

1980 REPORT OF EXPLORATION ACTIVITIES

on the

WEST CARBON CREEK PROPERTY

Coal Licences Numbered 4104 to 4123 inclusive and 5171 to 5173
in the Liard Mining Division approximately
36km west from W.A.C. Bennett Dam
centered on
55°57'N, 122°50'W

Owned By: Utah Mines Ltd.

by:

J. C. Ridley and

P. S. Cowley

of

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Work performed between June 19 and August 18, 1980

CONFIDENTIAL
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PR - Carbon Creek - West 80(4) A

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ABSTRACT

Twenty-three continuous coal licences, numbered 4104 to 4123 inclusive and 5171 to 5173 were issued to Utah Mines Ltd. on August 15, 1978 and **May 4**, 1979. These licences comprise the West Carbon Creek Property located in the Peace River area of the Liard Mining Division. An exploration program was formulated for the 1980 field season to provide further data on the extent, metallurgical quality and coal seam continuity on the property, pursuant to the 1978 program. Geological mapping and the drilling of three diamond drill holes were planned to accomplish these objectives.

Extensive geological mapping by the Mines Ltd. personnel on and adjacent to the property greatly improved the understanding of the stratigraphy and structural complexity on the West Carbon Creek Property. Coal measures previously assumed to be Gething Formation were identified to be **Bickford** Formation of the Minnes Group. A total of 617.92 metres of diamond drilling was completed in three holes. Correlation of coal seams between the 1978 and 1980 holes are tentative due to the wide spacing of holes and lenticular nature of the coal measures. The 1980 exploration program provides a base for further exploration of the West Carbon Creek Property.

PROPERTY AND TITLE

The West Carbon Creek Property comprises twenty-three **contiguous** coal licences numbered 4104 to 4123 **includiye** and 5171, 5172 and 5173. Licences 4104 to 4123 were issued on August 15, 1978. Licences 5171 to 5173 were issued on May 8, 1979. These licences encompass an area of 6678 hectares (rounded upward from 6666.58 hectares). (See Figure 1, page 3). The West Carbon Creek Property forms the western extension of the Carbon Creek Property. North, south and west of the West Carbon Creek Property are presently unoccupied.

LOCATION AND ACCESS

The West Carbon Creek Property is located within the area commonly referred to as the Northeast Coal Block in the Liard Mining Division. This area is covered by the National Topographic System designation 93-0-15. The twenty-three coal licences comprising the property are arranged in an irregular "horseshoe" configuration **centred** on Mount Rochfort at approximately **55°57'N; 122°50'W**. The northeast corner of the property lies approximately 36 kilometres west of the W.A.C. Bennett Dam. Vancouver is approximately 770 kilometres south from the property (see Figure 2, page 4).

Road **access** is available only to the eastern boundary of the property. Highway 29, **joining Chetwynd, Hudson's Hope and Fort St. John, passes approximately 53 kilometres** to the east of the property. Johnston Creek Road, built by **Canfor Ltd.** (a major forest products company), leaves Highway 29, 19 **kilometres** south of Hudson's Hope and heads west to the Carbon Creek Property. A gravel road, built by Utah Mines Ltd. in 1976, extends to the eastern boundary of the West Carbon Creek Property directly east of Mt. Rochfort. Alternate access to the Johnston Creek Road is possible by travelling over 13.7 kilometres of

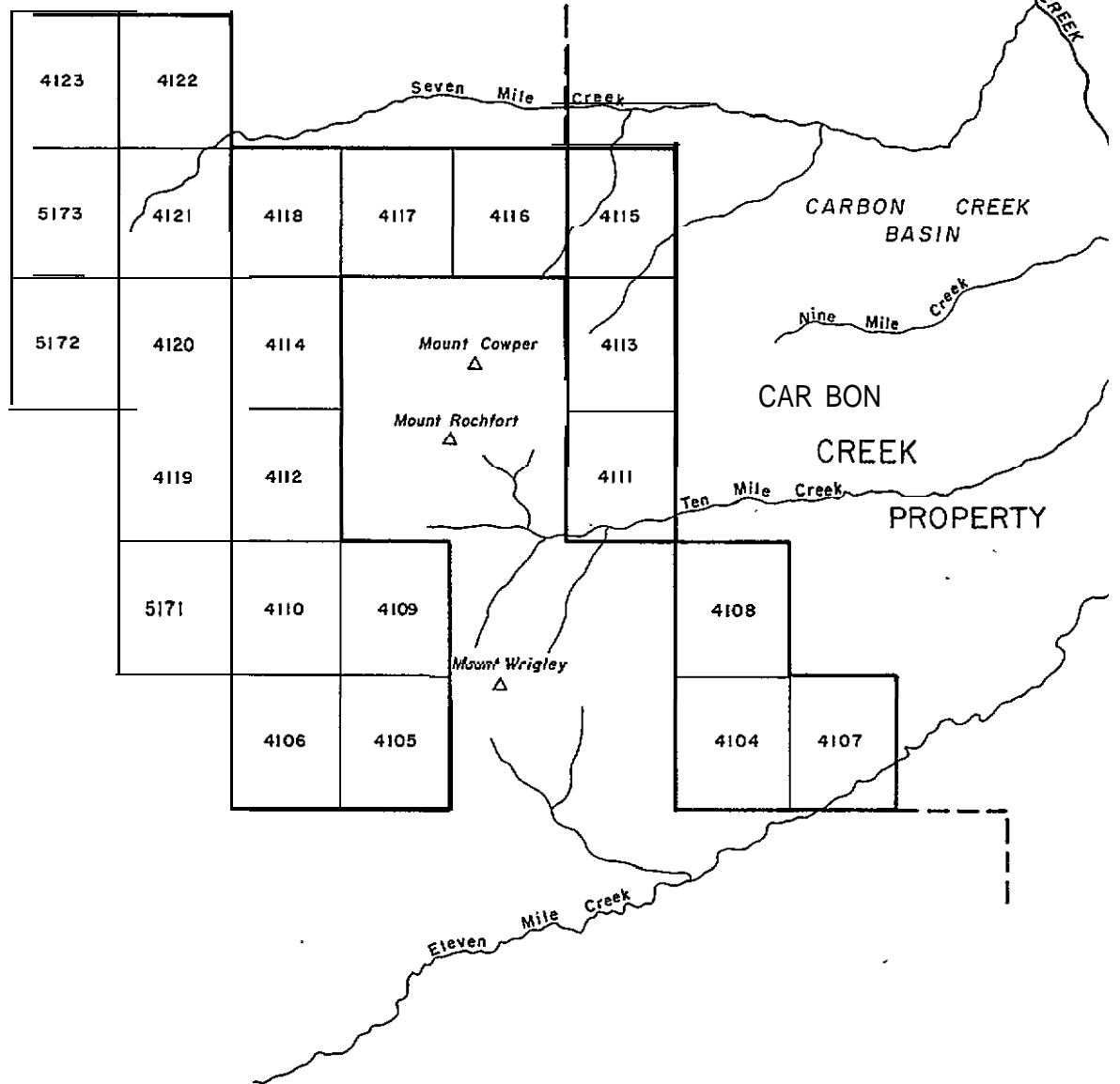
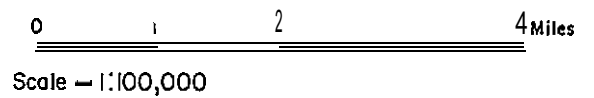
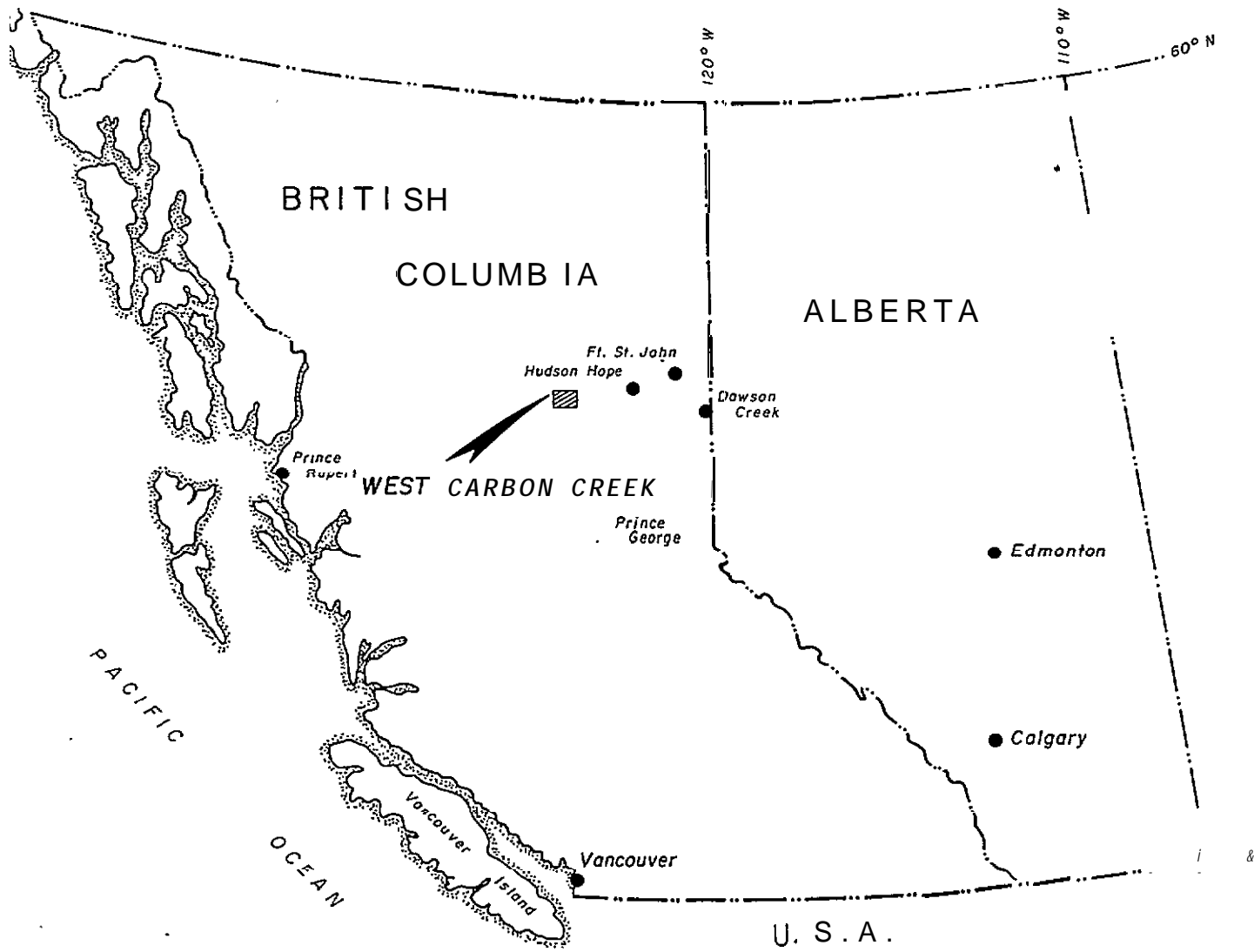


FIGURE - 1
WEST CARBON CREEK





UTAH MINES LTD.
WEST CARBON CREEK
LOCATION MAP

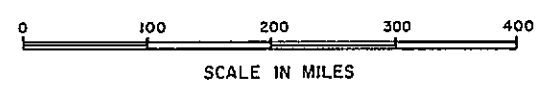


FIGURE - 2

Utah **Mines** Ltd. road from the West end **of** the W.A.C. Bennett Dam (see Figure 3, page 6).

Access on the property is by helicopter only. Much of the property is above **treeline** (approximately 1500 metres) making access by helicopter convenient. Heavy **tree cover** below **treeline** restricts helicopter landing pads to drill sites and wide creek beds.






PHYSIOGRAPHY

The West Carbon Creek Property is situated in a mountainous region toward the western margin of the Rocky Mountain Foothills. The Foothills belt trends north-northwest and, in the area of Peace River, is approximately 72 kilometres wide. To the west, the margin **of** the belt is considered to be the easternmost major fault which thrusts Paleozoic strata over Mesozoic strata (Holland, 1976). The eastern margin is less precisely defined but occurs where the deformed strata of the Foothills meets the flat lying to gently dipping strata of the Alberta Plateau (see Figure 4, page 7). Folding and thrust faulting within the Foothills belt trend north-northwesterly, closely paralleling the belt. The thrust faults dip to the southwest. Bedrock structure and lithology are commonly reflected by the topography.

