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ACTUAL DRILL HOLE DATA

Mc[illegible] [illegible] Area

[illegible]

Alberta [illegible] Company

John T. Boyd & Associates
Mining Engineers

October 1964

JOHN T. BOYD & ASSOCIATES

J. W. WOOMER - SENIOR ASSOCIATE

Mining Engineers
Geologists

OLIVER BUILDING · MELLON SQUARE
PITTSBURGH, PENNSYLVANIA 15222

CONSULTANTS
DESIGNS AND REPORTS

October 20, 1964

Alberta Natural Gas Company
140 Sixth Avenue, S.W.
Calgary, Alberta

Attention: Mr. C. P. Smith
Vice President and General Manager

Dear Sirs:

Herewith is a record of factual information based on core drilling along your 36-inch gas pipeline right of way which traverses a coal-bearing formation owned by the Crow's Nest Pass Coal Company, Limited. This coal-bearing formation is located in the McGillivray Loop Area of British Columbia.

Due to the possible occurrence of coal seams of mineable thickness under the pipeline right of way, 3195 feet of test hole (cored) was drilled during the period from September 1963 through January 1964.

The results of the actual core drilling and tests made on portions of the cores are presented in this cover. We have made no findings or interpretations on the geological data obtained from this core drilling.

Very truly yours,

John T. Boyd

GENERAL STATEMENT

The zone along the pipeline right of way that was explored by drilling is bounded on the east by the so-called "Erickson Fault" and extends westward into the Michel Valley then south for 16,700 feet, for a total horizontal pipeline distance of 24,000 feet.

Boyles Brothers Drilling Company, Limited, of Vancouver, British Columbia, performed the diamond core drilling. The size of the core from each hole was standard NX, approximately 2-1/8 inches in diameter.

J. W. Woomer & Associates assigned Melvin E. Hinkle, a graduate mining engineer, as project engineer to observe the drilling. His duties were to locate and set the direction of drill holes, verify logs of holes, approve daily drill reports and invoices.

The drilling program was set up to explore all of the strata along the pipeline right of way to a depth of 500 feet.

Following this General Statement is a profile along the pipeline showing the location of the seven (7) drill holes. Each drill hole is placed in a separate section of this report with a record of all factual data available.

Respectfully submitted,

JOHN T. BOYD & ASSOCIATES

By:

Melvin E. Hinkle

John T. Boyd

DRILL HOLE NO. 1

Drill Number:	One
Location:	850 ft. downgrade west of Erickson Fault
Starting Date:	September 22, 1963
Completion Date:	October 21, 1963
Angle of Hole:	50° off horizontal
Thickness of Mantle:	40 feet
Dip of Strata:	11° or 69° off horizontal
Total Depth of Hole:	514 feet
Percent Core Recovery:	87.3 (driller's measurements)
Number of Core Pulls:	120
Average Length of Core per Pull:	4 feet
Number of Core Boxes:	31
Coal Seams Encountered:	—

Hole Interval	Core Thickness	Remarks
42'-0" to 43'-6"	1'-6"	Coal pulverized
119'-0" to 125'-0"	6'-0"	Coal pulverized; 10% core recovery
144'-0" to 145'-8"	1'-8"	Coal pulverized
162'-0" to 162'-8"	0'-8"	Coal pulverized
486'-0" to 489'-0"	3'-0"	Coal and mud; 25% core recovery

An analysis was made on the portion of the core from 119'-0" to 125'-0" and showed a 37.5% ash and a free swelling index of 3.5. The analysis report is placed at the end of this Drill Hole No. 1 report.

Pictures of the core from interval 109 to 119 ft., the immediate roof above the coal seam, show a recovery of 50% of black shale which was broken and pulverized.

FIELD REPORT

DRILL HOLE NO. 1

By
Melvin E. Hinkle
John T. Boyd & Associates

The first drill and equipment for Drill Hole No. 1 was unloaded from the truck at McGillivray Valley bottom on the morning of September 19, 1963. The drill was moved up the mountainside and the setup completed at the end of the shift on September 22. During this 4-day period, Alberta Natural Gas Company supplied the necessary heavy equipment and personnel to move the drill and equipment to the drill site and also supplied a rented 4000 gallon, trailer-type, water tank, a pump and two water supply tanks of 1000 gallon and 500 gallon capacity as water supply equipment for the drill.

Some of the heavy equipment supplied by Alberta Natural Gas Company consisted of,

1 - Nodwell tracked carrier
1 - Cat. 577 tractor equipped with blade and winches
1 - GM 7000 truck for pulling the 4000 gallon water tank
2 - Pickup trucks

It was estimated that Alberta Natural Gas Company had $200,000 worth of equipment on the job to get drilling started.

Drill Hole No. 1 was located on the pipeline right of way a horizontal distance of 850 feet down the pipeline from the point where the surface trace of the Erickson Fault crossed the pipeline. From information taken from geologic maps of the area, it was assumed that the strata dipped to the west at an angle of 40 degrees from the horizontal and had a north-south strike. Therefore, Drill Hole No. 1 was to be drilled at an angle of 50 degrees in a due east direction, or at right angles to both dip and strike.

The water supply pump and two supply tanks were located at the bottom of a very steep section of the pipeline approximately 1600 feet horizontally down the pipeline from the drill location and at a difference in elevation of 450 feet. Rubber water hose was strung between the supply pump and the drill. Water was hauled in the 4000 gallon tank from Michel Creek, where Alberta Natural Gas Company's pump was located, to the two water supply tanks a horizontal distance of 4400 feet.

Actual drilling did not get started until the midnight shift of September 24 due to the rubber hose line continually bursting and to the pressure pump at the drill not working properly. A new pump was installed and 1000 feet of rubber water hose was replaced by aluminum pipe.

Overburden was tricone-drilled with mud to a depth of 40 feet. Coring was then started using an NX core barrel giving a 2-1/8 inch diameter core. Core barrels were 5 and 10 feet in length.

The hole was drilled to a depth of 514 feet. The dip of the strata was nearly constant in relation to the core. Two measurements were made, one at 228 feet, which showed that the bedding plane was 29 degrees off right angle to the core for a dip of either 11 degrees or 69 degrees off horizontal; the other was at 446 feet, at which the bedding plane was 30 degrees off right angle to the core for a dip of either 12 degrees or 72 degrees off horizontal.

At a depth of 341 feet in the hole the core barrel stuck and broke off. After 8 hours lost drilling time at an unsuccessful attempt to fish and save the core barrel, it was decided to wedge the hole and drill past the core barrel. Two more drilling days were lost in waiting for a wedge to be sent from Vancouver by Boyles Drilling Company.

A 2 degree wedge was placed in the hole to change the angle of the hole from 50 to 48 degrees. Drilling past the wedge started during the night of October 8, 1963. After drilling to 340 feet, the drill rods became stuck twice within the last 2 feet due to caving material from higher in the hole. It was decided to cement the hole back to 268 feet. Four bags of cement were used and poured down the hole by the drill foreman (not pumped). After drilling out the cement and coring to a depth of 353 feet, the drill rods again stuck and had to be "drilled" back. Decided first cement job did not work and tried cementing again back to 325 feet and pumping down drill rods. The cement was again drilled out and coring resumed to 367 feet. In the last 2 feet of coring, the hole caved in and it was decided to finish the hole by drilling with mud.

Two acid tube dip tests were taken, the first at 300 feet which showed the hole to be on a 50 degree angle, and the second at a depth of 514 feet which showed the hole to be on a 48 degree angle.

Coal was cut at 42'-0" to 43'-6" for a 1'-6" thickness; another seam at 119 to 125 feet for a 6'-0" thickness with a recovery of 10% and a true thickness of 5'-3" for either 11 or 69 degree dip; another at 144'-0" to 145'-8" for a 1'-8" thickness; one at 162'-0" to 162'-8" for an 0'-8" thickness; and the last seam at 486 to 489 feet for a 3'-0" thickness with a recovery of 25% and a true thickness of 2'-7" for either a 12 or 72 degree dip. All of the above coals were in a finely pulverized condition and could not be recovered in the core barrel; most of the coal being washed away.

The strata between the above coal seams from the bottom of the overburden to the bottom of the hole consisted of gray sandstones, gray to dark gray siltstones, dark gray to black shales and jumbo or clay seams. The strata was found to be very broken with portions pulverized, highly fractured and slicken-sided. This condition of the strata greatly slowed drilling. The driller's marked wood blocks along the length of the core showed that there were 120 pulls of the drill rods for an average core length per run of 4 feet.

Drill Hole No. 1 was completed on October 21 for a total drilling time of 30 days.

Following is a summary of main operations showing man hours required and percent of drilling time.

	Man Hours	Percent Drilling Time
Setting up drill	112	7
Repair to Rubber Hose Line	64	4
Lost time water supply	14	1
Lost core barrel and wedging	80	5
Cementing and drilling out	97	7
Drill breakdowns	217	13
Actual drilling	1000	63
	1584	100

Total footage cored was 474 feet with 409 feet of core recovered for an overall core recovery of 87.1%.

There are a total of 31 core boxes, together with the acid tubes, stored at the Alberta Natural Gas Company's No. 1 Pumping Station located off British Columbia Highway No. 3 several miles west of Crow's Nest, B.C., Canada.

D.H. #1
(ANG Survey Stn. #16)

Started: Sept. 22, 1963
Finished: Oct. 21, 1963
Depth: 514'0"

40'4" Casing & N Casing to Bedrock
NX Core

Top casing from Grd. at 90°-0.0'
Ground Elevation 811.9'(not sea lev.)
Direction - Due East
Angle - 50° (See Wedging)

Description of Strata	Feet	Depth Feet
Cover - Boulders & Clay	40'0"	40'0"
Sandstone, gray, hard (outcrop)	1'0"	41'0"
Shale, black, outcrop, soft	1'0"	42'0"
Coal, outcrop (not seam thick) pulverized	1'6"	43'6"
Sandstone, gray, broken	1'0"	44'6"
Shale, black, broken & slicken-sided, soft spots	20'0"	64'6"
Shale, dark gray, silty, broken & slicken-sided	8'6"	73'0"
Siltstone, gray, hard, broken(but in larger pieces)	22'0"	95'0"
Lost 6' core - (Ground up & washed away) Assumed to be black shale.	6'0"	101'0"
Shale, black, broken, top 12" ground up	2'0"	103'0"
Siltstone, dark gray, broken, some calcite streaks	7'0"	109'0"
Shale, black, broken & crushed fine (5' core missing) Washed away (brown colored washings)	12'0"	119'0"
Coal, crushed, very fine, only recovered 9" remainder washed away, drillers footage for coal 119-125'. (Black washings)	6'0"	125'0"
Shale, black, broken & portions pulverized	19'0"	144'0"
Coal, pulverized, some 1" pieces, boney	1'8"	145'8"
Shale, black, broken, small pieces	3'0"	148'8"

Description of Strata	Feet	Depth Feet
Siltstone, gray, sandy, calcite streaks, broken hard	3'4"	152'0"
Shale, black, broken, upper 4' pulverized	10'0"	162'0"
Coal, pulverized	0'8"	162'8"
Shale, black, hard, broken w/3'8" section pulverized	13'10"	176'6"
Siltstone, gray, hard, broken	1'6"	178'0"
Shale, black, hard, broken	3'0"	181'0"
Siltstone, gray, hard, sandy, broken, calcite streaks	11'0"	192'0"
Gumbo (mud seam)	0'8"	192'8"
Siltstone, dark gray, broken, hard	3'10"	196'6"
Gumbo (clay seam)	0'6"	197'0"
Ran 3-1/2" casing to 65' depth - past caved section		
Siltstone, gray, hard, broken, top 10" pulverized.	5'0"	202'0"
October 2, 1963 (205' - 2:00 p.m.)		
Siltstone, broken & gumbo mixed	3'0"	205'0"
Siltstone, pulverized	3'0"	208'0"
Siltstone, gray, hard, broken, calcite streaks	5'0"	213'0"
(See 4" piece at 228' for bedding plane shows 29° from Rt. L. - Box 11)		
Shale, black, broken & pulverized, slicken-sided	20'0"	233'0"
Siltstone, sandy, dark gray, hard, broken	7'6"	240'6"
Gumbo (clay seam)	0'6"	241'0"
Siltstone, sandy, dark gray, hard, broken, calcite streaks	6'0"	247'0"

Description of Strata	Feet	Depth Feet
Same as above - not as broken - core pieces as long as 6"	18'0"	265'0"
Siltstone, sandy, dark gray, hard, broken (Drillers claim caving at 280')	17'0"	282'0"
Shale, black, pulverized & washed away (Driller's called mud seam)	4'0"	286'0"
Shale, black, hard, broken	3'0"	289'0"
Clay seam	0'8"	289'8"
Sandstone, fine grained, hard, broken	35'4"	325'0"
Siltstone, dark gray, hard, broken, in place mat. or caved? Top 10" pulverized	16'0"	341'0"

(Last Box #19 - from 316'-330' - Driller threw away 330-341', came as above)

(Started 2° wedge into hole at 4:00 p.m. Start offset hole at 317' & 48°)
Full core at 327'

October 10

Siltstone, dark gray, hard, broken, bot. 12" pulverized	13'0"	340'0"

(Cement back to 268', drill rods sticking last two pulls)
Four bags cement used - poured in hole. Driller said cement only to about 320' Did not reach bottom hole. Last 8' shows pieces rounded & scored by bit. Only three small pieces core in last 5' run.

Siltstone, gray, hard, broken	13'0"	353'0"

(Two bags cement used, pumped in hole, to cement back to 325')

Siltstone, gray, sandy, hard, broken	14'0"	367'0"

(Start drilling with mud)

Siltstone - same - with clay streaks	14'0"	381'0"
Clay seam - mixed with small pieces shale	7'6"	388'6"

Description of Strata	Feet	Depth Feet
Siltstone, Gray, hard broken	7'6"	396'0"
Siltstone, sandy, gray, hard, crushed	3'0"	399'0"
Clay seam, mixed w/fine pieces shale	1'3"	400'3"
Siltstone, gray, sandy, hard, crushed	5'9"	406'0"
Clay & broken shale, soft	2'0"	408'0"
Shale, black, hard, broken w/Numberous clay seams 4" to 9" thick	52'0"	460'0"
Clay seam mixed with soft shale and a few coal streaks	20'0"	480'0"
Shale, sandy, hard (solid core)	0'9"	480'9"
Clay and broken shale, soft (coal at end)	5'3"	486'0"
Coal, mud 0'9" core 2'3" washed away	3'0"	489'0"
Mississippian - Fault		
Dolomite, dark gray, hard (large core pieces) effervesces with dilute HCl (10%)	25'0"	514'0"
Total Depth of Hole	514'	

Acid Dip Test Angle at 300' - 50°

Acid Dip Test Angle at 514' - 48°

No. Core Boxes - 31

SIGNED: C. O'Brien

Foreman

Boyles Bros. Drilling Co. Ltd.

By Norman Boyse
Alberta Natural Gas Company

CORE LOG

McGILLIVRAY PROJECT

Hole No. 1

(0-40') Overburden

(40-41') Rec. 7"

Sandstone, buff, fine grained, angular to sub-rounded grains, hard, appears to contain feldspars and heavy minerals.

(41-44') Rec. 3'

2' Soft grey shale, abundant carbonaceous material, some very dirty coal in lower foot.
1' Siltstone, grey, carbonaceous partings, slickensiding, core is badly broken.

(44-49') Rec. 39"

Shale, grey, silty, carbonaceous, badly broken, slickensiding, blocky, minor amounts of grey sandstone, medium grained, sub-angular, yellow coloring under microscope (sideritic)

(49-50') Rec. 1'

Interbedded grey siltstone and shale, badly broken.

(50-53') Rec. 2'

Shale, grey, slightly silty, badly broken, carbonaceous, slickensided.

(53-57') Rec. 30"

Shale, grey, badly broken to pulverized, looks like coal in part but is not. Appears to be vertical fracturing.

(57-65') Rec. 38"

6" Shale, grey to black, pulverized
32" Shale, grey, badly broken, carbonaceous partings along near vertical fracture plains.

(65-68') Rec. 30"

Shale, grey, silty, badly broken, scattered, phosphate inclusions.

(68-73') Rec. 5'

Shale, grey, hard, badly broken, white phosphatic inclusions and partings along fracture planes which appear near vertical, minor carbonaceous partings.

(73-78') Rec. 5'

Siltstone predominantly, grey, interbedded grey shale, carbonaceous partings, phosphate along fracture planes. Core is less broken. Fracturing appears to be roughly perpendicular to bedding plane which is now becoming evident by core breakage and scattered thin laminae of light grey sand lenses. Bedding planes appear to be at 30° to vertical axis of core. Hole is being drilled at 50° below horizontal - therefore dip of beds at 10°

(78-83') Rec. 5'

Shale, grey to very dark grey, badly broken, some phosphatic material along fracture planes, near vertical fracture.

(83-85') Rec. 2'

Shale as above, broken down to relatively fine pieces, one laminae of coal.

(85-86') Rec. 6'

Shale as above, broken, phosphate and carbonaceous partings, some slickensiding.

(86-90') Rec. 4'

Shale, grey, silty, broken, phosphatic stringers, factured.

(90-95') Rec. 3-1/2'

Shale, grey, silty, broken, one good piece showing light grey silty bedding which gives orientation of core to bedding plane.

(95-103') Rec. 2'

Grey silty shale as above, scattered carbonaceous material, slickensided, shale pulverized in part.

(103-109') Rec. 5'

Grey silty shale as above, strong evidence of vertical fracturing.

(109-117') Rec. 3'

Grey silty shale and siltstone as above, badly broken.

(119-125) Rec. 6"

Coal, pulverized - believed to be 6' coal seam.

(125-128') Rec. 3'10"

Top part 8" coal, might be picked up core from interval (119-125) Remainder dark grey shale, carbonaceous in part, badly broken, pulverized in part.

(128-135') Rec. 5'

Shale, grey to dark grey, broken to pulverized, strong evidence of vertical bedding also evidence of bedding plane at 30° to axis of core.

(135-144) Rec. 6'

Shale as above, carbonaceous material along fracture planes.

(144-152') Rec. 8'

144-145.8 Coal
4' badly broken grey shale, carbonaceous partings, slickensided.
3" grey siltstone
2'1" badly broken grey shale and grey siltstone, phosphate stringers instilling vertical fractures.

(152-162') Rec. 5'

3'10" grey pulverized shale
1'2" shale, grey, broken, vertical fractures.

(162-168') Rec. 5'

2" Coal
4'4" shale, grey, broken, alternating to grey mud stone.

(168-172') Rec. 4'3"

Shale as above, pulverized.

(172-180') Rec. 6'

6' shale, grey, broken, carbonaceous, partings, slickensided, minor amounts of phosphatic material.

(180-185') Rec. 4'3"

1'4" Pulverized grey shale (mudstone?)
2'9" Grey broken silty shale and grey siltstone, stringers of phosphatic material in siltstone.

(185-192') Rec. 7'

Broken grey shale as above and pulverized grey shale, phosphate stringers along bedding plane and fracture planes, fracturing is vertical.

(192-193') Rec. 1'

Shale and mudstone as above

(193-194') Rec. 1'

Broken shale as above.

(194-196) Rec. 2'

Grey, broken shale as above.

(196-197) Rec. 1'

Shale and mudstone

(197-202) Rec. 3'3"

1' Pulverized shale
2'3" Broken grey shale, evidence of vertical fracturing.

(202-205) Rec. 4'

As above.

(205-207) 3'2"

As above.

(207-211) Rec. 4'

As above, phosphatic material more prominant in blocky shale, some carbonaceous material, slickensiding.

(211-212) Rec. 1'

Broken and pulverized grey shale.

(212-213) Rec. 1'

Broken grey shale as above.

(213-218) Rec. 5'

1' Shale, dark grey to black, silty, very finely broken, (pulverized).
20" Shale dark grey to black, broken, fracturing evident, some phosphatic stringers.
7" shale, dark grey to black, very finely broken.
21" Shale, dark grey, silty, near vertical fracturing, phosphatic stringers.

(218-228) Rec. 8'2"

2'8" Shale, dark grey, very finely broken.
5'6" Shale, dark grey, silty, broken, vertical fracturing, phosphatic stringers and partings.

(228-231) Rec. 3'

2'2" Shale, dark grey grading almost to argillaceous siltstone, near vertical fracturing, some thin lenses of white, very fine stained sandstone portraying bedding plane.
10" Shale, dark grey, finely broken, soft (mudstone).

(231-236) Rec. 3'8"

Shale, dark grey, alternating between coarsely and finely broken, slightly silty in part, minor amounts of phosphate in stringers.

(236-239) Rec. 3'

Shale, dark grey, silty in part, broken, near vertical fracturing, some phosphatic stringers and partings. - first foot of core could be called argillaceous siltstone.

(239-242) Rec. 3'

Shale as above, an 8" band at about 240 which could be called mudstone.

(242-244) Rec. 2'

Shale, dark grey as above grading to argillaceous siltstone, near vertical fracturing, phosphatic stringers and partings.

(244-247) Rec. 3'

Shale and siltstone as above.

(247-252) Rec. 5'

Siltstone, grey, argillaceous, minor carbonaceous and phosphatic partings, slickensided in part along fracture planes, near vertical fracturing.

(252-256) Rec. 4'

Siltstone as above, more argillaceous and broken near vertical fracturing.

(256-261) Rec. 5'

Grey siltstone as above, phosphatic stringers following both fracture and bedding planes.

(261-264) Rec. 3'

Siltstone and shale as above, more argillaceous, quite broken, phosphatic partings and stringers. Minor amount of interbedded fine grained white sandstone.

(264-267) Rec. 3'

Shale, grey as above, silty grading to mudstone, minor interbedding of white, fine grained sandstone.

(267-269) Rec. 2'

Shale, dark grey, silty to sandy, broken, near vertical fracturing, phosphatic stringers or partings along fracture planes.

(269-270) Rec. 1'

As above.

(270-276) Rec. 6'

Shale and siltstone as above.

(276-286) Rec. 6'

Silty shale to argillaceous siltstone, near vertical fracturing, broken, phosphatic partings along fracture planes.

(286-288) Rec. 2"

Shale, grey, silty, broken, 4" of mud at 286' composed of finely broken shale and fine to medium grained rounded quartz grains.

(288-290) Rec. 2'

Dark grey broken shale and argillaceous siltstone.

(290-296) Rec. 5'10"

As above.

(296-299) Rec. 3'

Siltstone, grey, argillaceous, fractured and broken.

(299-303) Rec. 4'

As above, minor interbedding of fine grained sandstone.

(303-308) Rec. 4'

As above.

(308-310) Rec. 2'

As above.

(310-315) Rec. 5'

As above.

(315-319) Rec. 4'

As above.

(319-320) Rec. 1'

Grey argillaceous siltstone, fractured broken.

(320-324) Rec. 4'

Grey siltstone and silty shale, fractured and broken.

(324-328) Rec. 4'

1' Siltstone, grey, grading to fine sand, badly broken, phosphatic partings, minor amounts of finely disseminated pyrite.
1' Shale, grey silty, pulverized.
2' Siltstone, grey, badly broken, phosphatic partings, some slickensiding.

(328-330) Rec. 1'

Siltstone as above.

(330-334) Rec. 2'9"

Siltstone, as above, argillaceous, fracturing,

(334-337) Rec. 3'

Siltstone as above, pulverized in part.

(337-339) Rec. 1'8"

Siltstone as above, grading to silty shale, badly broken.

