

Record
Report # 113

MR12-5

#1

¹²
January 14th, 1912.

Mr. M. M. Gilchrist,
Cheyenne, Wyo.

Dear Sir:-

In accordance with your instructions of recent date, I herewith submit my report upon lands lying in Township 1 South, Range 1 East of the Wind River Meridian.

As in your instructions to me you stated, only, that you thought of purchasing, without naming the price asked, I have herein recommended their purchase at \$500.00 per acre.

~~Yours~~ very respectfully,

State Geologist,

O I L L A N D S I N T H E
W I N D R I V E R I N D I A N R E S E R V A T I O N .

G E N E R A L D E S C R I P T I O N .

The lands discussed in this report lie along the crest and eastern flank of the Shoshoni anticline, in the Wind River Indian Reservation, about seven miles north of Lander, the county seat of Fremont county, and the western terminus of the Chicago & Northwestern Railway. The lands are readily reached from Lander by team or automobile, over good roads, the distance by road being about ten miles. (Figure 1).

The altitude at Lander, as determined by the United States Geological Survey, is 5,545 feet, while at the Washakie Oil Spring near these lands, it is 5,410 feet, as determined by aneroid barometer.

The property consisting of 1,000 acres,
described as

the west half of section 24; the west
half and the southeast quarter of section
25; the northwest quarter of section 36;
the northeast quarter of the southeast
quarter of section 23; Township 1 south
of the Fort Washakie base line, Range 1
east of the Wind River Meridian,

is held under lease secured from the Shoshone and
Arapahoe Indian Council, subject to the rules and
regulations of the Department of the Interior. The
terms of the lease, briefly stated, are as follows:

The lease runs for a period of ten years, about
two months of which have expired, and if the conduct
of the company and the work performed are satisfactory

may be renewed at the end of that time. Until the lands become productive rentals are paid as follows; fifteen cents per acre during the first year; forty cents per acre during the second year; seventy-five cents per acre during the third and succeeding years. When the lands become productive a royalty of twelve and one-half per cent is paid and no further rental is required.

GEOLOGY.

The oldest rock exposed on this lease are shales and sandstones of the Fort Benton formation, Cretaceous age, which occupy the crest and flanks of the Shoshone anticline. South of the southern border of this lease, some two miles, sandstones of the Dakota and Lower Cretaceous formation appear, the latter being the oil sandstone of this region. As the crest of the anticline is followed farther south the clays and shales of the Morrison formation and the sandstones and limestones of the Sundance formation, both of Jurassic age, are exposed, while in the extreme southern portion of the district the Chugwater red beds of the Triassic system appear, underlying the Jurassic beds. (Figure 2).

West of the lands included in this lease is an area occupied by sandstones and shales of the Wind River formation, Tertiary age. These beds, however, are of no economical importance in this region.

Sections of the Fort Benton and the Dakota and Lower Cretaceous formations, which are of principal importance in this district are given below:

Fort Benton Formation.

Yellow sandstone, very fossiliferous	68	feet.	
Gray, fine-grained sandstone	417	"	} 923
Brown sandstone	4	"	
Gray sandstone	409	"	} 812
Dark, carbonaceous shale, with 6 feet of impure coal	18	"	
Gray sandstone	75	"	} Nebraska
Shaly limestone	5	"	
Soft, gray shale	50	"	} Frontier 176'
Gray limestone	9	"	
Gray sandstone	143	"	} many
Buff sandstone	32	"	
Hard bluish-gray shale with several thin sandstone beds	425	"	
Soft, gray shale	198	"	
Total -----	1853	feet.	

Not correct these are interstratified ss + shales

Dakota and Lower Cretaceous Formations.

Gray and brown, massive sandstone	51 feet.
Soft, dark gray shale	97 "
Soft yellow sandstone	2 "
Soft, gray sandy shale	26 "
Buff sandstone	38 "
Dark carbonaceous shale	23 "
Soft gray and yellow sandstone and dark shale	29 "
Concealed, probably shale	31 "
Dark gray shale	100 "
Coarse-grained gray sandstone, the oil sandstone	<u>22 "</u>
Total -----	419 feet.

OIL.

The exact date of the discovery of oil in this region is not known, but the existence of oil, as indicated by the Washakie Oil Spring, has been, without doubt, known for many years.

In 1908 the Lander Oil Syndicate Inc., secured a lease of 100 acres, including the Wash-akie Oil Spring, and in 1909 a well was drilled. A large flow of oil accompanied by gas was obtained, June 1909, at a depth of 250 feet. The initial flow of this well is reported to have been 240 barrels per day. The well was immediately capped and except for short periods, has remained so to the present time. Small quantities of this oil, in all probably 1000 barrels, have been sold to local consumers at \$1.00 per barrel at the well, while the management informed me that the Salt Lake Refining Company offered \$2.50 per barrel, delivered at the refinery. In the summer of 1911

The well was opened and it was found that the oil bearing stratum was badly choked with paraffin. The well was pumped and is reported to have yielded 40 barrels of oil per day. This well has not reached the oil sand, the bottom of the well being in Fort Benton Shales. The oil obtained in this well has probably seep^{ed} upward through a fracture caused by faulting and has formed a pool in the shale.

As to the origin of the oil obtained in this field there is some doubt, but it is probable that it is the result of the decomposition of the remains of fish, which abounded in the Fort Benton sea, as indicated by the numerous fish scales found in the shales of the Fort Benton formation.

Ho Ho! and then suggested downward to the Brown Cr. as stated p. 4 this report?

Yield of Oil.

As no wells have yet penetrated the oil-bearing sandstone there are no data available on which to base an opinion as to the probable yield per well. The coarse-grained sandstone and conglomerate at the base of the Lower Cretaceous formation, which is believed to form the reservoir in which the oil has accumulated has an average thickness of twenty-five feet. Assuming that the interstitial space in this sandstone occupies only fifteen per cent of the whole, one acre of oil saturated sandstone would contain 25,000 barrels of oil. As one well will ordinarily drain about one acre, the production per well based on the above figures should be about 25,000 barrels. However, it should be borne in mind that the above is a mere guess. Some of the wells may far exceed this figure.

But this oil originates in the Bunter shales above this horizon as per previous page.

Quality of the Oil.

The oil in the Washakie Oil Spring and that obtained in the well of the Lander Oil Syndicate is a high grade illuminant of paraffin base.

The analyses quoted below will give an idea of the products which may be obtained upon refining:

(From U. S. G. S. Bulletin 452)

Gasoline %	Kerosene %	Residum %
14.5	42.7	42.8

Specific gravity crude oil 0.8121 (42.4°B.)
Color, green.

(By Wells Oil Refining Process Co., Columbus, Ohio)

"The 5-% unit samples are just as received from the condenser, having had no treatment. The commercial samples are finished and ready for the market. The records of all are as follows:-

No.	1.	5-%	70.0	Be.	No.	11.	5-%	39.3	Be.
"	2.	"	65.3	"	"	12.	"	38.3	"
"	3.	"	61.3	"	"	13.	"	37.0	"
"	4.	"	57.6	"	"	14.	"	35.9	"
"	5.	"	54.3	"	"	15.	"	34.3	"
"	6.	"	51.0	"	"	16.	"	32.4	"
"	7.	"	47.6	"	"	17.	"	30.5	"
"	8.	"	44.9	"	"	18.	"	28.3	"
"	9.	"	42.3	"	"	19.	"	25.6	"
"	10.	"	40.5	"	"	20.	4-%	23.1	"
					"	21.	1-%	Asphalt.	

- Commercial Samples -

A. Gasoline	19-%	64.0	Be.				
B. Naptha	5 "	54.7	"				
C. Kerosene	14 "	42.3	"				
D. Spindle Oil	15 "	35.3	"	300-flash	150-fire	Viscosity.	
E. Engine Oil	12½ "	29.7	"	370 "	355 "	55 @	70
F. Cylinder Oil	10 "	27.3	"	470 "	440 "	165 "	70
G. Automobile Oil	22½ "	28.4	"	405 "	550 "	97 "	212
					475 "	342 "	70
					74 "	74 "	212

"No allowance has been made for the small loss in treatment, or the amount of wax that may have been extracted."