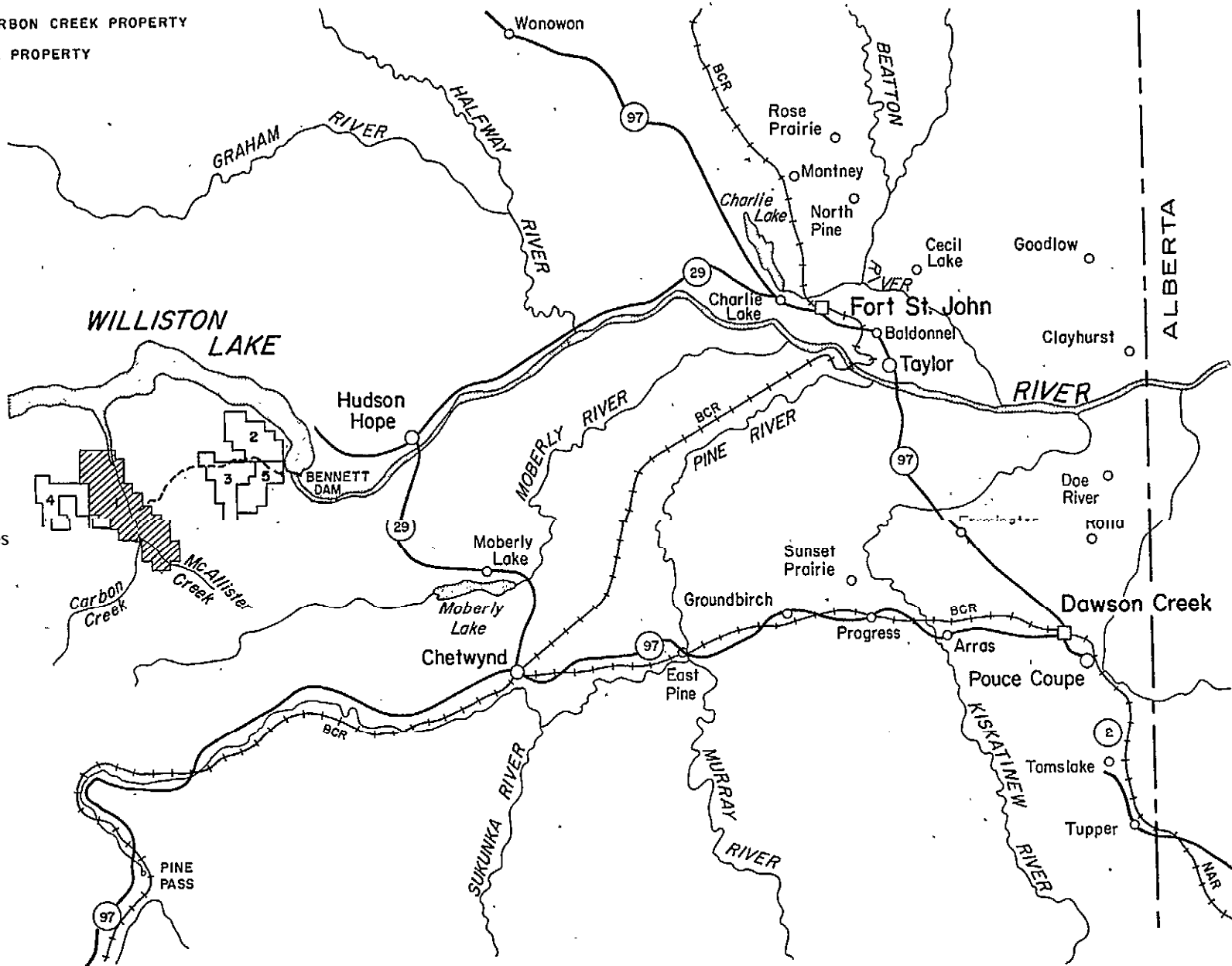
Within the boundaries **of** the property, maximum relief is in the order of 850 metres. The lowest elevation of 1015 metres above sea level, occurs in a **north-flowing** tributary of Seven Mile -Creek. Elevations of peaks and ridge **crests within the** property boundaries rarely exceed 1850 metres above sea level. Mount Rochfort, which is surrounded by the property, reaches an elevation of 1989.1 metres above sea level.

FIGURE-3

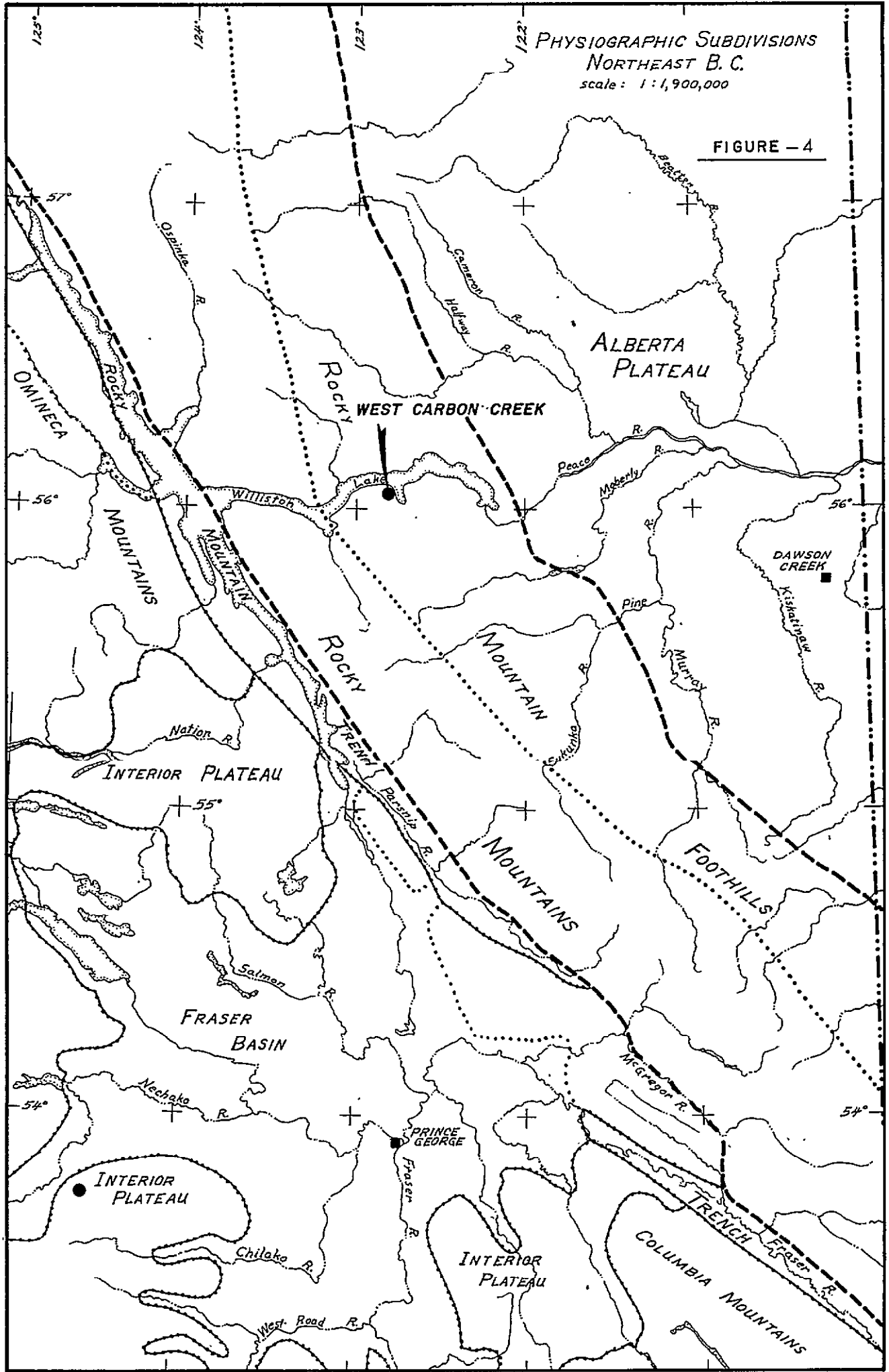
PROPERTY LOCATION MAP

-  CARBON CREEK PROPERTY
-  EAST MT. GETHING PROPERTY
-  SOUTH MT. GETHING PROPERTY
-  WEST CARBON CREEK PROPERTY
-  BRI COAL PROPERTY

SCALE: 1 inch = 16 miles



0



Peaks and ridges **range** in form from flat or rounded to acute and rugged. Slopes range from gentle to very steep. Dip slope surfaces and vertical cliffs are common. Eleven Mile Creek valley is generally broad with a flat gravel floor but most valleys are V-shaped in form with minor gravel deposits in their bottoms. Many streams have cut deep, steep to vertical walled canyons over a part of their length. Great variability in all of the components of the topography imparts a very irregular character to the area.

HISTORY OF EXPLORATION

Coal occurrences in the Carbon Creek area were first documented in the early 1900's by prospectors such as Rochfort, Barr and McAllister. Claims were staked on August **18th**, 1917 by McAllister for D. Barr. The Burns Foundation of Calgary acquired the ten Crown granted claims' in 1943. The British Columbia Department of Mines then sent W.H. Mathews into the area to investigate the coal resources. Most of his work involved the structure and distribution of coal-bearing rocks and exposures of coal of possible commercial interest (Mathews, 1947). Since that time, several other geologists have mapped the area at regional scales. The most noteworthy contributions have been made by Muller, 1961, Hughes, 1964, and St&t, 1973 (see Figure 5, page 9). In 1970 Utah Mines Limited acquired 'the Burns Foundation Crown grants and 66 coal **licences** forming the Carbon Creek Property.

• In August ~~of~~ 1975, **G.H. Raymer** made a reconnaissance **evaluation** in the area of the present West Carbon Creek Property on behalf of Utah Mines Ltd. His work outlined shallow dipping coal measures, considered to be the Gething Formation, along and adjacent to the synclinal axis on the western part of the property. The coal

FIGURE - 5

		Mathews (1946)	Muller (1961)	Hughes (1964)	Stott (1973)						
BULLHEAD GROUP	NON - MARINE	<p>Sandstone, Shale And Coal</p>	<p>BEATTIE PEAKS FORMATION</p> <p>Sandstone, Conglomerate, Shale, Coaly Shale And Coal.</p>	CRASSIER GROUP	<p>BEATTIE PEAKS FORMATION</p> <p>Sandstones, Siltstones, Shales, Coal And Mudstone.</p>	BULLHEAD GROUP	<p>BEATTIE PEAKS FORMATION</p> <p>Fine Grained Sandstone Minor Shale, Coal And Conglomerate. (Marine And Non-Marine)</p>				
								<p>MONACH FORMATION</p> <p>Sandstone</p>	<p>MONACH FORMATION</p> <p>Marine Sandstone</p>	<p>MONACH FORMATION</p> <p>Sandstones And Grits Con- glomeritic Layers, Shales Carbonaceous Shales, Silty Shales, Coal, Siltstones, Minor Quartzites.</p>	<p>CADOMIN FORMATION</p> <p>Massive Conglomerate And Conglomeritic Sandstone.</p>
								<p>MONTEITH FORMATION</p> <p>Sandstone, Quartzite 1" Upper Part.</p>	<p>MONTEITH FORMATION</p> <p>Crossbedded Sandstone, Quartzite, Minor Conglo- merate, Siltstone And Shale.</p>	<p>MONTEITH FORMATION</p> <p>Quartzites And Quartzitic Sandstones, Medium To Very Coarse Grained. Lesser Sandstones, Few Shales And Siltstones</p>	<p>MONTEITH FORMATION</p> <p>Massive Quartzitic Sandstones.</p>
		<p>NIKANASSIN FORMATION</p>									
	MARINE	BULLHEAD GROUP			disconformity	unconformity					

measures were estimated to be approximately 1040 metres thick, containing several coal seams, one measuring 2.23 metres thick.

In August of 1978, 20 coal **licences** were acquired, making up the West Carbon Creek Property. An exploration program was designed to test the economically recoverable coal potential. Between May and September of 1978, geological mapping and diamond drilling was undertaken by R.B. Anderson and A.T. Armstrong of Utah Mines **Ltd.** In total, 371.55 metres of diamond drilling were completed in two holes. Twenty-one samples were taken from the core and analysed in the Utah International Inc. Minerals Laboratory in Sunnyvale, California. (Results can be found in the 1978 Property Report).

1980 EXPLORATION PROGRAM

The 1980 Exploration program was designed to test the economically recoverable coal potential of the property, and to get a better understanding of the stratigraphy and structural complexity on the property.

Geological mapping was undertaken from June 19 to August 18, by J. Ridley, assisted by K. Yip, K. Hartmann, R. Olauson, C. Corney, E. Anderson and J. **Balfour**. The coal measures previously considered to be the **Gething** Formation were identified as the **Bickford** Formation of the Minnes Group (see Figure 5, page 9 and Geology section). The geological map sheets 1 and-2 (scale 1:10,000) are included in the **map** folder.

A fly camp located at the drillsite of W.C.C.-78-1 was used for accommodation of geological staff before drilling started. After June 27, all personnel stayed in the Utah Mines trailer camp

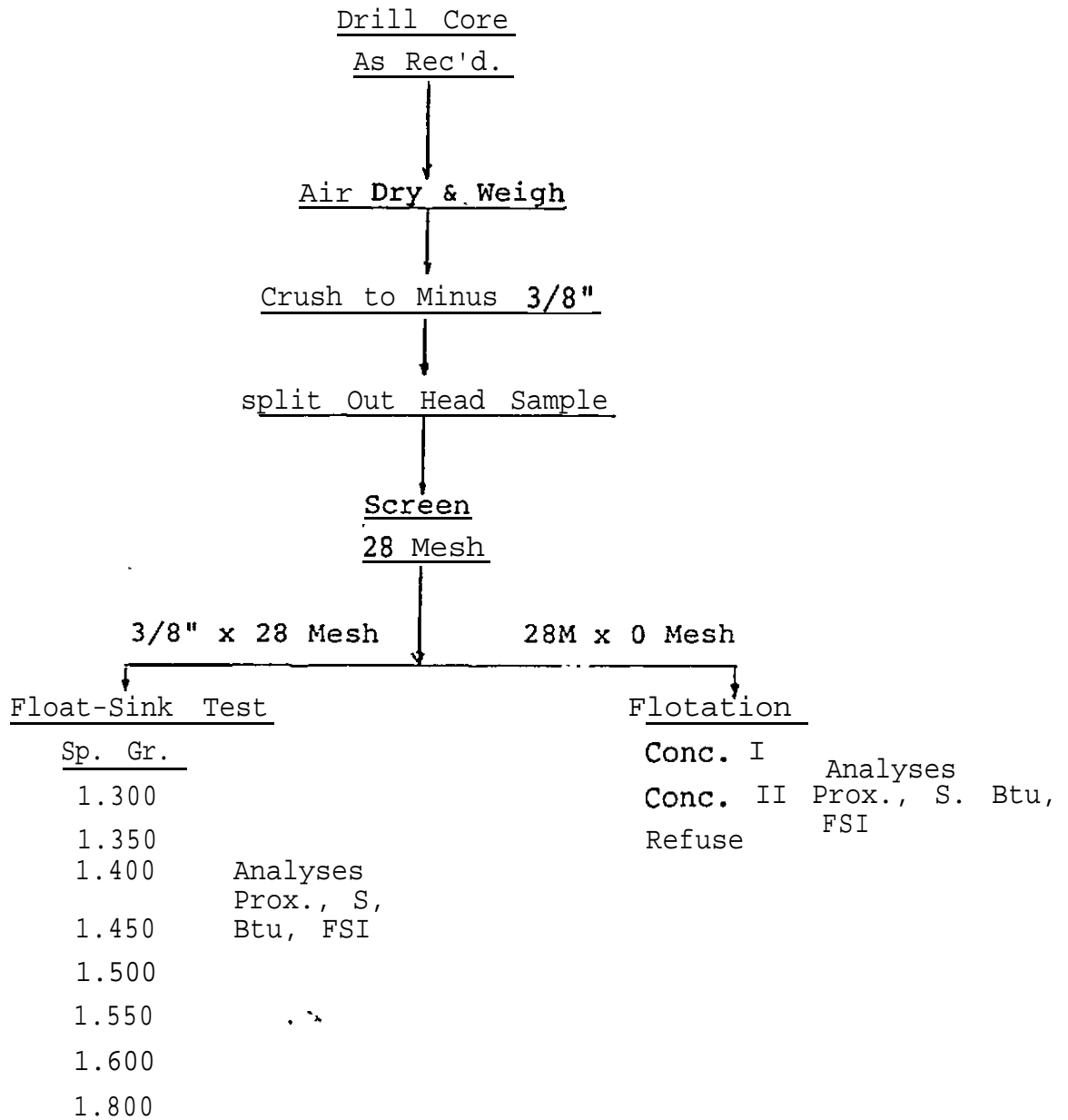
located at the intersection of Dowling and Gething Creeks on the Bri-Dowling Creek Property.