(339-340) Rec. 1'

Shale, grey, finely pulverized, for the most part.

(340-345) Rec. 1'8"

Shale, grey, silty, badly broken.

(345-348) Rec. 1'6"

Siltstone, grey, argillaceous, grading to fine grained sand in part.

(348-353) Rec. 2"

Grey siltstone with some whitefine grained sandstone.

(353-358) Rec. 9'

Siltstone as above.

(358-360) Rec. 8"

Siltstone as above.

(360-365) Rec. 4'1"

Siltstone as above, and pulverized grey silty shale.

(365-367) Rec. 2'

1' Grey silty shale, pulverized for most part.
1' Siltstone, as above.

(367-369) Rec. 0'

Lost core, no indication of coal in cuttings during drilling.

(369-373'6") Rec. 3'6"

Badly broken grey argillaceous siltstone and silty shale, minor amounts of phosphatic streaks.

(373'6" - 377'6") Rec. 3'6"

Grey to black, argillaceous siltstone and silty shale, broken Some carbonaceous partings.

(377'6"-382) Rec. 2'1"

1'10" Siltstone and shale as above.
3" Mudstone, brownish, appears slightly carbonaceous.

(388-388) Rec. 4'

Predominantly mudstone, grey to brown, appears to be carbonaceous.

(388-393) Rec. 4'

Shale, grey, silty, badly broken.

(393-394) Rec. 1'

As above.

(394-395'6") Rec. 1'

As above.

(395'6"-396'6") Rec. 1'

As above.

(396'6"-398'6") Rec. 2'

Siltstone and shale as above, badly broken, some carbonaceous material along partings.

(398'6"-402') Rec. 3'2"

11" Grey silty shale and argillaceous siltstone.
14" Mudstone, grey to brown, carbonaceous in part.
13" Siltstone and shale as above, badly broken.

(402-404'9") Rec. 2'

Grey to black silty shale and argillaceous siltstone, badly broken.

(404'9"-407') Rec. 2'3"

1'3" Shale and siltstone as above, badly broken
1' Mudstone, dark brown, carbonaceous.

(407-411'6") Rec. 2'7"

Siltstone and shale as above, badly broken.

(411'6"-417') Rec. 5'6"

Siltstone and shale as above, badly broken.

(417-418'8") Rec. 1'8"

6" Sandstone, grey, fine grained, no cementing material - very friable, carbonaceous flecks.
1'2" Siltstone and shale as above, badly broken.

(418'8"-421) Rec. 1'6"

Shale, grey, silty.

(421-426) Rec. 5')

Shale, grey to dark grey, silty badly broken.

(426-430) Rec. 4'

Shale as above.

(429'-429'6") Sandstone, brown, very fine grained, no cementing material, carbonaceous inclusions.

(430-432) Rec. 2'

Shale, grey to dark grey, silty grading to grey siltstone, badly broken.

(432-434'6") Rec. 2'6"

2' Dark grey shale, badly broken.
6" Mudstone, brownish color, carbonaceous?

(434'6"-437'4") Rec. 2'10"

Mudstone and shale, brownish black, some carbonaceous material, badly broken.

(437'4"-440'6") Rec. 3'2"

Shale, brownish black, carbonaceous, streak, fractured, badly broken.

(440'6"-444') Rec. 3'6"

6" Mudstone, silty loose not compacted.
3' Shale, brownish black, carbonaceous streak. Badly broken.

(444'-446'6") Rec. 2'6"

9" Mudstone, dark brown
1'9" Shale, brownish black, some light grey, fine grained sand lenses or laminae.
One piece exhibits fair bedding - plane is 24° off horizontal axis of core.

(446'6"-453'6") Rec. 2'

5' Clay seam reported - no recovery.
2' Shale, brownish black, finely silty, carbonaceous streak, badly broken.

(443'6"-455) Rec. 1'6"

Shale as above, badly broken.

(455-460) Rec. 2'9"

Interbedded black shale and mudstone. Evidence of vertical fracturing, shale badly broken.

(460-468) Rec. 8'

Mudstone, grey to black, carbonaceous.

(468-475) Rec. 6'

3' Mudstone, as above.
3' Fine grained sandstone, grey, and grey argillaceous siltstone.

(475'-478') Rec. 2'7"

Mudstone, brownish.

(478-481'6") Rec. 3'3"

1'9" Mudstone, grey to brownish.
8" Siltstone, grey, some carbonaceous material along partings, vertical fractures infilled with phosphatic material.
10" Mudstone, brown

(481'6"-483'6") Rec. 2'

Mudstone as above.

(483'6"-484'6") Rec. 1'

Mudstone as above.

(484'6"-489') Rec. 2'4"

1'7" Mudstone as above.
9" Coal

NOTE: (2'4" missing core - assume that this is coal - total coal thickness 3' ±)

(489-514) Rec. 25'

Limestone, grey to dark grey, dense, numerous fractures infilled with white phosphatic material.

CORE RUNS IN D. H. #1

Driller's Marked Woodblocks	Length of core	Driller's Marked Woodblocks	Length of core
40' Bedrock	—	239'	3'
41	1'	242	3
44	3	244	2
Not marked	-	247	3
Not marked	-	252	5
53	-	256	4
57	4	261	5
65	8	264	3
68	3	267	3
73	5	269	2
78	5	270	1
83	5	276	6
85	2	286	10
86	1	288	2
90	4	290	2
95	5	296	6
Lost 6' core	6	299	3
103	2	303	4
109	6	308	5
117	8	310	2
119-6"	2-6"	315	5
125	5-6"	319	4
128	3	320	1
135	7	324	4
144	9	328	4
152	8	330	2
162	10	334	4
168	6	337	3
172	4	339	2
180	8	340	1
185	5	345	5
192	7	348	3
193	1	353	5
194	1	354	1
196	2	360	6
197	1	365	5
202	5	367	2
205	3	369	2
207	2	373-6"	4-6"
212	5	377-6"	4
213	1	382	4-6"
218	5	388	6
228	10	393	5
231	3	394	1
236	5	395-6"	1-6"

Driller's Marked Woodblocks	Length of core
396-6"	1'
399-6"	3
402	2-6"
404-9"	2-9"
407	2-3"
411-6"	4-6"
418-8"	7-2"
421	2-4"
426	5
430	4
432	2
434-6"	2-6"
437-4"	2-10"
440	2-8"
444	4
445-6"	1-6"
448	2-6"
455	7
460	5
Not marked	-
468	-
475	7
478	3
481-6"	3-6"
483-6"	2
484-6"	1
489	4-6"
496-6"	7-6"
506	9-6"
511-6"	5-6"
514	2-6"
END	

120 pulls
4' av. per pull

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by
A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta.

		Hole #1 (119-125)		Hole #1 (162-162.8)	
Your Designation:					
Date Sample Taken:		Dec. 19/63		Dec. 19/63	
Laboratory Sample No.:		401-64		402-64	
		As Received	Dry	As Received	Dry
Moisture	%	13.7	-		-
Ash	%	37.3	43.2		67.9
Volatile Matter	%	17.1	19.8		14.4
Fixed Carbon	%	31.9	37.0		17.7
Sulfur	%				
Calorific Value, B.t.u. per lb.					
Free Swelling Index		3 1/2		Nonagglomerating	

Remarks:

The sample 402-64 was inadvertently dried before grinding, and therefore we cannot give you the Analysis on the As Received Basis. However, since all of these samples have been wetted by drilling mud, only the analyses on the dry basis are significant.

Date: January 14, 1964. Signed: W. H. Mannion

Coal Analytical Laboratory Approved: J. F. Hayes

DRILL HOLE NO. 2

Drill Number:	Two
Location:	1600 ft. downgrade and west of No. 1 Hole
Starting Date:	October 20, 1963
Completion Date:	November 13, 1963
Angle of Hole:	50 degrees off horizontal
Thickness of Mantle:	101 feet
Dip of Strata:	Variable (see Field Report)
Total Depth of Hole:	533 feet
Percent Core Recovery:	95.4 (driller's measurements)
Number of Core Pulls:	95
Average Length of Core per Pull:	4.5 feet
Number of Core Boxes:	33
Coal Seams Encountered:	

Hole Interval	Core Thickness	Remarks
*183'-0" to 187'-0"	4'-0"	Coal pulverized, 17% rec.
459'-0" to 461'-0"	2'-0"	Coal pulverized, 50% rec.

* The true thickness for this seam is 3'-10".

Samples were taken from portions of the recoverable cores for analyses. The results show 42.4% ash for the 4'-0" seam and 22.2% ash for the 2'-0" seam. The free swelling index shows very poor coking qualities for both seams. The analysis report is at the end of this Drill Hole No. 2 report.

Also included at the end of this report are conclusions drawn from examination of core chips.

FIELD REPORT

DRILL HOLE NO. 2

By
Melvin E. Hinkle
John T. Boyd & Associates

A second drill was delivered by truck to the McGillivray Valley bottom on October 20, 1963, for setting up at the site of Drill Hole No. 2.

Drill Hole No. 2 was located on the right of way at the base of the very steep portion of the pipe line and close to the water supply pump and tanks as described in the Drill Hole No. 1 Report, and at a horizontal distance of 1600 feet down the pipeline from Drill Hole No. 1 location. This drill hole was also drilled at an angle of 50 degrees from the horizontal and in a due east direction.

It required four days to move the drill and equipment up the hill and set up the drill. Drilling started October 24. Overburden consisting of boulders and clay was found to a depth of 101 feet; 54 feet of H-casing and 101 feet of N-casing were used to bedrock.

The same water supply setup used for Drill Hole No. 1 was used for this drill hole. Equipment and operators for hauling water were supplied by Alberta Natural Gas Company. The 4000 gallon water tank was filled at Michel Creek by pump and pulled up the pipeline right of way by the Nodwell or tractor a horizontal distance of 4400 feet, and at a difference in elevation from the creek to the drill site of approximately 370 feet.

This drill hole was stopped at a depth of 533 feet. An acid dip tube test was made at 520 feet and showed the hole bottomed at a 53 degree angle. One-half the depth of the hole was accepted to be on a 50 degree angle and the bottom half on an angle of 53 degrees.

Many measurements were made of the angle the bedding plane was off right angle to the core where core pieces showed a plain bedding. As in Drill Hole No. 1, two dips of strata can be calculated from these measurements, a lesser or the greater.

Following is a tabulation of the various measured angles the bedding plane was off right angle to the core at different depths in the drill hole.

Depth in Drill Hole (Feet)	Angle off Right Angle to Core	Lesser Angle of Dip	Greater Angle of Dip
112	62	22	78
115	60	20	80
123	42	2	82
130	20	20	60
146	18	22	58
167	12	28	52
193 & 197	16	24	56
290	12	25	49
298	16	21	53
305	20	17	57
338	20	17	57
342	13	24	50
378	11	26	48
405	32	5	69
421	55	18	88
424	25	12	62
437-6"	40	3	77
531	28	9	65

Two coal seams were cut in this drill hole. The first was cut at 183 feet to 187 feet for a 4'-0" thickness, with a recovery of 17% and a true thickness of 3'-10". The second was cut at a depth of 458 to 460 feet for a cut thickness of 2'-0". Both coal seams were in a finely pulverized condition and were unable to be recovered by coring, most of the fine material being washed away.

The strata between the coal seams and from the bottom of the overburden to the bottom of the hole consisted of gray to dark gray siltstones, gray sandstones, black shales and minor clay seams. The strata was found to be broken, fractured and slicken-sided, with little pulverizing. Coring was not as difficult as found in Drill Hole No. 1.

Little trouble or lost drilling time was encountered in drilling this hole. Following is a tabulation of the major items encountered:

	Man Hours	Percent Drilling Time
Setting up No. 2 Drill	114	11
Fishing for dropped rods in hole	32	3
Drill breakdowns	18	2
Actual drilling	844	80
Pull rods and tear down	40	4
	1048	100

The hole made water at the rate of 2 gallons per minute when bedrock was reached and continued making water at end of drilling.

Drilling was carried on 24 hours per day for 7 days per week, as was Drill Hole No. 1.

Drillers marked wood blocks along the length of the core showing that they had to pull rods 95 times for an average length of core of 4.5 feet. The core was NX size, or a 2-1/8 inch diameter core.

Total length of cores placed in core boxes was 432 feet with 412 feet of core recovered for an overall core recovery of 95.4%.

The hole was completed on November 13 covering a total drilling time of 24 days.

There are 33 core boxes, together with the acid test tube, stored at the same location as Drill Hole No. 1 core boxes.

Started: Oct. 24, 1963
Finished: Nov. 13, 1963
Depth: 388'

D.H. #2
(Acid Survey Station #11)

3'4" - N Casing
101' - N Casing

Top casing from ground level = 0.00
Ground Elev. - 360'(Mot Sea Level)
Direction: Due East
Angle: 60° (53° at 320')

Hole making H2O since bedrock - 2 gal./min.

	Feet	Depth Feet
Overburden, Loudiere and clay	101'0"	101'0"
Siltstone, sandy, gray, fractured and broken, Calcite streaks	4'6"	105'6"
Lead and broken shale	3'0"	108'6"
7" piece core at 112' shows dip to be 62° off Rt. L. to core " " 115' " " " " 60° " " " " " " 123' " " " " 42° " " " "		
Siltstone, sandy, grey, fractured and broken, calcite streaks and small clay seams	15'0"	123'6"
Clay, gray (Fault?)	2'0"	125'6"
Clay, brownish	4'0"	129'6"
A 2" piece core at 167' shows bedding to be 12° off Rt. L.		
Sandstone, grey, light hard wedge fractures filled with calcite, fine grain, calcite streaks, large core pieces	53'6"	183'0"
COAL, pulverized - 8" core, assume 3'4" washed away.	4'0"	187'0"
Sandstone, grey, light hard med. grain, badly fractured and broken, some mud streaks (calcite streaks only from 230' to 245')	68'6"	255'6"
Clay, grey	1'6"	257'0"
Core piece at 290' shows bedding to be 12° off Rt. L. core " " " 295' " " " " 16° " " " " " " 305' " " " " 20° " " " " " " 330' " " " " 25° " " "		

	Feet	Depth Feet
Sandstone, gray, hard, fine to med. grain, fractured and broken, calcite streaks angle of hole at 322' - 30° by Brunton Compass	85'0"	340'0"
Core piece at 342' shows bedding to be 13° off Rt. L. to core		
" " " 374' " " " " " 11° " " " " "		
Siltstone, dark grey, sandy, broken and slickensided, with several med streaks	34'6"	374'6"
Core piece at 378' shows bedding to be 11°-15° off Rt. L. to core		
Shale, black, hard, broken	6'0"	380'6"
Shale, black, pulverized	1'6"	382'0"
Shale, black, hard, fractured and slickensided	9'0"	391'0"
A 3" core at 405' shows bedding to be 12° off Rt. L. to core		
Sandstone, grey, med. grain, hard, broken	30'0"	421'0"
4" core at 421' shows bedding to be 40° off Rt. L. to core 4" core at 434' shows bedding to be 20° off Rt. L. to core 2" core at 437'6" shows bedding to be 40° off Rt. L. to core		
Sandstone, gray, fine & med. grain, hard, fractured and broken	23'6"	444'6"
Mudstone, light gray, solid and med. hard, slickensided	3'6"	447'6"
Clay, gray, soft	1'6"	449'0"
Sandstone, gray, fine grain, fractured & broken	6'0"	454'0"
Shale, black, sandy, hard, broken & slickensided	4'0"	458'0"
COAL, pulverized 3'0" run 458'-461', 3'0" of core with 1'0" coal. Assume 1'0" coal washed away.	2'0"	460'0"
Shale, black, hard, fractured and slickensided	10'0"	470'0"
Siltstone, dark gray, sandy, hard, fractured and broken	33'6"	503'6"
Mud and Broken shale	1'0"	504'6"

	Feet	Depth Feet
Siltstone, dark grey, sandy, hard, fractured and broken	2'6"	507'0"
Clay, grey, hard	0'6"	507'6"
Siltstone, dark grey, sandy, hard, fractured and broken	10'4"	518'0"
Core at 501' shows bedding to be 26° off R.L. to core		
Sandstone, light grey, med. grain, hard, fractured and broken w/coal streak at 518'10"	15'0"	533'0"

END OF HOLE

Hole making 2 gal. water per minute

Acid Dip Test at 528' - 53°

No. Core Boxes - 33

Signed: Norman A. Boyle
Foreman
Boyles Bros. Drilling Co. Ltd.

By Norman Boyse
Alberta Natural Gas Company

CORE LOG

McGillivray Project

D.H. #2

(0 - 101') Overburden

(101 - 106') Rec. 2'6"

2' - Sandstone, brown, medium grained, rounded to subangular, slightly calcareous, conglomeratic, abundant black carbonaceous material, light brown to yellowish streaking (sideritic or limonitic?)

6" - Shale, grey, broken

(106-108'6") Rec. 2'6"

Shale or mudstone, brownish, badly broken, some slickensiding.

(108'6" - 110') Rec. 1'6"

1' - Sandstone as above.

6" - Shale or mudstone as above.

(110' - 111') Rec. 1'

Sandstone as above, some streaks of white phosphatic material (infilling).

(111'-113') Rec. 2'

Sandstone as above, badly broken in part, bedding is 60° off horizontal axis of core. Dip of beds, therefore, 20°E or 80°E.

(113'-117') Rec. 3'9"

Sandstone as above, last 9" badly broken, bedding at 114' is 60° to horizontal axis of core. Fracturing evidenced by infilling with white phosphatic material. Fracturing at right angles to bedding as well as minor hairline fracturing of no particular orientation.

/..2

(117'-121') Rec. 4'

Sandstone as above, bedding not distinct, however core breakage suggest some 60° angle to horizontal axis of core.

(121'-124') Rec. 3'

Sandstone as above, fracturing very pronounced, phosphatic infilling, core broken fairly badly. Last 4-5" light grey mudstone, badly broken up.

(124'-129') Rec. 5'

Light gray to brownish mud.

(129'-134') Rec. 5'

Sandstone as above, fracturing pronounced at right angles to bedding, fractures infilled with white phosphatic material. At 140'6" bedding is 20° off horizontal axis of core. Dip of beds therefore, 20°W or 60° W.

(134'-144') Rec. 10'

Sandstone as above, quite massive, less fracturing bedding remains at 20° to horizontal axis of core.

(144'-154') Rec. 10'

As above, some bedding.

(154'-159') Rec. 5'

Sandstone as above, badly broken, argillaceous to carbonaceous partings.

(159'-164') Rec. 5'

1'9" Sandstone as above.

8" Shale, brownish black, carbonaceous, slickensided.

2'8" Sandstone as above, badly broken.

/..3

(166'-173') Rec. 6'10"

Sandstone, essentially as above, quite argillaceous in part, bedding at about 20° to horizontal axis of core.

(173'-180'6") Rec. 6'

Sandstone, grey, medium grained, angular to sub-angular, grey to light grey chert. Minor amounts of carbonaceous material, heavily pyritic one spot, siliceous cement, trace pale green mineralization.

(180'6" - 181') Rec. 6"

Sandstone as above.

(181'-190') Rec. 6'

1'10" Sandstone as above

8" - COAL, Pulverized

3'6" Sandstone as above, carbonaceous material more abundant.

Sandstone is badly broken in part and therefore, some of it could have been lost. Maximum coal seam thickness can only be 3'8" - it is probably less.

(190'-196') Rec. 6'

Sandstone, grey, medium grained, angular to sub-rounded, light grey to milky colored chert, for the most part sand is highly silicified, some carbonaceous specks, Minor pyrite, very minor amounts of pale green mineralization.

(196'-202') Rec. 6'

Sandstone as above, carbonaceous partings along bedding planes or fractures. Bedding plane appears to be at about 20° to horizontal axis of core although not as distinct as previous measurements. Sandstone is fairly badly broken up.

(202-209') Rec. 4'6"

Sandstone as above, very badly broken in part.

/..4

(209'-217') Rec. 3'2"

Sandstone as above, bedding fairly distinct. One piece of core shows bedding varying between 10 x 20" to horizontal axis of core. For the most part core is badly broken.

(217'-219'6") Rec. 2'6"

Sandstone as above, badly broken in part.

(219'6"-224') Rec. 4'6"

Sandstone as above, badly broken, undoubtedly due in part to fracturing.

(224'-229') Rec. 5'

Sandstone as above.

(229'-235') Rec. 6'

Sandstone as above, near vertical fracturing. Bedding quite distinct at 20° to horizontal axis of core.

(235'-242'6") Rec. 7'6"

As above.

(242'6"-249') Rec. 6'6"

Sandstone as above grading to fine grained and siltstone, badly broken, fractured, white phosphatic material infilling fractures. Some bedding exhibited quite distinctly, at an angle of 15° to horizontal axis of core.

(249'-255') Rec. 6'

Sandstone as above, becoming quite argillaceous in part. Sandstone shows irregular fracture pattern with white phosphatic infilling. At about 253' core finely broken.

(255'-261') Rec. 6'

/..5

(258'-261') Con't.

1'0" Mudstone, light grey.
Fault?
4'4" Sandstone, grey as above, fine grain size.
At 256'8" bedding is about 12° off horizontal axis of core.
Core is fractured with white phosphatic infilling.

(261'-267') Rec. 5'

Sandstone as above, fractured near vertical.

(267'-270'6") Rec. 3'6"

As above, very badly broken in part. Bedding at 20° to horizontal axis of core.

(270'6"-276') Rec. 7'6"

Sandstone as above, some carbonaceous material along partings. Badly broken in part.

(276'-282') Rec. 4'

Sandstone as above.

(282'-288') Rec. 6'

Sandstone as above, fractured broken carbonaceous material along partings, slickensided, very argillaceous or carbonaceous at 287'.

(288'-292'6") Rec. 4'6"

Sandstone as above, bedding distinct at 12° to horizontal axis of core.

(292'6"-296') Rec. 3'6"

Sandstone as above, badly broken in part, fractured.

//..6

(298'-300') Rec. 4'

Sandstone as above, fractured and broken, some thin interbedding of light and dark sand, some carbonaceous material along partings, slickensided, bedding 16° off horizontal axis of core.

(300'-303') Rec. 3'

Sand.as above, badly broken, irregular carbonaceous break at about 301'. Bedding at 303' about 13° off horizontal axis of core.

(303'-305') Rec. 2'

Sandstone as above, badly broken in part, carbonaceous, slickensided material along partings, bedding 20° to horizontal axis of core.

(305'-306'6") Rec. 1'6"

As above.

(306'6"-311'6") Rec. 5'

Sandstone as above, 3-4" carbonaceous shale at 310'.

(311'6"-315') Rec. 3'

Sandstone as above, minor amounts of carbonaceous material along partings, fractures infilled with white phosphatic material.

(315'-318') Rec. 3'

Sandstone as above, bedding at 20° to horizontal axis of core.

(318'-322') Rec. 4'

Sandstone as above, very argillaceous in part, badly broken, near vertical fracturing, slickensided carbonaceous partings, bedding at 20° off horizontal axis of core.

/..7

(322'-327') Rec. 5'

Sandstone as above, bedding at 20° off horizontal axis of core.

(327'-331') Rec. 3'

Sandstone as above, badly broken.

(331'-335') Rec. 4'

Sandstone as above, bedding at 20° to horizontal axis of core.

(335'-340') Rec. 5'

Sandstone as above, fine grained, distinct bedding at 20° to core. Carbonaceous partings, fractured, white phosphatic infilling, badly broken corefor most part.

(340'-346'6") Rec. 6'

As above core badly broken.