The oil from this field is of somewhat higher grade than that obtained in the Salt Creek field north of Casper. The following analysis of the Salt Creek oil is taken from U. S. G. S. Bulletin 452, being the highest grade of Salt Creek oil therein mentioned:

Gasoline %	Kerosene %	Residuum %
16.4	29.8	53.8
Sp. Gr. crude oil	0.8221 (40.3°B.).	

Value of Oil.

As has been previously stated the oil obtained in the well of the Lander Oil Syndicate has been sold at \$1.00 per barrel at the well, while the Salt Lake Refining Company made a bid of \$2.50 per barrel at the refinery. The crude oil was tested

in gasoline engines at the power plant of the Town of Riverton and was reported to be satisfactory in every way. W. J. Melson of Lander operated, for a short time, a small refinery, using the crude oil from this field. His gasoline and kerosene found a ready market in and near Lander, where it is reported that the Melson products were much superior to the imported oils.

The commercial oils obtained on refining, as reported by the Wells Refining Company, are here repeated with the number of gallons per barrel and the wholesale price per gallon in Cheyenne:

	Per Cent	Gallons per barrel crude	Value per gallon	Value per bbl. crude
Gasoline	19	8.0	14¢	\$1.12
Naphtha	5	2.1	15¢	.31
Kerosene	16	6.7	10¢	.67
Spindle Oil	15	6.3	275¢	17.32
Engine Oil	12½	5.2	51¢ (average)	2.65
Cylinder Oil	20	4.2	41¢ (average)	1.72
Automobile Oil	22½	9.5	51¢ (average)	4.84
Total		42.0		\$28.63

While the automobile industry is providing a large and increasing market for gasoline it seems probable that on account of the larger market for fuel oil it would be better to refine this oil in such a way as to produce about 20 per cent gasoline and kerosene, 55 per cent oil suitable for fuel, and 25 per cent lubricating oils, the value of which would be \$1.09, \$0.41 and \$4.83, a total, per barrel of crude oil, of \$6.33.

Good Ref.!
Increase the fuel oil at the expense of higher priced products.

Transportation Facilities.

A four-inch pipe line has recently been laid from the Lander Oil Syndicate's well to the railroad, a distance of six miles. This line passes over a portion of the lands under discussion, where it is equipped with two-inch connections at intervals of 500 feet. At the railroad terminal of the pipe line a spur track has been laid, and as the Popo Agie River is but a few hundred feet distant, this would be a favorable point for a refinery.

Conclusions.

The prospective value of the lands in question is a matter of opinion. However, the existence of oil in springs and wells near these lands and the favorable geological structure, lead to the conclusion that oil will be obtained in wells drilled upon this

tract, at depths ranging from 800 to 3000 feet.

(Figure 3).

I would place the prospective value of these lands at between \$2,000 and \$3,000 per acre. I recommend their purchase at \$500 per acre.

of a lease only
Respectfully submitted,

State Geologist,

C. E. JAMISON
STATE GEOLOGIST AND
EX-OFFICIO DIRECTOR OF MINES

The State of Wyoming
Office of State Geologist
Cheyenne

MR 12-5
#2

January 18th, 1912.

Mr. M. N. Gilchrist,
Cheyenne, Wyo.

Dear Sir:-

In accordance with your instructions of recent date, I herewith submit my report upon certain oil lands lying in the Wind River Indian Reservation, Fremont county, Wyoming.

Very respectfully,

State Geologist,

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O I L L A N D S I N T H E
W I N D R I V E R I N D I A N R E S E R V A T I O N .

G E N E R A L D E S C R I P T I O N .

The lands discussed in this report lie along the crest and eastern flank of the Shoshoni anticline, in the Wind River Indian Reservation, about seven miles north of Lander, the county seat of Fremont county, and the western terminus of the Chicago & Northwestern Railway. The lands are readily reached from Lander by team or automobile, over good roads, the distance by road being about ten miles. (Figure 1).

The altitude at Lander as determined by the United States Geological Survey, is 5,345 feet, while at the Washakie Oil Spring near these lands, it is 5,410 feet, as determined by aneroid barometer.

The property, consisting of 1,520 acres,
described as

the southwest quarter of section 6, Town-
ship 1 south, Range 1 east of the Wind
River Meridian; the west half of section
30; the south half of the southwest quarter
of section 19; Township 1 south, Range 2
east of the Wind River Meridian; the west
half of section 18; the northwest quarter
of section 19 and the west half of the south-
west quarter of section 19, all in Township
2 south, Range 2 east of the Wind River Mer-
idian; the south half of the southeast
quarter of section 1; the south half of the
northeast quarter of section 12, and the

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north half of the southeast quarter of
section 12, all in Township 2 south, Range
1 east of the Wind River Meridian,

is held under lease secured from the Shoshone and
Arapahoe Indian Council, subject to the rules and
regulations of the Department of the Interior. The
terms of the lease, briefly stated are as follows:

The lease runs for a period of ten years,
less than one week of which has expired.
If the conduct of the lessee, and the work
performed are satisfactory, the lease may
be renewed at the end of that time. Until
the lands become productive rentals are
paid as follows: fifteen cents per acre
during the first year; forty cents per
acre during the second year; seventy-
five cents per acre during the third and

succeeding years. When the lands become productive a royalty of twelve and one-half per cent is paid and no further rental is required.

GEOLOGY.

The oldest rocks exposed on these lands are the red shales and sandstones of the Chugwater formation. These beds, of Triassic age, occupy the crest of the anticline in the southwest quarter of section 6, Township 1 south, Range 1 east, and in a portion of the southwest quarter of section 18, Township 2 south, Range 2 east. (Figure 2).

Underlying the Chugwater beds, although not exposed on the lands under discussion, are limestones and shaly sandstones of the Embar formation, Upper Carboniferous age. Excellent exposures of the rocks of this formation are afforded in the canyons of Pope

Agie, North Fork and Little Wind Rivers on the eastern flank of the Wind River Mountains. The shaly sandstones of the Embar formation form the oil sands of the Dallas field, yielding fuel oil of asphaltum base. These sands will, no doubt be encountered in wells drilled on section 6, Township 1 south, Range 1 east and on section 18, Township 2 south, Range 2 east. (Figure 3).

Overlying the Chugwater beds are limestones, shales and sandstones of the Sundance and Morrison formations, both of Jurassic age.

Next above the Jurassic rocks is a series of sandstones and shales, with coarse grained sandstone or conglomerate at the base. These rocks, of Lower Cretaceous age, are capped with from 45 to 60 feet of massive sandstone, the Dakota formation. The

coarse grained sandstone at the base of the Lower Cretaceous is believed to form the reservoir in which the high grade illuminating oil of this region has accumulated. A section of the Dakota and Lower Cretaceous formations is given below:

Dakota and Lower Cretaceous Formations.

Gray and brown, massive sandstone	51 feet.
Soft, dark gray shale	97 "
Soft yellow sandstone	2 "
Soft, gray sandy shale	26 "
Buff sandstone	38 "
Dark carbonaceous shale	23 "
Soft gray and yellow sandstone and dark shale	29 "
Concealed, probably shale	131 "
Dark gray shale	100 "
Coarse-grained gray sandstone, the oil sandstone	<u>22 "</u>
Total -----	419 feet.

Overlying the Dakota sandstone are shales and sandstones of the Mancos group, including the

Fort Benton, Biobrara and Pierre formations. A section of the Fort Benton formation, which is the only member of the Mancos group exposed on these lands, is given below:

Fort Benton Formation.

Yellow sandstone, very fossiliferous	68	feet.
Gray, fine-grained sandstone	417	"
Brown sandstone	4	"
Gray sandstone	409	"
Dark, carbonaceous shale, with 6 feet of impure coal	18	"
Gray sandstone	75	"
Shaly limestone	5	"
Soft, gray shale	50	"
Gray limestone	9	"
Gray sandstone	143	"
Buff sandstone	32	"
Hard bluish-gray shale with several thin sandstone beds	425	"
Soft, gray shale	198	"
Total -----	1853	feet.

