the present time this deposit of rock phosphate is marginal but should the price of phosphate increase there would be a possibility of economic exploitation.

The phosphate units investigated to the north of Racehorse Pass and south of Deadman's Pass are very thin and lenticular and of no economic importance.

Indications suggest Southeast B.C., as an extremely potential area for phosphate exploration. The thickness and grade of Basal Fernie phosphate tend to be variable and under the right conditions could easily yield an economic deposit.

Due to the close proximity of known phosphate deposits that are thick or of high grade quality the Basal Fernie in the areas of Leach Creek (Map 1) and Crowsnest (traverse #17 and #18, Map 1) appears promising. A more detailed investigation is warrented in these areas.

On account of the poor exposures, exploration would

entail trenching in order to open up the phosphate zone and determine exact thickness and grade. If encouraging,trenching should be followed up by diamond drilling to evaluate the phosphate at depth.

Current prices, F.O.B. producing point are $6.00 and $8.00 per ton for rock phosphate, from $48.00 to $60.00 for various triple super phosphate and $55.00 to $60.00 for phosphoric acid. Preliminary investigations indicate a substantial savings on freight rates from the Crowsnest Pass area to Calgary as compared with Montana to Calgary. The close proximity to abundant supplies of sulphur, natural gas, water and electrical power as well as railway and highway transportation facilities greatly enhance the potential of this area as a rock phosphate producer.

4. RECOMMENDATIONS

1. The area between Deadman's Pass and Racehorse Pass appears to be the most promising of the Alberta holdings and a more detailed study should be conducted.

2. The area at the headwaters of Leach Creek (Map 1) should be staked for Basal Fernie Phosphate. This would entail approximately 120 claims at a cost of about $2,000. Staking should be followed up by a trenching and diamond drilling program to determine actual grade, thickness and tonnage of mineable rock. Price (1965) has included a detailed areal geologic map of this area in Memoir 336.

3. The area south of and in the vicinity of the hamlet of Crowsnest should be acquired, if possible, under an Alberta Rock Phosphate Permit and a program of trenching undertaken.

Respectively submitted,

[redacted]

F. A. Peel, P. Geol.

A P P E N D I X

SUMMARY OF TRAVERSES

Traverse #1 - Exshaw

Phosphate zone covered by talus. Occasional piece of black pelletal silty phosphate rock found in talus (approximately 15% P_2O_5). Unable to predict thickness of phosphate zone.

Traverse #2 - Exshaw

Two phosphate units located near the top of the formation.

(a) The lower unit 1.5-feet is a black cherty phosphatic shale.

Assays: (a) P_2O_5 = 8.76%

(b) P_2O_5 = 6.79%

(b) The upper unit is 2.0-feet thick and separated from the lower one by 11-feet of black siliceous shale and is a black pelletal phosphatic rock with a bluish white phosphate. Fluorite is found in small quantities.

Assays: (a) P_2O_5 = 22.2%

(b) P_2O_5 = 19.24%

Traverse #3 - Exshaw

Two units seen at Traverse #2 are present.

(a) Lower unit 1.5-feet hard black siliceous phosphatic shale.

Assays: (a) P_2O_5 = 4.52% (1526)

Traverse #3 - Exshaw (cont'd)

(b) The upper unit separated from the lower by about 11.5-feet black siliceous shale is a black pelletal phosphatic rock as seen in Traverse #2.

Assays: (a) P_2O_5 = 15.90% (15.29)

Traverse #4 - Exshaw

Fifteen feet of black siliceous shale with four zones of lenticular black pelletal phosphatic rock were noted. The phosphate lenticules varied in thickness from 2" to 6" and assays showed the P_2O_5 content varying from 10.05% to 22.50%.

Traverse #5 - Exshaw

Black silicious shales sl. calcareous, sl. phosphatic.

No phosphate rock noted.

Traverse #6 - Exshaw

No phosphate unit noted. Black shales slightly phosphatic in part.

Traverse #7 - Exshaw

No phosphate noted.

Traverse #8 - Exshaw

Occasional 1" to 2" stringer of black oolitic phosphate.

Traverse #9 - Exshaw

1" to 2" unit of black oolitic phosphatic rock.

Traverse #10 - Exshaw

About 15' from base of unit a 3' zone of phosphatic shale but pelletal content very low, about 15% to 25% of shale.