(346'6"-353') Rec. 6'

Sandstone as above, badly broken, grading to argillaceous in part.

(353'-357') Rec. 4'

Sandstone, fine grained, dark grey, light grey sandstone interbedding, fractured and badly broken in part, carbonaceous material along partings.

(357'-367') Rec. 10'

6" - Light grey mudstone.

9'6" - Sandstone and siltstone, argillaceous, fractured, badly broken, white phosphatic infilling, carbonaceous partings, grading to carbonaceous shale in part.

/..8

(367-371') Rec. 4'

Interbedded sand and siltstone, grey to light grey, carbonaceous partings, slickensided, fractured, broken, white phosphatic material along breaks.

(371'-378') Rec. 7'

As above, bedding indistinct, is about 15° to horizontal axis of core.

(378'-386'6") Rec. 8'6"

6' - Sand and siltstone as above.

2'6"- Shale, carbonaceous, some interbedded sand.

(386'6"-389'6") Rec. 2'7"

Interbedded carbonaceous shale and sand as above badly broken.

(389'6"-392') Rec. 2'6"

Sandstone, grey, medium grained, subangular, made up of gray to black chert, quartz, carbonaceous flecks, siliceous cement. Sand might be classified as conglomeratic. Interbedded with grey to brownish gray carbonaceous shale, slickensided. Core is badly broken.

(392'-397') Rec. 4'

Predominantly sandstone as above, some shale as above, Core badly broken.

(397-402) Rec. 5'

As above, core badly broken, no indication of angle of bedding.

(402-404) Rec. 2'

As above.

/..9

(404-406'6") Rec. 2'6"

Sandstone as above, broken, fractured bedding at 405'6" is 30° off horizontal axis of core.

(406'6"-411') Rec. 4'6"

Sandstone as above, more massive in part; partially broken.

(411'-413'6") Rec. 2'6"

Sandstone as above, minor fine carbonaceous parting along bedding plane. Core broken. Bedding at 411'6" is 45° off horizontal axis of core.

(413'6"-416'6") Rec. 3'

Sandstone as above, core badly broken.

(416'6"-419'6") Rec. 2'9"

Sandstone as above.

(419'6"-425') Rec. 5'4"

Sandstone as above, carbonaceous parting along bedding plane. Bedding at 421'4" is 55° off horizontal axis of core. At 423'8" bedding is 25° off horizontal axis of core.

(425'-426'6") Rec. 1'6"

Sandstone as above, carbonaceous partings along bedding planes, core is badly broken.

(426'6"-429') Rec. 2'4"

6" - Shale, grey, very badly broken
1'10"- Sandstone, as above but finer grained fractured near vertical.

(429'-434') Rec. 5'

Fine grained sandstone as above, bedding at 25° off horizontal axis of core. Near vertical fractures, core broken.

/..10

(434'-437') Rec. 3'

As above. (Massive cross bedding?)

(437'-441') Rec. 4'

Sandstone as above, bedding 40° off horizontal axis of core at 437'6". Cross bedding exhibited in one large piece of core starting at 438'6".

(441'-444') Rec. 11"

8" - Siltstone, gray
3" - Sandstone, loose, coarse grained, completely friable. Probably most of sand washed away accounting for low recovery.

(444-446') Rec. 2'

1' Sandstone, gray, medium grained, angular to sub-rounded, composed of quartz, gray to black chert, minor amounts of carbonaceous material.

1' Shale, light gray, waxy in appearance, slightly micaceous.

(446'-447') Rec. 1'

Shale as above, suspicion of plant molds. Badly broken up.

(447'-450') Rec. 3'

1'4" Shale as above.
1'8" Siltstone - dark gray.

(450'-454') Rec. 4'

6" Medium grained very friable sandstone as above, one piece (1") black carbonaceous silty shale.

3'6" Siltstone, gray, small discontinuous fractures filled with white phosphatic material (Maybe calcite) Sand appears to be somewhat calcareous.

(454'-458') Rec. 5'

Shale, brown, very carbonaceous, silty in part, indurated, badly broken.

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(458'-461') Rec. 2'

5" Shale, brownish black, very carbonaceous.
6" Coal
1'1" Shale as above.

(461'-465') Rec. 2'6"

Shale, dark brown, quite carbonaceous in part, badly broken, slickensided.

(465'-470') Rec. 5'

Shale, as above, less carbonaceous toward bottom. quite silty in part.

(470'-476') Rec. 6'

Shale, brown, silty, carbonaceous grading to argillaceous siltstone, some interbedding of medium sandstone as above. Badly broken in part.

(476'-481') Rec. 2'9"

As above, core badly broken.

(481'-489') Rec. 5'

As above.

(489'-499') Rec. 10'

As above.

(499'-505') Rec. 4'6"

As above, bedding parrallel to horizontal axis of core.

(505'-507') Rec. 2'

Brownish gray argillaceous siltstone to silty shale. Quite carbonaceous in part.

(507'-510') Rec. 3'

As above, badly broken, heavy carbonaceous partings, slickensided.

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(510'-513') Rec. 3'

As above.

(513'-516'6") Rec. 3'6"

As above, fractured and broken, badly in part.

(516'6"-519') Rec. 2'6"

2' - Siltstone and silty shale as above.

2'6" Sandstone, gray to dark gray, medium to coarse grained angular, composed of quartz and chert. Fair amount of pyrite, highly siliceous. Bedding not distinct, however, it appears to be 20° off horizontal axis of core. Core fairly badly broken.

(519'-522') Rec. 3'

As above.

(522'-523') Rec. 1'

As above.

(523'-528') Rec. 5'

As above.

(528'-528'8") Rec. 8"

As above.

(528'8"-529'6") Rec. 8"

As above.

(529'6"-533') Rec. 3'6"

As above, bedding at 531' is 26° off horizontal axis of core.

CORE RUNS IN D. H. #2

Driller's Marked Woodblocks	Length of core	Driller's Marked Woodblocks	Length of core
101' Bedrock		331'	4'
106'	5'	335	4
108-6"	2-6"	340	5
110	1-6"	346-6"	6-6"
111	1	353	6-6"
113	2	357	4
117	4	367	10
121	4	371	4
124	3	378	7
129	5	384	6
134	5	386-6"	2-6"
144	10	389-6"	3
154	10	392	2-6"
159	5	397	5
166	7	402	5
173	7	406	4
180-6"	7-6"	411	5
181	0-6"	413	2
190	9	417	4
196	6	419-6"	2-6"
200	4	425	5-6"
202	2	426-6"	1-6"
209	7	434	7-6"
217	8	437	3
219-6"	2-6"	441	4
224	4-6"	442	1
229	5	446	4
235	6	447	1
242-6"	7-6"	450	3
249	6-6"	454	4
255	6	458	4
261	6	461	3
270-6"	8-6"	465	4
278	7-6"	470	5
282	4	476	6
288	6	481	5
292-6"	4-6"	489	8
296	3-6"	499	10
300	4	505	6
303	3	507	2
305	2	510	3
306-6"	1-6"	513	3
311-6"	5	514-6"	1-6"
315	3-6"	519	4-6"
318	3	522	3
322	4	523	1
327	5	528	5

Core runs in D.H. #2 - con't

Driller's Marked Woodblocks	Length of core
529-6"	1-6"
533	3-6"
END	

95 pulls
4.5' av. per pull

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 240 Sixth Avenue S.W.,
Calgary, Alberta.

Your Designation:		Hole #2 (183-187)		Hole #2 (458-460)	
Date Sample Taken:		Dec. 18/63		Dec. 18/63	
Laboratory Sample No.:		403-64		404-64	
		As Received	Dry	As Received	Dry
Moisture	%	15.9	-	.8	-
Ash	%	42.4	50.4	22.2	22.4
Volatile Matter	%	14.0	16.7	19.9	20.1
Fixed Carbon	%	27.7	32.9	57.1	57.5
Sulfur	%				
Calorific Value, B.t.u. per lb.					
Free Swelling Index		Nonagglomerating		1	

Remarks:

Date: January 14, 1964. Signed: W. H. Barrion

Coal Analytical Laboratory Approved: J. F. Payne

CONCLUSIONS DRAWN FROM EXAMINATION OF

CORE CHIPS IN WELL #2, #4, #6

There are 2 distinct sandstone units in #4 and #6.

The top unit in well #4 is from 112' (First core chip) to 137'. It is predominantly brown-gray medium grained and medium sorted, salt and pepper, quartz, black and white chert, argillite, trace green mineral partly pyritic. The matrix is argillaceous, siliceous. In well #6 the First unit is very much like the First unit in well #4, it covers interval 303' (first corechip) through 312'. 335' appears to be a gradation to unit 2, it is becoming dolomitic and decreasing in grain size.

The second unit in well #4, From 151' to 235' (last chip), is gray-brown, fine grained, medium to poor sorted at top becoming medium sorted going down in the section, salt and pepper, quartz, chert, light brown, brown and trace of black and white, trace argillite fragments, dolomite fragments, becoming silty in places, argillaceous and dolomite cement.

In well no 6 there is a more gradational change from unit I to unit II. Unit II covers 335' through 443' and is very simular to unit II in well #4.

The difference between the two units is;

I The cementation in unit I is siliceous, in unit II it is dolomitic

II Unit I is predominantly medium grained, unit II is fine to very fine grained, except for 335' and 343' in unit 6 which appears to be a gradation to unit 2

III Argillite content in unit I is greater than in unit II

IV Chert in unit I is mostly black, with trace of black and white.

There does not appear to be any sharp contact between the two units in the core chips examined.

In well #2 260' and 269' are very similar to unit #2; in well no 4 and no 6, 533' is more similar to unit 1.

CANADIAN STRATIGRAPHIC SERVICE LTD.

SIEBOLD MACHIELSE

DRILL HOLE NO. 3

Drill Number:	One
Location:	5600 feet south of Drill Hole No. 6
Starting Date:	October 25, 1963
Completion Date:	November 22, 1963
Angle of Hole:	48 degrees off horizontal
Thickness of Mantle:	132 feet
Dip of Strata:	Variable (see Field Report)
Total Depth of Hole:	490 feet
Percent Core Recovery:	91.4 (driller's measurements)
Number of Core Pulls:	79
Average Length of Core per Pull:	4 feet
Number of Core Boxes:	18
Coal Seams Encountered:	None

Below the mantle at 132 foot depth the strata was too soft and broken and coring could not be carried out. A tricone bit was used from 165 to 246 feet in depth.

FIELD REPORT

DRILL HOLE NO. 3

By
Melvin E. Hinkle
John T. Boyd & Associates

The drill from completed Drill Hole No. 1 was moved down the mountain and into the valley bottom to Drill Hole No. 3 location. The drill and equipment was moved by Alberta Natural Gas Company equipment and operators.

Drill Hole No. 3 was located on the pipeline right of way about 2 miles down the pipeline from Drill Hole No. 2 location, or approximately 1.4 miles south along the British Columbia dirt road from the point where the road crosses under the Canadian Pacific Railway loop at McGillivray.

Actual drilling was started on October 25, 1963, and completed on November 22, for a total of 29 days. The hole was started at an angle of 48 degrees from the horizontal and completed at the same angle as determined by an acid dip tube test at 460 feet. The hole was drilled in a due east direction.

Overburden was encountered to a depth of 132 feet. The final depth of the hole was 490 feet.

No coal was encountered in this hole.

Drilling from bedrock, at 132 feet, by coring was found to be so difficult through clay and soft, extremely broken, black shale to 165 feet, that tricone bit drilling had to be employed until harder strata was reached at 246 feet. The hole was cased with 11 feet of 6 inch pipe, 58 feet of H-casing, and 246 feet of N-size casing. All casing was recovered.

Water was supplied to the drill by pumping direct from Michel Creek through pipe laid by the drill crews.

The strata below the "gouge" material consisted of limey light gray to black shales, greenish dark gray sandstone, limestone and minor clay seams.

The following tabulation shows the measured angles or core pieces that the bedding plane was off right angles to the core at various depths and the accepted angle of dip of the strata to the west:

Depth in Drill Hole (Feet)	Angle off Right Angle to Core	Lesser Angle of Dip	Greater Angle of Dip
250	18	24	60
281-6"	14	28	56
314	35	7	77
398	18	24	60
468	45	3	87
475	30	12	72

No serious trouble was encountered drilling this hole except for the 114 feet of "gouge" material and lost drilling time due to a snowstorm of blizzard proportions which started November 19. Below is a tabulation of the major items encountered in drilling this hole.

	Man Hours	Percent Drilling Time
Moving and setting up drill	115	8
Drill breakdowns	88	6
Pulling casing and reaming hole	112	8
Fishing for broken bit and shell and stuck rods	101	7
Lost time due to snowstorm	117	8
Actual drilling	794	56
Pulling casing and tearing down	104	7
	1431	100

A total of 358 feet of rock strata was drilled of which 277 feet was cored for 77.4% and 81 feet was tricone drilled for 22.6% of the interval.

Of the 277 feet core drilled, 253 feet of core was recovered for a core recovery of 91.4%. Drilling was carried on for 24 hours a day for 7 days a week.

Driller's marked wood blocks along the length of the core show that they had to pull rods 79 times for an average length of core of 4 feet. The core was NX-size, or 2-1/8 inch diameter.

The total length of core was placed in core boxes. There are 18 core boxes together with the acid test tube stored at the same location as the core boxes from the first two drill holes.

Started: Oct. 25, 1963
Finished: Nov. 22, 1963
Depth: 400'

D. H. #5

(ANC Survey Station E-9)

Top casing from Grd. level - 0.00
Ground Elevation: 59.0'
(Not sea level)
Direction: Due East
Angle: 40°

12' 6" Pipe
60' - H Casing
340' - N Casing

	Feet	Depth Feet
Overburden, boulders and clay	132'0"	132'0"
Clay and black shale, soft and extremely broken	13'0"	165'0"
Assumed to be same as above, Tricone drilled with mud from 165' to 246' - mostly mud with occasional boulders (Washings were brown colored No black washings observed throughout interval. Mud too thick to catch cuttings.)	81'0"	246'0"
Shale, black, hard, extremely broken, sandy in spots. This black shale gives a brown colored cuttings. (3" piece of core at 250' shows bedding to be 18° off Rt. L. to core.) (Drill angle measured by Brunton at 263' = 40°.)	16'0"	262'0"
Clay and broken black shale	4'0"	266'0"
Shale, black, hard, broken but more solid (3" core at 291-1/2' shows bedding to be 14° off Rt. L. to core)	44'0"	310'0"
Shale, black, pulverized and small pieces	1'3"	311'3"
Shale, black, hard, fractured and slickensided and broken (A 4" core at 314' shows bedding to be 38° off Rt. L. to core)	50'0"	361'3"
Clay and broken shale, black	2'4"	363'7"
Shale, black, hard, broken and black clay	9'8"	373'3"
Clay and broken shale, black, some calcite streaks (A 3" piece of core at 398' shows bedding to be 18° off Rt. L.)	29'3"	402'6"

/..2

	Feet	Depth Feet
Sandstone, greenish dark grey, glauconitic, broken, hard	8'6"	411'0"
Shale, dark grey, hard and broken	29'0"	440'0"
Shale, light grey, limey, fairly hard and broken, calcite streaks	10'0"	450'0"
Limestone, grey, soft, silty, very thin bedded, much calcite, bedding planes twisted and distorted Fault? (Fernie) (At top of sect. bedding plane appears nearly at Rt. L. to core) (Core at 468' shows bedding to be 45° off Rt. L. to core) At 435' bedding appears to reverse.	23'0"	473'0"
Limestone, grey, hard, silty, calcite streaks, broken mainly along bedding planes (4" piece of core at 475' shows bedding to be 30° off Rt. L. to core)	17'0"	490'0"

END OF HOLE

NO COAL

Acid dip test angle at 460' - 46°
No. core boxes - 18

Signed: S. O'Brien
Foreman
Boyles Bros. Drilling Co. Ltd.

CORE RUNS IN D. H. #3

Driller's Marked Woodblocks	Length of core
132' Bedrock	
134	2
136	2
137	1
141	4
142	1
146	4
147	1
148-6"	1-6"
151	2-6"
154	3
155	1
163	8
165	2
Tricone drilled from 165'-246'	
251	5
253	2
255-6"	2-6"
259	3-6"
Not marked	-
262	-
Not marked	-
267	-
272-6"	5-6"
276	3-6"
279-6"	2-6"
284-6"	5
286	1-6"
289-6"	3-6"
294	4-6"
298-6"	4-6"
303	4-6"
307-6"	4-6"
312	4-6"
316	4
321-6"	5-6"
325	3-6"
327	2
331-6"	4-6"
334	2-6"
338	4
343	5
347	4
351	4
354	3
356-6"	2-6"
358	1-6"
Not marked	-
370	-
373	3
375-6"	2-6"
377-6"	2
380-6"	3
384	3-6"
386	2
390-6"	4-6"
393	2-6"
396-6"	3-6"
400	3-6"
402-6"	2-6"
404	1-6"
407	3
411	4
415	4
417-6"	2-6"
423	5-6"
425	2
427	2
430	3
431	1
436-6"	5-6"
440	3-6"
444	4
446-6"	2-6"
454	7-6"
457	3
461	4
465-6"	4-6"
471	5-6"
480	9
490	10
END	

79 pulls
4' av. per pull

By Norman Boyse
Alberta Natural Gas Company

CORE LOG

McCLELLAND PROJECT

Drill Hole #8

(0 - 132') Overburden?

(132'-149') Rec. 15'

Shale, black, carbonaceous, silty to sandy, badly broken to pulverized.

(149'-151') Rec. 2'

Shale, brownish black, silty, carbonaceous streak, interbedded mudstone. Core badly broken up.

(151'-154') Rec. 2'2"

Shale, brownish black, silty, carbonaceous streak, fractured infilled with white calcareous material. Core very badly broken.

(154'-155') Rec. 1'

Shale as above with some mudstone.

(155'-163') Rec. 3'

3" Shale as above.
2'9" Shale, pulverized, brownish black, carbonaceous, fair amount of pyrite, scattered quartz grains.

(163'-165') Rec. 2'

Shale, brownish black, silty, carbonaceous streak, some stringers of pyrite, badly broken. Some mudstone.

(165'-243') Drilled.

Returns to surface so fine that no samples could be caught by screening. Sludge collected in box contained nothing but mud. Constant observation of drilling fluid returns indicated that no coal had been penetrated in this interval. It is assumed that the interval consists of the shale and mudstone observed in the core as described above.

/..2

(250'-251') Rec. 1'6"

Siltstone, brownish black, very argillaceous to shaley, carbonaceous streak, carbonaceous partings, some minor lenses of white very fine grained sand, exhibiting bedding which is 18° off horizontal axis of core.

(251'-253') Rec. 2'

1' Shale, brownish black, silty, carbonaceous streak, carbonaceous partings, slickensided.

1' Shaley sandstone, completely pulverized, fine to medium quartz grains, subangular, traces of carbonaceous material, badly broken.

(253'-255'6") Rec. 2'6"

Shale, brownish black, silty in part, very carbonaceous, slickensiding prominent, shale grades to almost a siltstone in part, badly broken.

(255'6"-259') Rec. 3'6"

Shale, brownish black, very carbonaceous, silty in part, some white calcite infilling in fractures, minor amounts of light gray sand interbedding. Core badly broken.

(259'-262') Rec. 3'

Shale, brownish black, slightly silty, very carbonaceous, in part, carbonaceous slickensiding prominent, grades to a sandy shale at base completely pulverized.

(262'-267') Rec. 5'

Predominantly brownish black carbonaceous mudstone, grades to silty brownish black carbonaceous shale.

(267'-272'6") Rec. 4'

Shale, brownish black, silty in part, very carbonaceous, minor amounts of white calcareous material in small patches along breaks, broken.

/..3

(272'6"-276') Rec. 3'6"

Shale as above, broken.

(276'-279'6") Rec. 3'6"

Shale as above, grading to argillaceous siltstone.

(279'6"-284'6") Rec. 5'

Siltstone, brownish black, carbonaceous, white calcareous infilling along fractures, minor light gray sand interbedding and lenses, indicating bedding which is 14° off horizontal axis of core.

(284'6"-286') Rec. 2'1"

Shale, brownish black, silty, carbonaceous, slickensided carbonaceous film along partings.

(286'-289'6") Rec. 3'6"

Shale as above, fractured, infilled with white calcareous material. Bedding indistinct but seems to be almost parallel with horizontal axis of core.

(289'6"-294') Rec. 4'6"

As above, badly broken in part, bedding as above.

(294'-298'6") Rec. 4'6" (Fault?)

Shale as above, badly broken in part, fractures evident At 296'6" core is finely broken - mudstone - bedding appears to change to 40° off horizontal axis of core.

(298'6"-303') Rec. 4'6"

Brownish black shaley siltstone as above, fractured bedding indistinct but appears to be about 40° off horizontal axis of core.

(303'-307'6") Rec. 5'

Siltstone, brownish black, argillaceous, carbonaceous, broken.

/..4

(307'6"-312') Rec. 4'6"

1'10" Shale, brownish black, carbonaceous
1'4" Shale, as above, but badly broken into fine pieces
1'2" Shale, brownish black, carbonaceous.

(312'-316') Rec. 4'

Shale, brownish black, carbonaceous, at 314' bedding is 35° off horizontal axis of core.

(316'-321'6") Rec. 5'

Shale as above, badly broken.

(321'6"-325') Rec. 3'6"

Shale as above, badly broken.

(325'-327') Rec. 2'

Shale as above, badly broken.

(327'331'6") Rec. 4'

Shale as above, badly broken.

(331'6"-334') Rec. 2'6"

Shale as above, badly broken, fair amount of fracture infilling with white calcareous material.

(334'-338') Rec. 4'

Shale as above, badly broken.

(338'-343') Rec. 5'

Shale as above, badly broken.

(343'-347') Rec. 3'8"

Shale as above, badly broken.

/..5

(347'-351') Rec. 4'

Shale as above, more competent in part, some interbedding and lensing of light grey fine grained sand.

(351'-361') Rec. 9'

Shale as above, fractured, badly broken, calcite infilling.

(361'-370') Rec. 8'4"

Shale, brownish black, silty, carbonaceous grading to brownish black carbonaceous mudstone.

(370'-375'6") Rec. 5'

As above.

(375'6"-380'6") Rec. 4'

Shale, brownish black, carbonaceous, silty to slightly sandy in part, is almost mudstone, very badly broken.

(380'6"-384') Rec. 3'6"

As above.

(384'-386') Rec. 1'9"

As above.

(386'-390'6") Rec. 3'6"

As above.

(390'6"-393') Rec. 2'6"

As above.

(393'-395') Rec. 2'

As above.

/..6

(399'-399'6") Rec. 1'3"

As above.

(399'6"-403') Rec. 4'6"

1"	Shale, light gray, wavy, soft.
2"	Shale, brownish, silty, carbonaceous
3"	Siltstone, brownish black, silty carbonaceous, very argillaceous.
1"	Shale, light gray, wavy, soft.
2'9"	Siltstone as above, broken, grades almost to shale.
1'2"	Shale, brownish black, silty, carbonaceous, bedding at 399' is about 10° off horizontal axis of core.

(403'-402'6") Rec. 2'6"

Siltstone, brownish gray, very argillaceous in part, fine hairline fractures infilled with white calcareous material. Bottom 3" badly fractured and infilled.

(402'6"-404') Rec. 1'6"

Sandstone, grey to greenish gray, fine grained, heavily glauconitic for the most part, argillaceous, fractures infilled with calcite.