The structural features of this region include the monocline which forms the eastern flank of the Wind River Mountains, the syncline forming the Lander valley, and the Shoshone anticline. The anticlinal theory of the accumulation of oil is applicable to this region, the oil having accumulated along the flanks and crest of the Shoshone anticline.

OIL.

The existence of oil in the Lander district has been known since early in the nineteenth century, Capt. Bonneville having visited the "Tar Springs" in the Dallas oil field in 1833. No work was carried on until 1880, when during the period extending from 1880 to 1885 three wells were drilled in the Dallas field, but, on account of distance from transportation, little further development was attempted until 1906.

when the Chicago & Northwestern Railway was completed to Lander. The Wind River Indian Reservation was opened and leasing of lands permitted in 1906, since which time operations have been more actively conducted.

In 1908 a party of Los Angeles investors secured control of a lease on the Reservation, and in June 1909 completed the first well. This lease is now held by the same men under the corporate names of Lander Oil Syndicate, Inc., Pioneer Oil Company, and Wyoming Oil Company. The well above mentioned, owned by the Lander Oil Syndicate, was brought in, June 1909, at a depth of 252 feet, the initial flow, as reported by the manager of the Syndicate, being 240 barrels per day. The well was immediately capped, and, except for short periods, has remained so to the present time. Small quantities of the oil obtained from this well, in all probably 1000 barrels, have

been sold to local consumers at \$1.00 per barrel at the well. In the summer of 1911 the well was opened and was found to be badly choked with paraffin. The well was pumped for several weeks and is reported to have yielded 40 barrels of oil per day. This well has not reached the oil sand, the bottom of the well being in Fort Benton shales. The oil obtained has probably seeped upward through a fracture caused by faulting, and has formed a pool in the shale.

The Pioneer Oil Company has drilled one well to a depth of about 1300 feet on Section 12, Township 2 South, Range 1 East. At 1250 feet a showing of oil was reported, while I am informed by a member of the company that at the present time the gas encountered in this well may be ignited at the collar of the well with a match. This well will probably enter the oil sand within the next 200 feet.

The Wyoming Oil Company is drilling on Section 1, Township 2 South, Range 1 East; the Wind River Oil, Coal & Gas Company on Section 26, Township 1 South, Range 1 East; The Lander Oil Syndicate, Inc., on Section 26, Township 1 South, Range 1 East; the Shoshone Oil & Gas Company on Section 24, Township 2 South, Range 1 East; the Texas Oil Company on Section 20, Township 2 South, Range 2 East.

George Mitchell of California drilled a well in Section 19, Township 2 South, Range 2 East, to a depth of 800 feet, when, on account of losing a string of tools in the hole, the well was abandoned. Across the Popo Agie river and about one-fourth mile from the holdings of the Texas Oil Company, a well was drilled some years ago, in which the oil sand was encountered at a depth of 1560 feet. The well was continued to 1860 feet where water was struck.

This well, which is located about 1000 feet east of the axis of the anticline, is now flowing three barrels of oil and 50 barrels of water per day.

In the fall of 1908 J. C. Underwood of California began drilling on the south half of the northeast quarter of Section 26, Township 1 South, Range 1 East, but after drilling some 400 feet the hole became crooked and was abandoned. In 1909 a new well was started, but for reasons unknown drilling was soon abandoned. In 1910 a third well was started and drilling was continued to about 600 feet, when on account of a disagreement with the original lessee, from whom Mr. Underwood had a sub-leased on a royalty basis, work was discontinued, since which time no further work has been carried on. This well is located on a portion of the lands under discussion and is reported to be in good shape for further drilling.

YIELD OF OIL.

There are three oil sands in this region, the upper and lower Dallas sands, which yield fuel oil of asphaltum base, 24°B., and the illuminating oil sand, yielding a high-grade illuminant of paraffin base, 42°B. Forty or more wells have been drilled in the Dallas field, nine miles southeast of Lander, and oil obtained in most of them, although the field is small. The yield of fifteen wells which are pumped is reported by Col. E. H. Power, president of the Wyopo Oil Company, to be 1200 barrels per day, though the yield is reported by others to be as little as 350 barrels. Reports as to the average yield per well vary greatly, ranging from 20 to 90 barrels per day. The wells drilled in 1885 are yet producing, although they have been flowing or have been pumped during a large portion of the time which has elapsed since their completion.

Assuming that these wells have been productive but one-half the time since 1885, and that the average yield is but five barrels per day, the total yield to date would be 32,000 barrels per well. Assuming that one well will drain one acre, a rather large figure, the yield of fuel oil per acre would be in excess of 30,000 barrels.

As no wells have yet penetrated the sandstone which forms the reservoir for the illuminating oil there are no data available on which to base an opinion as to the probable yield per well. The coarse-grained sandstone and conglomerate at the base of the Lower Cretaceous formation, which is believed to form the reservoir in which the oil has accumulated, has an average thickness of twenty-five feet. Assuming that the interstitial space in this sandstone occupies but fifteen per cent of the whole, one acre of oil saturated sandstone would contain 25,000 barrels of oil. As

one well will ordinarily not drain more than one acre, the production per well based on the above figures should be somewhat more than 25,000 barrels. However, it should be borne in mind that the above is a mere guess. Some of the wells may far exceed this figure.

QUALITY OF OIL.

The oil in the Washakie Oil Spring and that obtained in the well of the Lander Oil Syndicate, is a high-grade illuminant of paraffin base.

The analyses quoted below will convey an idea of the products which may be obtained upon refining this oil:

(From U. S. G. S. Bulletin 452)

Gasoline %	Kerosene %	Residuum %
14.5	42.7	42.8

Specific gravity crude oil 0.8121 (42.4°B.)
Color, green.

(By Wells Oil Refining Process Co., Columbus, Ohio)

"The 5-%unit samples are just as received from the condenser, having had no treatment. The commercial samples are finished and ready for the market. The records of all are as follows:-

No.	1.	5 %	70.0	Be.	No.	11.	5 %	39.3	Be.
	2.	5	65.3			12.	5	38.3	
	3.	5	61.3			13.	5	37.0	
	4.	5	57.6			14.	5	35.9	
	5.	5	54.3			15.	5	34.3	
	6.	5	51.0			16.	5	32.4	
	7.	5	47.6			17.	5	30.5	
	8.	5	44.9			18.	5	28.3	
	9.	5	42.3			19.	5	25.6	
	10.	5	40.5			20.	4	23.1	
					No.	21.	1 %		Asphalt.

Commercial Samples.

A. Gasoline	19 %	64.0	Be.				
B. Naptha	5	54.7					
C. Kerosene	16	42.3					
D. Spindle Oil	15	35.3		300 flash	150 fire	Viscosity.	
E. Engine Oil	12½	29.7		370	355	55	◎ 70
F. Cylinder Oil	10	27.3		470	440	165	◎ 70
G. Automobile Oil	22½	28.4		405	550	97	◎ 212
					475	342	◎ 70
					74	74	◎ 212

"No allowance has been made for the small loss in treatment, or the amount of wax that may have been extracted"

The asphaltum base oil produced in this district is a heavy, dark-brown oil, specific gravity 22.2° to 25.5° Beaume. Analyses of this oil show it to contain two per cent gasoline and from 20 to 24 per cent kerosene, and to be suitable for use as fuel without refining. At the present time it is used on some of the locomotives of the Chicago & Northwestern Railway and in the power plants at Casper and at Lander.

VALUE OF OIL.

As has been previously stated the oil obtained in the well of the Lander Oil Syndicate has been sold at \$1.00 per barrel at the well, while the Salt Lake Refining Company made a bid of \$2.50 per barrel at the refinery. The crude oil was tested in gasoline engines at the power plant of the Town of Riverton and was reported to be satisfactory in every way. W. J. Melson of Lander operated, for a short time, a small refinery, using the crude oil from

oil it would be better to refine this oil in such a way as to produce about 20 per cent gasoline and kerosene, 55 per cent oil suitable for fuel, and 25 per cent lubricating oils, the value of which would be \$1.09, \$0.41 and \$4.83, a total, per barrel of crude oil, of \$6.33.