The exploration program included three diamond drill holes. Diamond drilling was performed by a **Longyear** '38' diamond drilling **rig**, which was moved from the Bri-Dowling Creek Property on June 27, 1980. Drillers were W. **Castle** and A. Hayes; driller's helpers were L. Martin and C. Hayes. Drilling ceased between July 14th and July 22nd for drillers' time off. Drilling was completed on July 26, 1980. The rig was moved to the South Mount Gething Property on July 28, 1980. In total, 617.92 metres were drilled in the three holes. Logging of the core was by J. Ridley, assisted by K. Yip, K. **Hartmann** and R. Olauson, (descriptive lithologic logs are attached in Appendix I, graphic lithologic logs are included in the map folder). Mechanical logs consisting of combined gamma-ray with density and resistivity with density logs were run in all holes. Mechanical logging of drill hole W.C.C.-80-3 was performed by R. Anderson and N. Duncan. Mechanical logging of drill holes **W.C.C.-80-4** and W.C.C.-80-5 were performed by J. Ridley, assisted by R. Olauson and K. Hartmann. All mechanical logging was performed using a portable **Gearhart-Owen**, Model 06-3200 Widco Logger employing electric hoisting and a combination down hole tool owned by Utah Mines Ltd. (Mechanical logs are included in the map pocket).

Twenty-one coal samples were shipped to Utah International Inc. Minerals Laboratory at 1190 Bordeaux Drive, Sunnyvale, California, 94086. Analyses followed the procedures outlined on the laboratory flow chart on the following page (Table I). Analytical results are included in this report (Appendix II). Twenty-four coal samples were also shipped to Utah International Inc. Minerals Laboratory (same address as above) for determination vitrinite reflective indices. Results can be found in Appendix IV.

TABLE- I

CANADIAN COAL - FLOW SHEET



Analyses on the Head Sample (3/8" x 0)

- 1) HGI
- 2) Proximate, S, Btu, and FSI
- 3) Ultimate Analysis
- 4) Mineral Analysis of Ash
- 5) Fusion Temperature of Ash
- 6) Water Soluble Alkalies
- 7) Sulfur Forms
- 8) Equilibrium Moisture

0

All drill holes were sealed with cement, following the completion of mechanical logging, in accordance with the instructions of the Chief Inspector of Mines.

All drill core was shipped to the Charlie Lake core storage facility of the British Columbia Ministry of Energy, Mines and Petroleum Resources.

Helicopter support for mapping and daily drill crews was provided by Maple Leaf Helicopters and Okanagan Helicopters of Chetwynd, B.C., using Bell 206 Jet Rangers and an A-star. All drill moves required a Bell 205 supplied by Northern Mountain Helicopters out of Prince George, B.C.

GEOLOGY - GENERAL AND LOCAL

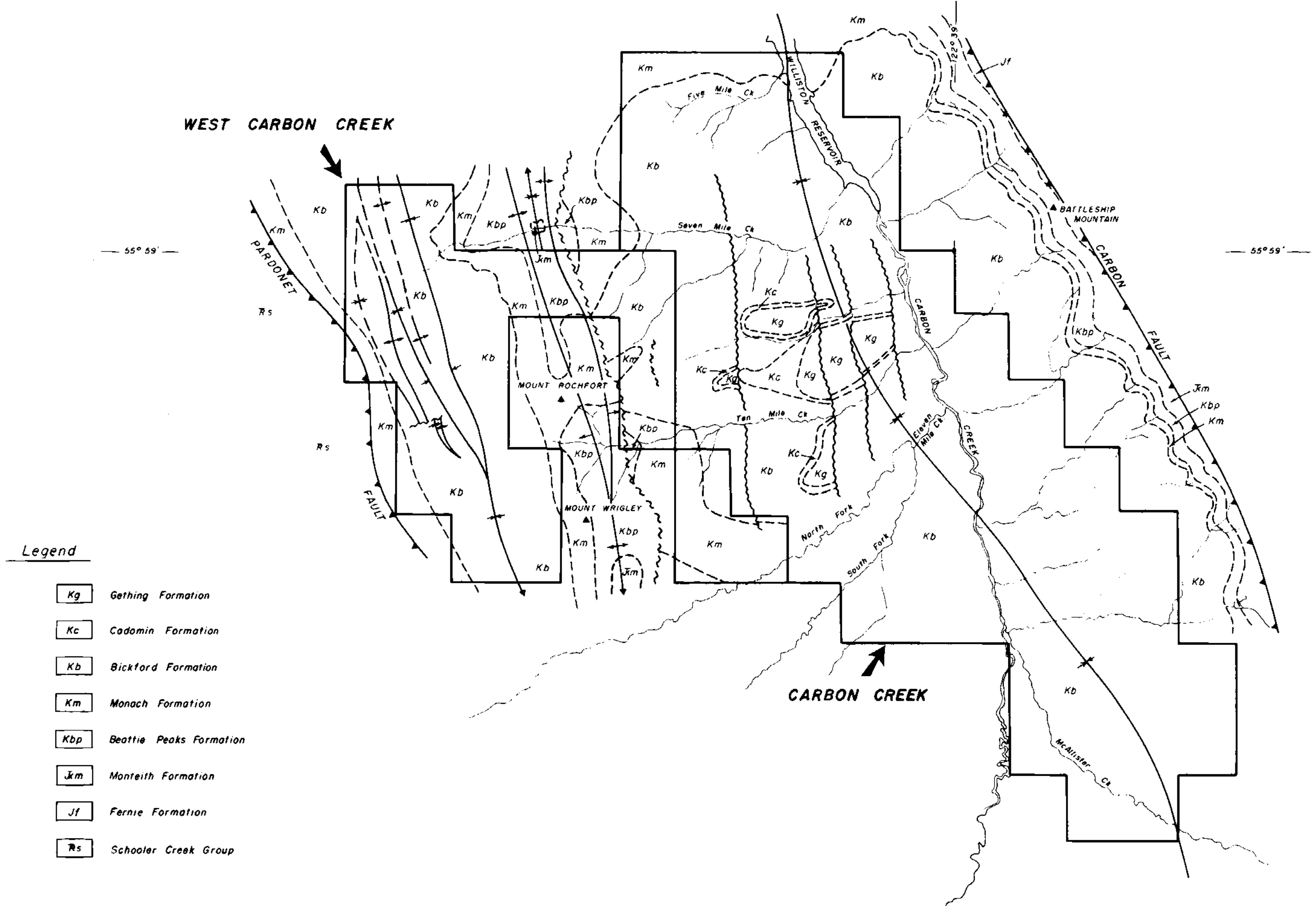
STRATIGRAPHY:

The West Carbon Creek Property is underlain by folded and faulted Minnes Group sediments of Upper Jurassic to Lower **Cretaceous** age (see Map 1 and 2, Map Folder). The Minnes Group consists of, in ascending order, Monteith, **Beattie Peaks**, **Monach**, and **Bickford** Formations (see Figure 6 and 7, page 14 and 15). Formations within the Minnes Group find their type section in the Carbon Creek basin. Each **formation varies** in thickness away from this location as a result of **facies** change or erosion.

The nearshore marine **sediments** of the Monteith Formation may be divided into two **lithofacies**; an upper unit of clean **quartzitic** sandstones and conglomerates, dirty sandstones and minor siltstone; and a lower unit of dirty sandstones. The upper Monteith unit contains approximately 300m of an almost continuous sequence of fine-grained orthoquartzites to quartzite granular conglomerate

TABLE OF FORMATIONS CARBON CREEK COAL BASIN

SERIES	GROUP	FORMATION	THICKNESS	LITHOLOGY
<u>Holocene</u>				<u>Alluvium</u>
Pleistocene	erosion0 I	surface	0 - 411 m.	Terraced drift Glacial till
Albion	Bull head Group	Gething	500 - 600 m.	Fine to coarse grained sandstones siltstone, coal carbonaceous shale and conglomerate.
Lower cretaceous		Codomin unconformity	45 - 60 m.	Sandstone, coarse grained to massive conglomerate with quartz and chert pebbles.
Barremian	erosion01			
Hauterivian	Minnes Group	Bickford	650 - 750 m.	Quartzite, sandstone, conglomerate, siltstone, coal, minor shale.
Valanginian		Monach	400 - 450 m.	Quartzite, sandstone, conglomerate, minor shale and coal.
		Beattie Peaks	450 - 500 m.	Shale, floggy sandstone.
		Monteith	300 - 350 m.	Sandstone, fine to coarse grained, quartzite.
Tithonian				
Triassic		Fernie'	150 - 250 m.	Chiefly shale, sandy near the top.



Legend

- Kg Gething Formation
- Kc Cadomin Formation
- Kb Bickford Formation
- Km Monach Formation
- Kbp Beattie Peaks Formation
- Jm Monteith Formation
- Jf Fernie Formation
- Rs Schooler Creek Group

FIGURE - 7
**CARBON CREEK BASIN -
 GEOLOGY**

0 1 2
 SCALE IN MILES

0

with minor interbeds of fine-grained dirty sandstones and **silt-**stones. The orthoquartzites may be white to light grey on a fresh surface and weather light grey, The clean **quartzitic** sandstones are massive with occasional cross-bedding but rarely may be thick to thin bedded. Beds range from **0.01m** to 20m thick. Interbedded with the orthoquartzites are fine-grained, medium brown, thin to thick bedded sandstones and medium brown **siltstones**. The upper lithofacies of the Monteith Fm. is easily recognized on the land--**scape** by the light grey prominent orthoquartzites. The formation is exposed at one locality on the property.

The Monteith Fm. conformably overlies the Jurassic Fernie shales and is overlain conformably by the Lower Cretaceous **Beattie** Peaks Fm. The Monteith-Beattie Peaks contact is assumed to be the contact between **massive** quartzose sandstones and the recessive **Beattie** Peaks Fm.

The marine **Beattie** Peaks Fm. is conformably overlain by the Lower Cretaceous Monach Fm. It is distinguished from overlying and underlying strata by its recessive, thinly interbedded siltstone, fine-grained sandstone, **mudstone** and rare coals. Casts and worm tracks **and** burrows are common. The sandstone may contain abundant pelecypods in medium beds, making good marker beds in the formation.

The Monach Formation consists mostly of massive quartz arenites and orthoquartzites interbedded with some siltstones, mudstones and thin coal seams. The sediments were deposited in a nearshore-marine environment. The stratigraphic similarity **between** the Monach Formation and the Monteith Formation makes identification difficult without a complete Minnes Group section.

The Bickford Formation conformably overlies the **Monach** Formation. The Bickford Formation contains interbedded sandstones, siltstones, **silty** mudstones, mudstones, coal and some conglomerates typical of a nearshore deltaic environment. This formation contains the metallurgical grade coals on the West Carbon Creek Property. Sandstones of the Bickford Formation frequently truncate the top of the coal seams. The sandstones range from fine to medium to coarse **grained** to granular conglomerate. The finer **grained** sandstones are moderate to high in quartz content. The coarser sandstones are quartz arenites and orthoquartzites deposited in medium to thick beds in a sequence up to 18 metres thick. Many sandstones have a secondary calcite cement. A sandy talc-arenite which contains recrystallized shell fragments occurs in at least two beds approximately **.5 metres** thick in the middle of the formation (see Appendix III). The conglomerates are lenticular in distribution, ranging from 0.5 metres to 10 metres thick, moderate to poorly sorted and **consists** of **chert** and quartzite pebbles. The formation contains a **higher** percentage of siltstones and muddy siltstones than true mudstones. Sedimentary features found in the Bickford Formation are: pyritised pelecypods, pyritized siltstone laminae, bands and nodules, secondary calcite cement and recrystallized calcareous shell fragments, **extreme** bioturbation and burrowing, convoluted bedding, roll structure, and rip up **clasts**.

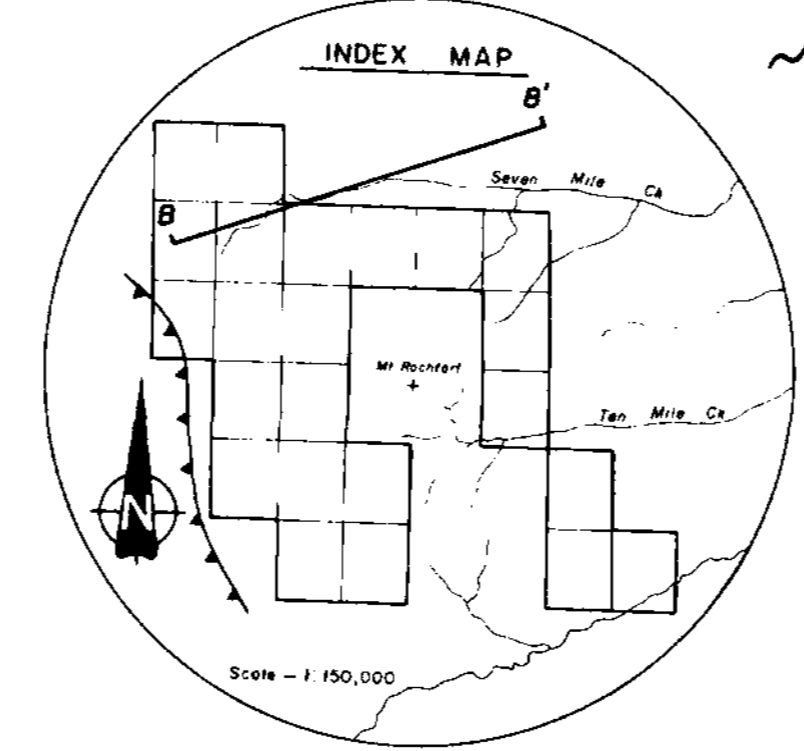
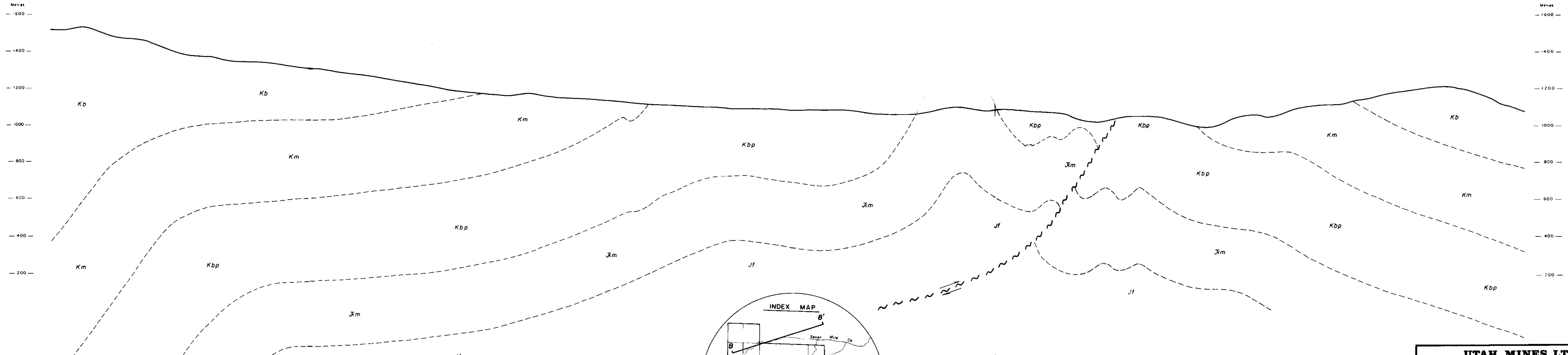
A regional erosional unconformity exists between the Bickford Formation and the overlying Cadomin Formation. The Cadomin Formation is not exposed on the West Carbon Creek Property, **but** found on the Carbon-Creek Property. **The formation consists** of approximately 60 metres of coarse **grained** sandstone with

lenticular beds of **chert** and quartz pebble conglomerate and rare thin mudstones and coal seams (see Figure 9, page 20). The stratigraphic similarity between the Bickford Formation and the Gething Formation makes identification difficult without exposure of the intervening Cadomin Formation.