FERNIE CONTACT 402'6"

(404'-407') Rec. 3'

As above, sand is quite shaley in part. Bedding is 50°? off horizontal axis of core.

(407'-411') Rec. 4'

3'6"	Sandstone as above, grades to glauconitic shale in part, fairly badly broken.
6"	Shale, predominantly black, faint trace of glauconite. Very badly broken.

(411'-415') Rec. 4'

9"	Black shale, pulverized, calcite stringers assumed.
3'3"	Argillaceous siltstone and silty shale, non-calcareous Badly broken in lower 15 inches.

/..7

(413'-417'6") Rec. 2'

Shale, dark gray to black, silty.

(417'6"-423') Rec. 5'6"

Shale as above, pulverized in part, fair amount of carbonaceous material along partings. Some slickensiding.

(423'-427') Rec. 4'

As above, badly broken to pulverized.

(427'-430') Rec. 3'

Shale as above, badly broken.

(430'-431') Rec. 1'

8" Shale as above.
4" Siltstone, very argillaceous.

(431'-436'6") Rec. 5'6"

Shale, brownish black, silty, carbonaceous streak, carbonaceous film along partings, fractured, fractures infilled with white calcite. Core badly broken.

(436'6"-440') Rec. 3'6"

1'6" Shale, pulverized, sandy, trace glauconite.
2' Sandstone, dark gray, medium grained, very argillaceous to shaley, heavily glauconitic. Core is broken to pulverized in part.

(440'-444') Rec. 4'

Shale, light gray with slight green tinge, soft, waxy in part, traces of glauconite, limey in part. Fractures infilled with white calcite.

(444'-446'6") Rec. 2'6"

Shale as above.

/..8

(446'6"-454') Rec. 7'3"

3'5" Shale, greenish gray, wavy, soft.
3'10" Interbedded shale as above and gray limestone, bedding is irregular and somewhat discontinuous, core has a scaley appearance. Appearance of core suggests much movement of strata.

(454-457) Rec. 2'3"

As above.

(457'-461') Rec. 4'

As above.

(461'-465'6") Rec. 4'6"

As above, bedding suggests angle of 35° off horizontal axis of core.

(465'6"-471') Rec. 5'6"

Shale and limestone as above. Bedding is 45° off horizontal axis of core.

(471' -480') Rec. 9'

4' Shale and limestone as above.
5' Shale, brownish gray, limey, fracture infilling with white calcite. Bedding is 30° off horizontal axis of core.

(480'-490') Rec. 9'

Brownish gray shale as above, fractured and infilled with white calcite.

DRILL HOLE NO. 4

Drill Number:	Two
Location:	950 feet downgrade and west of D.H.#7
Starting Date:	November 17, 1963
Completion Date:	December 9, 1963
Angle of Hole:	67 degrees off horizontal
Thickness of Mantle:	110 feet
Dip of Strata:	Variable (see Field Report)
Total Depth of Hole:	444 feet
Percent Core Recovery:	98.8 (driller's measurements)
Number of Core Pulls:	101
Average Length of Core per Pull:	3.3 feet
Number of Core Boxes:	23
Coal Seams Encountered:	None

A report giving conclusions drawn from examination of core chips from 112 to 137 foot depth and from 151 to 235 foot depth in this hole is included at the end of this Drill Hole No. 4 report.

FIELD REPORT

DRILL HOLE NO. 4

By
Melvin E. Hinkle
John T. Boyd & Associates

The drill and equipment from Drill Hole No. 2 were moved down the pipeline to Drill Hole No. 4 location, a horizontal distance of 1900 feet from Drill Hole No. 2 location. The move was made on November 14, 1963. It required 3-1/2 days to move and set up the drill.

Drill Hole No. 4 was located on the pipeline right of way. The angle of the hole was to be set at 65 degrees, but after the drill crews had the drill set up over the hole, it was found that a skid, or a foundation sill, would be in line with the drill rods, so the drill head was lowered to an angle of 67 degrees. The 65 degree angle was decided upon from the information gained from Drill Hole No. 2 which indicated the strata was dipping at an angle around 25 degrees.

The drill was supplied with water by the same Alberta Natural Gas Company equipment and operators used on Drill Hole No. 2. Water was hauled from Michel Creek up the pipeline over a horizontal distance of about 2400 feet. This method of water supply was carried on until around November 28 when a sump was dug with the Alberta Natural Gas Company's bulldozer and water being made by the drill hole was saved for use as drill water.

Actual drilling got started by the afternoon shift on November 17. Overburden consisting of boulders and clay was encountered to a depth of 110 feet, or for a vertical depth of 101.25 feet.

The hole was cased with 25 feet of 5-1/2" casing and 110 feet of N-size casing to bedrock. At the end of drilling all casing was pulled except for 35 feet of N-casing and shoe which broke off and was lost.

The hole started to make water at around 189 feet at a measured rate of about 7 gallons per minute, and continued making the water to the end of drilling. As mentioned above, this water eventually was used as supply water for drilling. The water was shut off at the end of drilling when the casing was lost in the hole and the hole caved.

No coal was encountered in this hole. The strata above 165 feet of depth consisted of non-calcarous gray, medium-grained sandstones and black shale. The strata below this depth consisted mainly of calcareous, fine grain sandstone.

This drill hole was stopped at a depth of 444 feet when it was observed that from a depth of 260 feet the hole was being drilled nearly parallel with the dip of the strata. An acid dip test at 430 feet showed that the hole bottomed at an angle of 70 degrees from the horizontal. One-half the depth of the hole was accepted to be on an angle of 67 degrees and the bottom half on an angle of 70 degrees.

Many measurements were made of the angle that the bedding plane was off right angle to the core where core pieces showed a plain bedding. These angles varied to such a great degree as to complicate the decision of the actual dip of the strata when compared to the original decision of the angle to start the hole as explained above.

Following is a tabulation of the various measured angles that the bedding plane was off right angles to the core at different depths in the drill hole.

(Feet) Depth in Drill Hole	Angle off Right Angle to Core	Lesser Angle of Dip	Greater Angle of Dip
119	28	5	51
128	38	15	61
165	22	1	45
211	23	0	46
254	21	1	41
265	40	20	60
291	52	32	72
325	62	42	82
345	65	45	85
345-376	90	70	70
392	60	40	80
407-430	90	70	70
433	65	45	85

Not much trouble was encountered in drilling this hole. The chief items of lost drilling time were due to a snowstorm and drill breakdowns. Following is a tabulation of the major items encountered in drilling.

	Man Hours	Percent Drilling Time
Moving and setting up drill	122	12.0
Lost drilling due to snowstorm	52	5.0
Drill breakdowns	120	11.7
No water supply for drill	44	4.3
Actual drilling	630	61.5
Pulling rods and tearing down	57	5.5
	1025	100.0

Drilling was carried on 24 hours per day for 7 days per week. The hole was completed on December 9 covering a total drilling time of 26 days.

No correlation can be made between the strata cut in this hole with that cut in Drill Hole No. 2.

Total length of cores placed in core boxes was 334 feet with 330 feet of core recovered for an overall core recovery of 98.8%. There are 23 core boxes together with the acid test dip tube stored at the same location as the other core boxes.

D. H. #4

Started: Nov. 17, 1963
Finished: Dec. 9, 1963
Depth: 444'

35' - 5-1/2" Casing
110' - N Casing

Top casing from grd. level - 0.00'
Ground Elevation: 167'
(Not Sea Level)
Direction: Due East
Angle - 67°

	Feet	Depth Feet
Overburden, Boulders and Clay	110'-0"	110'-0"
Sandstone, gray, med. grain, broken	0'8"	110'8"
Shale, black, very carbonaceous (2 pieces), as much as 6" could have been washed away. A 2' run, 110'-112', broken contact between sandstone and black shale appears to show bedding at Rt. L. to core.	0'2"	110'10"
Sandstone, gray, med. grain, fractured and broken A 17" core at 120' shows bedding to be 30° off Rt. L. to core A 6" core at 119' shows bedding to be 20° off Rt. L. to core A 10" core at 165' shows bedding to be 22° off Rt. L. to core (From 152' wedge fracturing and several small clay seams)	54'2"	165'0"
Sandstone, gray, calcareous fine grain, hard, thin-bedded, fractured and broken (Fernie?) Hole started making water at 169' - 7 gal./min. Water has an unpleasant odor (sulfur water) A 3" piece core at 211' shows bedding to be 23° off Rt. L. to core A 7" piece core at 254' shows bedding to be 21° off Rt. L. to core.	72'0"	237'0"
Sandstone, gray, fine grain, slightly or non- calcareous, hard, thin-bedded, fractured and broken (Fault?)	17'0"	254'0"
Sandstone, gray, fine grain, extremely broken and slickensided, non-calcareous	6'0"	260'0"
Sandstone, gray, fine grain, hard, thin-bedded, calcareous, fractured and broken. A 6" pc. core at 265' shows bedding to be 40° off Rt. L. to core A 4" pc. core at 291' shows bedding to be 52° off Rt. L. to core A 8" pc. core at 325' shows bedding to be 62° off Rt. L. to core	68'0"	328'0"

/..2

	Feet	Depth Feet
Sandstone, light gray, calcareous, fine grain, hard, fractured and slicken-sided, much calcite streaks An 8" core at 345' shows bedding to be 65° off Rt. L. to core. Pieces of core between 345' to 370' shows bedding to be very distorted, some being parallel with core which means a 67° dip to east, also from 407' to 430' ±	46'0"	374'0"
Shale, black, hard, fractured, broken and slicken sided	5'0"	379'0"
Sandstone, light gray, calcareous, fine grain, fractured, broken and slicken-sided, calcite streaks (Wire-line core drilling started at 411') (An 8" piece core at 392' shows bedding to 67° off Rt. L. to core) (A 10" pc. core at 433' shows bedding to be 65° off Rt. L. to core) (Hole no longer making water, caved shut while pulling casing)	65'0"	444'0"

END OF HOLE

Acid dip tests angle at 430' - 70°
Number of core boxes - 23

Signed: _____
Foreman
Boyles Bros. Drilling Co. Ltd.

DRILL HOLE # 4

December 11, 1963

By Norman Boyse
Alberta Natural Gas Company

Interval	Feet	Description
110-111	1'	Sandstone interbanded with black very carbonaceous shale. Sandstone, medium grained, salt and pepper. Quartz crystals subangular abundant black material - no reaction HCL. Shale - 2 pieces - carbonaceous to coal like friable.
111-139	28'	Sandstone, medium grained, subangular, salt and pepper. Abundant black crystals, scattered pyrite crystals, quartz crystals, subangular to white blobs. Black crystals have glistening shiny appearance when broken. No reaction with HCL. (130 feet - 1/2" - fine grained, very silty sandstone - no reaction with HCL.)
139-161	22'	Sandstone as above - scattered crystals that react with HCL - increasing reaction with depth. Plant fossils at 156'.
161-166	5'	Sandstone - finer grained - gray to salt and pepper. Stronger effervescence with HCL.
166-166.5	0'5"	Sandstone - very fine grained, very silty, black imbedded bitumen specks. Bedding 20° to core axis.
166.5-171.5	5'0"	Sandstone, fine grained. Same as 161-166. Medium effervescence.
171.5-174	2'5"	As above - very broken up.
174-176.5	1'5"	Sandstone, very fine grained, very silty. Conchoidal fractures equigranular, crushed in part. Massive greyish brown to naked eye. Lower contact with sandstone 25° to core axis.
176.5-181.5	5'	Sandstone - fine grained, salt and pepper texture and color - very fine bedding 21° to core axis. 179' - finer grained sandstone with clusters of black crystals - interval has mild to medium effervescence with HCL.
181.5-183	1'5"	Sandstone as above, extremely fractured.

/..2

Interval	Feet	Description
183-184	1'	Fault? - Mudstone, black, siliceous, calcareous - partially sandy.
184-186.5	2'5"	Mudstone - silicified, fine grained conchoidal and irregular fracturing. Fault zone?
186.5-225	38.5'	Sandstone, brown, fine grained, abundant black carbonaceous crystals - good reaction with HCL. Bedding 30° to core axis. Numerous fractures infilled with calcite. 191.6-194.6 - extremely injected with calcite - haphazardly - slickensides on fracture face at 191' - fractured 35° to core axis. At 207' - bedding 27° to core axis. Sandstone very argillaceous(occassionally). Reacts with HCL but does not completely break down.
225-229	4'	Sandstone, very fine grained, brown vitreous with scattered isolated coal blebs. 228' - black carbonaceous shale vitreous - Fault? - Sandstone fractures evenly - very clean break - finely banded but not platey. Appears to thin bands of black carbon shale breaks.
229-253	24'	Sandstone - brown, fine grained, argillaceous, well cemented, predominately good recovery, finely bedded 26° to core axis at 243'. 252-252.5 banded carbonaceous shales, coal like appearance.
253-258	5.0'	very finely bedded, fine grained sandstone with black carbonaceous shale. Shale partings have black coal like sheen. 257' - extremely coal like. Movement Fault?
258-277	19'	Sandstone - fine grained, brown, sandstone as above Bedding from 258 to 264 questionable, vertical 264.5 to 277 - 35° to core axis.
277-280	3'	Fine gr. sandstone - thin bedded with black carbon shale, greasy and vitreous like coal. Possible movement fault? - bedding and shear planes - 40° to core axis.
280-307	27'	Sandstone very fine grained, finely banded with black carb. shale - massive to extremely fractured. Poor reaction to HCL to fair. Bedding - 55° to core axis.

/..3

Interval	Feet	Description
307-310.5	3'5"	Sandstone and banded shale as above. Fracturing wafer like along bedding planes. Banding more pronounced. Fractures along black shale planes with occassional slickensides. Gives shiny coal like surface.
310.5-318.5	8'	Sandstone fine grained, brownish, abundant black carbonaceous material, appears to be same as sandstone and shale as above but more consolidated. Poor reaction with HCL.
318.5-444	125'5"	Sandstone as above, finely bedded with black coal like shale. Competent to broken sheared zones, which appear coal like. 325' bedding planes 60o to core axis 345' - 65° to axis. 357' - 75° to core axis 366' to 376' bedding vertical 376'-391' - 75° to axis 393' - 65° to axis 393'-400' - vertical 400.5' 40o to core axis to 405' 405.5 - bedding 15° to core axis 405.5 - 432 - vertical 432-444 - 65° to axis.

CORE RUNS IN D.H. #4

Driller's Woodblocks	Length of Core	Driller's Woodblocks	Length of Core
110' - Bedrock		274'6"	3'6"
112'	2'	278'	3'6"
113'	1'	279'-6"	1'6"
116'	3'	281'-6"	2'
118'-9"	2'9"	283'	1'6"
124'	5'3"	Missed	-
128'	4'	289'	-
Missed	-	291'	2'
Cannot Read	-	295'	4'
139'	-	296'	1'
142'	3'	301'	5'
146'	4'	305'	4'
149'	3'	307'	2'
152'	3'	313'	6'
155'	3'	315'	2'
161'	6'	319'	4'
165'	4'	323'-6"	4'6"
169'	4'	325'	1'6"
171'	2'	327'	2'
174'	3'	330'	3'
177'6"	3'6"	332'	2'
179'6"	2'	335'-6"	3'6"
182'	2'6"	338'	2'6"
184'	2'	341'-6"	3'6"
187'	3'	344'-6"	1'
195'	8'	348'	3'6"
199'6"	4'6"	353'	5'
205'	5'6"	355'	2'
210'	5'	Not Marked	-
213'	3'	Not Marked	-
216'6"	3'6"	Not Marked	-
221'	4'6"	364'-6"	-
Not Marked	-	368'-6"	4'
Not Marked	-	371'	2'6"
Not Marked	-	378'	7'
233'	-	382'	4'
239'	6'	384'	2'
242'	3'	386'	2'
246'	4'	390'	4'
254'	8'	392'	2'
256'	2'	396'	4'
Cannot Read	-	400'	4'
263'	-	404'-6"	4'6"
264'	1'	405'	0'6"
271'	7'	407'-6"	2'6"

/..2

Driller's Woodblocks	Length of Core
411'	3'6"
414'	3'
417'6"	3'6"
419'	1'6"
422'	3'
424'	2'
428'	4'
431'6"	3'6"
433'-6"	2'
438'	4'6"
440'	2'
444'	2'

END

101 Pulls -

3.3' AV. PER PULL

There are 2 distinct sandstone units in #4 and #6.

The top unit in well #4 is from 112' (First core chip) to 137'. It is predominantly brown-gray medium grained and medium sorted, salt and pepper, quartz, black and white chert, argillite, trace green mineral partly pyritic. The matrix is argillaceous, siliceous. In well #6 the First unit is very much like the First unit in well #4, it covers interval 303' (first corechip) through 312'. 335' appears to be a gradation to unit 2, it is becoming dolomitic and decreasing in grain size.

The second unit in well #4, From 151' to 235' (last chip), is gray-brown, fine grained, medium to poor sorted at top becoming medium sorted going down in the section, salt and pepper, quartz, chert, light brown, brown and trace of black and white, trace argillite fragments, dolomite fragments, becoming silty in places, argillaceous and dolomite cement.

In well no 6 there is a more gradational change from unit I to unit II. Unit II covers 335' through 443' and is very simular to unit II in well #4.

The difference between the two units is;

I The cementation in unit I is siliceous, in unit II it is dolomitic

II Unit I is predominantly medium grained, unit II is fine to very fine grained, except for 335' and 343' in unit 6 which appears to be a gradation to unit 2

III Argillite content in unit I is greater than in unit II

IV Chert in unit I is mostly black, with trace of black and white.

There does not appear to be any sharp contact between the two units in the core chips examined.

In well #2 260' and 269' are very similar to unit #2, in well no 4 and no 6, 533' is more similar to unit 1.

CANADIAN STRATIGRAPHIC SERVICE LTD.

SIEBOLD MACHIELSE

DRILL HOLE NO. 5

Drill Number:	One
Location:	9700 feet south of Drill Hole No. 3
Starting Date:	November 8, 1963
Completion Date:	December 11, 1963
Angle of Hole:	70 degrees off horizontal
Thickness of Mantle:	133 feet
Dip of Strata:	Variable (see Field Report)
Total Depth of Hole:	264 feet
Percent Core Recovery:	88.5
Number of Core Pulls:	44
Average length of Core per Pull:	3 feet
Number of Core Boxes:	9
Coal Seams Encountered:	None

FIELD REPORT

DRILL HOLE NO. 5

By
Melvin E. Hinkle
John T. Boyd & Associates

The drill and equipment from Drill Hole No. 3 were moved to the site of Drill Hole No. 5 a horizontal distance of 9600 feet, 1.82 miles, south along the pipeline on November 25, 1963, by Alberta Natural Gas Company heavy equipment and operators. It required three days to move and set up the drill ready for drilling.

Water was supplied for the drill by pumping from Michel Creek through pipe laid by the drill crews a distance of about 200 feet.

Drilling started on November 28. Overburden consisting of boulders and clay was found to a depth of 133 feet. The hole was drilled at an angle of 70 degrees to the horizontal and in a due east direction. The vertical depth of the overburden was 125 feet.

The initial 55 feet of bedrock consisted of calcareous dark gray to black shales. Drilling continued to a depth of 264 feet through calcareous strata, then drilling was stopped. No coal was found. The drill hole was completed on December 11, 1963, for a total of 15 drilling days.

At a depth of 209 ft. 6 in. a fault zone was encountered as evidenced by alternating beds of loose sand or pulverized shale and finely broken sandstone and shale passed through to a depth of 258 feet. This zone was called "gouge" material. At 257 feet it was decided to cement the hole as drilling was becoming difficult due to caving material and sticking rods and it was not known how much deeper the hole would have to be drilled to get through the "gouge" material. The hole was cemented back to 210 feet.

The hole was drilled with NX equipment giving a 2-1/8" diameter core. The hole was cased with 20 feet of 5-1/2" casing and 130 feet of H-size casing to bedrock. All casing was removed from the hole at the end of the drilling.

An acid dip test was made at a depth of 260 feet and the etched line on the tube showed that the hole stayed on the 70 degree angle.

A number of bedding plane readings were taken to show the angle that the bedding plane made to a right angle across the core. These angles varied considerably as shown by the following tabulation of the angles measured at various depths:

Depth in Drill Hole (Feet)	Angle off Right Angle to Core	Lesser Angle of Dip	Greater Angle of Dip
140	35	15	55
142-155	10	10	30
155-162	At rt. angle to core	20	20
182	32	12	52
253	32	12	52

The chief trouble encountered in drilling this hole was due to weather conditions, - cold, light snow and overnight freezing. Below is a tabulation of the major items of operation in drilling this hole.

	Man Hours	Percent Drilling Time
Moving and setting up drill	121	16
Drill breakdowns	75	10
Cementing hole and drilling same	69	9
Actual drilling	454	59
Pulling casing and tearing down	44	6
	763	100

A total of 131 feet of rock strata and "gouge" material was cored and 116 feet of core recovered for a core recovery of 88.5%.

Driller's marked wood blocks along the length of the core show that they had to pull rods 44 times for an average length of core of 3 feet.

The total length of core was placed in core boxes. There are 9 core boxes which, along with the acid dip tube, are stored at the same location as the core boxes from the first four drill holes.

D. H. "5

Started: Nov. 28, 1963
Finished: Dec. 11, 1963
Depth: 264'
Top Casing from Grd. Level - 0.00'
Ground Elev. - ?
Direction: Due East
Angle: 70°

20' of 5-1/2" Casing
43' - M Casing
155' - W Casing

	Feet	Depth Feet
Overburden, boulders and clay	133'0"	133'0"
Shale, dark gray, calcareous, broken and slickensided, platy structure Core piece at 140' shows bedding to be 35° off Rt. L. to core Core from 142' to 155' shows bedding off only 10° from 155'-162' bedding is at Rt. L. to core. Core piece at 162' shows bedding to be 32° off Rt. L. to core.	51'6"	184'6"
Shale, black, calcareous, carbonaceous, platy structure, broken and slickensided. (Cannot distinguish bedding plane in this interval)	12'6"	197'0"
Sandstone, gray, fine grain, hard, non-to-slightly calcareous, phosphatic, very broken. (Cannot distinguish bedding plane in this interval.)	12'6"	209'6"
COUCH MATERIAL		
Sand and broken sandstone (same as above)	5'6"	215'0"
Sand, calcareous	4'0"	219'0"
Broken sandstone (same as above)	0'6"	219'6"
Sand, very calcareous	2'0"	221'6"
Broken sandstone (same as above)	3'0"	224'6"
Sand, very calcareous	2'0"	226'6"
Broken sandstone (same as above) (FAULT)	5'6"	232'0"
Sand, calcareous	1'6"	233'6"
Broken sandstone (same)	2'6"	236'0"
Sand, very calcareous	4'6"	240'6"
Broken sandstone (same)	1'6"	242'0"
Sand, very calcareous	2'0"	244'0"
Shale, dk. gray, hard, platy, slightly calcareous phosphatic, broken	2'0"	246'0"
Sand, calcareous	1'0"	247'0"
Broken shale (same as above)	4'0"	251'0"

/..2

	Feet	Depth Feet
Sand, calcareous	2'0"	253'0"
Broken shale (same)	4'0"	257'0"

(1" core pc. at 253' shows bedding to be 32° off Rt. L. to Core)

Same to end of hole.

Cemented Hole Back to 210'

Broken shale (same)	1'0"	258'0"

End of Gouge Material

Shale, dark gray, thin-bedded, calcareous, hard, broken.	6'0"	264'0"

END OF HOLE

Acid Dip Test at 260' - 70°

No. of Core Boxes - 9

Signed: _____

Foreman

Boyles Bros. Drilling Co. Ltd.