The fuel oil now used on the Chicago & Northwestern Railway brings a price of 65 cents per barrel at the loading station.

MARKET.

I have recently been informed by Mr. Davidson, Engineer of Tests for the Chicago & Northwestern Railway, that his road is at the present time in condition to use 1,600 barrels of fuel oil per day, while, if assured of production, all engines owned by the Chicago & Northwestern west of the Missouri River would be equipped with oil burners. Conditions on the Burlington and Union Pacific railways are much the same as on the Northwestern.

TRANSPORTATION FACILITIES.

A four-inch pipe line has recently been laid from the Lander Oil Syndicate's well to the railroad, a distance of six miles. This line passes over a portion of the lands under discussion, where it is equipped with two-inch connections at intervals of 500 feet. At the railroad terminal of the pipe line a spur track has been laid, and as the Pope Agie River is but a few hundred feet distant, this would be a favorable point for a refinery.

COST OF DRILLING AND SUPPLIES.

Drilling may be contracted at the following figures, the contractor furnishing portable drilling rig and all supplies exclusive of casing:- first one thousand feet at \$2.00 per foot; next five hundred feet at \$2.50; next five hundred feet at \$3.00 per foot. No extremely hard formations are encountered in this district and from 50 to 100 feet may readily

be drilled per day. It is much cheaper and more satisfactory to drill wells by the day rather than by contract. Costs of labor and supplies are given below:

Driller	\$5.00 per day and board.
Tool dresser	\$4.00 per day and board.
Teamster	\$45.00 per month and board.
Team and wagon	\$5.00 per day.
Teamster and 4 horses	\$6.00 per day and board without horse feed.
13-inch casing (average)	\$3.25 per foot delivered.
10-inch casing (average)	\$2.40 per foot delivered.
8 $\frac{1}{2}$ -inch casing (average)	\$1.05 per foot delivered.
6 $\frac{1}{2}$ -inch casing (average)	\$0.65 per foot delivered.
Derrick (turn-buckle) F. O. B. cars Lander	\$700.00
Derrick--erected	\$850.00
Drilling machinery, complete,	\$4500 to \$5000

VALUE OF THE LANDS UNDER DISCUSSION.

The prospective value of the lands in question is a matter of opinion. However, the existence of oil in springs and wells near these lands and the favorable geologic structure lead to the conclusion that oil will be obtained in wells drilled on these tracts at depths ranging from 800 to 3,000 feet.

Southwest Quarter of Section 6, Township 1 South, Range 1 East.

In this portion of the field the upper Dallas sand should be reached at depths ranging from 1000 to 2200 feet (Section A--B, Figure 3), while the entire area should be productive. Based upon the estimate of production previously made--30,000 barrels per acre--this tract should yield a profit, above cost of producing, of not less than \$5,000.00 per acre, a total productive value for the tract of \$800,000.00. I estimate the value of this tract at the present time to be \$300.00 per acre.

The North Half of the Southeast Quarter and the South
Half Half of the Northeast Quarter of Section 26,
Township 1 South, Range 1 East.

This tract is practically proven by the well
of the Lander Oil Syndicate. The oil sand (illuminating
oil) should be encountered at depths ranging from 700
feet to 1600 feet (Section C--D, Figure 3). The net
value of the production of this tract will probably be
not less than \$1,000,000, based upon a production of
15000 barrels per acre. I estimate the value of this
tract at the present time to be \$1,000.00 per acre.
The West Half of Section 30 and the South Half of the
Southwest Quarter of Section 19, Township 1
South, Range 1 East.

Wells upon this tract will range from 2000 to
3000 feet in depth (Section C--D, Figure 3). On account
of the depth necessary to drill to reach the oil sand and
the slight knowledge we now have in regard to the presence
of water in the oil sand at that depth, I estimate the

present value of this tract to be only \$10.00 per acre.
The South Half of the Southwest Quarter of Section 1
and the North Half of the Southeast Quarter
and the South Half of the Northeast Quarter
of Section 12, Township 2 South, Range 1 East.
Wells should strike the oil sand on these
tracts at depths ranging from 800 to 1800 feet (Section
E--F, Figure 3). Upon completion of the well of the
Pioneer Oil Company this land will be proven ground.
However, at the present time I estimate the value of
this land to be \$500.00 per acre.

The West Half of Section 18, and the Northwest Quarter
of Section 19, Township 2 South, Range 2 East. ✓
With the exception of about 100 acres this
tract will be productive of illuminating oil. Wells
reaching the oil sand at depths ranging from 700 to
2000 feet. (Section G--H, Figure 3). About four hund-
red acres of this tract should be productive land, the
present value of which I place at \$250.00 per acre

making an average for the tract of \$200.00 per acre.
The West Half of the Southwest Quarter of Section 19,
Township 2 South, Range 2 East.

This tract of 80 acres should be productive
of fuel oil at depths ranging from 1200 to 2500 feet.
(Section K--L, Figure 3).

On account of proximity to the railroad and
the certainty of obtaining producing wells, I estimate
the value of this tract at \$750.00 per acre.

Resume.

160 acres @	\$300.00	\$ 48,000.00
160 acres @	1000.00	160,000.00
400 acres @	10.00	4,000.00
240 acres @	500.00	120,000.00
480 acres @	200.00	96,000.00
80 acres @	750.00	60,000.00
<hr/>		
1520 acres		\$488,000.00

CONCLUSIONS.

With the exception of 400 acres lying in Sections 19 and 30, Township 1 South, Range 2 East, I consider the lands discussed in this report to be first class oil lands, and recommend the purchase of the lease hold at \$100.00 per acre, which I understand to be the price asked. I look upon such purchase as an excellent investment.

Respectfully submitted,

State Geologist.

Cheyenne,
1912.

this field. His gasoline and kerosene found a ready market in and near Lander, where it is reported that the Melson products were much superior to the imported oils.

The commercial oils obtained on refining, as reported by the Wells Refining Company, are here repeated with the number of gallons per barrel of crude oil, and the wholesale price per gallon in Cheyenne:

	Per cent	Gallons per barrel crude	Value per gallon	Value per bbl. crude
Gasoline	19	8.0	14¢	\$1.12
Naphtha	5	2.1	15¢	.31
Kerosene	16	6.7	10¢	.57
Spindle Oil	15	6.3	275¢	17.32
Engine Oil	12½	5.2	51¢ (average)	2.65
Cylinder Oil	10	4.2	41¢ (average)	1.72
Automobile Oil	22½	<u>9.5</u>	51¢ (average)	<u>4.84</u>
Total		42.0		\$ 28.63

While the automobile industry in providing a large and increasing market for gasoline it seems probable that on account of the larger market for fuel

The State of Wyoming
Office of State Geologist
Cheyenne

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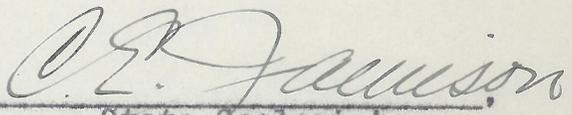
January 18th, 1912.

Mr. M. M. Gilchrist,
Cheyenne, Wyo.

Dear Sir:-

In accordance with your instructions of recent date, I herewith submit my report upon certain oil lands lying in the Wind River Indian Reservation, Fremont county, Wyoming.

Very respectfully,


State Geologist,

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REPORT

ON LANDS LYING IN THE

WIND RIVER INDIAN RESERVATION,

FREMONT COUNTY, WYOMING.

WITH PARTICULAR

REFERENCE TO

OIL.

By
C. E. Jamison,
State Geologist,
Cheyenne,
1912.

O I L L A N D S I N T H E
W I N D R I V E R I N D I A N R E S E R V A T I O N .

GENERAL DESCRIPTION.

The lands discussed in this report lie along the crest and eastern flank of the Shoshoni anticline, in the Wind River Indian Reservation, about seven miles north of Lander, the county seat of Fremont county, and the western terminus of the Chicago & Northwestern Railway. The lands are readily reached from Lander by team or automobile, over good roads, the distance by road being about ten miles. (Figure 1).

