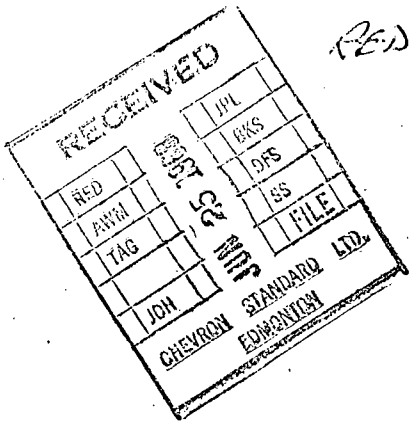
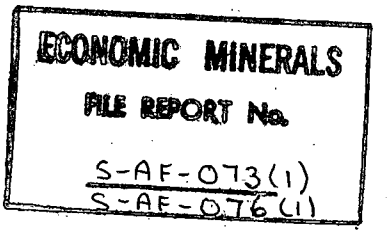
MAR 19680068: VERMILION CHUTES

Received date: Dec 31, 1968

Public release date: Jan 01, 1970



(FD. as requested by DFS



Calgary, Alberta
June 21, 1968

Sulphur Permits Near Vermilion Chutes

MR. W. E. BANNISTER:

The discovery of a sulphur deposit in surface soil a few miles north of Vermilion Chutes has caused Chevron Standard to take out several sulphur permits in the general area. So far, we have made three aerial reconnaissance flights over the terrain: two to check the reported sulphur discovery on Permit No. 8 and one to evaluate other permits.

Since the original discovery is the key to understanding sulphur deposits elsewhere in the area, it will be described in detail.

A trench in Lsd. 11-8-110-5 W5 is thought to be the showing on which the reported discovery is based. It is about 2 feet wide, 4 feet deep, and 80 feet long, and trends N 26° W. The trench is on a bulldozed line about 500 feet long that appears to have been cut for geophysical purposes. The ground is a level bench that is a few feet higher than land to the east and south. It is covered with small second-growth poplar and birch trees.

Immediately south of the trench there is a creek head that is partly filled with a deposit of clay and glacial erratics in which some small test pits have been dug. A sample from one of these pits gave a nil sulphur assay. The deposit appears to have been deposited by water flowing out of the creek head; however, the creek head is now dry.

The trench is in glacial drift consisting of clay with scattered small cobbles. As shown on the sketch, the colors are very patchy and variable. Numbered samples from the wall of the trench were assayed by distilling off the sulphur, and estimating the proportion of sulphur by volume. The table gives the results, together with the color of the sample assayed. As may be seen, sample color is not a good index of the sulphur content.

The weighted average percentage grade of sulphur by volume, using areas on the sketch as weighting factors, is about 7%. The highest assay comes from a small pit about 25 feet west of the main trench, where the ground is about 90% sulphur by volume.

The sulphur occurs as flour-like, imperfect, stubby crystals about 25 microns in length that are scattered more or less abundantly through the soil and subsoil. At the small pit giving the high sulphur assay, the ground is so firmly bonded by sulphur that it resembles bedrock, yet it melts and

flows on being heated, leaving a residue of sand and clay. At one place in the main trench (Sample 12), sulphur is associated with leaf mold and plant roots within a few inches of the surface, and therefore would appear to be forming at the present time; however, this cannot be conclusively demonstrated, as the sulphur may be simply a component of the soil in which roots have grown, and in which leaves have been buried by surface wash.

The trench smells strongly of sulphur dioxide and possibly also hydrogen sulphide. It is not known whether these gases were noticeable before the trench had been dug. Several test holes have been drilled east and west of the trench by oil companies, and one of them struck a small amount of sour inflammable gas at about 35-50 feet. Gray shale was reported from the lower part of the holes. The gas is under pressure, as it could be heard bubbling up through water at the bottom of the hole. The gray shale would appear to be the seal; according to current ideas the updip edge of the Grosmont dolomite crosses the area. Consequently, the gas may be trapped in the Grosmont.