Traverse #11 - Exshaw

No phosphate noted.

Traverse #12 - Exshaw

No phosphate noted.

Traverse #13 - Exshaw

No phosphate noted

Traverse #14 - Exshaw

The upper unit has thinned to a 2" to 3" and appears to be very lenticular. Lower unit was not seen in outcrop but "float" indiciated it to have become nodular.

Traverse #15 - Fernie

No phosphate noted.

Traverse #16 - Fernie

No phosphate noted.

Traverse #17 - Fernie

No phosphate noted due to heavy foliage.

Traverse #18 - Fernie

No phosphate noted.

Traverse #19 - Fernie

Old exploration adit. Two grab samples from the dump assayed 29.9% P_2O_5 and 35.6% P_2O_5.

Traverse #20 - Fernie

Small chips of dark gray to black pelletal phosphate rock found in talus. Assay - 15% P O . Thickness of phosphate rock unit could not be determined.

List of Assays

Sample No.	Traverse #	Formation	Represented	% P_2O_5
1506	#2	Exshaw	1.5	8.76%
1507	#2	Exshaw	1.5	6.79%
1504	#2	Exshaw	2.0	22.2%
1505	#2	Exshaw	2.0	19.24%
1526	#3	Exshaw	1.5	4.52%
1529	#3	Exshaw	2.0	15.90%
1532	#4	Exshaw	0.5	20.90%
1533	#4	Exshaw	0.5	22.50%
1534	#4	Exshaw	0.4	10.50%
1535	#19	Basal Fernie	Grab Sample	29.9%
1536	#19	Basal Fernie	Grab Sample	35.6%
1531	#20	Basal Fernie	Grab Sample	14.13%

Plate III - Exshaw Outcrop in Deadman Pass

Plate IV - Fernie outcrop in area of Proposed Staking

BIBLIOGRAPHY

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British Columbia and Alberta, Geol.
Sur. of Can. Mem. 336

Telfer, L. 1933, The Canadian Institute of Mining and Metallurgy,

Trans., Vol. 36

CERTIFICATE

This is to certify that I, Frederick A. Peel: -

1. Am a resident of Calgary, Alberta, and live at [redacted]

2. Am a graduate of Colorado College, Colorado Springs, Colorado, B. Sc. in 1961 with one year of graduate studies at Stanford University, California.

3. Am a member of the Association of Professional Engineers of Alberta.

4. Have no interest either direct or indirect in the properties or securities of Western Warner Oils Ltd., nor do I expect to have any other than that which I may purchase on the open market.

5. Have written this report on a personal examination of the area and assistance of those reports included in the Bibliography.

[redacted]

F. A. Peel, P. Geol.

LEGEND

Exshaw fm.

Basal Fernie fm.

Areas not included in permit

Areas to be retained

9 8 7 6 5 4 3 2 1 14 17 19 18 10 11 12 15 13 16 20

Northpork Pass

Racehorse Pass

Deadman Pass

Crow Mine

Crowsnest

Coleman

Blairmore

Area should be acquired under a Phosphate Permit

AREA OF PROPOSED FERNIE STAKING

Fernie

Dutch Creek

Oldman River

Racehorse Creek

Michel Creek

Gold Creek

Carbondale River

Castle River

Elk River

Leach Creek

Flathead River

Lodgepole Creek

T. 11

T. 10

T. 9

T. 8

T. 7 R. 2

T. 6

T. 5

T. 4

22°

MAGNETIC DECLINATION

CROWSNEST PASS AREA

WESTERN WARNER OILS LTD.

SCALE 1: 260,000

Miles 4 3 2 1 0 4 8 12 Miles

MAP 1

F. A. PEEL Aug. 1966

19660004

Rock Phosphate Prospecting Permit No. 21 was issued September 29, 1965 to Western Warner Oils Ltd., Calgary. The permit was cancelled without any lease(s) being selected no report was submitted.