The altitude at Lander as determined by the United States Geological Survey, is 5,345 feet, while at the Washakie Oil Spring near these lands, it is 5,410 feet, as determined by aneroid barometer.

The property, consisting of 1,520 acres,
described as

the southwest quarter of section 6, Township
1 south, Range 1 east of the Wind River
Meridian; the north half of the southeast
quarter and the south half of the northeast
quarter of section 26, Township 1 south,
Range 1 east of the Wind River Meridian;
the west half of the southwest quarter and
the southeast quarter of the southwest
quarter and the southwest quarter of the
southeast quarter of section 25; the west
half of the northeast quarter of section
36, Township 1 south, Range 1 east; the
west half of section 30; the south half
of the southwest quarter of section 19,
Township 1 south, Range 2 east; the west
half of section 18, Township 2 south,

Range 2 east; the south half of the south-east quarter of section 1, the south half of the northeast quarter and the north half of the southeast quarter of section 12, Township 2 south, Range 2 east of the Wind River Meridian,

is held under lease secured from the Shoshone and Arapahoe Indian Council, subject to the rules and regulations of the Department of the Interior. The terms of the lease briefly stated are as follows:

The lease runs for a period of ten years, less than one week of which has expired.

If the conduct of the lessee, and the work performed are satisfactory, the lease may be renewed at the end of that time. Until the lands become productive rentals are paid as follows: fifteen cents per acre during the first year; forty cents per acre during the second year; seventy-five cents per acre during the third and

succeeding years. When the lands become productive a royalty of twelve and one-half per cent is paid and no further rental is required.

GEOLOGY.

The oldest rocks exposed on these lands are the red shales and sandstones of the Chugwater formation. These beds, of Triassic age, occupy the crest of the anticline in the southwest quarter of section 6, Township 1 south, Range 1 east, and in a portion of the southwest quarter of section 18, Township 2 south, Range 2 east. (Figure 2).

Underlying the Chugwater beds, although not exposed on the lands under discussion, are limestones and shaly sandstones of the Embar formation, Upper Carboniferous age. Excellent exposures of the rocks of this formation are afforded in the canyons of Pope

Agie, North Fork and Little Wind Rivers on the eastern flank of the Wind River Mountains. The shaly sandstones of the Embury formation form the oil sands of the Dallas field, yielding fuel oil of asphaltum base. These sands will, no doubt be encountered in wells drilled on section 6, Township 1 south, Range 1 east and on section 18, Township 2 south, Range 2 east. (Figure 3).

Overlying the Chugwater beds are limestones, shales and sandstones of the Sandance and Morrison formations, both of Jurassic age.

Next above the Jurassic rocks is a series of sandstones and shales, with coarse grained sandstone or conglomerate at the base. These rocks, of Lower Cretaceous age, are capped with from 45 to 60 feet of massive sandstone, the Dakota formation. The

coarse grained sandstone at the base of the Lower Cretaceous is believed to form the reservoir in which the high grade illuminating oil of this region has accumulated. A section of the Dakota and Lower Cretaceous formations is given below:

Dakota and Lower Cretaceous Formations.

Gray and brown, massive sandstone	51 feet.
Soft, dark gray shale	97 "
Soft yellow sandstone	2 "
Soft, gray sandy shale	26 "
Buff sandstone	38 "
Dark carbonaceous shale	23 "
Soft gray and yellow sandstone and dark shale	29 "
Concealed, probably shale	31 "
Dark gray shale	100 "
Coarse-grained gray sandstone, the oil sandstone	<u>22 "</u>
Total -----	419 feet.

Overlying the Dakota sandstone are shales and sandstones of the Mancos group, including the

Fort Benton, Niobrara and Pierre formations. A section of the Fort Benton formation, which is the only member of the Mancos group exposed on these lands, is given below:

Fort Benton Formation.

Yellow sandstone, very fossiliferous	68 feet.
Gray, fine-grained sandstone	417 "
Brown sandstone	4 "
Gray sandstone	409 "
Dark, carbonaceous shale, with 6 feet of impure coal	18 "
Gray sandstone	75 "
Shaly limestone	5 "
Soft, gray shale	50 "
Gray limestone	9 "
Gray sandstone	143 "
Buff sandstone	32 "
Hard bluish-gray shale with several thin sandstone beds	425 "
Soft, gray shale	198 "
Total -----	1853 feet.

The structural features of this region include the monocline which forms the eastern flank of the Wind River Mountains, the syncline forming the Lander valley, and the Shoshone anticline. The anticlinal theory of the accumulation of oil is applicable to this region, the oil having accumulated along the flanks and crest of the Shoshone anticline.

OIL.

The existence of oil in the Lander district has been known since early in the nineteenth century, Capt. Bonneville having visited the "Tar Springs" in the Dallas oil field in 1833. No work was carried on until 1880, when during the period extending from 1880 to 1885 three wells were drilled in the Dallas field, but, on account of distance from transportation, little further development was attempted until 1906.

when the Chicago & Northwestern Railway was completed to Lander. The Wind River Indian Reservation was opened and leasing of lands permitted in 1906, since which time operations have been more actively conducted.

In 1908 a party of Los Angeles investors secured control of a lease on the Reservation, and in June 1909 completed the first well. This lease is now held by the same men under the corporate names of Lander Oil Syndicate, Inc., Pioneer Oil Company, and Wyoming Oil Company. The well above mentioned, owned by the Lander Oil Syndicate, was brought in, June 1909, at a depth of 252 feet, the initial flow, as reported by the manager of the Syndicate, being 240 barrels per day. The well was immediately capped, and, except for short periods, has remained so to the present time. Small quantities of the oil obtained from this well, in all probably 1000 barrels, have

been sold to local consumers at \$1.00 per barrel at the well. In the summer of 1911 the well was opened and was found to be badly choked with paraffin. The well was pumped for several weeks and is reported to have yielded 40 barrels of oil per day. This well has not reached the oil sand, the bottom of the well being in Fort Boston shales. The oil obtained has probably seeped upward through a fracture caused by faulting, and has formed a pool in the shale.

The Pioneer Oil Company has drilled one well to a depth of about 1300 feet on Section 12, Township 2 South, Range 1 East. At 1250 feet a showing of oil was reported, while I am informed by a member of the company that at the present time the gas encountered in this well may be ignited at the collar of the well with a match. This well will probably enter the oil sand within the next 200 feet.

The Wyoming Oil Company is drilling on Section 1, Township 2 South, Range 1 East; the Wind River Oil, Coal & Gas Company on Section 26, Township 1 South, Range 1 East; The Lander Oil Syndicate, Inc., on Section 26, Township 1 South, Range 1 East; the Shoshone Oil & Gas Company on Section 24, Township 2 South, Range 1 East; the Texas Oil Company on Section 20, Township 2 South, Range 2 East.

George Mitchell of California drilled a well in Section 19, Township 2 South, Range 2 East, to a depth of 800 feet, when, on account of losing a string of tools in the hole, the well was abandoned. Across the Popo Agie river and about one-fourth mile from the holdings of the Texas Oil Company, a well was drilled some years ago, in which the oil sand was encountered at a depth of 1560 feet. The well was continued to 1860 feet where water was struck.

This well, which is located about 1000 feet east of the axis of the anticline, is now flowing three barrels of oil and 50 barrels of water per day.

In the fall of 1908 J. C. Underwood of California began drilling on the south half of the northeast quarter of Section 26, Township 1 South, Range 1 East, but after drilling some 400 feet the hole became crooked and was abandoned. In 1909 a new well was started, but for reasons unknown drilling was soon abandoned. In 1910 a third well was started and drilling was continued to about 600 feet, when on account of a disagreement with the original lessee, from whom Mr. Underwood had a sub-leased on a royalty basis, work was discontinued, since which time no further work has been carried on. This well is located on a portion of the lands under discussion and is reported to be in good shape for further drilling.

YIELD OF OIL.