STRUCTURE

At the western edge of the West Carbon Creek property is the Pardonet Thrust which thrusts the Triassic Pardonet Formation onto the Lower **Cretaceous** Monach Formation. The West Carbon Creek property exposes a major **syncline** and anticline with a series of en echelon folds trending north-northwest, paralleling the foothills trend. The smaller folds appear to pinch out into the limbs of surrounding folds (see Photo 1, page 21). The major **syncline** lies in the western half of the property. The **syncline** is broad in the southern half of the property but tightens northward with the development of en echelon folds. The Bickford Formation is exposed in the core (see Photo 2, page 21). The major anticline, lying on the eastern half of the property, has a flat axial core and spreads into a box anticline towards the north (see Photo 3, page 22). The **Beattie** Peaks Formation is exposed in the core of the anticline except on Mount Rochfort, where the Monach Formation is exposed.

A reverse fault, dipping steeply to the west-southwest, extends along the eastern edge of the major anticlinal axis. Movement along the reverse fault is approximately 150 metres in the southern end on the property. There is at least one other **fault** in the West Carbon Creek area. This is a reverse, close to vertical, block fault (see Photo 4, page 22). Movement is approximately 80 metres. (See Figures 7 and 8, pages 15 and 19). Faulting **is** considered contemporaneous to the folding.



LEGEND

Kb	Bickford Formation
Km	Monach Formation
Kbp	Beattie Peaks Formation
Jm	Monteith Formation
Jf	Fernie Formation

UTAH MINES LTD. EXPLORATION DEPARTMENT Vancouver British Columbia		
WEST CARBON CREEK		
STRUCTURAL CROSS SECTION B — B' LOOKING NORTH		
Work by: J. Ridley	Date: April 1981	NTS Ref. 93 0/15
Drawn by: T. Drews	Revised:	Scale: 1:10,000
FIGURE — 8		

GAMMA LOG

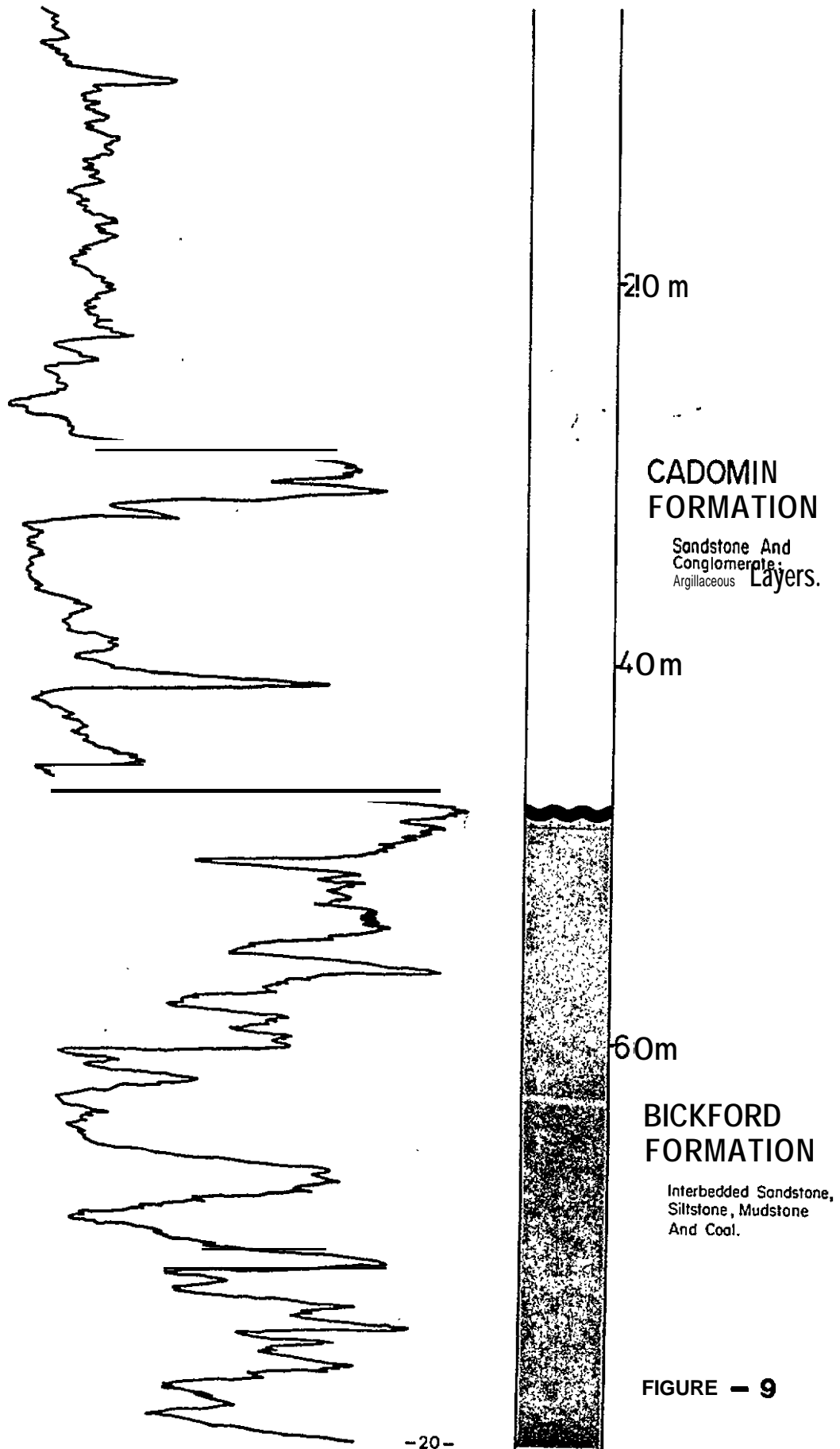


FIGURE - 9

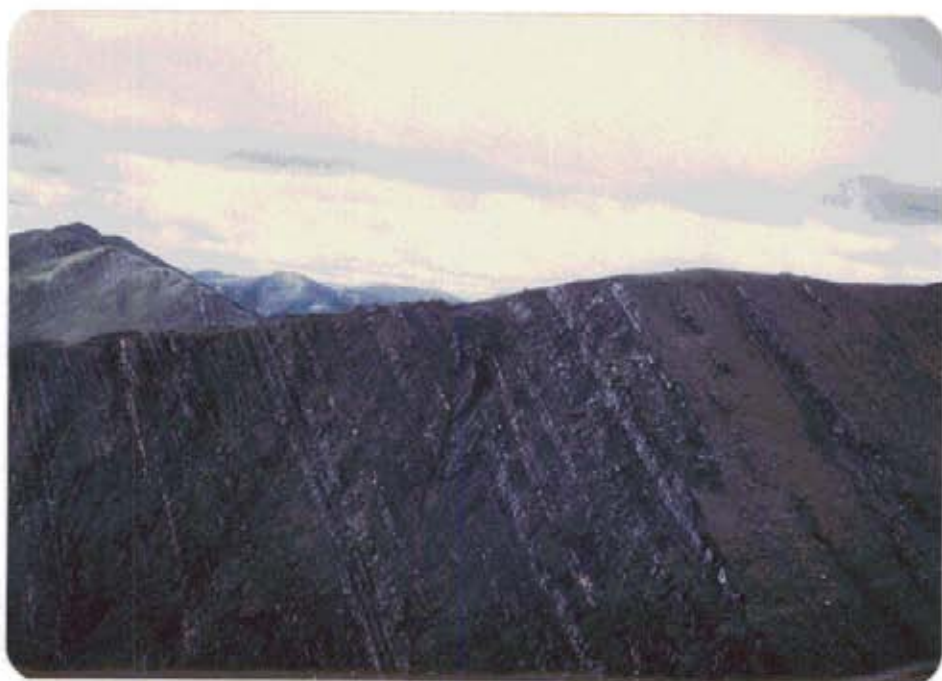


PHOTO 1: Bickford Formation, S vergence fold on the western limb of anticline, west of Mt. Rochfort.



PHOTO 2: Major syncline exposing the Bickford Formation



PHOTO 3: Box anticline, Mt. Wrigley in foreground,
Mt. Rochfort in background; facing north.

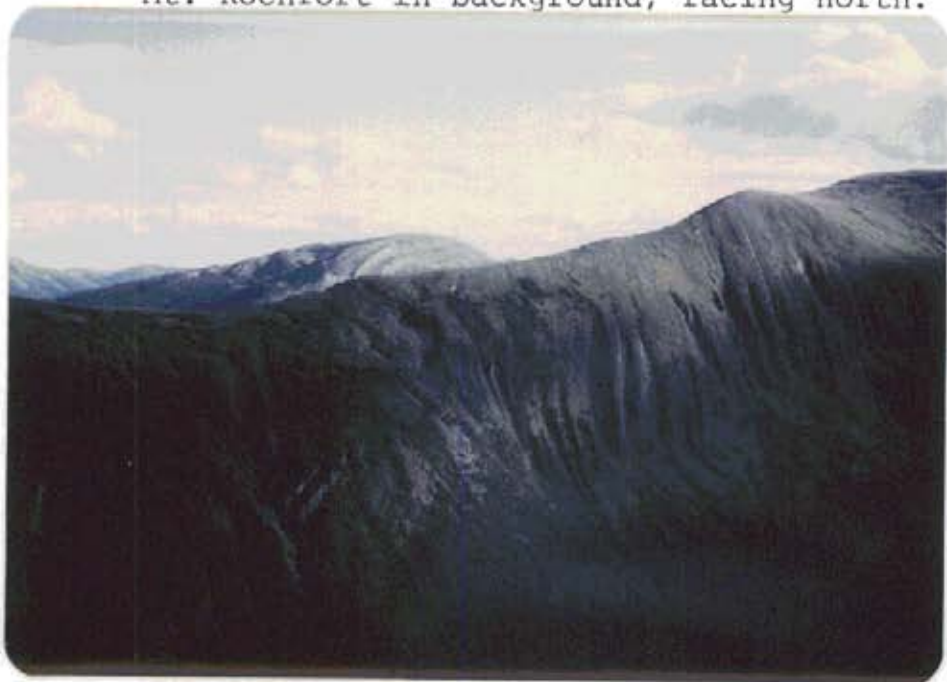


PHOTO 4: Block fault, left side moved upward; facing south.

DRILL HOLE DATA

D.D.H. W.C.C.-80-3

NELL COMPLETION REPORT

Location: In the alpine **valley (cirque)** of the south fork of seven mile creek.

- **McElhanney** Co-ordinates: 41,060mN x 33,450mE
- Coal **Licence** No. 5173

Elevation: 1455 metres

Orientation: Vertical

Date Collared: June 28, 1980

Date Completed: July 2, 1980 Plugged: Yes - cemented

Overburden Depth: 6.26 metres

Casing Depth: 6.40 metres Casing Size: H.W. - 114.3mm
(4.5") - recovered

Final Depth: 215.19 metres

Formations Encountered: 0 to 6.26m Overburden
6.26m to 215.19m Bickford Formation

Core Description By: J. Ridley

Coal Seams Sampled: .

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>Thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1		17.00m to 17.53m	0.53m	0.60m
2a		74.33m to 74.67m	0.34m) 0.80m
2b		74.79m to 75.25m	0.46m	
3		78.74m to 79.66m	0.92m	1.0m
4		92.91m to 93.87m	0.96m	0.96m
5		106.14m to 106.85m	0.71m	0.75m
6		154.50m to 155.63m	1.13m	1.20m
7		197.81m to 198.44m	0.63m	0.75m

Logs Run: Gamma, Density and Resistivity by Utah Mines Ltd.

B. COMMENTS

Site D.D.H. W.C.C.-80-3 was a helicopter accessible site measuring approximately 50 metres x 100 metres. The site was slashed with all felled trees limbed and bucked to four foot or shorter lengths. The site was cleaned up after the drill was removed and the hole cemented.

The **Bickford** Formation was penetrated below 6.26 metres of overburden. The section consisted of interbedded sandstones, siltstones, coals and rare carbonaceous mudstones. Massive sandstones were frequent. One massive sandstone bed was 13 metres thick. Bedding angles, measured from the vertical core axis, ranged from 90° to 60° . Minor slippage frequently occurred subparallel to bedding as **slickensides** or calcite veinlets.

Thirty (30) coal seams were intersected in core, ranging in true thickness from 0.04 metres to 1.13 metres. Seven of the coal seams were removed for analyses. The seams showed a range of volatile matter from 27% to 37% **d.m.m.f.** and sulphur concentrations from 0.58% to 2.15%. Ash content ranged from 2.68% to 13.74% and B.T.M. values from 12,432 **B.T.U./lb.** to 14,714 **B.T.U./lb.** Free Swelling Indices ranged from 5 $1/2$ to 8 $1/2$. Twenty-seven of the 30 seams were retained for reflectance study. Eight of the 27 were tested, showing a range from 1.02 to 1.08 \bar{R}_o max. A general-increase in **values** were-noted with-

D.D.H. W.C.C., -80-4

WELL COMPLETION REPORT

Location: In the alpine valley (**cirque**) of the south fork of seven mile creek.