DRILL HOLE #5

December 12, 1963

By Norman Boyse
Alberta Natural Gas Company

Interval	Feet	Description
130-132	2'	Mud and sand
132-197	65'	Shale, black carbonaceous - fractures in a set pattern along bedding planes. Wafer like perpendicular to core to a depth of 162' then 25° to 40° to axis. Shale - calcareous 178-184 - banded fine grained snd. stone and calcite infilling with shale - extremely crushed near base - approaching fault zone - has coal like coloring and finish
197-253	56'	Fault Zone Sandstone, brown, fine grained - interbedded with black shale, mud and sand - sandstone has fair to poor reaction with HCL - calcite weathers a chalky white - shale reacts with HCL. Also mud.
253-264	9'	Sandstone, brown, fine grained, very finely banded with black shale, 10° - 15° to core axis - shale is greasy vitreous coal appearance a;pmg fractire l;ames.

CORE RUNS IN D. H. #5

Driller's Marked Woodblocks	Length of Core
133' - Bedrock	
136'	3'
137'	1'
139-1/2'	2'6"
143'	2'8"
147'	5'
152'	5'
157'	5'
162'	5'
163'-6"	1'6"
165'	1'6"
168'-6"	3'6"
170'	1'6"
175'	5'
180'	5'
183'-6"	3'6"
184'-6"	1'
189'-6"	5'
195'	5'6"
199'	4'
201'	2'
203'	2'
204'	1'
205'	1'
207'	2'
207'6"	0'6"
208'6"	1'
209'6"	1'
213'	3'6"
219'	6'
219'-6"	0'6"
224'-6"	5'
229'	4'6"
233'	3'
234'-6"	1'6"
236'	1'6"
240'	4'
242'	2'
246'	4'
249'	3'
251'	2'
257'	6'
260'	3'
261'-6"	1'6"
264'	2'6"
END	

44 Pulls 3.0' AV. PER PULL

DRILL HOLE NO. 6

Drill Number:	Two
Location:	1900 ft. downgrade-west and 1300 ft. south of Drill Hole No. 4
Starting Date:	December 4, 1963
Completion Date:	January 26, 1964
Angle of Hole:	90 degrees off horizontal (vertical)
Thickness of Mantle:	95 feet
Dip of Strata:	Variable (see Field Report)
Total Depth of Hole:	445 feet 4 inches
Percent Core Recovery:	85.2
Number of Core Pulls:	106
Average Length of Core per Pull:	3-1/4 feet
Number of Core Boxes:	20
Coal Seams Encountered:	

Hole Interval	Core Thickness	Remarks
155'-0" to 155'-6"	0'-6"	Coal or bituminous black shale
295'-6" to 298'-0"	2'-6"	Pulverized coal and shale

The analysis shows 25.7% ash for the 2'-6" coal seam. This seam is not of mineable thickness. Analyses for a section of the drill hole from 97 feet through 125 feet show the ash content to vary from 57.6% to 82.9%. The analyses reports are included at the end of this Drill Hole No. 6 report.

Also included at the end of this report are conclusions drawn from examination of core chips from this hole.

FIELD REPORT

DRILL HOLE NO. 6

By
Melvin E. Hinkle
John T. Boyd & Associates

The drill that completed Drill Hole No. 4 was moved downhill to the site of Drill Hole No. 6 on December 11, 1963, a horizontal distance along the pipeline of 2300 feet. The drill and equipment were moved by Alberta Natural Gas Company's heavy equipment and personnel. The drill was set up to supply its own water by piping from Michel Creek. The hole was drilled vertically. Considerable trouble was met in drilling this hole.

The drill hole was started through overburden on December 14. Overburden consisting of boulders and clay was found to a vertical depth of 95 feet, at which depth the driller felt he was in "bedrock". The drillers ran into difficulty in drilling through the overburden when at 52 ft. 6 in. they lost a 3-7/8" tricone bit and were unable to fish it out of the hole. It was decided to attempt to push the bit to the side with casing rather than start a new hole.

The hole was cased with 20 feet of 5-1/2" pipe and to 47 feet with H-casing, at which depth the drillers could not hammer the casing past the lost bit. The drillers tried to drill past 52 feet with an N-carbide bit and got to 55 feet when the carbide bit broke off and was lost. They went down with a 3-7/8" tricone bit, knocked the lost carbide bit to the side, and drilled to 58 feet. It was then decided to put down smaller casing, NX size, to get past the 52 foot depth; but could not get below 53 feet. However, they were able to drill the hole to a depth of 95 feet with the 3-7/8" tricone. They put down H-rods and drove them to 65 feet, then were successful in driving the NX casing,

which telescoped the H-rods, to 72.5 feet, thereby pushing the tricone bit to the side. It required 7 drilling shifts, or 3-1/2 days, to get the casing past the 52 foot depth. During this time, the hole had been drilled through the overburden so it required only one more shift to drive the casing to 95 feet. Also, during this period, the drill crews had trouble due to freezing weather with the suction hose to their supply pump freezing many times which necessitated changing and thawing out the water supply hose several times.

The hole was started in bedrock using clear water with the N-size, wire-line type of core barrel. The first 33 feet of bedrock, to 128 foot depth, consisted of fine sand and pulverized black shale which could not be recovered as a core in the core barrel; the fine material kept washing away so that the material placed in core boxes was collected sludge samples. The N-casing was driven to a depth of 120 feet.

The above type of material slowed drilling considerably, requiring 5 drill shifts, 40 drill hours, to drill 33 feet. During this period of drilling freezing weather causing suction and supply hose lines to freeze again slowed the drilling.

Drilling was shut down for the Christmas holidays from January 22, 1963, to January 4, 1964, when drilling was again resumed.

Drilling for the next 70 feet, to 198 foot depth, proceeded with actual core recovery. It required 5 drill shifts to recover this 70 feet, as compared to the above. The strata to the 198 foot depth was logged as gray to black shale and gray mudstone. The strata was found to be in a very broken fractured and pulverized condition which slowed drilling considerably. In fact, only one

small piece of core in the 198 feet of drilling showed a bedding plane that could be measured; it gave an angle of 30 degrees off right angle to the core. At 188' foot depth the N-wire line rods became stuck and two 10 foot lengths broke off. These were fished out of the hole.

The drillers spent the next six shifts, or 46 drilling hours, trying to get back down to the 198 foot depth. The hole kept caving somewhere below the N-casing at 120 feet. The drillers alternately pulled rods when they became stuck, or mud cut off return circulation, and washed out the hole. The use of mud was tried but failed to stop the caving.

It was finally decided to cement the hole. Five bags of quick-setting cement were used and the hole cemented back to 114 feet. The cement was permitted to stand for 10 hours when drilling out the cement was started. The cement was drilled to 136 feet when it was found that the cement had not set completely. The hole was recemented back to 80 feet, using three bags of cement. The cement was allowed to set for 18 hours when drilling was resumed. The cement was able to be drilled out but when the drillers attempted to put the wire-line rods down, they would go only to 140 feet, then only to 134 feet, and, finally, after repeated operations of pulling rods and cleaning out the hole with a steelite bit, they were able to get to 196 feet. It was decided that the cementing of the hole failed and the hole was still caving. The NX-casing was driven from 117 feet to 128 feet and could not be hammered deeper.

The above cementing of the hole and drilling out the cement required 11 drill shifts, or 86 drill hours.

The bottom of the hole was now at 203 feet. It was decided that to continue drilling deeper to under-ream or enlarge the hole and drop the N-casing to the bottom. An N-size under-reamer was ordered from Boyle Brothers Drilling Company in Vancouver. The only successful method by which the hole could be cleaned out to get the under-reamer to the bottom of the hole was by the use of reverse circulation, which took three shifts. The hole was under-reamed from 132 to 202 feet and NX casing driven to 161 feet, then could not be driven deeper. This operation required 4 drill shifts, or 32 drilling hours.

It was decided that to continue drilling the hole would have to be cased with BX-size casing and the hole finished with a BX -size core about 1-7/8" in diameter. The BX-rods and core barrel were ordered and sent out from Vancouver. This was not the wire-line type of drilling. The BX-casing was run to 200 feet.

The first 27 feet of drilling with B-equipment to a depth of 230 feet, was in bud and finely broken and pulverized gray shale. No core recovery was made in this interval and the material placed in core boxes was again collected sludge.

At 204 feet, 30 feet of B-rods and core barrel broke off and before they could be fished out of the hole all BX-casing had to be pulled. To drill this 27 feet of hole, from 203 to 230 feet, required 9 drill shifts, or 73 drill hours.

The hole was finally drilled to a depth of 445 feet 4 inches and completed on January 26, 1964.

Two coal seams were encountered, one 6" thick at 155 feet and the other 2 ft. 6 in. of pulverized coal with a 40% recovery at around 296 foot depth.

An acid dip test made at the bottom of the hole showed that it finished at an angle of 87 degrees.

Below is a tabulation of readings taken at various depths to show the angle that the bedding plane of the strata made to right angle to the core.

Depth (Feet)	Angle off Right Angle to Core	Angle of Dip
181.5	30	30
236	32	32
240	24	24
256	28	28
268	28	28
283	40	40
314	35	35
348	30	30
372	30	30
421	18	18
432	15	15
435	28	28

A tabulation of the major items of operation in drilling follows:

	Man Hours	Percent Drilling Time
Moving and setting up drill	130	8
Drill breakdowns	49	3
Cementing hole and drilling same	166	10
Preparation for Christmas holidays	40	3
Actual drilling	1131	71
Pulling casing and tearing down	76	5
	1592	100

A total of 350 feet of strata was core drilled with 298 feet of core recovered for a core recovery of 85.2%. Driller's marked wood blocks along the length of the core show that they had to pull the drill rods 106 times for an average length of core of 3-1/4 feet.

All of the recovered cores were placed in core boxes. There are 20 core boxes together with the acid dip tube stored at the same location as the first five drill holes.

D. H. #6

(ANG Survey Stn. A-1)

Started: Dec. 14, 1963
Finished: Jan. 26, 1964
Depth: 445'-4"
Top Casing from grd. level: 0.00
Ground Elev. - 0.00 (not sea level)
Angle: 90° (vertical)

20' of 5-1/2" Casing
47' - H Casing
161' - N Casing
200' - B Casing

	Feet	Depth Feet
Overburden - boulders and clay	95'	95'
Broken rock, rounded by drill - 25% recov.	2	97
Shale, black, very carb., pulverized - no recovery - washed away (Material in core box is collected cuttings sludge)	7	104
No recovery, washed away - assumed to be black shale as above.	2	106
Dec. 20 Sand, gray, with stones in top 1' (recovery with open-end casing and driving with 300 lb. hammer)	2	108
Shale, black, carbonaceous, pulverized - no recovery. (Material in core box is collected cuttings sludge)	4	112
Sand, fine brownish color - no recovery (Material in core box is collected cuttings sludge)	7	119
Jan. 7 Shale, black, bituminous, pulverized - no recov. (Material in core box is collected sludge)	2	121
Sand, fine brownish - no recovery (Collected sludge)	7	128
CORING BEGINS		
Shale, black, very broken	2'-0"	130'-0"
Shale, gray, very broken	0'8"	130'8"
Shale, black, bituminous, pulverized	0'4"	131'0"

/..2

	Feet	Depth Feet
Mudstone, brownish, very calcareous, soft (Good Core)	5'0"	136'0"
Mudstone, gray, slightly calcareous, soft (Good Core)	5'0"	141'0"
Mudstone, gray, very sandy, carb. soft, Calcareous (Good Core)	4'0"	145'0"
Mudstone, gray, soft, carb., non-calcareous (Good Core)	6'0"	151'0"
Mudstone, gray, pulverized	4'0"	155'0"
Coal or very bituminous black shale, soft and friable	0'6"	155'6"
Mudstone, gray, non-calc., soft and broken	10'6"	166'0"
Shale, gray, hard, non-calc., sandy in spots broken and fractured	23'6"	189'6"
Jan. 5 Shale, gray, very broken and pulv., non-calc. (Only 1 piece core to this depth at 191'6" shows bedding is 30° off Rt. L. to core.)	8'6"	198'0"

Caving material, stuck rods and cannot get past this depth. Cemented hole back to 114'. After 10 hours drilled from 114' to 136' - cement not set. Recemented to 80'. Never got back down to 203'. Cased with B Casing to bottom of hole. Jan. 17 - Start drilling with BX Equip. and mud.

Shale and mud, gray, finely broken and pulverized non-calc. (No recovery - material in core box collected sludge)	32'0"	230'0"
Shale, dark gray, hard sandy, non-calc., broken and fractured. (3" piece core at 236' shows bedding at 32° off Rt. L. to core)(2" piece core at 240' shows bedding at 24° off Rt. L. to core)	10'0"	240'0"
Shale, black, hard carb., non-calc., broken and fractured.	7'0"	247'0"

/..3

	Feet	Depth Feet
Shale, dark gray, hard sandy, non-calc. broken and fractured.	8'0"	255'0"
S.S., gray, fine grain, hard, shaly, non-calc. broken and fractured. (A 2" piece core at 256' shows bedding to be 30° off Rt. L. to core)	8'9"	263'9"
S.S. gray, med.-grain, hard, slightly calc. broken and fractured. (A 2" piece core at 268' shows bedding to be 28° off Rt. L. to core)	4'7"	268'4"
Shale, black, carbonaceous, hard with mud seams non-calc., very Bituminous at 272' broken, fractured and slickensided.	9'8"	278'
Shale, black, hard, calcareous, broken and fractured.	3'6"	281'6"
S.S., gray, fine-grained, very calcareous. (A 6" piece core at 283' shows bedding to be 40° off Rt. L. to core)	1'6"	283'0"
Shale, dark gray, black, hard, calcareous, broken & fractured	12'6"	295'6"
COAL, pulverized - 5'0" core run, 293'-298' 2'0" recovered consisting of 1'0" black shale and 1'0" pulv. coal, balance washed away. Assume 3'0" lost to be 1/2 shale and 1/2 coal. 40% recovered.	2'6" T.T. 2'0"	298'0"
S.S., gray, soft to hard, coarse grained, quartz-black chert, "salt and pepper" appearance, non-calcareous but becoming slightly calc. at bottom broken and fractured. (A 9" core piece at 314' shows bedding to be 35° off Rt. L. to Core)	46'6"	344'6"
S.S., grey, fine grain,, very calc., broken, wedge fractured and slicken-sided, calcite streaks. (8" core pc. at 348 shows bedding to be 30° off Rt. L. to Core) (12" core pc. at 372' shows bedding to be 30° off Rt. L. to core) (8" core pc. at 421' shows bedding to be 10° off Rt. L. to core) (8" core pc. at 432' shows bedding to be 15° off Rt. L. to core) (8" core pc. at 435' shows bedding to be 20° off Rt. L. to core)	100'10"	445'4"

Acid Dip Test at 445' - 87° END OF HOLE
No. core boxes - 20
Core Recovery - 85.2%

Signed: _____

Foreman
Boyles Bros. Drilling Co. Ltd.

By Norman Boyse
Alberta Natural Gas Company

CORE LOG
D.H. #3

0-97	Bedrock
Drilled 97-106'	
97-104	Shale, dark brown, very carbonaceous, scattered pieces of coal.
106-108	Drive sample - dark gray to grey, mud, minor amounts of sand.
108-128	Drilled - sludge samples
108-112	Dark brown shale, very carbonaceous, scattered coal pieces.
112-19	Shale, dark gray to dark brown, sandy, scattered pieces of coal. (appears to be interbedded shale, sand with stringers of coal.)
119-21	Shale, dark gray to dark brown, very carbonaceous, and coal - (appears to be interbedded shale and coal)
121-29	Shale, brown, carbonaceous, scattered pieces of coal.
Cored 129-198'	
129-174	Shale breccia, gray, waxy in part. Carbonaceous films and partings, sandy in part, some near vertical fracturing with very carbonaceous to coaly parting, minor amounts of coal at 154' and 155' core is badly broken to pulverized in part.
174-89	Shale, grey to dark grey, silty, fractured and broken, calcite infilling of fractures, fracture planes at 35° to vertical axis of core - might indicate a fault plane of 55° dipping to west probably. Shale has somewhat of a waxy appearance.
189-90	Pulverized shale, grey, sandy.
190-98	Shale, gray to dark gray, waxy in part, strongly breciated in part, badly broken sandy in part.

/..2

Drilled 198-230

198-230	Shale, gray to dark gray, scattered carbonaceous material.

Cored 230-454'4"

230-239	Shale, gray, silty, fractured and broken, bedding at 236' is 32° off horizontal axis of core, fracturing is 35-40° off vertical axis of core - fault plane at 50-55° dipping to west? Fracture planes are carbonaceous.
239-247	Shale, black, carbonaceous, some very minor interbedding or lensing of white fine grained sand.
247-263'-6"	Shale, gray, fractured and broken, carbonaceous film along fracture plane, some interbedding of fine grained sand, bedding at 256' is 28° off horizontal axis of core.
263-6"- 268'	Sandstone, gray, fine to medium grained, some argillaceous bedding in last foot. Bedding is 28° off horizontal axis of core.
268-282	Shale, gray to black, fractured and badly broken, very carbonaceous in part.
282-283	Sandstone, fine grained, gray, very limy, bedding at 40° off horizontal axis of core.
283-294	Shale, gray, fractured and broken, carbonaceous films and partings along fracture planes, fracturing is vertical.
294-298	Coal - driller (Hendricks) says from drilling time coal could not have been more than three feet thick and is probably 2-6" - 3'. Recovery in core from 293-298 only 2 feet.

Basal Kootenay Sand

298-346	Sandstone, gray to dark grey, medium, quartz ore, cherty carbonaceous inclusions, iron calcareous. Real salt and pepper appearance in part. Bedding at 313' is 35° off horizontal axis of core. Sand is argillaceous from 332-334. Fracturing is near vertical. Sand becomes calcareous at 346'.
346-362-4"	Sandstone, gray to light gray, fine to medium slightly calcareous.

/..3

362-4" - 364-4"	Shale, brownish black.
364-4"-445-4"	Sandstone, gray to dark gray, fine grained, calcareous to limy. Bedding at 372' is 30° off horizontal axis of core. Fractured, material carbonaceous, along fracture planes, some white calcite infilling.

CORE RUNS IN D. H. #6

Driller's marked Woodblocks	Length of Core	Driller's marked Woodblocks	Length of Core
95' Taken as bedrock		228'	3'
97'	2'	230	2
104	7	232	2
106	2	235	3
110	4	237	2
112	2	242	5
114	2	247	5
115	1	252-6"	5-6"
117	2	257-6"	5
119	2	260	2-6"
121	2	264-9"	4-9"
123	2	268	3-3"
125	2	272	4
127	2	274	2
Not marked	-	278	4
131	-	283	5
135	4	288	5
140	5	293	5
147	7	298	5
150	3	303	5
155	5	308	5
157	2	311-6"	3-6"
162	5	315	3-6"
166	4	316	1
168-6"	2-6"	319	3
171	2-6"	321	2
177	6	324	3
179	2	326	2
181	2	329-6"	3-6"
184	3	334	4-6"
188	4	336-4"	2-4"
189-7"	1-7"	339-10"	3-6"
191	1-5"	340-10"	1
193-8"	2-8"	346	5-2"
195-6"	1-10"	348-8"	2-8"
198	2-6"	353	4-3"
201	2-6"	357-6"	4-6"
203	2	362-4"	4-10"
204	1	364	1-8"
205	1	365	1
208	3	368-6"	3-6"
212	4	373-6"	5
215	3	378-6"	5
219	4	382-6"	4
222	3	387	4-6"
225	3	391	4

Core runs in D.H. #6 - con't

Driller's marked Woodblocks	Length of Core
393-10"	2-10"
398-6"	4-8"
403-4"	4-10"
408	4-8"
413	5
417-10"	4-10"
422	4-2"
427	5
432	5
435	3
436	1
437	1
439	2
440-6"	1-6"
445-4"	4-10"

END
106 pulls
3¼ FT. AV. PER PULL

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (97-104)		Hole #6 (106-108)	
Date Sample Taken:					
Laboratory Sample No.:		405-64		406-64	
		As Received	Dry	As Received	Dry
Moisture	%	.5	-	.6	-
Ash	%	64.4	64.7	63.1	63.5
Volatile Matter	%	15.6	15.7	14.3	14.4
Fixed Carbon	%	19.5	19.6	22.0	22.1
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Pearson

Coal Analytical Laboratory Approved: [signature]

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 11th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (108-110)		Hole #6 (110-112)	
Date Sample Taken:					
Laboratory Sample No.:		407-64		408-64	
		As Received	Dry	As Received	Dry
Moisture	%	.6	-	.5	-
Ash	%	57.6	57.9	53.5	53.8
Volatile Matter	%	14.3	14.4	15.3	15.4
Fixed Carbon	%	27.5	27.7	30.7	30.8
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Bramley

Coal Analytical Laboratory Approved: S. Daya

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (112-114)		Hole #6 (114-115)	
Date Sample Taken:					
Laboratory Sample No.:		409-64		410-64	
		As Received	Dry	As Received	Dry
Moisture	%	.6	-	.6	-
Ash	%	77.7	78.2	83.3	83.8
Volatile Matter	%	10.2	10.3	8.8	8.9
Fixed Carbon	%	11.5	11.5	7.3	7.3
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. A. Hamilton

Coal Analytical Laboratory Approved: J. J. Fitzgerald

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natual Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (115-117)	Hole #6 (117-119)
Date Sample Taken:			
Laboratory Sample No.:		411-64	412-64
		As Received / Dry	As Received / Dry
Moisture	%	.5 / -	.5 / -
Ash	%	75.0 / 75.4	88.6 / 89.1
Volatile Matter	%	12.5 / 12.6	7.7 / 7.8
Fixed Carbon	%	12.0 / 12.0	3.2 / 3.1
Sulfur	%		
Calorific Value, B.t.u. per lb.			

Remarks:

Date: January 30, 1964. Signed: W. H. Pearson

Coal Analytical Laboratory Approved: F. F. Hughes

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 11th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (119-121)		Hole #6 (121-123)	
Date Sample Taken:					
Laboratory Sample No.:		413-64		414-64	
		As Received	Dry	As Received	Dry
Moisture	%	1.2	-	.7	-
Ash	%	74.9	75.8	76.4	77.0
Volatile Matter	%	10.8	10.9	9.6	9.7
Fixed Carbon	%	13.1	13.3	13.3	13.3
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Bruce Wilson

Coal Analytical Laboratory Approved: G. F. Taylor

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 11th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Soyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation: Hole #6 (123-125)

Date Sample Taken:
Laboratory Sample No.: 415-64

		As Received	Dry	As Received	Dry
Moisture	%	.8	-		
Ash	%	82.9	83.6		
Volatile Matter	%	8.1	8.1		
Fixed Carbon	%	8.2	8.3		
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W.H. Bannister

Coal Analytical Laboratory Approved: J.F. Taylor

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 11th Street
Edmonton, Alberta

Report of Analysis

The following are the analyses of samples of coal submitted by

A.N. Boyce, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue, S.W.
Calgary, Alberta

Your Designation: Hole #6 (293-298)

Date Sample Taken: Jan. 26, 1964
Laboratory Sample No.: 416-64

		As Received	Dry	As Received	Dry
Moisture	%	13.4	-		
Ash	%	25.7	29.7		
Volatile Matter	%	18.9	21.8		
Fixed Carbon	%	42.0	48.5		
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: February 5, 1964. Signed: W. H. Harrison

Coal Analytical Laboratory Approved: J. F. Fryer

CONCLUSIONS DRAWN FROM EXAMINATION OF

CORE CHIPS IN WELL #2, #4, #6

There are 2 distinct sandstone units in #4 and #6.