There are three oil sands in this region, the upper and lower Dallas sands, which yield fuel oil of asphaltum base, 24°B., and the illuminating oil sand, yielding a high-grade illuminant of paraffin base, 42°B. Forty or more wells have been drilled in the Dallas field, nine miles southeast of Lander, and oil obtained in most of them, although the field is small. The yield of fifteen wells which are pumped is reported by Col. E. H. Power, president of the Wyopo Oil Company, to be 1200 barrels per day, though the yield is reported by others to be as little as 350 barrels. Reports as to the average yield per well vary greatly, ranging from 20 to 90 barrels per day. The wells drilled in 1885 are yet producing, although they have been flowing or have been pumped during a large portion of the time which has elapsed since their completion.

Assuming that these wells have been productive but one-half the time since 1885, and that the average yield is but five barrels per day, the total yield to date would be 32,000 barrels per well. Assuming that one well will drain one acre, a rather large figure, the yield of fuel oil per acre would be in excess of 30,000 barrels.

As no wells have yet penetrated the sandstone which forms the reservoir for the illuminating oil there are no data available on which to base an opinion as to the probable yield per well. The coarse-grained sandstone and conglomerate at the base of the Lower Cretaceous formation, which is believed to form the reservoir in which the oil has accumulated, has an average thickness of twenty-five feet. Assuming that the interstitial space in this sandstone occupies but fifteen per cent of the whole, one acre of oil saturated sandstone would contain 25,000 barrels of oil. As

one well will ordinarily not drain more than one acre, the production per well based on the above figures should be somewhat more than 25,000 barrels. However, it should be borne in mind that the above is a mere guess. Some of the wells may far exceed this figure.

QUALITY OF OIL.

The oil in the Washakie Oil Spring and that obtained in the well of the Lander Oil Syndicate, is a high-grade illuminant of paraffin base.

The analyses quoted below will convey an idea of the products which may be obtained upon refining this oil:

(From U. S. G. S. Bulletin 452)

Gasoline %	Kerosene %	Residuum %
14.5	42.7	42.8

Specific gravity crude oil 0.8121 (42.4°B.)
Color, green.

The asphaltum base oil produced in this district is a heavy, dark-brown oil, specific gravity 22.2° to 25.5° Beaume. Analyses of this oil show it to contain two per cent gasoline and from 20 to 24 per cent kerosene, and to be suitable for use as fuel without refining. At the present time it is used on some of the locomotives of the Chicago & Northwestern Railway and in the power plants at Casper and at Lander.

VALUE OF OIL.

As has been previously stated the oil obtained in the well of the Lander Oil Syndicate has been sold at \$1.00 per barrel at the well, while the Salt Lake Refining Company made a bid of \$2.50 per barrel at the refinery. The crude oil was tested in gasoline engines at the power plant of the Town of Riverton and was reported to be satisfactory in every way. W. J. Nelson of Lander operated, for a short time, a small refinery, using the crude oil from

this field. His gasoline and kerosene found a ready market in and near Lander, where it is reported that the Melson products were much superior to the imported oils.

The commercial oils obtained on refining, as reported by the Wells Refining Company, are here repeated with the number of gallons per barrel of crude oil, and the wholesale price per gallon in Cheyenne:

	Per cent	Gallons per barrel crude	Value per gallon	Value per bbl. crude
Gasoline	19	8.0	14¢	\$1.12
Naphtha	5	2.1	15¢	.31
Kerosene	16	6.7	10¢	.67
Spindle Oil	15	6.3	275¢	17.32
Engine Oil	12½	5.2	51¢ (average)	2.65
Cylinder Oil	10	4.2	41¢ (average)	1.72
Automobile Oil	22½	<u>9.5</u>	51¢ (average)	<u>4.84</u>
Total		42.0		\$ 28.63

While the automobile industry in providing a large and increasing market for gasoline it seems probable that on account of the larger market for fuel

oil it would be better to refine this oil in such a way as to produce about 20 per cent gasoline and kerosene, 55 per cent oil suitable for fuel, and 25 per cent lubricating oils, the value of which would be \$1.09, \$0.41 and \$4.83, a total, per barrel of crude oil, of \$6.33.

The fuel oil now used on the Chicago & Northwestern Railway brings a price of 65 cents per barrel at the loading station.

MARKET.

I have recently been informed by Mr. Davidson, Engineer of Tests for the Chicago & Northwestern Railway, that his road is at the present time in condition to use 1,600 barrels of fuel oil per day, while, if assured of production, all engines owned by the Chicago & Northwestern west of the Missouri River would be equipped with oil burners. Conditions on the Burlington and Union Pacific railways are much the same as on the Northwestern.

TRANSPORTATION FACILITIES.

A four-inch pipe line has recently been laid from the Lander Oil Syndicate's well to the railroad, a distance of six miles. This line passes over a portion of the lands under discussion, where it is equipped with two-inch connections at intervals of 500 feet. At the railroad terminal of the pipe line a spur track has been laid, and as the Pope Agie River is but a few hundred feet distant, this would be a favorable point for a refinery.

COST OF DRILLING AND SUPPLIES.

Drilling may be contracted at the following figures, the contractor furnishing portable drilling rig and all supplies exclusive of casing:- first one thousand feet at \$2.00 per foot; next five hundred feet at \$3.50; next five hundred feet at \$3.00 per foot. No extremely hard formations are encountered in this district and from 50 to 100 feet may readily

be drilled per day. It is much cheaper and more satisfactory to drill wells by the day rather than by contract. Costs of labor and supplies are given below:

Driller	\$5.00 per day and board.
Tool dresser	\$4.00 per day and board.
Teamster	\$45.00 per month and board.
Team and wagon	\$3.00 per day.
Teamster and 4 horses	\$6.00 per day and board without horse feed.
13-inch casing (average)	\$3.25 per foot delivered.
10-inch casing (average)	\$2.40 per foot delivered.
8 $\frac{1}{2}$ -inch casing (average)	\$1.05 per foot delivered.
6 $\frac{1}{2}$ -inch casing (average)	\$0.65 per foot delivered.
Derrick (turn-buckle) F. O. B. cars Lander	\$700.00
Derrick--erected	\$850.00
Drilling machinery, complete,	\$4500 to \$5000

VALUE OF THE LANDS UNDER DISCUSSION.

The prospective value of the lands in question is a matter of opinion. However, the existence of oil in springs and wells near these lands and the favorable geologic structure lead to the conclusion that oil will be obtained in wells drilled on these tracts at depths ranging from 800 to 3,000 feet.

Southwest quarter of Section 6, Township 1 South, Range 1 East.

In this portion of the field the upper Dallas sand should be reached at depths ranging from 100 to 2200 feet (Section A--B, Figure 3), while the entire area should be productive. Based upon the estimate of production previously made--30,000 barrels per acre--this tract should yield a profit, above cost of producing, of not less than \$5,000.00 per acre, a total productive value for the tract of \$800,000.00. I estimate the value of this tract at the present time to be \$300.00 per acre.

The North Half of the Southeast Quarter and the South
Half Half of the Northeast Quarter of Section 26,
Township 1 South, Range 1 East.

This tract is practically proven by the well
of the Lander Oil Syndicate. The oil sand (illuminating
oil) should be encountered at depths ranging from 700
feet to 1600 feet (Section C--D, Figure 3). The net
value of the production of this tract will probably be
not less than \$1,000,000, based upon a production of
18000 barrels per acre. I estimate the value of this
tract at the present time to be \$1,000.00 per acre.
The West Half of Section 30 and the South Half of the
Southwest Quarter of Section 19, Township 1
South, Range 1 East.

Wells upon this tract will range from 2000 to
3000 feet in depth (Section C--D, Figure 3). On account
of the depth necessary to drill to reach the oil sand and
the slight knowledge we now have in regard to the presence
of water in the oil sand at that depth, I estimate the

present value of this tract to be only \$10.00 per acre.

The South Half of the Southwest Quarter of Section 1
and the North Half of the Southeast Quarter
and the South Half of the Northeast Quarter
of Section 12, Township 2 South, Range 1 East.

Wells should strike the oil sand on these
tracts at depths ranging from 800 to 1800 feet (Section
E--F, Figure 3). Upon completion of the well of the
Pioneer Oil Company this land will be proven ground.
However, at the present time I estimate the value of
the land to be \$500.00 per acre.