This association of shallow gas and native sulphur seems too close to be coincidental, and therefore is assumed to have genetic significance. Hydrogen sulphide can be oxidized to elemental sulphur by atmospheric oxygen, which is a normal constituent of the soil air. Therefore, precipitation of native sulphur in the soil and subsoil is a possibility if sour gas leaked to the surface from an imperfectly sealed trap, as for example at the site of the trenching.

If this is the origin of the sulphur deposit, the chances that similar conditions exist in other places do not appear to be good, as the required sequence of geological events seems too exacting: Grosmont carbonate should be truncated updip by pre-Cretaceous erosion, then overlain by Cretaceous shale that subsequently has been nearly, but not quite eroded away in Pleistocene time. According to this scheme, favorable conditions will exist where the line of Grosmont truncation and the line of Pleistocene erosion intersect, and therefore are apt to be limited to a point. If so, the deposits are likely to be small.

However, the Grosmont along the erosion edge in less favorable positions may be leaking sulphurous connate water that may form sulphur deposits at the surface. This may take place anywhere, but more particularly at the updip edge of the Cretaceous cover.

A small slough in Sec. 17-106-6 W5, Permit No. (76), is depositing large amounts of yellowish-white granular calcium carbonate sediment from spring water that oozes into it from the east side. This slough is located three miles north of a large outcrop of Loon River shale on the Mikkwa River and, so far as present information indicates, may be close to the Devonian-Cretaceous contact. Consequently, it may be the result of updip seepage of carbonate-rich water along the contact; however, the water of the slough

is not salty, and there is no smell of sulphur gases at the site. A sample of the carbonate gave a negative sulphur test.

Sulphur permits in the Vermilion Chutes area are not well suited to purely aerial reconnaissance because of the forest cover. The several reconnaissance flights covered Permits Nos. 8, 30, 31, 32, and parts of 18 and 76. Permit No. 73 was not flown for logistical reasons. The Mikkwa River was also flown from a point south of the upper Vermilion Chutes upstream as far as the south border of Twp. 102.

Little was seen in Permits Nos. 18, 31 and 32.

Permit No. 31 is on the south slope of the Caribou Mountains; it is heavily timbered and lacks well-defined drainage. Since the Caribou Mountains are composed of Cretaceous rocks, a fairly thick Cretaceous cover is likely in the northern part of this permit. There are large outcrops of Loon River shale along Lawrence River, about five miles to the west.

In Permit No. 30, a close examination of Grosmont dolomite at the upper Vermilion Chutes failed to detect the native sulphur that had been reported there. The dolomite is lumpy-textured, where the texture can be made out, and contains scattered small bitumen-lined vugs.

Permit No. 32 is tree-covered, with small swampy areas. No anomalies were detected during a rapid aerial reconnaissance. The Wabiscaw River, which cuts across the west edge of the permit, flows in a deep valley that contains large outcrops of Loon River shale. The permit is undoubtedly underlain by the shales, which detract from its value as a prospective sulphur-bearing area.

Permit No. 76 is interesting on account of its position on the Devonian-Cretaceous contact; however, except along the Mikkwa River and around the lakes and ponds, aerial reconnaissance is hampered by the dense poplar bush.

Loon River shale is exposed in two places on Mikkwa River in Twp. 105. No outcrops were seen in Twp. 104, where Devonian rocks had been reported by McConnell in 1893 (G.S.C. Annual Rept., pt. D, 1890-91, pp. 1-67). Apart from the shale outcrops and Devonian outcrops near the mouth, no other outcrops were detected on the River north of Twp. 102. Possibly McConnell's outcrop of Devonian is below water level, which was fairly high at the time of the reconnaissance. It should be checked again at a more favorable time, as the existence of Devonian south of Cretaceous outcrops implies a structural high, and the Devonian-Cretaceous contact bordering it would be favorable to sulphur accumulation.