(Some information on Permit 21 can be found in the report submitted for Permit 20, ie. "Preliminary Geological Examination" by F.A.Peel)

19660004

SCALE 0 1 2 MILES

ROCK PHOSPHATE PROSPECTING PERMIT NO. 20

82 G/10

WESTERN WARNER OILS LTD.,
215A – 10th. STREET N.W.,
CALGARY, ALBERTA

DATE OF ISSUE – AUGUST 30, 1965
AREA – 30,249 ACRES
■ – NOT IN PERMIT

BOUNDARY

COLUMBIA

BRITISH

ALBERTA

TP. 11

TP. 10

TP. 9

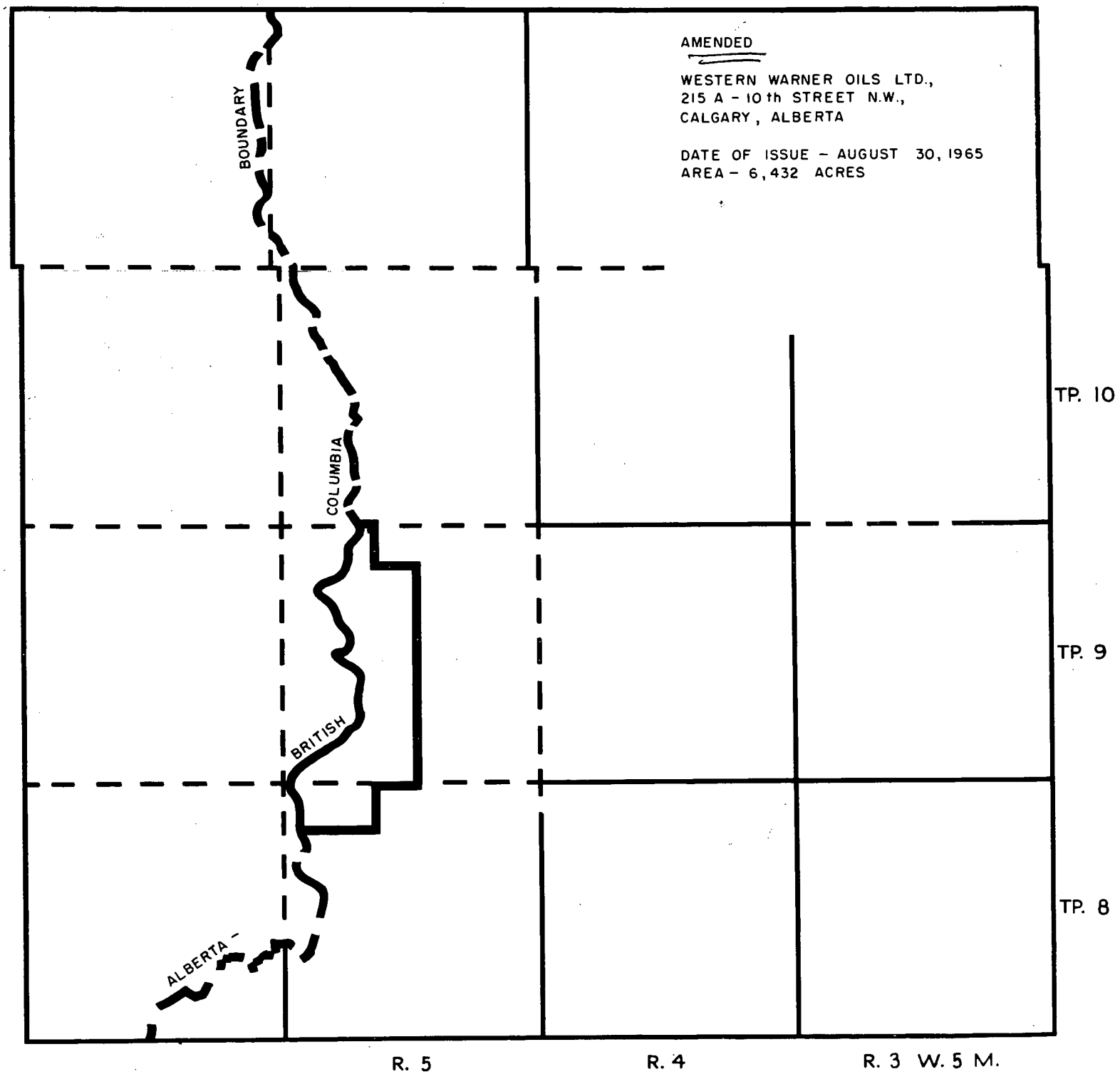
TP. 8

R. 5

R. 4

R. 3 W. 5 M.

ROCK PHOSPHATE PROSPECTING PERMIT NO. 20 (Amended)



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ROCK PHOSPHATE PROSPECTING PERMIT NO. 21