The West Half of Section 18, Township 2 South, Range
2 East.

With the exception of about 20 acres this
tract will be productive of illuminating oil, wells
reaching the oil sand at depths ranging from 700 to
2000 feet (Section G--H, Figure 3). Not less than
300 acres of this tract should be productive land,
the value of which I would place at \$250.00 per acre

The West Half of the Southwest Quarter and the Southeast Quarter of the Southwest Quarter and the Southwest Quarter of Section 25; and the West Half of the Northeast Quarter of Section 26, Township 1 South, Range 1 East.

This tract adjoins and is much like the lands lying in Section 26. Illuminating oil should be obtained on this tract at depths ranging from 800 to 2500 feet.

I estimate the value of this tract to be \$300.00 per acre.

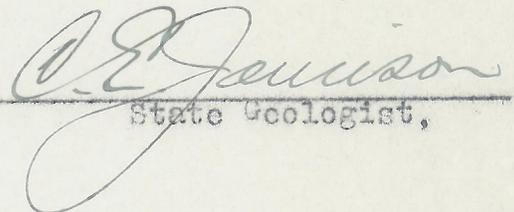
Resume.

160 acres @	\$300.00	\$ 48,000.00
160 acres @	1000.00	160,000.00
400 acres @	10.00	4,000.00
240 acres @	500.00	120,000.00
320 acres @	250.00	80,000.00
240 acres @	300.00	72,000.00
1,520 acres		<hr/> 484,000.00

CONCLUSIONS.

With the exception of 400 acres lying in Sections 19 and 30, Township 1 South, Range 2 East, I consider the lands discussed in this report to be first class oil lands, and recommend the purchase of the lease-hold at \$100.00 per acre, which I understand to be the price asked. I look upon such purchase as an excellent investment.

Respectfully submitted,


State Geologist,

Cheyenne, Wyo.
January 18th, 1912.

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THE WEST HALF OF THE NORTHEAST QUARTER AND
THE NORTHEAST QUARTER OF THE NORTHEAST
QUARTER OF SECTION 13, TOWNSHIP 2 SOUTH,
RANGE 1 EAST.

About twenty acres of this tract should be
productive of illuminating oil at comparatively shallow
depths, while the Dallas oil sands should be encountered
in the remainder of the tract at depths ranging from
2000 to 3000 feet. (Section G--H, Figure 3). I estimate
the value of this tract to be \$100.00 per acre.

THE SOUTH HALF OF THE SOUTHWEST QUARTER AND
THE SOUTHWEST QUARTER OF THE SOUTHWEST
QUARTER OF SECTION 13, TOWNSHIP 1 SOUTH,
RANGE 1 EAST.

It is extremely difficult to set any figure
as to the value of this tract as the anticline is con-
cealed by the alluvium of the Mill Creek valley and
its position can only be inferred. The axis of the
anticline at this point makes a wide ~~curve~~ which may
bring it through this tract. I cannot give a definite
figure for this tract.

Resume.

160 acres (Sec. 6, T. 1 S., R. 1 E.)	@ \$300	\$48,000
160 acres (Sec. 26, T. 1 S., R. 1 E.)	@ 1000	160,000
240 acres (Secs. 1 & 12, T. 2 S., R. 1 E.)	@ 500	120,000
300 acres (Sec. 18, T. 2 S., R. 2 E.)	@ 250	75,000
20 acres (Sec. 18, T. 2 S., R. 2 E.)	-----	-----
120 acres (Sec. 13, T. 2 S., R. 1 E.)	@ 100	12,000
120 acres (Sec. 13, T. 1 S., R. 1 E.)	@ (?)	?
400 acres (Secs. 19 & 30, T. 1 S., R. 2 E.)	@ (?)	?
<hr/>		<hr/>
1520 acres		\$415,000
Average estimated value per acre	-----	\$273

CONCLUSIONS.

With the exception of those lands lying in Sections 19 and 30, Township 1 South, Range 2 East, and Section 13, Township 1 South, Range 1 East, I consider the lands discussed in this report to be first class oil lands, and recommend the purchase of the lease-hold at \$100.00 per acre, which I understand to be the price asked. I look upon such purchase as an excellent investment.

Respectfully submitted,

State Geologist,

Cheyenne, Wyo.
March 26th, 1912.



FIG. 1.

- Water well
 - Oil well
 - ⊕ Oil spring or seepage
 - Unfinished well
 - ▨ Lands under discussion
- Scale 1 in = 1 mile