The top unit in well #4 is from 112' (First core chip) to 137'. It is predominantly brown-gray medium grained and medium sorted, salt and pepper, quartz, black and white chert, argillite, trace green mineral partly pyritic. The matrix is argillaceous, siliceous. In well #6 the First unit is very much like the First unit in well #4, it covers interval 303' (first corechip) through 312'. 335' appears to be a gradation to unit 2, it is becoming dolomitic and decreasing in grain size.

The second unit in well #4, From 151' to 235' (last chip), is gray-brown, fine grained, medium to poor sorted at top becoming medium sorted going down in the section, salt and pepper, quartz, chert, light brown, brown and trace of black and white, trace argillite fragments, dolomite fragments, becoming silty in places, argillaceous and dolomite cement.

In well no 6 there is a more gradational change from unit I to unit II. Unit II covers 335' through 443' and is very simular to unit II in well #4.

The difference between the two units is;

I The cementation in unit I is siliceous, in unit II it is dolomitic

II Unit I is predominantly medium grained, unit II is fine to very fine grained, except for 335' and 343' in unit 6 which appears to be a gradation to unit 2

III Argillite content in unit I is greater than in unit II

IV Chert in unit I is mostly black, with trace of black and white.

There does not appear to be any sharp contact between the two units in the core chips examined.

In well #2 260' and 269' are very similar to unit #2, in well no 4 and no 6, 533' is more similar to unit 1.

CANADIAN STRATIGRAPHIC SERVICE LTD.

SIEBOLD MACHIELSE

DRILL HOLE NO. 7

Drill Number:	Two
Location:	1000 ft. downgrade and west of D.H.#2
Starting Date:	January 31, 1964
Completion Date:	February 14, 1964
Angle of Hole:	90 degrees off horizontal (vertical)
Thickness of Mantle:	46 feet
Dip of Strata:	Variable (see Field Report)
Total Depth of Hole:	505 feet
Percent Core Recovery:	88.9
Number of Core Pulls:	140
Average Length of Core per Pull:	3.28 feet
Number of Core Boxes:	24

Coal Seams Encountered:

Hole Interval	Core Thickness	Remarks
176'-0" to 179'-10"	2'-6" coal	Coal finely pulverized.
	0'-4" shale	Drive tube sample - 80% rec.
	1'-0" coal	
187'-8" to 190'-9"(a)	1'-4" coal	Coal finely pulverized.
	1'-0" mud	Drive tube sample - 100% rec.
	2'-1" coal	
331'-6" to 344'-6"(b)	4'-0" coal	Coal broken; solid pieces with
	1'-6" shale	shale finely pulverized.
	2'-0" coal	95% rec.
	1'-6" shale	
	4'-0" coal	
394'-2" to 394'-6"	1'-4"	Coal broken, solid pieces; 100% rec.
398'-9" to 400'-0"	1'-3"	Coal broken, solid pieces; 100% rec.
481'-6" to 488'-0"(c)	6'-6"	Coal broken and pulverized with 7" shale band.

(a) Seam of mineable thickness which included 1 foot of mud. The mud plus the top bench of 37.3% ash eliminates this seam as being merchantable.

(b) The full seam shows 13 feet which includes 3 feet of shale band. The top and middle benches of coal are high ash, 19 to 22%, the lower bench of coal showing 15.0% ash with a 5-1/2 F.S.I. which shows coking characteristics. The seam could be mined together and rough cleaned as a low grade steam coal. (See Coal Seam "B" below)

(c) The coal seam is high ash without the 7 inch shale band (29.0 to 35.0%). This coal would not make a steam coal unless it could be mechanically cleaned.

The analyses reports are included at the end of this Drill Hole No. 7 report.

FIELD REPORT

DRILL HOLE NO. 7

By
Melvin E. Hinkle
John T. Boyd & Associates

The drill from Completed Drill Hole No. 6 was moved uphill along the pipeline on January 28, 1964, a horizontal distance of approximately 4100 feet to the site of Drill Hole No. 7 which was located about halfway between completed Drill Holes No. 2 and No. 4. The drill and equipment were moved by Alberta Natural Gas Company's heavy equipment and personnel. Water was supplied to the drill in a 500 gallon tank attached to a flat-bottom truck, filled at Alberta Natural Gas Company's pumping station and hauled to the drill. The truck, water tank and two truck drivers for two-shift hauling were supplied by Alberta Natural Gas Company.

The hole was drilled vertically. Drilling started on January 31. Overburden consisting mostly of clay was found to a depth of 46 feet. The rock strata, to a final depth of 505 feet, consisted of shales, sandstones and coal seams which were found to be in a broken, fractured and pulverized condition.

More coal seams were encountered in this hole than in any of the previous six holes drilled. The coal seams were as follows:

Depth to Bottom of Seam	Seam Thick. As Cut	Measured Dip of Strata (Degree)	Calculated True Thick. of Coal Seam
179'-10"	3'-10"	32	3'-3"
190'- 9"	4'-5"	32	3'-9"
344'- 6"	13'- 0"	12	12'-8"
395'- 6"	1'- 4"	-	-
400'- 0"	1'- 3"	-	-
488'- 0"	6'- 6"	17	6'-2.5"

The drill hole was stopped at 505 foot depth on February 14, 1964. An acid dip test was made at a depth of 504 feet and the result showed the hole ended at an angle of 88 degrees, or 2 degrees off vertical.

A number of bedding plane readings were taken to show the angle that the bedding plane made to a right angle across the core. These angles varied considerably as shown by the following tabulation of the angles measured at various depths.

Depth (Feet)	Angle off Right Angle to Core	Angle of Dip
60-63	Bedding parallel to core	90
65	55	55
74	60	60
100	50	50
128	30	30
152	30	30
171	32	32
237	16	16
274	22	22
375'-6"	8	8
478	17	17
504	20	20

Following is a list of the major items of operation in drilling this hole:

	Man Hours	Percent Drilling Time
Moving and setting up drill	144	15
Reaming hole for casing	112	12
Actual drilling	576	62
Pulling casing, tearing down and loading truck	104	11
	936	100

A total of 458 feet of rock strata was drilled by coring with 407 feet of core recovered for a core recovery of 88.9%.

The total length of core was placed in core boxes. Driller's marked wood blocks along the length of the core show that they had to pull rods 140 times for an average length of core of 3.28 feet.

There are 24 core boxes for this hole, together with the acid dip tube, stored at the same location as the core boxes for the other six holes.

D. D. - 7

(A.M.S. Survey Stn. A-9)

Started: Jan. 31, 1956
Finished: Feb. 14, 1956
Depth: 5-45'
Top Casing Above Grd. - 2.0'
Ground Elev: 271' (not sea level)
Angle: 90° (vertical)

40' of 5-1/2" casing
100' - N Casing
113' - "D" Casing

	Feet	Depth Feet
Overburden - Clay	43'0"	45'0"
Drilled 1'0" for lowering N-Casing	1'0"	47'0"
Sh., Black, hard, massive, non-calc., broken and fractured	7'0"	54'0"
Sandstone, gray, hard, med.-grain, calcareous, some calcite streaks, broken and fractured.	9'0"	63'0"
(Bedding appears distorted with section from 60'-63' shows bedding parallel to core.)		
Sandstone, dark gray, silty, hard, calcareous, much calcite streaks.	5'0"	68'0"
(core pc. at 65' show bedding to be 55° off Rt. L. to core.)		
Shale, dark gray, limey, hard, massive, calcareous, calcite streaks, broken and wedge fractured.	3'0"	71'0"
Shale, black, hard, massive, non-to-slightly calcareous, no calcite streaks, broken and wedge fractured.	11'0"	82'0"
(core pc. at 74' shows bedding to be 60° off Rt. L. to core.) (wedge fractures are at 70° to Rt. L. to core)		
Shale, dark gray, limey, hard, very calc., broken and fractured.	25'0"	107'0"
(Core pc. at 100' shows bedding to be 50° off Rt. L. to core)		

/..2

	Feet	North East
Shale, black, hard, carbonaceous, non-calc. Top 4' very broken.	6'6"	113'6"
Shale, dark gray, hard, sandy, massive, non-to-very calc., broken.	20'0"	133'6"
(Core pc. at 120' shows bedding to be 30° off Rt. L. to core.)		
Shale, black, hard, non-to-very calc., massive with indication of thin bedding at 164', fractured.	35'6"	169'0"
(Core pc. at 152' shows bedding to be 30° off Rt. L. to core)		
(D.H. making small amt. water at about 169' and also losing drilling water at around same depth.)		
(Black shale gives a brown scratch mark and a brown streak on a streak plate.)		
Shale, black, very carbonaceous, hard, broken and slickensided.	3'0"	172'0"
(Core pc. at 171' shows bedding to be 32° off Rt. L. to core.)		
(This carb. mat. gives a black scratch mark and a black streak on a streak plate. Will not burn or coke in an acetylene torch flame, but does give off strong bituminous odor. It has appearance of cannel coal - dull luster with conchoidal fracture.)		
(Gouge Material)		
Shale, black, hard, very broken.	1'0"	173'0"
Lost Core - Reamer rods dropped from 173'-175'; return water muddy; No sludge available for sample.	3'0"	176'0"
Shale, finely pulv.) Drive tube samples	2'6"	178'6"
Shale, black, carb.) Measures 3'0" 83%	0'4"	178'10"
Shale, finely pulv.) recov. T.T. 3'3"(32°)	1'0"	179'10"
Small and broken pieces of shale (Drive tube sample)	6'6"	186'4"

/..3

		Thick	Depth Down
Sand, finely pulv. and black pieces of shale	Drive tube sampler, 100% recov. 2'0" as cut R. T. 3'9" (32°)	1'4"	187'0"
		1'0"	188'0"
Silt, 10% finely pulv., 90% broken pea.		2'1"	190'9"
Shale, black, broken pea. (Drive tube sample)		0'6"	191'3"
? Shale, black, very carb. pulv., no bituminous odor on heating (Drive tube sample)		1'9"	193'0"
(Coring Resumed)			
Shale, dark gray, hard, sandy, non-calc. broken and fractured		56'4"	249'4"
(Core pa. at 287' shows bedding to be 16° off Rt. L. to Core.)			
Sandstone, gray, fine grain, hard, non-calc. broken and fractured.		5'6"	254'10"
Sandstone, gray, med. grain, hard, non-calc. broken and fractured.		38'2"	293'0"
(1. 0" pa. core at 274' shows bedding to be 32° off Rt. L. to core)			
Shale, dark gray, hard, non-calc. broken and fractured.		7'0"	300'0"
Shale, dark gray, finely pulv. (Drive tube sample)		6'5"	306'5"
Shale, dark gray, hard, non-calc., very broken(only meas. 3'7", 312'10"-318')		12'2"	318'2"
Coal, bony, hard		0'5"	318'7"
Shale, dark gray, hard, broken (6' missing 321'4"-327' - only meas. 3'6")		3'5"	322'0"
Shale, finely pulverized (Drive tube sample) (Would have to come down with sand)		9'6"	331'6"

/...2

		Feet	Depth Feet
Coal, broken and solid pieces, top 12" pulv., soft to hard, bright, 100% recov.		4'0"	335'6"
Shale, finely pulv. carb.	13'0" out 10'0" coal	1'6"	337'0"
Coal, broken, solid pieces, 100% rec. soft to hard, bright	T. P. 13'0" (12") P. P. coal	2'0"	339'0"
Shale, finely pulv. carb.	9'9"	1'6"	340'6"
Coal, broken, solid pieces, 100% recov. soft to hard, bright		4'0"	344'6"
Shale, finely pulv.		1'6"	346'0"
Shale, dark gray, hard, sandy, non-calc., calcite streaks		19'0"	365'0"
Shale, dark gray, pulv. (Drive tube sample)		9'0"	374'0"
Shale, dark gray, hard, very sandy, broken and fractured.		19'6"	394'2"
(A 12" core pc. at 375'6" shows bedding to be 8° off Rt. L. to Core)			
Coal, soft to hard, bright, broken, solid pieces 100% recov.		1'4"	395'6"
Shale, black, carb. broken, fractured and slickensided.		3'3"	398'9"
Coal, soft, bright, broken, solid pieces, 100% recov.		1'3"	400'0"
Shale, dark gray, carb. pulv.		8'0"	408'0"
No recov. - Driller's called mud.		3'0"	411'0"
(2X Core drilled with mud)			
Sandstone, gray, hard, med. grain, non-calc. broken and fractured, massive			443'0"

/..5

	Feet	Depth Feet
Shale, pulv.	0'9"	443'9"
Mudstone, grey, fine grain, hard, non-calc. broken and fractured.	8'3"	452'0"
Shale, black, hard, non-calc. broken and fractured.	12'4"	464'4"
Coal, finely pulv.	0'5"	464'9"
Shale, black, hard, non-calc., broken and fractured.	5'3"	470'0"
Sandstone, grey, fine to med. grain, hard, broken, non-calc.	6'6"	476'6"
Shale, black, hard, carb., broken and pulverised.	5'0"	481'6"
(7" core pc. at 478' shows bedding to be 17° off Rt. L. to Core.)		
Coal, broken and pulv. } Shale, black } 6'6" seam as cut Coal, broken }	4'6"	486'0"
	0'7"	486'7"
	1'5"	488'0"
Sandstone, grey, med. grain, hard, massive broken and fractured. (Hole still making water.) (At 504' bedding is 30° off Rt. L. to Core.)		505'0"

END OF HOLE

No. Core Bones - 24
Acid Dip Test @ 504' - 58°

Signed _____
Foreman
Boyles Bros. Drilling Co. Ltd.

By Norman Boyse
Alberta Natural Gas Company

D.S. # 7

CORE LOG

0 - 47	Overburden
47 - 54	Shale, gray, slightly silty, plant casts, fracturing near vertical, shale is quite massive. Bedding appears to vary from parallel to horizontal axis of core to about 25° off horizontal axis.
54 - 66'6"	Sandstone, gray, fine to medium grained, calcareous, fractured, shaley carbonaceous partings and stringers along fractures, slickensided bedding dip varies from 0° to vertical, some calcite stringers.
66'6" - 73	Shale, gray to dark gray, fractured, fracture planes 60° off horizontal axis of core, shale is calcareous.
73 - 83	Shale, black, massive, fractured, fracture planes 60° off horizontal axis of core, some carbonaceous material along fracture planes, slickensided.
83 - 106	Sandstone, predominantly brown, fine grained, limy, this irregular interbedding of gray fine grained sand very calcareous, sand is argillaceous to shaley in part. Bedding is 50° off horizontal axis of core.
106-113'6"	Shale, dark gray to black, very carbonaceous in part, slickensided.
113'6" - 133'10"	Shale, gray, calcareous in part, some minor interbedding of light gray sand. Shale grades to argillaceous sandstone, some fracturing with calcite infilling. Bedding plane at 30°.
133'10" - 160'10"	Shale, dark gray, broken in part, some fracturing vertical to bedding plane which dips at 30°.
160'10" - 173	Shale, gray to black, very carbonaceous in part. Badly broken.
173 - 176	No recovery, driller reports returns were just mud - return water muddy.

/..2

176 - 178'6"	Coal - pulverized.
178'6" - 179'10"	Coal - (178'6" - 178'10") 4" of bony coal - doesn't burn very well - probably high ash.
179'10" - 186'4"	Pulverized shale.
186'4" - 187'8"	Coal
187'8" - 188'8"	Mud and shale.
188'8" - 190'9"	Coal
190'9" - 191'3"	Shale
191'3" - 193'	Very carbonaceous black shale.
193 - 203	Shale, gray, massive, fracturing in conchoidal.
203 - 208'6"	Shale, gray, brecciated, wavy appearance, appears to be a sheer zone, slickensiding abundant.
208'6" - 249	Shale, gray, massive, clay to sandy, fractured and broken in part - grades to argillaceous sandstone, gray to brown.
249 - 255	Sandstone, gray, fine grained, fractured in part, carbonaceous material along fracture plane, fracturing is vertical.
255 - 293	Sandstone, dark gray, medium grained, broken and fractured, some carbonaceous material along breaks slickensided, some evidence of crossbedding sandstone contains quartz, chert and carbonaceous material, some green mineral might be termed a fine conglomerate.
293 - 300	Shale, brownish gray to gray, broken in part, some slickensiding.
300 - 306	Shale, dark brown, carbonaceous, pulverized, scattered pieces of Coal.

/..3

306 - 322	Sh[illegible], dark gray, broken and f[illegible]tured, shale is [illegible] massive. One piece at 31[illegible]" very carbon- [illegible]ac shows bedding to be dip[illegible]g at 25°.
322 - 332	[illegible]le, dark brown, carbonace[illegible], pulverized, [illegible]tered pieces appear to be [illegible]oal. Rec. only 33".
332 - 335	[illegible]al, lumpy, shiny.
335 - 337	[illegible]ale, black, pulverized.
337 - 338'10"	Coal, lumpy, shiny
338'10" - 340'6"	Coal, pulverized appears to be quite shaley.
340'6" - 344'6"	Coal, lumpy, shiny - pulverized in last 8".
344'6" - 346	Coal, pulverized, appears to be more shale than coal.
346 - 365	Shale, gray, silty to sandy, fractured and broken, fractures near vertical, some brecciation.
365 - 374'8"	Predominantly black shale, carbonaceous, pulverized, and coal.
374'8" - 394'7"	Shale, gray to dark gray, fractured and broken, some lensing and interbedding of light gray sand.
394'9" - 395'6"	Coal, lumpy, shiny.
395'6" - 398'6"	Shale, black, very carbonaceous in part, slickensiding.
(398'6" - 401)?	Coal, lumpy, bright.
(401 - 408)	Shale, brown, carbonaceous, pulverized, scattered pieces of coal.
408-411	No recovery. Driller reports mud only in returns.
411-443	Sandstone, gray, medium grained, massive non-calcareous - salt and pepper type.

/..4

443 - 443'9"	Coal, pulverized.
443'9" - 452	Sandstone, gray to brown, fine grained, massive, fractured and broken.
452 - 467	Shale, gray to black, quite carbonaceous in part, broken, abundant carbonaceous slickensiding.
467 - 476'6"	Sandstone, gray, fine grained, fine argillaceous bedding streaks, bedding is 15° off horizontal axis of core.
476'6" - 481'6"	Shale, black, very carbonaceous for the most part, shale, - broken and pulverized.
481'6" - 486	Coal, broken and pulverized.
486 - 486'6"	Shale, black, very carbonaceous.
486'6" - 488	Coal, badly broken.
488 - 505	Sandstone, gray, medium grained, salt and pepper type.

CORE RUNS IN D.H. #7

(Drilled completely with NX Wire-line)

Driller's Marked Woodblocks	Length of Core
47 on bedrock	
48	1'
48'6"	0'6"
51'2"	2'8"
52'6"	1'4"
55'6"	3'0"
58'6"	2'0"
61'	2'6"
63'	2'
64'	1'
66'6"	2'6"
68'6"	2'
71'	2'6"
73'	2'
75'	2'
77'	2'
79'	2'
82'	3'
84'6"	2'6"
87'	2'6"
90'	3'
95'	5'
102'	7'
106'	4'
110'	4'
112'	2'
115'6"	3'6"
120'	4'6"
123'	3'
130'	7'
132'6"	2'6"
133'1"	0'7"
138'	4'11"
144'9"	6'9"
149'5"	4'8"
156'6"	7'1"
163'	6'6"
166'6"	3'6"
168'	1'6"
171'	3'
173'	2'
176'	3'
180'	4'
182'4"	2'4"

Driller's Marked Woodblocks	Length of Core
186'	3'8"
187'8"	1'8"
189'	1'4"
190'	1'
193'	3'
195'	2'
197'	2'
201'	4'
206'6"	5'6"
208'6"	2'
214'8"	6'2"
220'	5'4"
225'	5'
228'3"	3'3"
233'	4'9"
238'	5'
240'4"	2'4"
246'	5'8"
249'4"	3'4"
252'4"	3'
258'	5'8"
260'	2'
265'4"	5'4"
270'	4'8"
272'	2'
274'	2'
275'5"	1'5"
277'2"	1'9"
278'	0'10"
279'	1'
280'	1'
280'9"	0'9"
282'	1'3"
283'6"	1'6"
290'	6'6"
291'	1'
292'6"	1'6"
293'	0'6"
293'6"	0'6"
295'	1'6"
296'	1'
298'6"	2'6"
300'	1'6"
305'	5'
306'	1'
307'	1'

Driller's marked Woodblocks	Length of Core
311'	4'
312'10"	1'10"
318'	5'2"
321'4"	3'4"
331'	9'8"
337'	6'
340'6"	3'6"
344'6"	4'
346'	1'6"
349'	3'
351'	2'
355'4"	4'4"
356'6"	1'2"
358'	1'6"
360'10"	2'10"
365'	4'2"
370'3"	5'3"
380'	9'9"
384'6"	4'6"
387'	2'6"
391'	4'
396'	5'
401'	5'
408'	7'
411'	3'
413'6"	2'6"
415'2"	1'8"
419'8"	4'6"
424'	4'4"
428'	4'
433'	5'
438'	5'
443'	5'
448'	5'
449'	1'
452'	3'
457'6"	5'6"
461'6"	4'
464'4"	2'10"
466'	1'8"
470'6"	4'6"
475'	4'6"
476'6"	1'6"
481'6"	4'
486'	4'6"

Driller's Marked Woodblocks	Length of Core
488'	2'
491'	3'
496'	5'
500'	4'
505'	5'

END

140 Pulls - 3.28 Av. Core Length per pull

ENGINEERS & CHEMISTS LTD.

128 EAST 4TH AVE., VANCOUVER 10, B.C. TELEPHONE: TRINITY 6-4111

REPORT OF: Chemical Testing

AT: Vancouver Laboratory

PROJECT: Coal Analysis

REPORTED TO: Alberta Natural Gas Company,
503 Natural Gas Building,
140 Sixth Avenue S.W.,
Calgary, Alberta

FILE NO. C.3-A.1-64 10394

DATE February 19, 1964

REPORT NO.

ORDER NO.