- **McElhanney** Co-ordinates: 40,870mN x 34,750mE
- Coal **Licence** No. 4120

Elevation: 1348 metres

Orientation: Vertical ,

Date Collared: July 6, 1980

Date Completed: July 10, 1980 Plugged: Yes - cemented

Overburden Depth: 5.19 metres

Casing Depth: 5.19 metres Casing Size: H.W. - 114.3mm
(4.5") - recovered

Final Depth: 181.66 metres

Formations Encountered: 0 to 5.19 m Overburden
5.19m to 181.66m Bickford Formation

Core Description By: J. Ridley

Coal Seams Sampled:

<u>Sample No.</u>	<u>Seam Name</u>	<u>Interval</u>	<u>thickness</u>	
			<u>Core</u>	<u>Density Log</u>
1		74.81m to 75.93m	1.12m	1.25m
2		111.35m to 112.22m	0.87m	0.85m
3		117.00m to 117.78m	0.78m	1.40m (0.5m split
4		132.80m to 133.33m	0.53m	0.60m

Logs Run: Gamma, Density and Resistivity by Utah Mines Ltd.

B. COMMENTS

A clearing measuring approximately 50 metres x 100 metres was slashed for site D.D.H. **W.C.C.-80-4**. All felled trees were limbed and bucked into four foot or shorter lengths. All equipment, including the drilling rig, mud tanks and mixer, and drilling supplies were flown into the site using a Bell 205 helicopter. Crew changes and additional supplies were flown by Bell 206 helicopter. Upon removal of the drill, the site was cleaned and hole cemented.

In W.C.C.-80-4, the **Bickford** Formation was penetrated below 5.19 metres of overburden. The section cored consisted of interbedded sandstones, siltstones, coals and rare carbonaceous mudstones. As in W.C.C.-80-3, many massive sandstone beds were encountered. Bedding angles, measured from the vertical core axis, ranged from 60° to 90° . Slickensides and calcite **veinlets** subparallel to bedding were present but not as frequent as in W.C.C.-80-3.

Twenty-six (26) coal seams were intersected in the section ranging in thickness from 0.04 metres to 1.12 metres. Of the 26 seams, only 4 were retained for analyses. The samples showed a range of volatile matter from 28.5% to 35% and sulphur concentration from 0.61% to 0.83%. Ash content ranged **11.57%** to 25.83% and B.T.U. values from 10,934 **B.T.U./lb.** to 13,397 **B.T.U./lb.** The Free Swelling Indices ranged from 6 $1/2$ to 7 $1/2$. **Twenty-five (25)** reflectance- samples were taken but only **6** were tested: The values, ranging from 1.04 to 1.08 \bar{R}_o max, showed an increase with depth.

D.D.H. W.C.C.-80-5

WELL COMPLETION REPORT

Location: In the alpine valley (**cirque**) of the south fork of seven mile creek.

- **McElhanney** Co-ordinates; 35,230mE x 41,960mN

- Coal **Licence** No. 4118

Elevation: 1315 metres

Orientation: Vertical

Date Collared: July 22, 1980

Date Completed: July 26, 1980 Plugged: Yes - cemented

Overburden Depth: 2.20 metres

Casing Depth: 2.20 metres Casing Size: H.W. - **114.3mm**
(4.5") - recovered

Final Depth: 221.25 metres

Formations Encountered: 0 to **2.20m** Overburden
 2.20 to **189.40m** Bickford Formation
 189.40m to **221.25m** **Monach** Formation

Core Description By: J. Ridley

Coal Seams Sampled:. --

<u>Sample No.</u>	<u>Seam Name.</u>	<u>Interval</u>	<u>Core Thickness</u>	<u>Density Log</u>
1		6.47m to 7.02m	0.55m	1.20m
2		58.67m to 59.28m	0.61m	0.70m
3		83.57m to 84.59m	1.02m	1.05m
4		86.63m to 87.05m	0.42m	0.60m
5		114.61m to 115.06m	0.45m	1.00m
6		127.78m to 128.57m	0.79m	1.10m
7a		146.93m to 147.81m	0.71m) 0.17m)	1.20m
7b		147.81m to 148.01m	0.20m)	
8		163.48m to 164.81m	1.33m	1.25m

Logs Run: Gamma, Density and Resistivity - by Utah Mines Ltd.

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B. COMMENTS

During site preparation of **W.C.C.-80-5**, all felled timber was limbed and bucked into four foot lengths. Upon the completion of drilling, the drill hole was sealed with cement in accordance with the instructions of the Chief Inspector of Mines. After the removal of the drilling rig, the site was cleaned.

Below 2.20 metres of overburden drill hole **W.C.C.-80-5** penetrated the **Bickford** Formation. The interval from 2.20 metres to 49.90 metres consisted predominantly of sandstones, up to 4 metres thick, with muddy layers, **mudstone** beds, and four coal seams ranging in **thicknes** from 0.20 metres to 0.68 metres. Several minor faults were indicated by slickensides on carbonaceous surfaces especially between 27.50 metres and 34.75 metres.

The interval from 49.90 metres and 34.75 metres contained **inter-bedded** sandstones, siltstones, coal and minor mudstones. Three coal seams, 0.61, 0.68 and 1.02 metres thick occurred in this interval. A 13 metre sandstone bed occurred below 89.90 metres. The interval from 102.40 metres to 189.40 metres consist of siltstone interbedded with sandstones, mudstones, and several coal seams which range in thickness from 0.22 metres to 1.33 metres. At 189.40 metres the **Monach** Formation was penetrated. This package consisted predominantly of massive sandstones, muddy sandstone with minor thin coal seams.

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Twenty-nine. (29) coal-seams were penetrated; ranging in thickness from 0.03 metres to 1.33 metres. Of the 29 seams intersected, only 8 seams were retained for analyses. The seams displayed a range in volatile matter from 27% to 36.5% and sulphur concentration from 0.64% to 0.79%. Ash content ranged from 2.51% to 26.78% and B.T.U. values ranged from 10,789 **B.T.U./lb** to 14,742 **B.T.U./lb**.

The Free Swelling Indices ranged from 2 1/2 to 8. Twenty-eight (28) reflectance samples were taken from the 29 coal seams. Only 10 of the samples were tested. Values showed an increase with depth from 1.08 to 1.18 \bar{R}_o max.

CORRELATION OF COAL SEAMS

The coal seams of the Bickford Formation show significant variability in thickness and lateral extent. While coal seams are correlated over one or two kilometres distances, correlations are very tentative. Without reliable marker horizons, correlation becomes complex, involving physical, chemical and geophysical drill derived data. Reflective indices were run on coal seams from the three 1980 holes. values increased with depth in the section. The values did not vary significantly with proximity to fold axes. As a result, reflective indices can be a useful tool in correlating coal seams in the West Carbon Creek area (see Figure 10, Map Folder).

Diamond drill holes W.C.C.-78-2 and **W.C.C.-80-5** have been correlated together as the lower Bickford Formation. The Bickford-**Monach** contact was found at the base of both holes.

Diamond drill holes W.C.C.-78-1, **W.C.C.-80-3** and **W.C.C.-80-4** have been correlated together as the upper to middle Bickford Formation.

CONCLUSIONS AND RECOMMENDATIONS

The south-southeast trending belt of flat lying to gently dipping, Bickford Formation sediments, which forms the core of the western **syncline, holds** the greatest potential for the discovery of economically **mineable** coal. Geological mapping and air photo interpretation have indicated an area of approximately nine square kilometres to sustain a mining operation, given sufficient coal seam thickness, continuity and quality. Numerous coal seams were intersected in diamond drill holes W.C.C.-80-3, W.C.C.-80-4 and W.C.C.-80-5, ranging up **to 1.33** metres in thickness. Significant variation in coal seam thickness make correlation and tonnage estimates very tentative. Many of the coals sampled show good coking characteristics and are low in sulphur. Volatile matter is frequently high..

Significant deformation, including highly variable bedding orientations and minor folding, has been noted in the limbs of the **syncline** in close proximity to the area of primary interest. The possibility of encountering structural disruptions within the belt of relatively flat-lying Bickford sediments should not be overlooked.

Further **exploration work** should be undertaken on the western coal **licences** of West Carbon Creek Property. Additional geological mapping should be done to more accurately **outline** the width and **configuration** of the area of relatively-flat-lying Bickford sediments. Additional drilling should be done in order to **establish** better correlation between drill holes. **Correlation** between drill holes **is** unreliable due to the spacing of the drill holes and the lenticular nature of the Bickford Formation.

P/C
The coal bearing Bickford section should be more fully tested for additional coal seams. It is important that adequate stratigraphic overlap be planned between adjacent drill holes to facilitate correlation of coal seams with reasonable certainty. Any drill holes located away from the synclinal axis will also provide data useful in defining the form of the syncline and the width of the area of flat-lying to gently dipping Bickford sediments.

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APPENDIX V

COST STATEMENT

Note: represents consolidation **of** the costs included in the Application to Extend the Term of Licence for Coal Licence Numbers 4129 to 4152 inclusive, and 5171 to 5173 inclusive.

ON PROPERTY COSTS:

(1) Operators Fees, Salaries and Wages: Professional and Technical	\$ 12,161.00
(2) Contractors and Consultants: Longyear Canada Ltd. (includes charges for direct drilling costs, drill mud, additives, expenses for additional staff, etc.)	\$ 41,470.00
P. Demeulemeester (includes charges for slashing, clearing drill site and reclamation work).	\$ 51,983.00
(3) Equipment and Instructions Used: Gearhart-Owen Model 3200 logging unit (density-gamma @ \$3.05/metre for the first 300 metres, then \$1.83/metre; resistivity-gamma @ \$3.75/metre for the first 300 metres, then \$2.25/metre).	\$ 4,202.00
(4) Field Camp Costs: Food Accommodation Telephone	\$ 3,028.00 \$ 3,530.00 \$ 96.00

(5)	Sampling, Analysis and Testing: (Laboratory analysis of coal samples performed by Utah International Inc. Minerals Laboratory, Sunnyvale, California)	\$	15.00
(6)	Supplies and Materials Costs: Operating and maintenance supplies	\$	9,761.00
(7)	Transportation Costs: Bell 206B Jet Ranger from Okanogan Helicopters Ltd. and Maple Leaf Helicopters Ltd., Chetwynd , B.C., Bell 205 from Northern Mountain Helicopters Ltd., Prince George, B.C. 1 Chevrolet van from Westminster Chev-Olds Leasing Repairs, Parts and Fuel (for trucks, bulldozers, helicopters and camp)	\$	61,294.00 979.00
(8)	Reclamation Work: (Grass seed mixture supplied by Buckerfields Seed Division and B.C. Forest Service stumpage charges)	\$	111.00
	Total On Property Costs	\$	189,872.00
<u>OFF PROPERTY COSTS:</u>			
(1)	Logistics and Field-Support	\$	5,790.00
(2)	Technical and Feasibility Studies	\$	3,075.00
(3)	Supplies and Services	\$	108.00
(4)	Travelling Expenses	\$	3,678.00
	Total Off Property Costs	\$	12,651.00
	Total Project Costs	\$	202,523.00

APPENDIX VI

STATEMENT OF QUALIFICATIONS

I, JOEY C. RIDLEY, of 4697 W. 4th Avenue, Vancouver,
British Columbia, do hereby certify that:

I have completed all requirements for the
granting of a **BSc** degree in Geology (Majors)
which will be granted May 1981 by the University
of British Columbia.

I have worked as a summer student for Utah Mines
Ltd. between the periods of May 1979 to September
1979 and between May 1980 and the present.

I am a Student Councillor on the executive of the
Geological Association of Canada Cordilleran
Section:

Joey C. Ridley

Joey C. Ridley

Vancouver, B.C.

STATEMENT OF QUALIFICATIONS

I, PAUL STUART COWLEY, of 3180 W. **3rd Avenue**, Vancouver,
British Columbia, do hereby certify that:

I am a graduate of the University of
British Columbia, with a Bachelor of
Science Degree in Geology, 1979.

Since graduation I have been engaged
in Coal Exploration in British Columbia
for Utah Mines Ltd.



Paul S. Cowley
'Geologist

Vancouver, B.C.