[redacted]

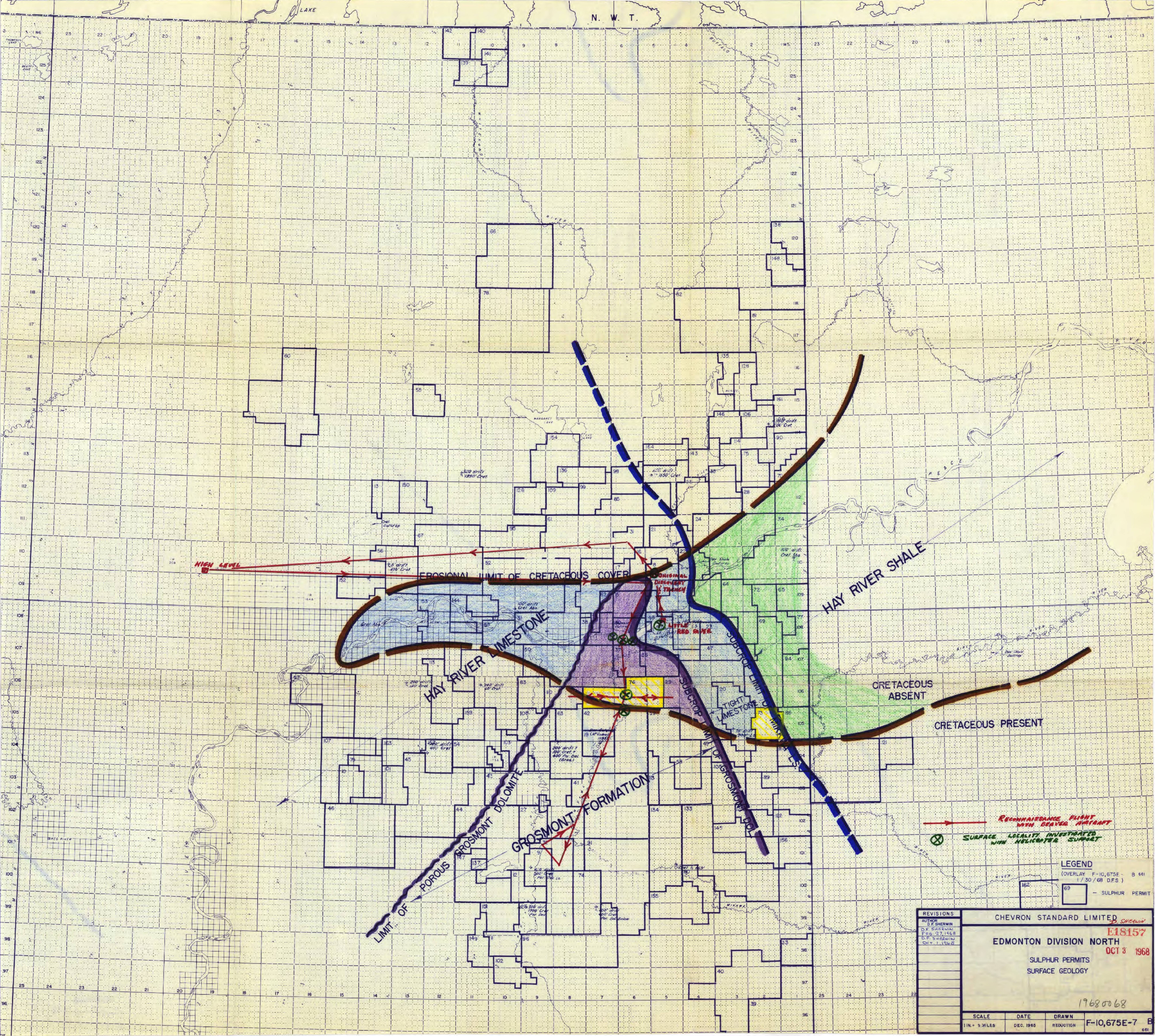
A. E. KLISKE

AEK/mm

Sulphur assays of samples from trench, by volume, estimated:

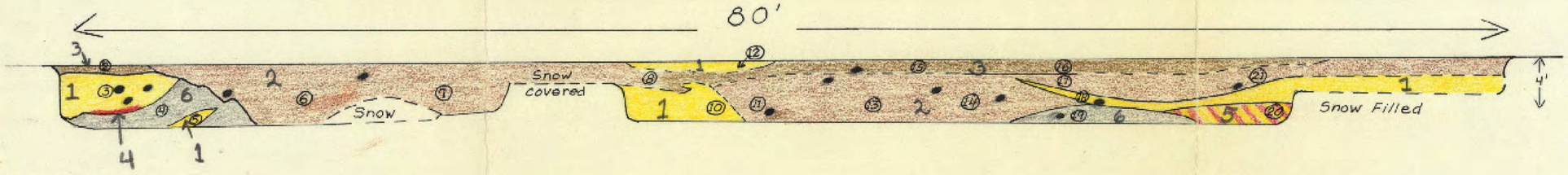
Sample	Assay	Color
2	1% S	Buff
3	Nil S	Yellow
4	Nil S	Gray
5	Nil S	Yellow
6	5% S	Buff
7	25% S	Buff
8	10% S	Buff
9	50% S	Yellow
10	60% S	Yellow
11	5% S	Yellow + Brown
12	40% S	Yellow
13	Trace S	Yellow + Brown
14	1% S	Yellow + Brown
15	10% S	Brown
16	1% S	Brown
17	Nil S	Buff
18	Nil S	Yellow
19	Nil S	Gray
20	Nil S	Red + Yellow
21	Nil S	Buff

Weighted average 7% S by volume


N. W. T.
LAKE
EROSIONAL LIMIT OF CRETACEOUS COVER
HAY RIVER LIMESTONE
HAY RIVER SHALE
CRETACEOUS ABSENT
CRETACEOUS PRESENT
TIGHT LIMESTONE
GROSMONT FORMATION
LIMIT OF POROUS GROSMONT DOLOMITE
HIGH LEVEL
RECONNAISSANCE FLIGHT WITH BEAVER AIRCRAFT
SURFACE LOCALITY INVESTIGATED WITH HELICOPTER SUPPORT
LEGEND
(OVERLAY F-10,675E - B 661 1/30/68 D.F.S.)
69 - SULPHUR PERMIT
REVISIONS
AUTHOR D.F. SHERWIN
D.F. SHERWIN FEB. 27, 1968
D.F. SHERWIN OCT. 1, 1968
CHEVRON STANDARD LIMITED
D. SHERWIN
E18157
EDMONTON DIVISION NORTH
OCT 3 1968
SULPHUR PERMITS
SURFACE GEOLOGY
19680068
SCALE 1 IN. = 5 MILES
DATE DEC. 1965
DRAWN REDUCTION
F-10,675E-7 B
661

SULPHUR PROSPECTING TRENCH

Trench = 2' wide. Bearing of trench 334° Azimuth; Location Lsd. 11-8-110-5 W.5



LEGEND

- Drift stones
- (13) Sample location

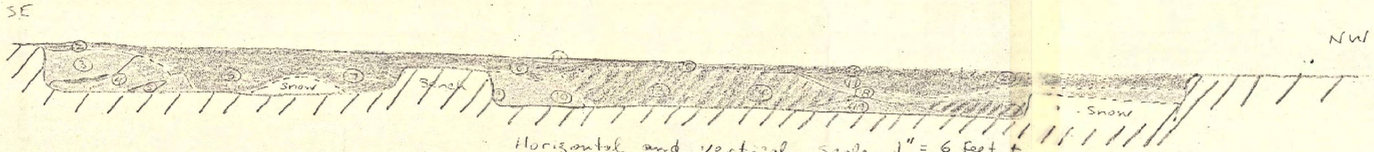
SOIL COLORS:

1- Yellow
2- Yellow-brown
3- Brown
4- Red
5- Red-brown + Yellow
6- Gray

BY: A.E. KLEISKE

Figure ID 19680068

Sketch of Sulphur prospecting Trench in Lsd 11, Sec. 8, Tp 110, Rge 5 W 5th Mer.