We have tested 5 samples of coal submitted by you on February 11, 1964 and we report as hereunder :

SAMPLE IDENTIFICATION D.H. #1

5 coal samples in bottles marked -

(1) 169' - 172'
(2) 176' - 179'10"
(3) 186'4" - 188'
(4) 188'8" - 190'9"
(5) 191'3" - 193'

RESULTS

	(1) As Rec'd	(1) Air Dry	(2) As Rec'd	(2) Air Dry
Moisture -				
Surface	1.1	-	1.2	-
Inherent	-	.4	-	.3
Total	1.5	-	1.5	-
Ash	54.5	55.1	26.0	26.3
Volatile Matter	15.1	15.3	28.1	28.4
Fixed Carbon	28.9	29.2	44.4	45.0
Free Swelling Index		1		2.1/2

../2

FORM 11

	(3) As Rec'd	(3) Air Dry	(4) As Rec'd	(4) Air Dry
Moisture -				
Surface	9.1		8.5	
Inherent		.4		.5
Total	9.5		9.0	
Ash	37.0	40.7	19.2	21.2
Volatile Matter	16.6	18.4	17.3	19.2
Fixed Carbon	36.9	40.5	54.5	59.1
Free Swelling Index		2		2.1/2

	(5) As Rec'd	(5) Air Dry	As Rec'd	Air Dry
Moisture -				
Surface	46.2			
Inherent		.3		
Total	46.5			
Ash	24.6	46.0		
Volatile Matter	9.3	16.8		
Fixed Carbon	19.6	36.9		
Free Swelling Index		1.1/2		

C O A S T E L D R I D G E

J. G. Smith
CHIEF CHEMIST

/ni

Chemical Testing — C.T.-A.1-64 10472

Vancouver Laboratory — February 27, 1964

Project: Coal Analysis

Forwarded to: Alberta Natural Gas Company,
100 Natural Gas Building,
240 Ninth Avenue S.W.,
Calgary, Alberta

We have tested 16 samples of coal submitted by you on February 18, 1964 and we report as hereunder :

Sample Identification

Samples marked as follows :

(1) Bullhose (Top)
(2) Bullhose (Middle)
(3) Bullhose (Bottom)
(4) 330'0" - 335'0" COAL
(5) 335'0" - 337'0" SHALE
(6) 337'0" - 339'0" COAL
(7) 339'0" - 340'0" SHALE
(8)* 340'0" - 344'0" COAL
(9) 344'0" - 345' SHALE
(10) 345' - 374'0" SHALE
(11) 384'2" - 385'0"
(12) 395'6" - 399'0" SHALE
(13)* 399'9" - 400'0"
(14) 400'0" - 400'6" SHALE
(15) 401'6" - 406'0"
(16)* 406'7" - 408'0"

* COKING POSSIBILITIES

RESULTS

		Sample (1) As Rec'd	Sample (1) Air Dry	Sample (2) As Rec'd	Sample (2) Air Dry
Moisture :	Surface - Wt %	10.5	-	5.1	-
	Inherent - Wt %	3.5	3.9	2.9	3.1
	Total - Wt %	14.0	-	8.0	-
Ash	Wt %	17.1	19.1	13.7	14.4
Volatile Matter	Wt %	20.6	23.0	22.1	23.3
Fixed Carbon	Wt %	48.3	54.0	56.2	59.2
BTU's/lb		9,270	10,350	10,840	11,420
Sulphur	Wt %	0.42	0.47	0.41	0.43
F.S.I. (Coking Index)		-	0	-	1 1/2

../2

FORM 11

Analysis (continued)

			Shale Sample (5) As Rec'd	Shale Sample (5) Air Dry	Coal Sample (4) As Rec'd	Coal Sample (4) Air Dry
Moisture :	Surface	Wt %	10.3	-	0.6	-
	Inherent	Wt %	2.4	2.7	.4	0.4
	Total	Wt %	12.7	-	1.0	-
Ash		Wt %	17.4	19.4	22.2	22.3
Volatile Matter		Wt %	21.2	23.6	20.3	20.
Fixed Carbon		Wt %	48.7	54.3	55.2	56.5
BTU's/lb			10,160	11,320	11,400	11,550
Sulphur		Wt %	0.46	0.51	0.65	0.39
F.S.I. (Coking Index)			-	2	-	1 1/2

			Shale Sample (5) As Rec'd	Shale Sample (5) Air Dry	Coal Sample (4) As Rec'd	Coal Sample (4) Air Dry
Moisture :	Surface	Wt %	7.5	-	0.4	-
	Inherent	Wt %	0.6	0.7	0.2	0.2
	Total	Wt %	8.1	-	0.6	-
Ash		Wt %	72.5	78.8	19.9	19.8
Volatile Matter		Wt %	9.5	10.3	20.5	20.6
Fixed Carbon		Wt %	9.9	10.7	60.0	60.2
BTU's/lb			1,680	1,815	11,715	11,780
Sulphur		Wt %	0.17	0.18	0.66	0.66
F.S.I. (Coking Index)			-	0	-	1 1/2

../3

[illegible] (CONTINUED)

			SHALE Sample (7)		COAL [illegible]	
			As Rec'd	Air Dry	As Rec'd	Air Dry
Moisture :	Surface	Wt %	6.5	-	0.7	-
	Inherent	Wt %	0.7	0.7	0.2	0.2
	Total	Wt %	7.2	-	0.9	-
Ash		Wt %	48.0	50.3	15.0	15.1
Volatile Matter		Wt %	14.1	15.1	23.7	23.9
Fixed Carbon		Wt %	28.9	30.9	60.4	60.8
BTU's/lb			4,740	5,070	12,620	12,710
Sulphur		Wt %	0.17	0.18	0.43	0.43
F.S.I. (Coking Index)			-	1	-	5 1/2

			SHALE Sample (9)		SHALE Sample (11)	
			As Rec'd	Air Dry	As Rec'd	Air Dry
Moisture :	Surface	Wt %	5.0	-	5.6	-
	Inherent	Wt %	0.3	0.3	0.6	0.7
	Total	Wt %	5.3	-	6.2	-
Ash		Wt %	62.5	65.7	72.5	76.9
Volatile Matter		Wt %	12.1	12.7	10.2	10.8
Fixed Carbon		Wt %	20.1	21.3	11.1	11.6
BTU's/lb			4,020	4,230	1,930	2,100
Sulphur		Wt %	0.16	0.17	0.24	0.25
F.S.I. (Coking Index)			-	1	-	0

COAL (CONTINUED)

		Sample (11) As Rec'd	Sample (11) Air Dry	SHALE Sample (12) As Rec'd	SHALE Sample (12) Air Dry
Moisture : Surface	Wt %	1.6	-	0.5	-
Inherent	Wt %	0.2	0.2	0.7	0.7
Total	Wt %	1.8	-	1.2	-
Ash	Wt %	33.8	34.4	74.9	75.1
Volatile Matter	Wt %	20.4	20.8	10.4	10.5
Fixed Carbon	Wt %	44.0	44.6	13.5	13.7
BTU's/lb		9,250	9,400	1,600	1,610
Sulphur	Wt %	0.41	0.42	0.12	0.12
F.S.I. (Coking Index)		-	1.1/2	-	0

		Sample (13) As Rec'd	Sample (13) Air Dry	SHALE Sample (14) As Rec'd	SHALE Sample (14) Air Dry
Moisture : Surface	Wt %	0.8	-	17.2	-
Inherent	Wt %	0.1	0.1	2.0	2.4
Total	Wt %	1.0	-	19.2	-
Ash	Wt %	17.5	17.6	49.5	59.7
Volatile Matter	Wt %	26.3	26.5	11.9	14.4
Fixed Carbon	Wt %	55.2	55.8	19.4	23.5
BTU's/lb		11,780	11,880	3,727	4,507
Sulphur	Wt %	0.47	0.47	0.35	0.42
F.S.I. (Coking Index)		-	6	-	1

Analyses (Continued)

			Sample (2B) As Rec'd	Sample (2B) Air Dry	Sample (2C) As Rec'd	Sample (2C) Air Dry
Moisture	Surface	Wt %	9.0	-	3.2	-
	Inherent	Wt %	0.1	0.1	3.5	3.5
	Total	Wt %	9.1	-	6.7	-
Ash		Wt %	34.2	37.6	27.8	29.8
Volatile Matter		Wt %	19.6	21.5	31.8	33.2
Fixed Carbon		Wt %	37.1	40.8	44.5	47.5
BTU's/lb			7,940	8,725	9,770	10,420
Sulphur		Wt %	0.35	0.38	0.44	0.47
F.S.I. (Coking Index)		Wt %	-	2.1/2	-	3.1/2

COAST EBERIDGE

J. C. Smith
CHIEF CHEMIST

/ml

K - McGillivray 64(2)A

Maps & Cross Sections

Crows Nest Pass Coal Company

430

2 of 3

GENERAL STATEMENT

The zone along the pipeline right of way that was explored by drilling is bounded on the east by the so-called Eaglesham Fault and extends westward into the Michel Valley then south for 16,700 feet, for a total horizontal pipeline distance of 24,000 feet.

Boyles Brothers Drilling Company, Limited, of Vancouver, British Columbia, performed the diamond core drilling. The size of the core from each hole was standard NX, approximately 2-1/8 inches in diameter.

J. W. Woomer & Associates assigned Melvin E. Hinkle, a graduate mining engineer, as project engineer to observe the drilling. His duties were to locate and set the direction of drill holes, verify logs of holes, approve daily drill reports and invoices.

The drilling program was set up to explore all of the strata along the pipeline right of way to a depth of 500 feet.

Following this General Statement is a profile along the pipeline showing the location of the seven (7) drill holes. Each drill hole is placed in a separate section of this report with a record of all factual data available.

Respectfully submitted,

JOHN T. BOYD & ASSOCIATES

By:

Melvin E. Hinkle

John T. Boyd

The Exhibits

EXHIBIT PRESENTATION

This Exhibit Section contains ~~five~~ six exhibits. They are,

Exhibit 1:

A profile along the pipeline showing the location of the seven (7) holes drilled. Scale 1 Inch = 400 feet.

Exhibit 2:

East-West sections drawn through Drill Holes No. 1, No. 2 and No. 4, located on Alberta Natural Gas Company's pipeline right of way.

The drill holes show the angle of drilling; total depth of hole; depth and description of the rock strata penetrated; the measured angle the bedding planes' strata were at right angle to the core at various depths; and the measured angle of the hole as determined from acid tube dip tests.

Exhibit 3:

East-West section drawn through Drill Hole No. 3 on Alberta Natural Gas Company's pipeline right of way.

The drill hole shows the angle of drilling; total depth of hole; depth and description of the rock strata penetrated; and the measured angle at various depths the bedding planes' strata were at right angle to the core.

Exhibit A
Plan of McGILLIVRAY AREA
1" = ?

Exhibit 4:

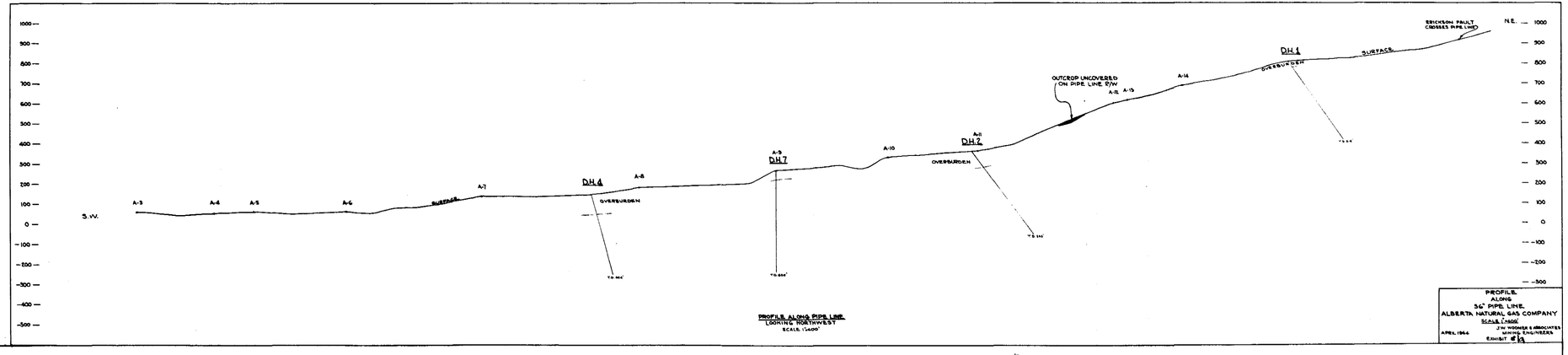
East-West sections drawn through Drill Hole Nos. 5 and 6 located on Alberta Natural Gas Company's pipeline right of way.

The drill holes show the angle of drilling; total depth of holes; depth and description of the rock strata penetrated; measured angle the bedding planes' strata were at right angle to core pieces taken at various depths; and the measured angle of the hole as determined from acid tube dip tests.

Exhibit 5:

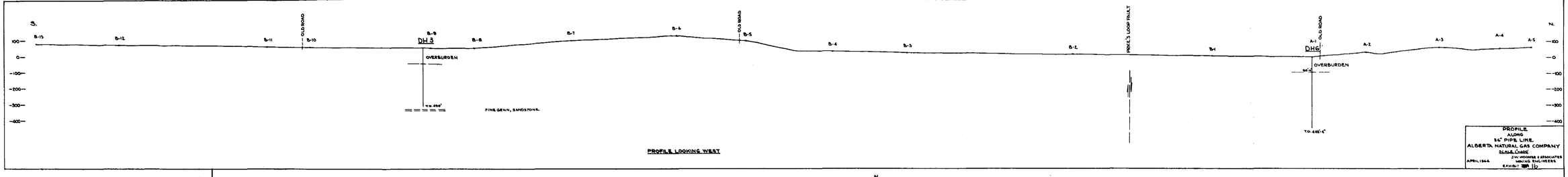
Section through Drill Hole No. 7.

This gives essentially the same information as contained in Exhibit 4.



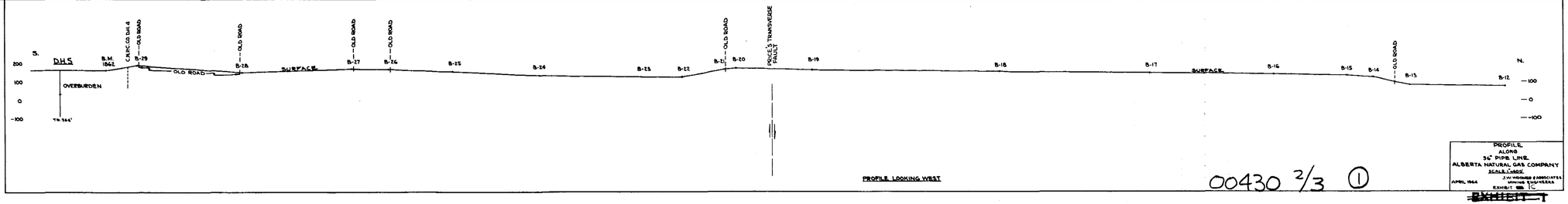
PROFILE ALONG PIPE LINE
LOOKING NORTHWEST
SCALE 1:4000'

PROFILE
ALONG
36" PIPE LINE
ALBERTA NATURAL GAS COMPANY
SCALE 1:4000
J.W. HOOSER & ASSOCIATES
MINING ENGINEERS
APRIL 1964
EXHIBIT # 1a



PROFILE LOOKING WEST

PROFILE
ALONG
36" PIPE LINE
ALBERTA NATURAL GAS COMPANY
SCALE 1:4000
J.W. HOOSER & ASSOCIATES
MINING ENGINEERS
APRIL 1964
EXHIBIT # 1b



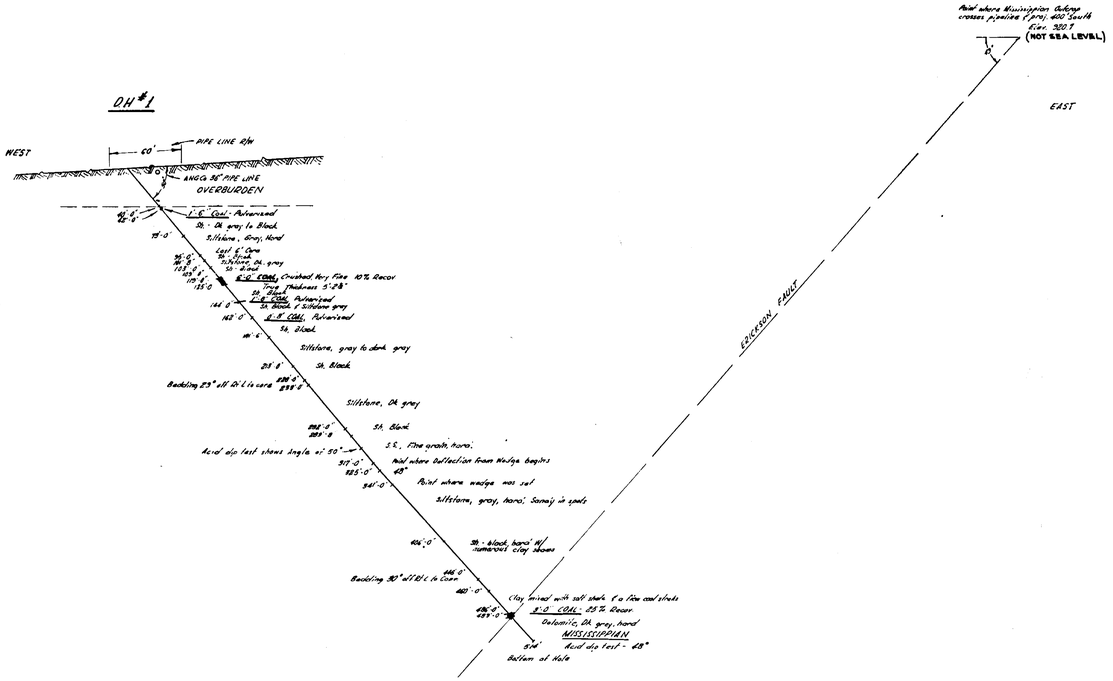
PROFILE LOOKING WEST

PROFILE
ALONG
36" PIPE LINE
ALBERTA NATURAL GAS COMPANY
SCALE 1:4000
J.W. HOOSER & ASSOCIATES
MINING ENGINEERS
APRIL 1964
EXHIBIT # 1c

00430 2/3 (1)

~~EXHIBIT T~~

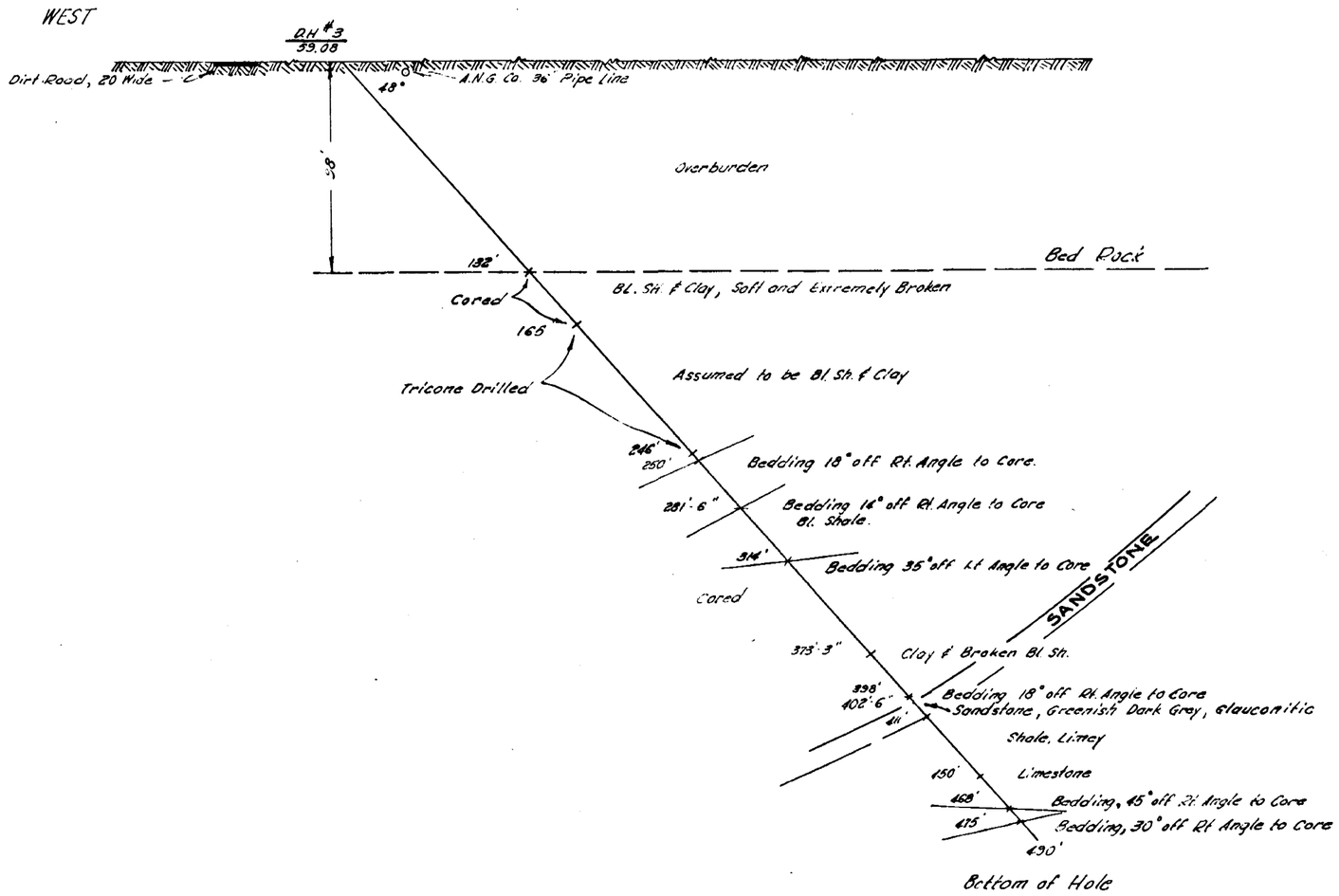
Ex's 1a, 1b, 1c.



EX-3

00430 2/3 (2)

J.W. WOOMER & ASSOCIATES
MINING ENGINEERS



McGILLIVRAY AREA

EAST-WEST SECTION DRAWN THROUGH D.H. #3

LOOKING NORTH

SCALE:

0 50 100 FT.

