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NOVEMBER 14, 1975.

# PRELIMINARY GEOLOGICAL INTERPRETATION

# OF THE HAT CREEK COAL BASIN

## INTRODUCTION

This report is intended as a brief informal outline of the Hat Creek coal basin preliminary to a more detailed report to be published in G.E.M. 1975. The descriptions and interpretations offered are based on direct field observations by the writer during the period June 17th to July 20th, 1975, and information supplied in older reports by the Geological Survey of Canada, and B.C. Hydro.

## PHYSIOGRAPHY AND ENVIRONS

The valley formed by the upper reaches of Hat Creek, site of the coal deposits, is a northerly-trending topographic and structural depression 14 miles long and 2 to 3 miles wide. This is an open basin bounded by the rugged Clear Range on the west and Cornwall Hills on the east. Relative relief is marked with slopes rising from Hat Creek, near Marble Canyon at the north end of the valley, elevation approximately 2,700 feet, to the encircling ridges and peaks with elevations in excess of 6,500 feet.

The area forms part of the Interior Dry Belt with annual precipitation usually less than 13 inches, combined rain and snow. Temperatures have been recorded in excess of 100 degrees Fahrenheit for brief periods during mid-summer.

Low areas on the valley floor and south-facing slopes at higher elevations are extensive grass covered forming ideal cattle country. Summit areas and north-facing slopes have forests of pine

and fir of sufficient quality and density to support logging operations.

The numerous small lakes and ponds in the area, while picturesque, are usually stagnant and not considered drinkable. Tourists enroute to the nearby Pavilion Lake - Marble Canyon recreation area are not advised to drink from Hat Creek because of a high coliform count in this water (no doubt owing to the large resident cattle population).

Wildlife is abundant. Grouse, deer, and yellow bears are commonly seen, although hunters and sportsmen are not generally welcomed by local ranchers.

## GLACIAL HISTORY

It is evident that the valley was overridden by at least two and possibly several Pleistocene ice sheets. The most recent advance originated in the Coast Mountains and moved easterly at 117 degrees, according to striae measurements, depositing much gravel and clay. Except for the coal beds now exposed at the north end of the valley, bedrock is rarely seen on the valley floor. Reconnaissance drilling shows that the average till cover is 170 feet thick.

The soils of Hat Creek valley are characteristically clay-rich. In many areas these clays have unusual swelling properties when water saturated suggesting the presence of bentonite - a type of clay formed by the decomposition of volcanic ash. Indeed in several places bands of volcanic ash are clearly visible intercalated in the glacial deposits.

The consequence of this clay-rich mantle is evident in the area immediately north of the proposed No. 1 pit, where two large active landslides have been identified. A second active landslide area is located farther south in the vicinity of White Rock Creek.

The bright yellow and reddish soils, conspicuous at several points in the valley, are residual and not glacial in origin. These are often found near coal seams and appear to be the cindery residue of burnt coal. There is evidence that much, if not all, of the exposed coal in the Hat Creek valley has been superficially burnt in prehistorical times.

GENERAL GEOLOGY

The general geology of the Hat Creek area is shown on the accompanying map.

Cover rocks of Tertiary and Cretaceous age, consisting of coal, and sedimentary and volcanic formations, rest with marked unconformity on a Paleozoic basement of metamorphosed carbonate and greenstone beds.

The soft, easily eroded coal and shaly formations are mostly on the floor of the valley whereas the resistant volcanic rocks and basement formations are found on the valley slopes and ridge crests.

Although extensive glacial deposits have hampered geological investigation to date, much stratigraphic information has been provided from drilling the "cover rocks". The most important relations revealed by this work shows that the coal is almost everywhere overlain

by a thick claystone sequence which in turn is overlain unconformably by a variety of volcanic rocks including lahars, and dacite, basalt, rhyolite, and trachyte lavas.

Owing to the great thickness of the claystone and coal, often in excess of 2,500' feet, few drill holes have penetrated below the main coal horizon. A thick succession of intermixed sandstones, conglomerates, and shales, found lateral to the coal formation, are thought to underlie the coal. In any case, andesitic volcanic rocks of the Kamloops Group (Eocene) and Spences Bridge Group (Cretaceous), exposed peripherally in the valley, most certainly form the base of the "cover rock" succession.

## STRUCTURE

The general structure of the Hat Creek basin is simple. The central zone of the valley, underlain mainly by coal and sedimentary formations, has been down dropped forming a graben. Apparently this has been achieved principally by downward movement on a series of north-south tension faults trending subparallel to the direction of regional maximum stress. Locally the walls of the graben have been off-set somewhat by a series of northwest and northeast-striking conjugate shear faults. An important system of easterly-trending gravity faults cutting across the basin is evidently of recent origin being superimposed on the main graben structures.