507

UTAH MINES LTD.
 CORPORATION DEPARTMENT
 VANCOUVER BRITISH COLUMBIA

WEST CARBON CREEK
 BEDROCK GEOLOGY AND
 DRILL HOLE LOCATIONS

Scale 1:10,000
 Date June 21, 1978
 Job No. 06298-4
 Sheet No. 7

LEGEND

SEE BEDROCK GEOLOGY AND DRILL HOLE LOCATIONS

MAP - 2

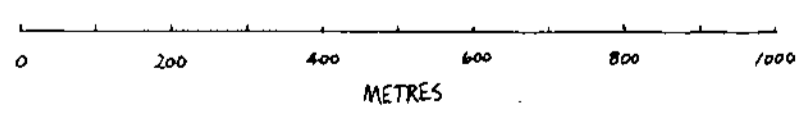
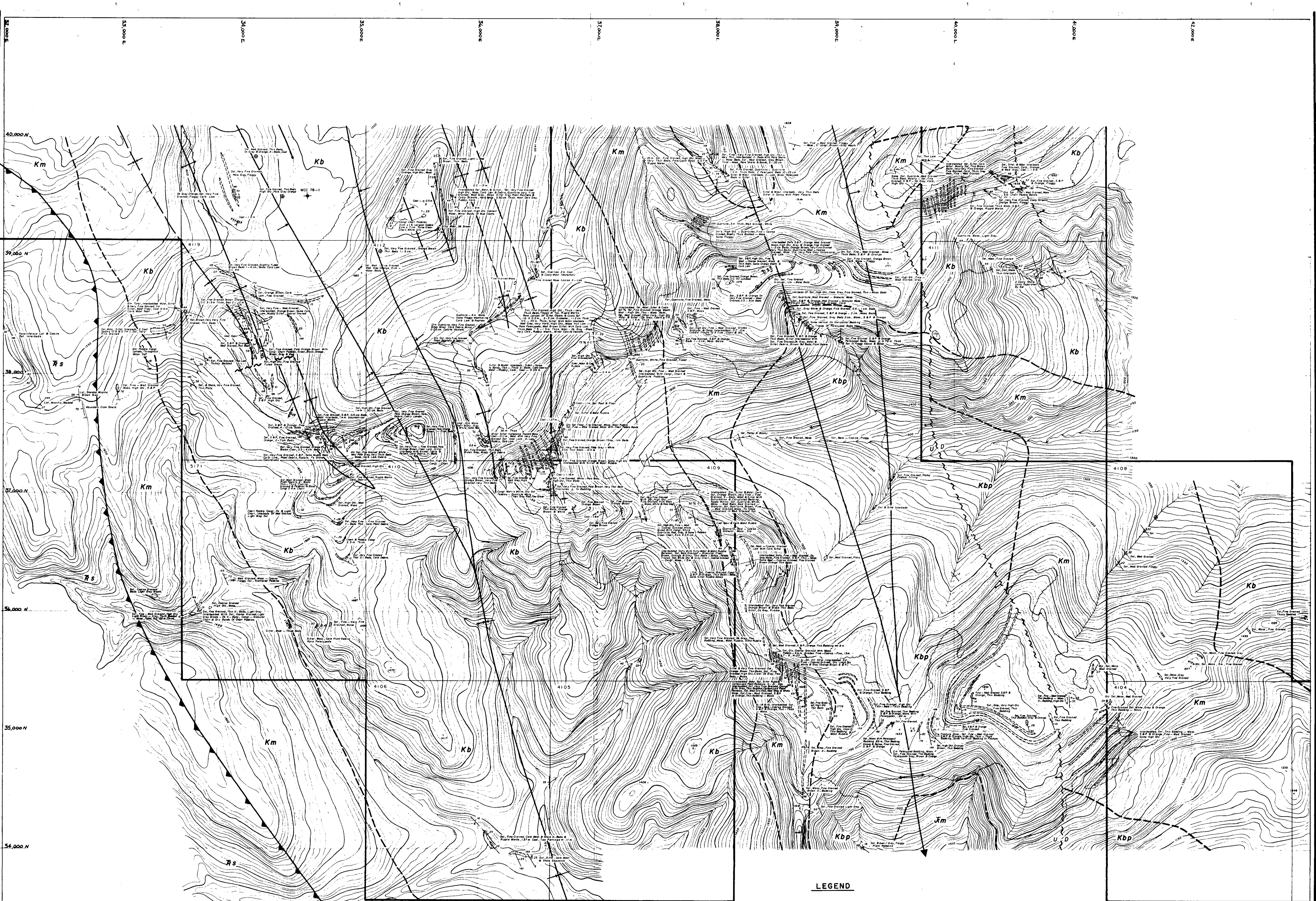
UTAH MINES LTD.

PRELIMINARY RECONNAISSANCE TYPE MAPPING

Scale - 1:10,000
 Contour - 10 Metres
 Date - June 21, 1978
 Job No. - 06298-4
 Sheet No. 7

McElhanney
 McElhanney Surveying & Engineering Ltd.
 1200 West Pender Street, Vancouver, B.C., Canada

Scale and elevation datum based on limited ground control resulting in good relative, but uncertain absolute map accuracy. Compiled from aerial photography at an approximate scale of 1 inch equals 5280 feet flown in 1970.



LEGEND

LOWER CRETACEOUS

- Kb** SICKFORD FORMATION - Quartzite, Sandstone, Conglomerate, Siltstone, Coal, Minor Shales
- Km** MORGAN FORMATION - Quartzite, Sandstone, Conglomerate, Minor Shale and Coal
- Kbp** BEATTIE PEAKS FORMATION - Shale, Fossiliferous Sandstone

UPPER JURASSIC OR LOWER CRETACEOUS

- Jm** MONTEITH FORMATION - Sandstone, Fine To Coarse Grained, Quartzite

JURASSIC

- Jf** FERNIE FORMATION - Cherty Shale, Sandy Near The Top

TRIASSIC

- R5** SCHOOLER GROUP - Calcareous Sandstone, Calcareous Shale, Limestone, Dolomite (Marine)

- Geologic Contact
- Syncline
- Anticline
- (Outcrop) - Strike And Dip Of Bedding
- Drill Hole Location
- Coal Outcrop, Measured Thickness Where Indicated
- Outcrop
- Thrust Fault
- Coal License Number
- Sample Number
- Section Line Location
- Fault
- Direction Of Dip
- Relative Movement Of Beds

507 West Carbon Creek West 60/218

UTAH MINES LTD.
EXPLORATION DEPARTMENT
VANCOUVER BRITISH COLUMBIA

WEST CARBON CREEK
BEDROCK GEOLOGY AND
DRILL HOLE LOCATIONS

Work by: J.C. Ridley Date: March 1978 NTS Ref: 93 0715
Drawn by: T. Drews Revised: Scale: 1:10,000

MAP - 2

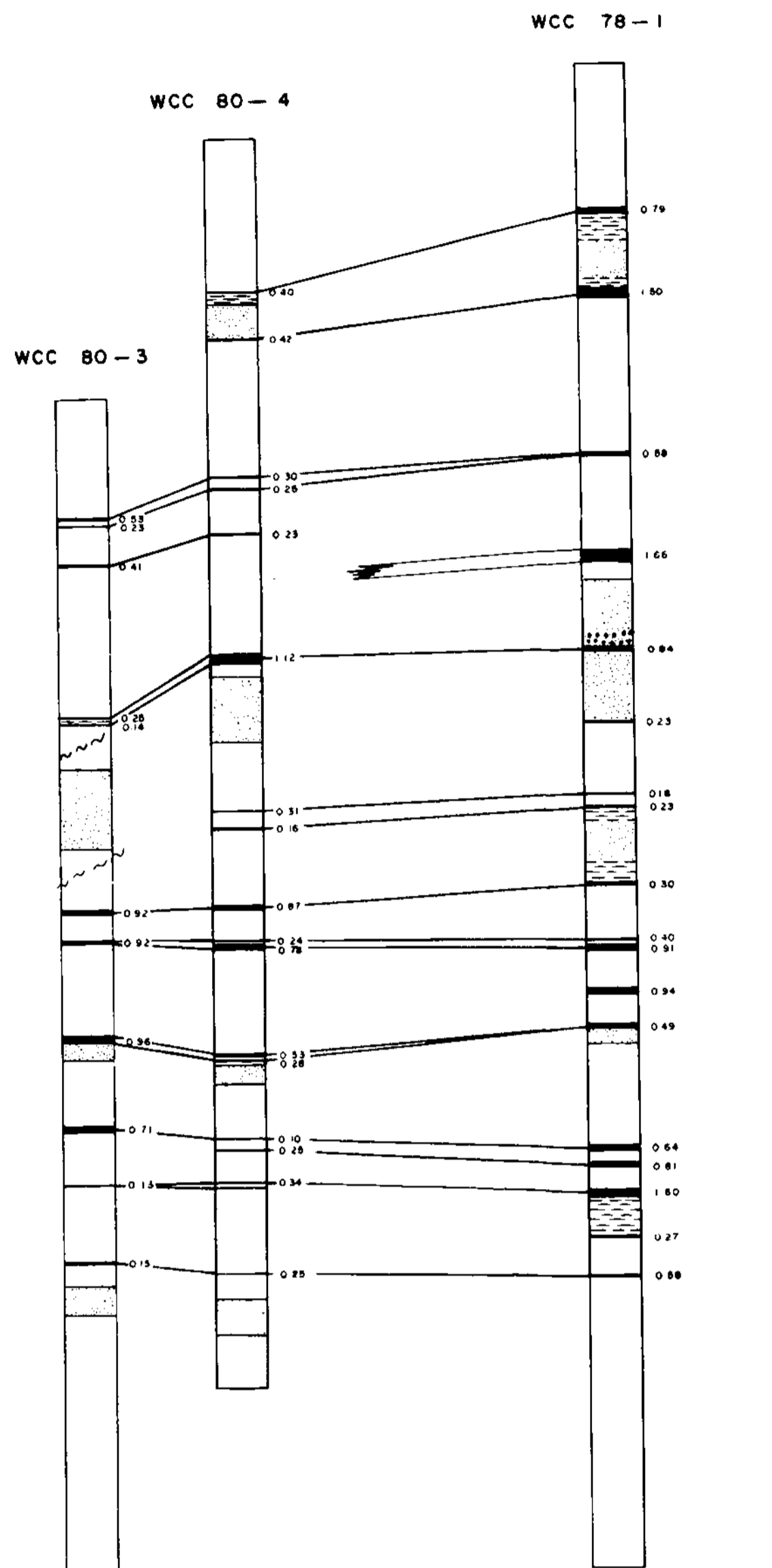
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UTAH MINES LTD.
CARBON CREEK
PRELIMINARY RECONNAISSANCE TYPE MAPPING

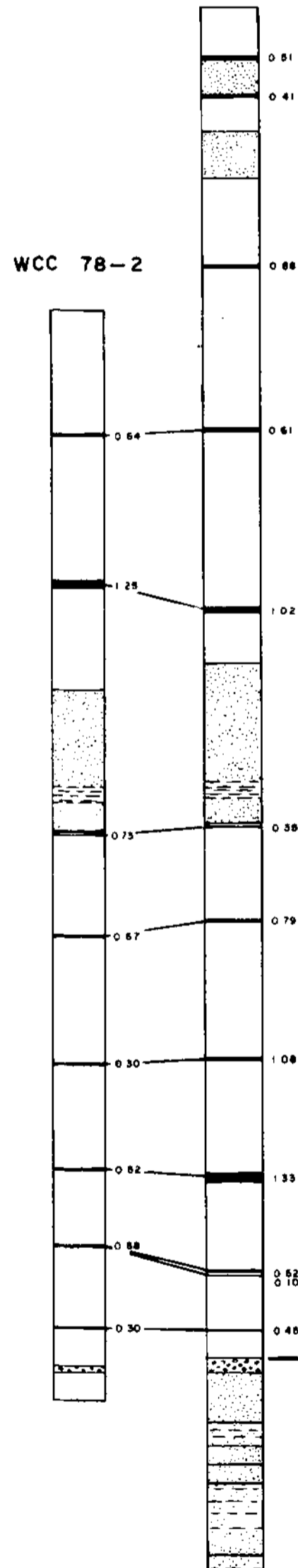
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Contour - 10 Metres
Date - June 21, 1978
Job No. - 06298-4
Sheet No. - 8

McElhenny
McElhenny Surveying & Engineering Ltd.
1200 West Pender Street Vancouver, B.C., Canada

WEST CARBON CREEK DIAMOND DRILL HOLES
(Vertical Scale 1:750)

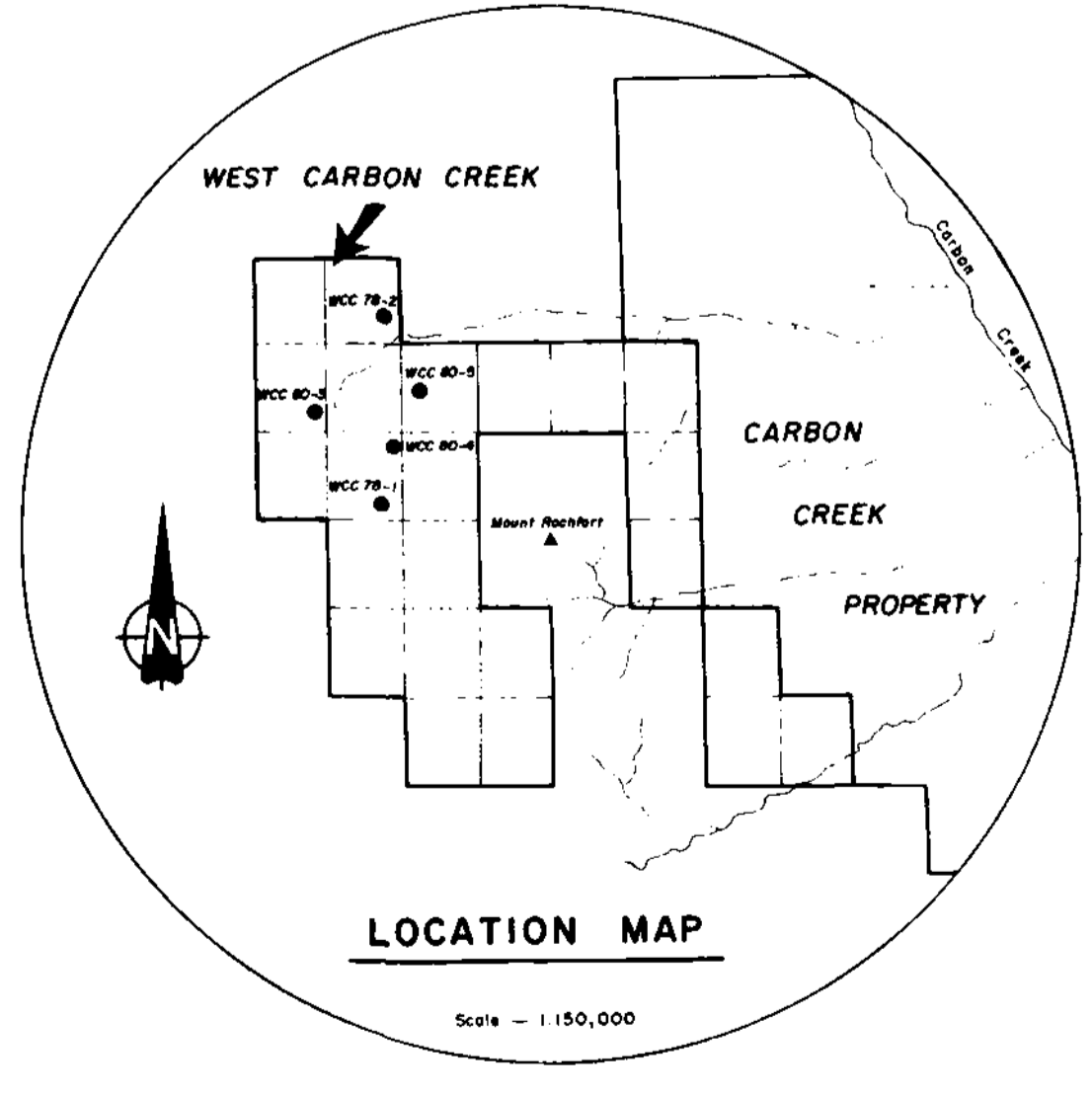


WCC 80-5



BICKFORD

MONACH



507

Pl. Carbon Creek - West 20(2)A

UTAH MINES LTD. EXPLORATION DEPARTMENT VANCOUVER BRITISH COLUMBIA		
WEST CARBON CREEK		
COAL SEAM CORRELATIONS		
Work by J. C. Ridley	Date: April 1981	NTS Ref
Drawn by T. Drews	Revised	
FIGURE - 10		

OPEN FILE

APPENDIX I

DESCRIPTIVE LITHOLOGIC LOGS FOR
D.D.H. W.C.C.-80-3, W.C.C.-80-4, and W.C.C.-80-5

~~CONFIDENTIAL~~

CORE DESCRIPTION

HOLE# WCC-80-3 From 0.00 To 10.71
 Area West Carbon Creek By J.C. Ridley

FROM	TO	DESCRIPTION
0.00	6.26	OVERBURDEN
6.26	7.93	SANDSTONE, MUDSTONE, SILTSTONE, interbedded. Moderately bioturbated - can still see laminae and bedding angle but worm burrows have caused moderate disturbance. More sand at top where medium grained. Sandstone becomes very fine grained and siltstone content increases towards base iron stain on fracture in rock. Ripple marks and much cross bedding (small scale trough).
7.93	10.54	SILTSTONE AND MUDSTONE interlaminated and interbedded with some very fine grained to fine grained Sandstone laminae and beds. Rock is extremely broken and iron stained on all fractures. SLICKENSIDES occur at: 7.93 horizontal (90° to C/A) calcite coating. 7.93 to 8.00 - 17° to C/A curved. Calcite coating. Iron stain on top of calcite 7.96 to 8.04 37° to C/A Calcite on slickensides 7.96 to 8.04 60° to C/A Calcite and iron stain on 8.32 to 8.68 15° to C/A Iron stain and slight calcite. Calcite veinlets in all directions severe 90° to C/A horizontal. 8.87 to 8.95 45° to C/A. Slight calcite and slight iron stain, all slickensides parallel bedding From 7.93 to 9.89 20% core loss depths brown numbers not very accurate. 10.29 Slickensides 70° to C/A. Slight calcite and iron stain. Bedding here appears close to horizontal, 85 to 80° to C/A.
10.54	10.71	MUDDY SILTSTONE - dark grey, bioturbated and well mixed.