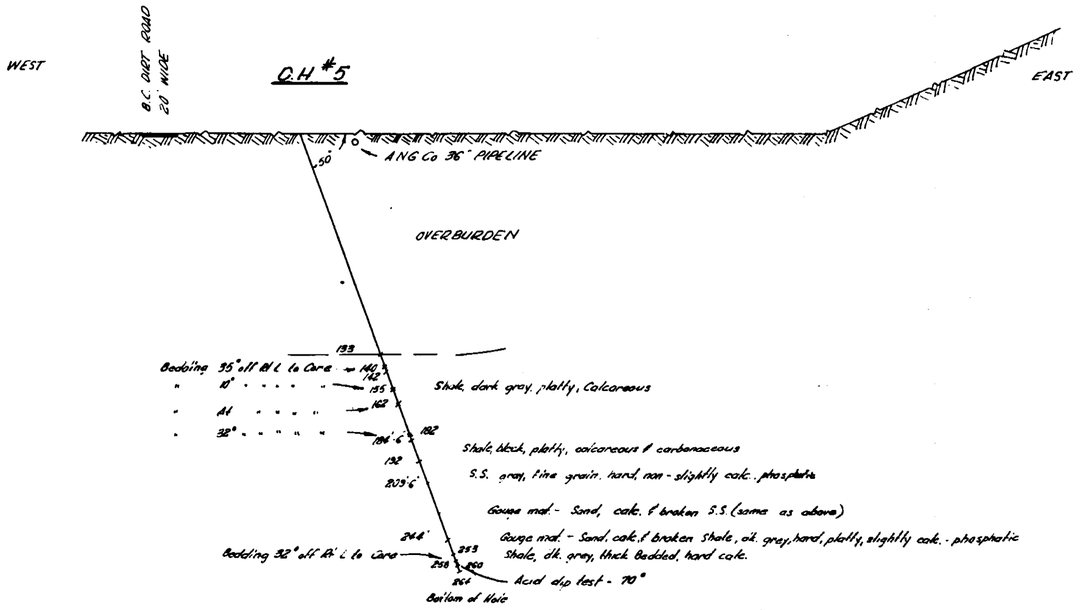
Drawn By:

J.W. WOOMER & ASSOCIATES

Mining Engineers

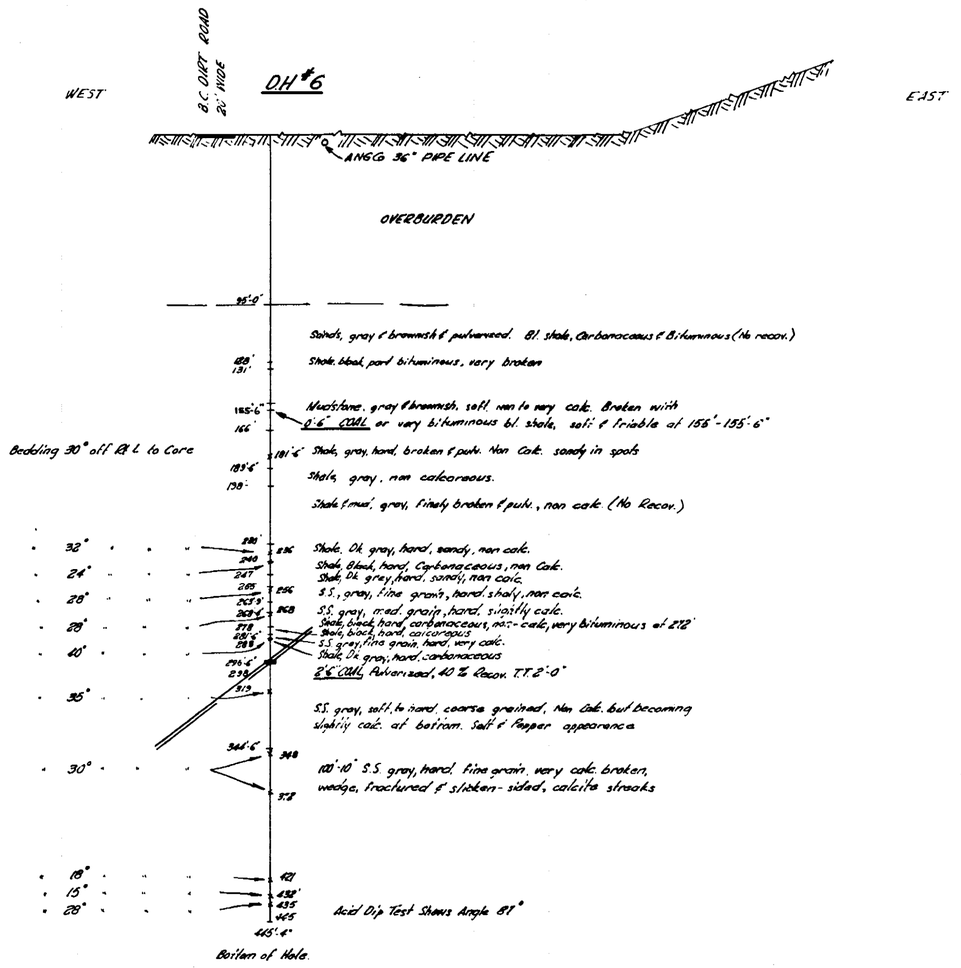
EXHIBIT 8

00430 2/3 (3)



EAST-WEST SECTION DRAWN THROUGH O.H #5

(LOOKING NORTH) SCALE 0 50 100 FT.



EAST - WEST SECTION DRAWN THROUGH O.H #6

(LOOKING NORTH) SCALE 0 50 100 FT.

J.W. WOOMER & ASSOCIATES
MINING ENGINEERS
EXHIBIT 4

00430 2/3 (4)

D.H. # 7

ANGLE OF D.H. 90°

SURF. ELEV.

46'-0" OVER BURDEN

BEDDING PARALLEL WITH CORE

CORE PC. SHOWS BEDDING TO BE 55° OFF RT. L TO CORE

CORE PC. SHOWS BEDDING TO BE 60° OFF RT. L TO CORE

" " " " " " 50° " " " " "

CORE PC. SHOWS BEDDING TO BE 30° OFF RT. L TO CORE

CORE PC. SHOWS BEDDING TO BE 30° OFF RT. L TO CORE

" " " " " " 32° " " " " "

CORE PC. SHOWS BEDDING TO BE 16° OFF RT. L TO CORE

CORE PC. SHOWS BEDDING TO BE 22° OFF RT. L TO CORE

CORE PC. SHOWS BEDDING TO BE 8° OFF RT. L TO CORE

CORE PC. SHOWS BEDDING TO BE 17° OFF RT. L. TO CORE

" " " " " " 20° " " " " "

46'-0"	8'-0" BLACK SHALE
54'-0"	9'-0" GREY SANDSTONE
63'-0"	5'-0" DARK GREY SANDSTONE
68'-0"	14'-0" DARK GREY SHALE
82'-0"	25'-0" DARK GREY SHALE
107'-0"	6'-6" BLACK SHALE
113'-6"	20'-0" DARK GREY SHALE
133'-6"	35'-6" BLACK SHALE
169'-0"	
172'-0"	3'-0" BLACK SHALE
172'-0"	1'-0" " "
176'-0"	3'-0" LOST CORE
178'-10"	3'-10" COAL SEAM - DRIVE TUBE SAMPLE, 80 % RECOVERY
184'-8"	1'-5" " " - " " " 100% "
190'-3"	
193'-0"	

CORING RESUMED

	56'-9" DARK GREY SHALE
249'-11"	5'-6" FINE GRAIN, GREY SANDSTONE
254'-10"	
	38'-2" MED. GRAIN, GREY SANDSTONE
293'-0"	7'-0" DARK GREY SHALE
300'-0"	6'-0" " " "
306'-0"	12'-2" " " "
318'-2"	0'-5" COAL, BONEY HARD
318'-7"	9'-6" SHALE, FINELY PULVERIZED
322'-0"	
331'-6"	13'-0" COAL SEAM
344'-6"	
	20'-6" DARK GREY SHALE
365'-0"	9'-8" DARK GREY SHALE
374'-8"	19'-6" DARK GREY SHALE
394'-2"	1'-9" COAL
395'-6"	1'-3" COAL
398'-9"	
400'-0"	
408'-0"	
411'-0"	
	32'-0" MED. GRAIN, GREY SANDSTONE
443'-0"	0'-9" COAL
443'-9"	8'-8" FINE GRAIN, GREY SANDSTONE
452'-0"	12'-4" BLACK SHALE
464'-4"	0'-5" COAL
464'-9"	5'-3" BLACK SHALE
470'-0"	6'-6" GREY SANDSTONE
476'-6"	5'-0" BLACK SHALE
481'-6"	6'-6" COAL SEAM
488'-0"	17'-0" MED. GRAIN, GREY SANDSTONE
505'-0"	

BOTTOM OF HOLE

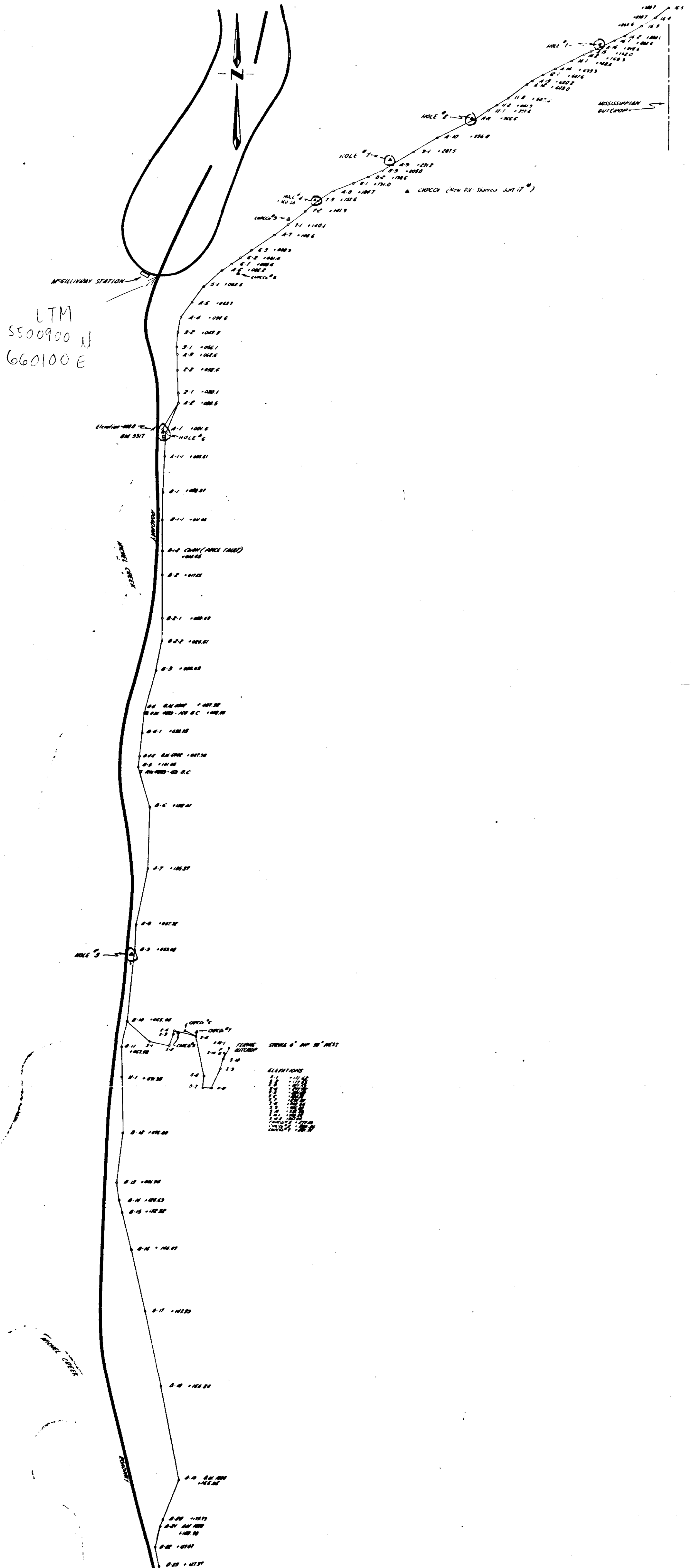
SCALE 0 50 100 FT.

SECTION DRAWN THROUGH D.H. # 7

J. W. WOOMER & ASSOCIATES

MINING ENGINEERS

EXHIBIT 5



ALBERTA NATURAL GAS COMPANY LTD.

PLAN VIEW
McGILLIVRAY AREA

Natural Scale 1" = 100' Nov. 5th 1963 R.E. Strong

00430 2/3 (5)

~~PET ANALYSIS~~ COPIES

K-McGILLIVRAY A64 BORE HOLE ANALYSIS 6 & 7

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by
A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (97-104)		Hole #6 (106-108)	
Date Sample Taken:					
Laboratory Sample No.:		405-64		406-64	
		As Received	Dry	As Received	Dry
Moisture	%	.5	-	.6	-
Ash	%	64.4	64.7	63.1	63.5
Volatile Matter	%	15.6	15.7	14.3	14.4
Fixed Carbon	%	19.5	19.6	22.0	22.1
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Parrish

Coal Analytical Laboratory Approved: [illegible]

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 11th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (108-110)		Hole #6 (110-112)	
Date Sample Taken:					
Laboratory Sample No.:		407-64		408-64	
		As Received	Dry	As Received	Dry
Moisture	%	.6	-	.5	-
Ash	%	57.6	57.9	53.5	53.8
Volatile Matter	%	14.3	14.4	15.3	15.4
Fixed Carbon	%	27.5	27.7	30.7	30.8
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Mannix

Coal Analytical Laboratory Approved: S. Favyn

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (112-114)		Hole #6 (114-115)	
Date Sample Taken:					
Laboratory Sample No.:		409-64		410-64	
		As Received	Dry	As Received	Dry
Moisture	%	.6	-	.6	-
Ash	%	77.7	78.2	83.3	83.8
Volatile Matter	%	10.2	10.3	8.8	8.9
Fixed Carbon	%	11.5	11.5	7.3	7.3
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Jamieson

Coal Analytical Laboratory Approved: J. F. Fraser

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Soyse, Alberta Natural Gas Company
503 Natual Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (115-117)		Hole #6 (117-119)	
Date Sample Taken:					
Laboratory Sample No.:		411-64		412-64	
		As Received	Dry	As Received	Dry
Moisture	%	.5	-	.5	-
Ash	%	75.0	75.4	88.6	89.1
Volatile Matter	%	12.5	12.6	7.7	7.8
Fixed Carbon	%	12.0	12.0	3.2	3.1
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Barnes

Coal Analytical Laboratory Approved: F. F. Hughes

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Soyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation:		Hole #6 (119-121)		Hole #6 (121-123)	
Date Sample Taken:					
Laboratory Sample No.:		413-64		414-64	
		As Received	Dry	As Received	Dry
Moisture	%	1.2	-	.7	-
Ash	%	74.9	75.8	76.4	77.0
Volatile Matter	%	10.8	10.9	9.6	9.7
Fixed Carbon	%	13.1	13.3	13.3	13.3
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W. H. Trainor

Coal Analytical Laboratory Approved: J. F. Taylor

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyse, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue S.W.
Calgary, Alberta

Your Designation: Hole #6 (123-125)

Date Sample Taken:

Laboratory Sample No.: 415-64

		As Received	Dry	As Received	Dry
Moisture	%	.8	-		
Ash	%	82.9	83.6		
Volatile Matter	%	8.1	8.1		
Fixed Carbon	%	8.2	8.3		
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: January 30, 1964. Signed: W.H. Fraser

Coal Analytical Laboratory Approved: J.F. Taylor

RESEARCH COUNCIL OF ALBERTA
87th Avenue and 114th Street
Edmonton, Alberta

Report of Analyses

The following are the analyses of samples of coal submitted by

A.N. Boyce, Alberta Natural Gas Company
503 Natural Gas Building, 140 Sixth Avenue, S.W.
Calgary, Alberta

Your Designation: Hole #6 (293-298)

Date Sample Taken: Jan. 26, 1964
Laboratory Sample No.: 416-64

		As Received	Dry	As Received	Dry
Moisture	%	13.4	-		
Ash	%	25.7	29.7		
Volatile Matter	%	18.9	21.8		
Fixed Carbon	%	42.0	48.5		
Sulfur	%				
Calorific Value, B.t.u. per lb.					

Remarks:

Date: February 5, 1964. Signed: W. H. Frannin

Coal Analytical Laboratory Approved: J. F. Fraser

	(3) As Rec'd	(3) Air Dry	(4) As Rec'd	(4) Air Dry
Moisture -				
Surface	9.1		8.5	
Inherent		.4		.5
Total	9.5		9.0	
Ash	37.0	40.7	19.2	21.2
Volatile Matter	16.6	18.4	17.3	19.2
Fixed Carbon	36.9	40.5	54.5	59.1
Free Swelling Index		2		2.1/2

	(5) As Rec'd	(5) Air Dry	As Rec'd	Air Dry
Moisture -				
Surface	46.2			
Inherent		.3		
Total	46.5			
Ash	24.6	46.0		
Volatile Matter	9.3	16.8		
Fixed Carbon	19.6	36.9		
Free Swelling Index		1.1/2		

C O A S T E L D R I D G E

J. G. Smith
CHIEF CHEMIST

/ni

[illegible]
ENGINEERS & CHEMISTS LTD.

125 EAST 4TH AVE., VANCOUVER 10, B.C. TELEPHONE: TRINITY 6-4111

REPORT OF: Chemical Testing

AT: Vancouver Laboratory

PROJECT: Coal Analysis

REPORTED TO: Alberta Natural Gas Company,
503 Natural Gas Building,
140 Sixth Avenue S.W.,
Calgary, Alberta

FILE No. C.3-A.1-64 10394

DATE February 19, 1964

REPORT NO.

ORDER NO.

We have tested 5 samples of coal submitted by you on February 11, 1964 and we report as hereunder :

SAMPLE IDENTIFICATION D.H. #7

5 coal samples in bottles marked -

(1) 169' - 172'
(2) 176' - 179'10"
(3) 186'4" - 188'
(4) 188'8" - 190'9"
(5) 191'3" - 193'

RESULTS

	(1) As Rec'd	(1) Air Dry	(2) As Rec'd	(2) Air Dry
Moisture -				
Surface	1.1	-	1.2	-
Inherent	-	.4	-	.3
Total	1.5	-	1.5	-
Ash	54.5	55.1	26.0	26.3
Volatile Matter	15.1	15.3	28.1	28.4
Fixed Carbon	28.9	29.2	44.4	45.0
Free Swelling Index		1		2.1/2

../2

Chemical Testing — C.S-A.1-34 10472

Vancouver Laboratory — February 27, 1934

Coal Analysis

Reference to: Alberta Natural Gas Company,
303 Natural Gas Building,
140 Ninth Avenue S.W.,
Calgary, Alberta

We have tested 16 samples of coal submitted by you on February 18, 1934 and we report as hereunder :

SAMPLE IDENTIFICATION

Samples marked as follows :

(1)	Bulldose (Top)	(9)	344'0" - 345'	SHALE	
(2)	Bulldose (Middle)	(10)	345' - 374'0"	SHALE	
(3)	Bulldose (Bottom)	(11)	394'2" - 395'6"		
(4)	330'8" - 333'0" COAL	(12)	395'6" - 398'0"	SHALE	
(5)	333'6" - 337'0" SHALE	(13)*	398'9" - 400'0"		
(6)	337'0" - 339'0" COAL	(14)	400'0" - 400'6"	SHALE	
(7)	339'0" - 340'0" SHALE	(15)	401'6" - 406'0"		
(8)*	340'8" - 344'3" COAL	(16)*	406'7" - 408'0"		

* Coking possibilities

RESULTS

		Sample (1)		Sample (2)	
		As Rec'd	Air Dry	As Rec'd	Air Dry
Moisture :	Surface - Wt %	10.5	-	5.1	-
	Inherent - Wt %	3.5	3.9	2.9	3.1
	Total - Wt %	14.0	-	8.0	-
Ash	Wt %	17.1	19.1	13.7	14.4
Volatile Matter	Wt %	20.6	23.0	22.1	23.3
Fixed Carbon	Wt %	48.3	54.0	56.2	59.2
BTU's/lb		9,270	10,350	10,040	11,420
Sulphur	Wt %	0.42	0.47	0.41	0.43
F.S.I. (Coking Index)		-	0	-	1.1/2

.../2

Drawer (Continued)

			Sample (2) As Rec'd	Sample (2) Air Dry	Coal Sample (1) As Rec'd	Coal Sample (1) Air Dry
Moisture :	Surface	Wt %	10.3	-	0.6	-
	Inherent	Wt %	2.4	2.7	.4	0.4
	Total	Wt %	12.7	-	1.0	-
Ash		Wt %	17.4	19.4	22.2	22.3
Volatile Matter		Wt %	21.2	23.6	20.6	20.1
Fixed Carbon		Wt %	40.7	54.3	56.2	56.5
BTU's/lb			10,160	11,320	11,400	11,550
Sulphur		Wt %	0.46	0.51	0.35	0.39
F.S.I. (Coking Index)			-	2	-	1.1/2

			Shale Sample (3) As Rec'd	Shale Sample (3) Air Dry	Coal Sample (4) As Rec'd	Coal Sample (4) Air Dry
Moisture :	Surface	Wt %	7.5	-	0.4	-
	Inherent	Wt %	0.6	0.7	0.2	0.2
	Total	Wt %	8.1	-	0.6	-
Ash		Wt %	72.5	70.3	19.9	19.0
Volatile Matter		Wt %	9.5	10.3	20.5	20.6
Fixed Carbon		Wt %	9.9	10.7	60.0	60.3
BTU's/lb			1,680	1,815	11,715	11,780
Sulphur		Wt %	0.17	0.18	0.36	0.36
F.S.I. (Coking Index)			-	0	-	1.1/2

../3

Results (Continued)

			SHALE Sample (7)		COAL # (1)	
			As Rec'd	Air Dry	As Rec'd	Air Dry
Moisture :	Surface	Wt %	6.5	-	0.7	-
	Inherent	Wt %	0.7	0.7	0.2	0.2
	Total	Wt %	7.2	-	0.9	-
Ash		Wt %	49.0	50.3	15.0	15.1
Volatile Matter		Wt %	14.1	15.1	23.7	23.9
Fixed Carbon		Wt %	29.9	30.9	59.4	60.0
BTU's/lb			4,740	5,070	12,660	12,710
Sulphur		Wt %	0.17	0.18	0.43	0.43
F.S.I. (Coking Index)			-	1	-	5.1/2

			SHALE Sample (9)		SHALE Sample (10)	
			As Rec'd	Air Dry	As Rec'd	Air Dry
Moisture :	Surface	Wt %	5.0	-	5.6	-
	Inherent	Wt %	0.3	0.3	0.6	0.7
	Total	Wt %	5.3	-	6.2	-
Ash		Wt %	62.5	65.7	72.5	74.9
Volatile Matter		Wt %	10.1	12.7	10.2	10.8
Fixed Carbon		Wt %	20.1	21.3	11.1	11.6
BTU's/lb			4,020	4,230	1,930	2,100
Sulphur		Wt %	0.16	0.17	0.24	0.25
F.S.I. (Coking Index)			-	1	-	0

RESULTS (CONTINUED)

			Sample (11) As Rec'd	Sample (11) Air Dry	SHALE Sample (12) As Rec'd	SHALE Sample (12) Air Dry
Moisture :	Surface	Wt %	1.6	-	0.5	-
	Inherent	Wt %	0.2	0.2	0.7	0.7
	Total	Wt %	1.8	-	1.2	-
Ash		Wt %	33.8	34.4	74.9	75.1
Volatile Matter		Wt %	20.4	20.8	10.4	10.5
Fixed Carbon		Wt %	44.0	44.6	13.5	13.7
BTU's/lb			9,250	9,400	1,600	1,610
Sulphur		Wt %	0.41	0.42	0.12	0.12
F.S.I. (Coking Index)			-	1.1/2	-	0

			Sample (13) As Rec'd	Sample (13) Air Dry	SHALE Sample (14) As Rec'd	SHALE Sample (14) Air Dry
Moisture :	Surface	Wt %	0.9	-	17.2	-
	Inherent	Wt %	0.1	0.1	2.0	2.4
	Total	Wt %	1.0	-	19.2	-
Ash		Wt %	17.5	17.6	49.5	59.7
Volatile Matter		Wt %	26.3	26.5	11.9	14.4
Fixed Carbon		Wt %	55.2	55.8	19.4	23.5
BTU's/lb			11,780	11,880	3,727	4,507
Sulphur		Wt %	0.47	0.47	0.35	0.42
F.S.I. (Coking Index)			-	6	-	1

Analysis (Continued)

			Sample (15) As Rec'd	Sample (15) Air Dry	Sample (17) As Rec'd	Sample (17) Air Dry
Moisture	Surface	Wt %	9.0	-	6.2	-
	Inherent	Wt %	0.1	0.1	0.5	0.5
	Total	Wt %	9.1	-	3.7	-
Ash		Wt %	34.2	37.6	27.0	30.3
Volatile Matter		Wt %	18.6	21.5	21.8	23.2
Fixed Carbon		Wt %	37.1	40.8	44.5	47.5
BTU's/lb			7,940	8,725	9,770	10,420
Sulphur		Wt %	0.35	0.38	0.44	0.47
F.S.I. (Coking Index)		Wt %	-	2.1/2	-	5.1/2

C O A S T E L D R I D G E

J. C. Smith
CHIEF CHEMIST

/cl