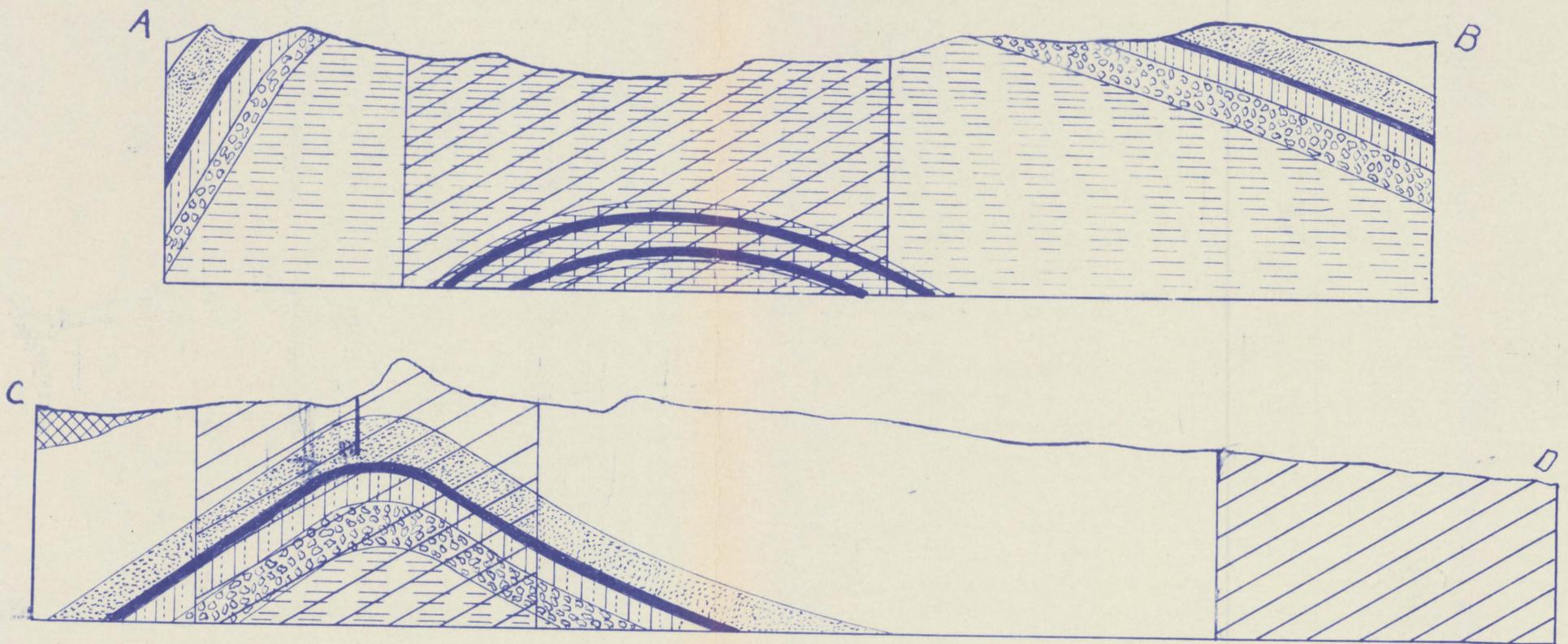
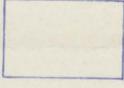
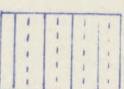
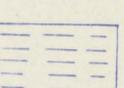
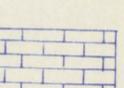
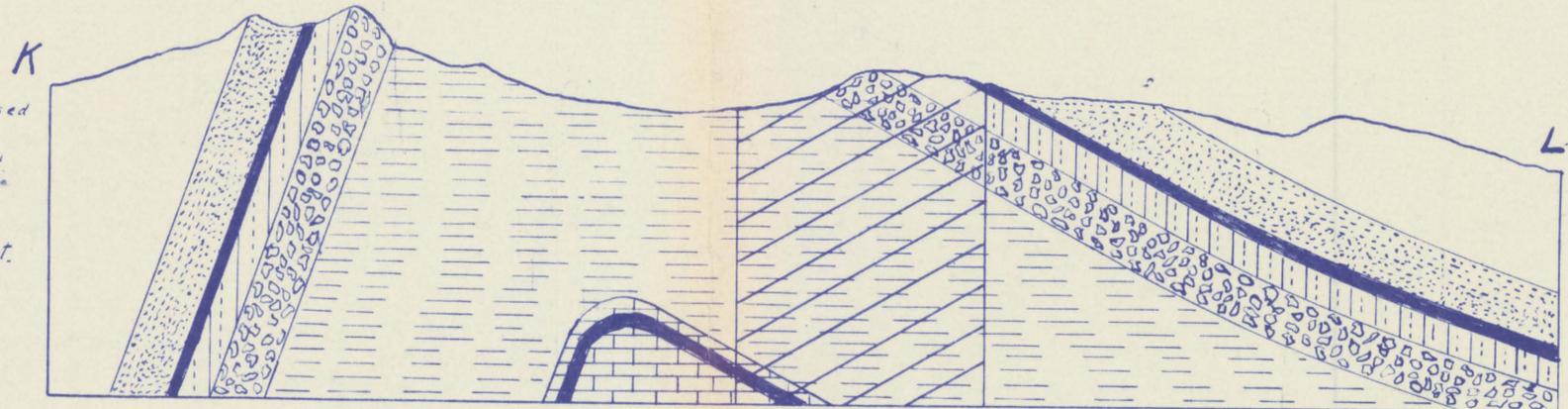
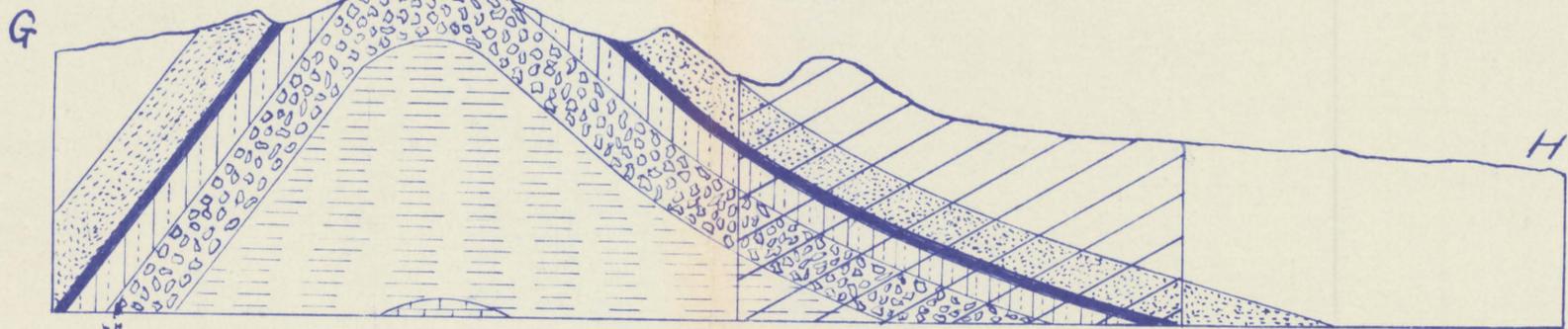
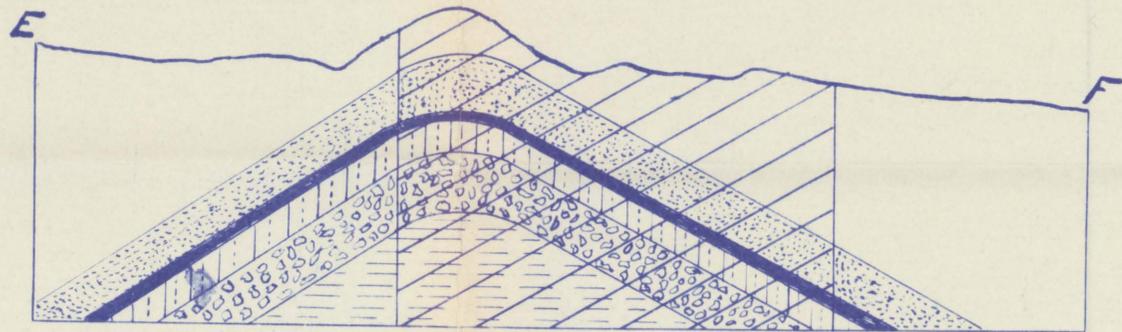


FIG. 3.

-  Tertiary
-  Mancos
-  Dakota and Lower Cretaceous
-  Morrison
-  Sundance
-  Chugwater
-  Embar
-  Oil Sand
-  Lands discussed in this report.

Scale - 1 inch = 1000 feet.



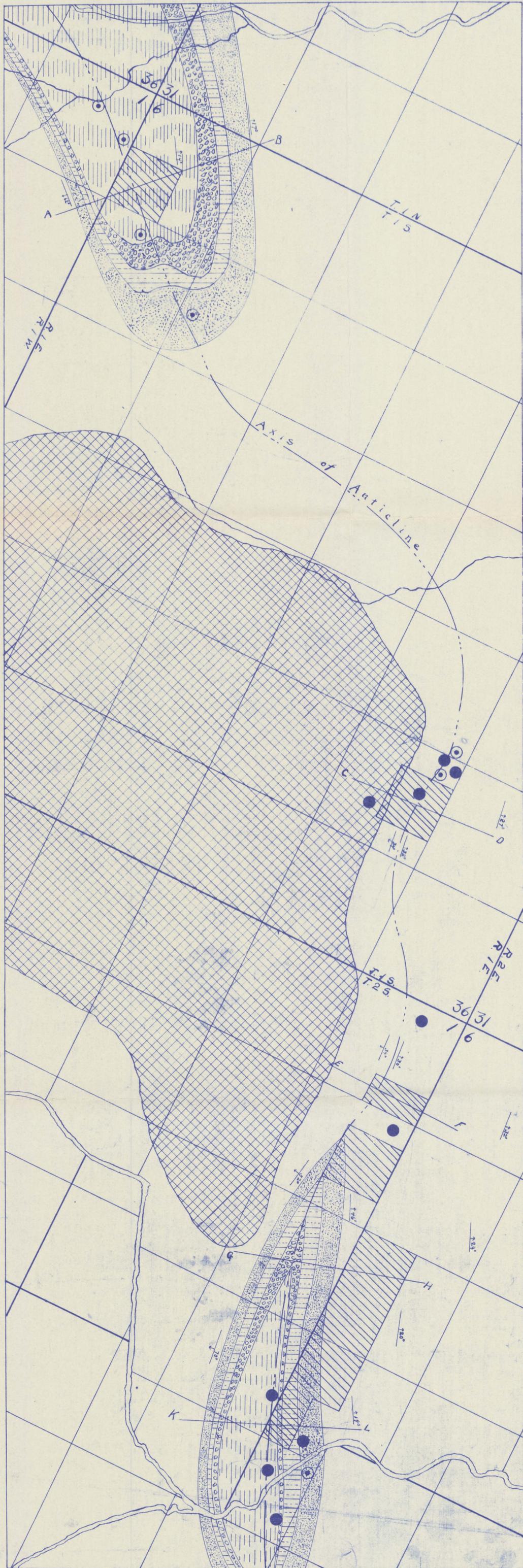
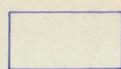
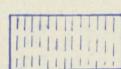
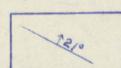


FIG 2.

-  Tertiary
-  Mancos
-  Dakota and Lower Cretaceous
-  Morrison
-  Sundance
-  Chugwater
-  Well
-  Oil spring or seepage
-  Dip
-  Lands discussed in this report

N
 1 inch = 1/2 mile