HOLE+ WCC-80-3From 10.71 To 15.06

J.C. Ridley

FROM	TO	DESCRIPTION
10.71	11.12	SILTY MUDSTONE - dark grey.
11.12	11.17	SANDSTONE - medium grained - rough contact with Mudstone, very pale grey - slight matrices.
11.17	11.53	MUDDY SILTSTONE with Sandstone interbeds, medium grained, very pale grey, bioturbated sands mixed into siltstone.
11.53	11.68	MUDSTONE - slightly silty dark grey to black.
11.68	11.79	SANDSTONE - with mudstone laminae, medium grained, very pale grey, slight mafics cross bedded and soft sediment folding. Bedding up to 65° to C/A.
11.79	12.63	MUDDY SILTSTONE with few medium grained Sandstone laminae, Sandstone very pale grey Siltstone medium to dark grey Bedding 80° to C/A. Calcareous towards base ripple marks, slightly bioturbated.
12.63	13.00	SANDSTONE - interbedded with interlaminated Muddy Siltstone, fine grained Sandstone and Mudstone. Sandstone is medium grained, very pale grey, few mafics. Siltstone medium grey) All Calcareous Mudstone dark grey to black)
13.00	13.45	MUDDY SILTSTONE, fine grained Sandstone interlaminated bioturbated and moderately well mixed bedding 80° to C/A at top ranges 60° to 70° towards base. Sandstone content increases towards base - calcareous.
13.45	13.90	SANDSTONE - medium grained very pale grey, interlaminated with Sandstone fine grained, medium grey and Siltstone and some Mudstone laminae with calcareous shelly bands very very very thin. Bedding 74° to C/A. Slightly bioturbated and trough crossbeds large mudstone clast. 3cm x 10cm x 4cm.
13.90	15.06	SANDSTONE - medium grained, very pale grey, some mafics, trough cross bedding. Siltstone and Mudstone laminae occasional bedding 70° to C/A.

FROM	TO	DESCRIPTION
13.90	15.06	Calcite vein at 14.47m. Varies 1 to 2cm wide. 50° from C/A other very thin >1mm calcite veinlets at same angle or 10° to C/A. Sandstone is massive to faintly bedded in middle but trough cross bedding at base and top calcareous.
15.06	15.85	SANDSTONE, SILTSTONE, MUDSTONE - interlaminated and interbedded. Sandstone is medium grained pale to medium grey slightly muddy has trough cross beds. A few worm burrows, ripple marks in Mudstone. Calcareous bedding 73° to C/A. Slickensides with calcite and iron stain at 15.82m 70° to C/A.
15.85	16.76	MUDSTONE AND SILTSTONE - interlaminated several small worm burrows 0.5cm long, bedding 78° to C/A. Calcareous.
16.76	17.00	MUDSTONE - with Siltstone laminae, carbonaceous at base, black in colour only calcareous at top.
17.00	17.53	COAL - 0.53 metres thick, 95% recovery - Sample 1 2 FSI, 1 Regular, 1 Ro, 1 Palynology. Several slickensided surfaces, 55° to C/A and 85° to C/A. Pyrite band at 17.26 0.5cm thick. Muddy coal band at 17.30 0.4cm thick. Muddy coal band at 17.31 to 17.41. Coal is moderately soft black shiny 50% cleated, blocky 50% conchoidal fracture.
17.53	17.65	COALY MUDSTONE - very carbonaceous and coaly streaks, black colour. Slickensides at 17.53 coaly and calcite 80° to C/A, very very thin calcite veinlets could be shell bands.
17.65	18.22	CARBONACEOUS MUDSTONE - black at top. Slickensided at 17.71 80° to C/A. Silty towards base and brown in colour. Calcareous shell bands very very thin <1mm appear wavy like pelecypods some very small coal chunks occur surrounded by calcite shell, fibrous aragonite band 1mm thick at base 0.75cm layer of shells.

FROM	TO	DESCRIPTION
17.65	18.22	CARBONACEOUS MUDSTONE - black at top, slickensided at 17.71 80° to C/A. Silty towards base and brown in colour. Calcareous shell bands very very thin <1mm appear wavy like pelecypods, some very small coal chunks occur surrounded by calcite shell, fibrous aragonite band 1mm thick at base 0.75cm layer of shells.
18.22	18.45	COAL - 0.23 metres thick, black shinev well cleated. Ro and Palynology Sample #2.
18.45	19.83	MUDSTONE - Carbonaceous especially at top - Coal band 1.5cm at 18.51 'black shinev well cleated. Mudstone is silty towards base. At 18.89 Mudstone is soft and, part-shy to 19.04. Same at 19. to 19. Calcareous Mud clasts 2cm x 1cm.
19.83	21.13	SSANDSTONE, MUDSTONE - r laminated and and interbedded. Sandstone is predominant and is clean very pale grey medium grained, cross bedded trough, some worm burrows, Calcite veinlet at 43° to C/A at 20.56 and associated smaller calcite veinlets.
21.13	21.51	MUDDY SILTSTONE with very fine grained sandstone and siltstone laminae. Small worm burrows vertical and horizontal, slight bioturbation.
21.51	21.86	MUDSTONE, SILTSTONE AND FINE GRAINED SANDSTONE - extremely bioturbated and well mixed. Sandstone is slightly calcareous.
21.86	22.39	SANDSTONE, MUDSTONE AND SOME SILTSTONE - interbedded and interlaminated. Sandstone is slightly calcareous. Sandstone is very pale grey and fine grained, only few mafics - calcareous bedding angles hard to tell due to bioturbation vertical and horizontal worm burrows.

FROM	TO	D E S C R I P T I O N
22.39	23.76	SANDSTONE - very pale grey to white Fine to medium grained. Mudstone laminae and coaly streaks, <0.4cm Pyrite bleb at 22.61 3cm x 2cm bioturbation is moderate. Calcareous coarseing upwards, trough cross bedding. Increase in Mudstone content towards base bedding 76° to C/A.
23.76	24.05	MUDSTONE AND VERY FINE GRAINED SANDSTONE - interlaminated slightly bioturbated. Horizontal worm burrows 3mm.
24.05	24.46	COAL - 0.41 metres, Sample 3 Ro 20% Black shiney cleated 80% Metallic dark grey hard.
24.46	24.78	VERY COALY MUDSTONE 0.32m - Sample 3 Palynology up to 40% bands of black shiney cleated coal.
24.78	24.88	COAL - 0.10 metres 90% Metallic dark grey hard 10% Black shiney cleated.
24.88.	25.16	COALY MUDSTONE Black bands up to 2mm thick, black shiney cleated.
25.16	25.56	SILTY MUDSTONE - dark grey to brown.
25.56	26.04	SANDSTONE - massive medium grained to slightly coarse salt and pepper. Calcareous Slickensides and calcite at 25.56 75° to C/A.
26.04	26.26	SANDY SILTSTONE - medium grey
26.26	28.13	SANDSTONE - massive to faintly bedded bedding 63° to C/A, pale grey colour medium to slightly coarse grained, coaly streaks at 27.04 Mudclasts and coal chunks at 28.02 to up to 4cm x 2.5cm Only slightly calcareous.

HOLE+ WCC-80-3 From 28.13 To 34.31

FROM	TO	DESCRIPTION
28.13	28.69	SANDSTONE - fine to medium grained, massive to faintly bedded, pale to medium grey.
28.69	28.87	MUDDY SILTSTONE - medium to dark grey
28.87	28.95	FINE GRAINED SANDSTONE - medium grey, massive.
28.95	29.51	SILTY MUDSTONE - dark grey, massive.
29.51	31.40	MUDDY SILTSTONE with Sandstone laminae very fine grained and some Sandstone mixed in, some mud clasts in Sandstone layers. Moderate bioturbation, more sand towards base.
31.40	32.31	FINE GRAINED SANDSTONE, FINE GRAINED SANDSTONE, MUDSTONE AND SLIGHT SILTSTONE, interlaminated and interbedded. Several mudclasts in sandy layers, clasts 1mm^2 to 1cm^2 trough and planar cross beds.
32.31	32.51	SANDSTONE - medium to slightly coarse grained salt and pepper, massive.
32.51	33.04	MUDSTONE, FINE GRAINED SANDSTONE AND SLIGHT SILTSTONE interlaminated. Sandstone pale to medium grey Bedding 70° to C/A few mud clasts in Sandstone layer $1\text{mm} \times 2\text{mm}$ trough crossbeds - not calcareous.
33.04	33.60	SANDSTONE - medium grained pale grey Mud chips laminae and coal chunks 1mm^2 to $4\text{cm} \times 0.05\text{cm}$ Crystalline calcite veinlet 0.5cm thick at 33.48m calcareous. Mudstone band at base 2cm thick
33.60	33.64	SANDSTONE - slightly coarse grained salt and pepper in lower half.
33.86	34.05	SILTY MUDSTONE - dark brown, massive
34.05	34.17	SANDSTONE - fine grained cross bedded planes medium grained with mafics at base.
34.17	34.31	SILTY MUDSTONE - dark brown, massive

FROM	TO	DESCRIPTION
34.31	38.94	SANDSTONE - coarse grained, massive salt and pepper, more salt one 3cm Mudstone band near top, occasional mud clasts 1mm ² , few carbonaceous streaks bands < 1mm. 36.51 to 36.61 several Mudstone clasts lenticular up to 2cm x 6cm. Non calcareous.
38.94	39.46	Carbonaceous Mudstone Coaly streaks < 1mm.
39.46	39.98	SILTY MUDSTONE - few very fine grained Sandstone laminae 1cm thick, coaly streaks < 1mm thick at top.
39.98	41.91	SANDSTONE AND SILTSTONE - interbedded with muddy beds and mudstone laminae increasing towards base. Sandstone is fine grained pale to medium grey, very slightly bioturbated. Calcareous.
41.91	42.52	MUDSTONE - black, massive slickensides horizontal - slightly calcareous.
42.52	42.88	SANDSTONE - fine grained, pale grey trough cross beds. Mudstone mixed in at top and in laminae to base, vertical worm burrow, 4cm long. 4cm wide bedding 75° to C/A. - Calcareous.
42.88	43.50	MUDSTONE, SILTSTONE AND SANDSTONE - interlaminated Mudstone is predominant Sandstone is fine grained, pale to medium grey bedding 75° to C/A. Calcareous
43.50	43.70	SANDSTONE - fine grained, pale grey planar cross bedded. - Calcareous, very small mud clasts at base up to 1mm x 2mm.
43.70	43.78	SANDSTONE with Mudstone laminae, slightly bioturbated, ripple marks Sandstone is fine grained, pale to medium grey - calcareous laminae
43.78	43.97	SANDSTONE fine grained, pale grey planar cross beds. Few muddy laminae.
43.97	44.15	MUDSTONE AND SANDSTONE - interlaminated and interbedded slight planar cross bedding, laminae partly mixed disturbed - calcareous.