## COAL RESERVES

### No. 1 Pit

The proposed No. 1 open pit is adjacent to the original dsicovery on Hat Creek near the north end of the valley. Here the main near-surface coal reserve covers approximately 290 acres. The area has been thoroughly drilled yielding intersections of coal formation ranging from several hundred to over one thousand feet. The geological insitu measured reserves of 500 million tons (to 2,000 feet above sea level) of coal are not expected to change by more than 20 per cent with further drilling. Indicated reserves of additional 130 million tons are calculated and these or a part thereof should move into the measured category with the drilling currently taking place.

Determining the actual economically recoverable reserves requires considerably more drilling than has been done to date. Designing a mining plan calls for detailed knowledge of the geometry of the deposit, location and planar orientation of all major faults, competency of the rocks in the pit walls, and variations in coal quality. Thus it is still not possible to calculate economically recoverable reserves of coal from the deposit. If the deposit can only be mined to 2,500 feet above sea level, calculations based on data from 21 holes gives reserves of only 200 million tons. Drilling for coal deeper than the 2,000-foot level is not likely as further pursuit of the coal formation in this area is made difficult by the displacement of beds by major faults and the down dip burial of coal under the claystone formations.

### No. 2 and No. 3 Pits

A second major near-surface coal occurrence was recently discovered to the south near the mid point in the valley. This is a sinuous 12,000-foot long band of coal paralleling the axis of a large negative gravity anomaly. Initial drilling has indicated a thickness of about 1,700 feet of coal, the beds dipping 20 to 30 degrees passing

westerly under the claystone formation. The band has been cut and displaced near the centre point by a fault.

This deposit is now being divided into north and south areas as the proximity of a large ridge on the east side would likely necessitate the development of two separate pits. These areas are shown on the accompanying map. The drilling to date has been chiefly exploratory and hence only indicated and inferred resources of 500 million tons each have been assigned to the deposit. At least another 50 to 75 holes will be necessary to delimit the reserves to a measured status. Potential within the bounds of presently known geology exists for development of reserves beyond that already in the indicated and inferred categories.

Other Areas

The major economic deposits of coal within the Hat Creek basin appear to have been discovered. The ultimate coal potential of the basin is well delineated by the negative gravity contours. However, coal outside the above noted pit areas appears to be deeply buried. The testing of these areas may not be of great importance at the present time.

The accompanying map shows the position of diamond-drill holes to July 20 - Nos. 75 - 77. The positions of recently completed holes, Nos. 75 - 78 to 75 - 106 have not been recorded and the core not yet examined. Much of this new drilling has been in the vicinity of No. 2 deposit.

Footnote

The number of drill holes required to prove specific deposits can be determined using Stein's equation (see attached reprint). For example, 21 holes assigned to the No. 1 deposit proved more than adequate at the 95-per-cent confidence level in establishing an average thickness of 338 feet of coal to the 2,500-foot elevation level. The calculations suggest that one hole to every 15 or 20 acres is sufficient.

November 14, 1975

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# ESTIMATED RESERVES OF No. 1 PIT AREA
## (ABOVE THE 2,500 FT. ELEVATION)

| Hole No. | Cover Thickness (ft.) | Coal Formation Thickness (ft.) |
|---|---|---|
| 25 - 2 | 0 | 350 |
| 25 - 4 | 25 | 330 |
| 25 - 5 | 10 | 300 |
| 57 - 8 | 60 | 450 |
| 57 - 9 | 130 | 450 |
| 57 - 10 | 175 | 350 |
| 57 - 11 | 150 | 250 |
| 57 - 12 | 100 | 450 |
| 57 - 13 | 110 | 500 |
| 57 - 14 | 100 | 490 |
| 57 - 15 | 380 | 175 |
| 59 - 16 | 20 | 350 |
| 59 - 18 | 50 | 425 |
| 59 - 20 | 50 | 300 |
| 74 - 26 | 50 | 310 |
| 74 - 39 | 50 | 300 |
| 74 - 43 | 200 | 280 |
| 74 - 46 | 400 | 310 |
| 74 - 48 | 480 | 200 |
| 74 - 50 | 76 | 325 |
| 74 - 53 | 400 | 200 |
| | 3,196 | 7,095 |
| Averages | 152 | 338 |

Reserve Area..... 12,500,000 ft.$^2$ (287 acres)

Volume of Coal Formation ..... 4,225,000,000 ft.$^3$

Reserve in tons of coal formation ..... 205, 546,000 tons

(Assumed specific gravity of coal - 1.56)

# GEOLOGY
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# OF THE HAT CREEK AREA


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