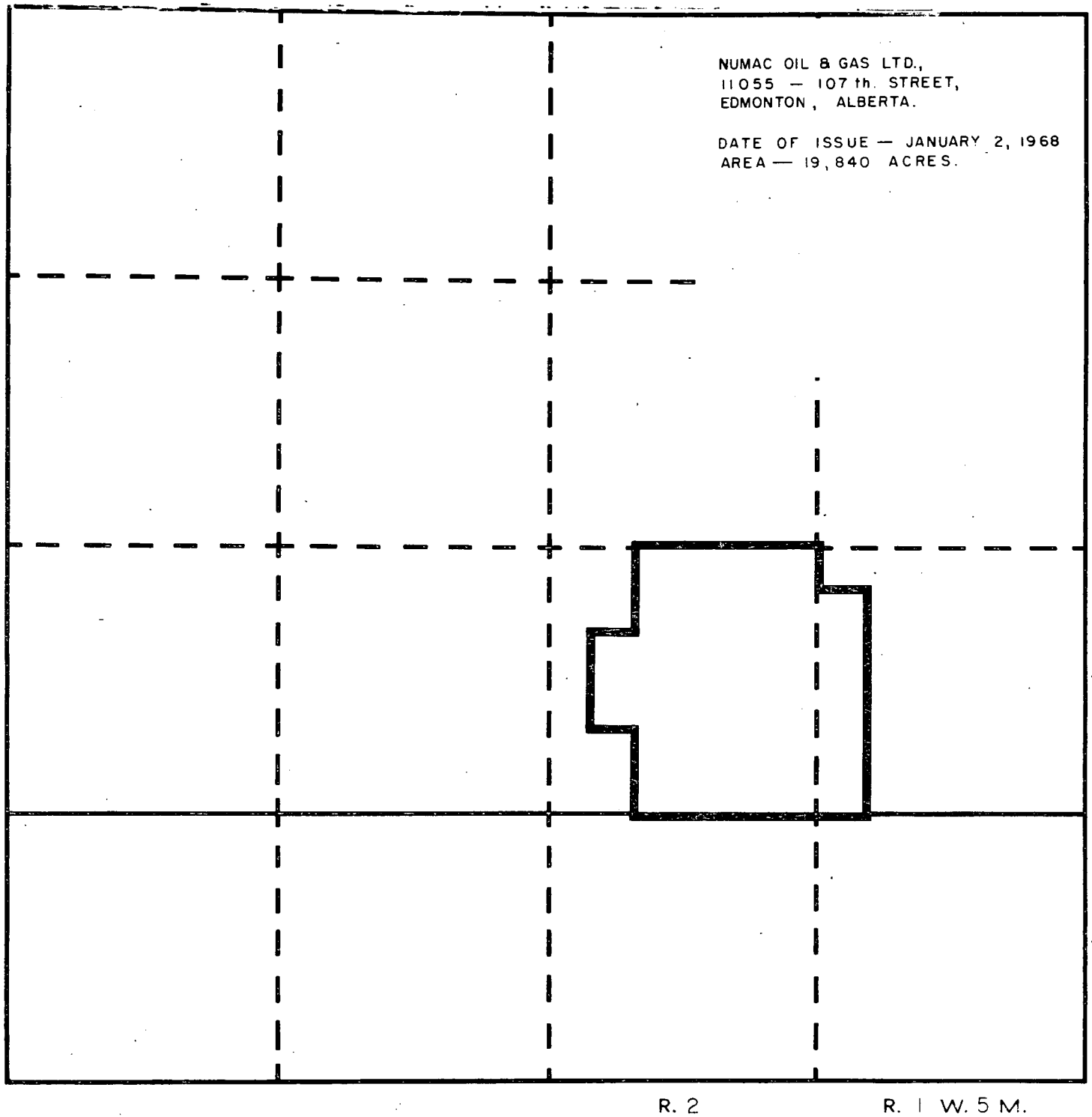


Color of Ground in Trench:

- Yellow
- Brown
- Brown and Yellow
- Buff
- Red
- Red and yellow
- Gray

② Assay Sample Locations

SULPHUR PROSPECTING PERMIT NO 73



19680068

SULPHUR PROSPECTING PERMIT NO. 76