FROM	TO	DESCRIPTION
44.15	45.56	SANDSTONE fine grained to 45.11 then medium grained to 45.56, pale grey, interbedded trough cross beds and massive mudstone band 1cm thick at 44.78. Calcite vein 2.5cm thick 60° to C/A at 44.86 and associated calcite veinlets in all direction. Slickensides at 44.93 with calcite crystals on top. Muddy band 45.00 to 45.11 Coaly streaks < 1mm thick 45.18 to 45.41, Calcareous
45.56	45.65	MUDSTONE with Sandstone and Siltstone laminae and lenticular lenses. Only Sandstone is calcareous.
45.65	46.25	Interbeds of Sandstone - fine grained, pale grey, planar cross beds with muddy laminae, Sandstone - medium grained massive pale grey - salt and pepper, and Mudstone - dark brown to black, Sediment Sample #5. One lenticular pyrite band 0.5cm thick at 46.12m. Sandstones are calcareous, 8cm bed of medium grained Sandstone sits at base on top of coal.
46.25	46.50	COAL - 0.25 metres only 70% recovery, Sample #4 Ro. Black shiney well cleated to metallic grey.
46.50	47.22	MUDSTONE - carbonaceous, very very thin coaly streaks <1mm, very very thin calcite veinlets <1mm Looks like pelecypod shells but calcite surrounds coal chunks. Mudstone is not calcareous.
47.22	47.28	COALY MUDSTONE - contains coal bands up to 2mm thick, black shiney cleated.
47.28	47.41	COAL - 0.14 metres. Ro Sample #5
47.41	48.88	MUDSTONE - carbonaceous, coaly at top, bands up to 0.5cm thick, black shiney cleated, slightly silty at base.
48.88	52.22	Fine grained Sandstone and Muddy Siltstone - Interbedded with occasional Mudstone beds. Sandstone is pale to medium grey

FROM	TO	DESCRIPTION
48.88	52.22	Siltstone medium grey
		Mudstone dark grey to black
		Occasional coal chunks and bands up to 0.3cm thick in Mudstone.
		Slickensides and crystalline calcite vein at 49.72m 65° to C/A.
		Most Sandstone is calcareous, bedding hard to see appears 83° to C/A.
52.22	53.70	SANDSTONE - interbeds of fine grained and medium grained, slightly muddy laminae, few bands of siltstone and mud clasts up to 1.4cm long, 0.5cm wide.
		Occasional coal chunks same size.
		Sandstone is pale to medium grey, few calcite veinlets 75° to C/A. <1mm to 3mm thick, planar crossbeds, slightly calcareous.
53.70	53.80	SANDSTONE - medium grained, massive very pale grey to white.
53.80	65.68	SANDSTONE - slightly coarse grained, coarsens downwards to a coarse grained Sandstone, massive .
		Grains up to 1mm ² at 59.43m.)
		10cm thick coarse bed 59.40 to 59.50)
		Occasional very very thin coaly streaks <1mm
		59.71 to 60.01 several coaly streaks and one muddy band 1cm thick.
		Only very slightly calcareous down to 60.08m, moderately calcareous to very slightly calcareous alternates below 60.08m.
		Mudstone band 1cm thick at 60.61m, few mudstone and calcite laminae below this for 19cm to 60.81m.
60.81	60.96	Bed of interlaminated Mudstone and very fine grained Sandstone and some medium grained Sandstone, some coaly laminae.
		Silty mud clasts 2.5cm x .4cm at 62.32.
		Distinct white and medium grey bands from 63.49 to 63.87m 63° to C/A.

HOLE+, WCC-80-3From 60.81 To 69.29

FROM	TO	DESCRIPTION
60.81	60.96	Stylolitic carbonized surface at 65.49m ~ 70° to C/A
(Continued)		Few more 3cm and 5cm above.
		Sandstone becomes very coarse at base
		Several clasts mudstone and siltstone 0.4cm x 0.2cm
		One white quartz pebble 1.2cm x 0.6cm
		One siltstone clast 4.8cm x 2cm
		Several coaly fragments and streaks close to base
		contact shows abrasion of mudstone by sand.
65.68	66.08	COALY MUDSTONE AND MUDDY COAL interbedded non-calcareous, core well broken but does not appear to have any solid coal >5cm thick.
		Bands of coal are black shiny and cleated.
66.08	66.33	SILTY MUDSTONE with coaly chunks, non-calcareous 1cm x 1mm.
66.33	66.48	SANDSTONE - fine grained pale grey, extremely mixed with silty Mudstone - convoluted bedding, only very slightly calcareous.
66.48	66.62	SANDSTONE - pale grey, very fine grained, convoluted bedding - calcareous.
66.62	66.79	SANDSTONE - same as bed above - calcareous mixed in convoluted bedding with Muddy Siltstone.
66.79	67.15	MUDDY SILTSTONE - with fine grained Sandstone, pale grey mixed in, still some convoluted bedding, some Mudstone clast 0.5mm to 1cm long, and clumps 4cm x 3cm. Very slightly calcareous.
67.15	69.29	SANDSTONE - fine grained at top coarsens to medium to slightly coarse at the base.
		Planar crossbeds, pale grey bands of muddy laminae throughout stylolitic carbonaceous streaks <1mm thick
		67.84 to 67.88 is a band of carbonaceous laminae.
		Siltstone, calcite veinlets and siltstone fragments in calcite.
		Slickensides in calcite at 68.02 at 80° to C/A
		moderately to slightly calcareous.
		Slickensides at 69.00.

HOLE #

WCC-80-3

From 69.29

To 74.11

FROM	TO	DESCRIPTION
69.29	70.42	CARBONACEOUS MUDSTONE with coal bands Palyn Sample #4 up to 2mm thick.
70.42	70.65	SILTY MUDSTONE - dark grey massive
70.65	70.69	SANDSTONE very fine grained, pale to medium grey mixed
70.69	71.12	MUDDY SILTSTONE - dark brownish-grey, few very fine grained Sandstone patches.
71.12	71.31	SANDSTONE very fine grained, pale grey with muddy siltstone laminae. Few horizontal worm burrows. Moderate bioturbation, very calcareous.
71.31	71.39	MUDDY SILTSTONE, very fine grained sandstone, pale grey and Mudstone interbedded and interlaminated, all very calcareous. Slightly bioturbated. bedding 85° to C/A. Sandstone decreases towards base as Mudstone content increases. Slickensides with calcite at 60° to C/A at 70.76.
71.39	71.48	MUDDY SILTSTONE - massive dark brownish-grey, very calcareous.
71.48	71.54	SILTY MUDSTONE Massive very calcareous dark grey.
71.54	71.64	CARBONACEOUS MUDSTONE non calcareous coal chunks at base 2mm x 2cm.
71.64	71.69	MUDDY COAL - 0.5cm thick with mud bands up to 1cm thick. Black shiny cleated.
71.69	71.90	COALY MUDSTONE - black massive, large coal chunks up to 2cm x 6cm.
71.90	72.78	MUDSTONE - carbonaceous and coaly in patches. Silty and calcareous in other patches.
72.78	73.13	SILTY MUDSTONE - dark grey massive Calcareous
73.13	73.89	SILTY MUDSTONE with siltstone laminae Siltstone is pale grey Mudstone medium to dark grey Calcareous
73.89	74.17	SILTY AND COALY MUDSTONE - terbeds of calcareous and non-calcareous coal chunks and streaks up to 2mm thick.

FROM	TO	DESCRIPTION
74.17	74.33	CARBONACEOUS MUDSTONE - black non calcareous, massive coaly streaks 2mm thick.
74.33	75.25	COAL - 0.92 metres total with a 12cm split Ro #6a, 2 FSI #2a, 1 Regular 2a 74.33 to 74.67m Coal 0.34m 90% metallic grey cleated moderately hard 10% shiney black conchoidal fracture to cleated, soft. 74.67 to 74.79m Mudstone Split 0.12m Palyn #5 black, coaly streaks, carbonaceous. 74.79m to 75.25m Coal 0.46m Ro#6b, 2 FSI #2b, 1 Regular 2b. 80% metallic grey, cleated) Moderately soft 20% shiney black, cleated)
75.25	75.96	SILTY MUDSTONE with Muddy Siltstone and fine grained Sandstone, very pale grey, interlaminae few vertical worm burrows 2cm x 0.7cm One burrow 1.3cm x 1cm - calcareous Calcite shell? band at top individual shells (veinlets) 0.1mm thick.
75.96	76.51	MUDSTONE with silty bands and blebs One fine grained very pale grey Sandstone band 1cm thick bedding ~ 85° C/A. Calcareous
76.51	76.69	SILTY MUDSTONE with Siltstone and very fine grained Sandstone laminae, calcareous.
76.69	76.98	MUDSTONE dark grey to brown Calcareous, silty at base.
76.98	77.14	COAL - 0.16 metres thick, Ro#7 50/50 metallic grey to shiney black, quite hard partially cleated.
77.14	77.75	SILTY MUDSTONE - coaly at top with very very thin .5mm calcite veinlets. Increasing silt towards base
77.75	78.30	SANDSTONE - very fine srained, very pale grey calcareous with muddy laminae, planar crossbeds.

HOLE+

WCC-80-3

From 78.30

To 84.45

FROM	TO	DESCRIPTION
78.30	78.74	SANDSTONE - medium grained very pale grey to white, coaly streaks < 1mm throughout, non calcareous, some stylolitic, more towards base.
78.74	79.66	COAL - 0.92 metres thick <u>Sample 3, Regular, 3 FS1-2 #8 Ro.</u>
79.66	79.93	PYRITIC MUDSTONE - black carbonaceous siltstone, partially replaced with pyrite in laminae 87° to C/A showing slight planar cross bedding. Laminae are 0.3mm to 3mm thick.
79.93	80.22	SANDSTONE, MUDSTONE AND SOME SILTSTONE - interlaminated Sandstone medium grey, very fine grained - slightly bioturbated } Mudstone black } non calcareous Siltstone dark grey }
80.22	81.33	SANDSTONE with Mudstone laminae Sandstone is very fine grained, cross bedded-trough medium grey Carbonaceous laminae, 0.5mm thick non-calcareous
81.33	82.42	SANDSTONE, MUDSTONE, AND SOME SILTSTONE interlaminated planar and trough cross beds, worm burrows horizontal and vertical .5cm x 1cm. Sandstone medium grey very fine grained Mudstone black Siltstone dark grey
82.42	82.46	COAL - 0.04m thick, black, shiney, well cleated.
82.46	82.72	SILTY MUDSTONE - dark brownish black Carbonaceous at top
82.72	82.82	SANDSTONE with Mudstone mixed in convoluted bedding. Sandstone is very pale grey, very fine grained slightly calcareous. Mudstone is dark brown black
82.82	83.13	MUDSTONE WITH SILTSTONE and some Sandstone mixed in convoluted bedding.
83.13	83.43	MUDSTONE - dark brown-black, sandy at base.
83.43	84.45	SANDSTONE, MUDSTONE AND some Siltstone, interlaminated and interbedded. Sandstone is very fine grained, fine grained and medium grained, all very pale to pale grey - calcareous.

FROM	TO	DESCRIPTION
83.43	84.45	MUDSTONE is dark brown to black, some very small worm burrows up to 2mm x 1cm, bedding fairly disturbed slightly convoluted.
84.45	84.70	SANDSTONE - medium grained salt and pepper calcareous massive to faintly cross bedded planar stylolitic carbonaceous bands .3mm thick. Mudclasts throughout in bands.
84.70	85.04	SANDSTONE with Muddy Siltstone laminae Sandstone is pale grey, trough cross beds very fine grained, calcareous.
85.04	85.77	SANDSTONE with Mudstone laminae and beds towards base. Sandstone is fine grained, pale grey calcareous Mudstone is dark brown Several worm burrows vertical and horizontal up to 1cm x 0.4cm
85.77	86.79	MUDSTONE with Siltstone laminae and blebs decreasing towards base. Mudstone is dark brown-black, blacker towards base.
86.79	86.85	VERY COALY MUDSTONE Coal bands up to 2cm thick black shiney cleated
86.85	86.98	COAL - 0.15 metres thick. Ro#9 Metallic grey to shiney black, well cleated, moderately soft, some conchoidal fracture
86.98	87.87	MUDSTONE - carbonaceous at top. Slickensides carbonaceous and calcite 50° to C/A. at 87.122. Very thin calcite veinlets - shells in the Mudstone here. Coaly fragments up to 4cm x 0.5cm non-calcareous.
87.87	89.40	SILTY MUDSTONE - calcareous in parts, very small 1cm x 1mm coaly fragments, calcite veinlets (shells) 0.1mm throughout. Large worm burrows very irregular long 9cm x 1cm wide filled with calcareous Sandstone mu surrounding is not calcareous at 89.13 to 89.22. Sediment Sample #7. Mudstone is sandy towards base

HOLE*

WCC - 80 - 3

From 89.40

To 98.13

FROM	TO	DESCRIPTION
89.40	90.14	SANDSTONE with Muddy Siltstone laminae Sandstone is very fine grained, very pale grey Calcareous, stylolitic vertical calcite veinlet. 21cm long, very calcareous
90.14	90.57	MUDDY SILTSTONE - massive, brownish gry - calcareous
90.57	91.27	SANDSTONE with Muddy Siltstone beds and laminae - very calcareous Sandstone is very fine grained, pale to medium grey bedding moderately disturbed i.e. convoluted below 91m bedding is at 75-80° to C/A cross beds.
91.27	91.92	MUDDY SILTSTONE and SANDSTONE interbedded and inter- laminated - calcareous Sandstone is fine grained, pale grey Siltstone is dark brown - grey. Ore bed of Sandstone is medium grained massive 4cm thick
91.92	92.91	MUDSTONE with very fine grained Sandstone beds laminae ^e and blebs, all calcareous.
92.91	93.87	COAL - 0.96 metres thick - Split 4cm 2-FSL #4 Ro #10, Reg #4. 25% black-shiney cleated soft 75% metallic grey hard cleated to conchoidal fractur ^e Mud clast and calcite veinlets 0.5mm at 91.11m. Split Mudstone 93.59 to 93.63
93.87	93.91	MUDSTONE - coaly at top, sandy at base
93.91	96.38	SANDSTONE - fine grained, medium grey crossbeds trough moderately shallow, vertical burrows filled with same Sandstone, calcareous
96.38	97.12	SANDSTONE with MUDSTONE laminae Sandstone is fine grained medium grey, calcareous Several small worm burrows 2mm x < 6mm vertical and horizontal.
97.12	97.97	MUDSTONE with very fine grained Sandstone laminae Sandstone is calcareous Mudstone brown - dark grey
97.97	98.13	MUDSTONE - very dark brownish-black.

HOLE*

WCC-80-3

From 98.13

To 103.98

FROM	TO	DESCRIPTION
98.13	98.32	MUDDY SILTSTONE - massive non calcareous dark brown.
98.32	98.74	MUDDY SANDSTONE Sandstone is fine grained pale grey to medium brownish grey Muddy laminae to 98.19, convoluted bedding below this.
98.74	98.93	SILTY MUDSTONE - dark brown-grey, slightly calcareous
98.93	98.99	MUDDY SANDSTONE - massive medium brown-grey calcareous
98.99	99.11	SANDSTONE with muddy laminae, increasing towards base Calcareous Sandstone is fine grained pale to medium grey, brown where muddy.
99.11	99.48	SILTY MUDSTONE dark grey Calcareous coaly streaks 0.4mm thick
99.48	100.17	SANDSTONE AND MUDDY SILTSTONE - well mixed in convoluted bedding. Sandstone is fine grained, very pale grey, calcareous Laminae in middle show up to 75° to C/A
100.17	100.43	MUDDY SILTSTONE - dark brown-grey massive. Slightly calcareous, some small sandy blebs.
100.43	100.90	SANDSTONE fine grained, pale to medium grey, massive to faintly cross bedded, calcareous.
100.90	100.96	MUDDY SILTSTONE - massive dark brown-grey, slightly calcareous.
100.96	101.04	SANDSTONE - medium grained, salt and pepper, two very very thin .3mm calcite veinlets 80° to C/A.
101.04	102.41	VERY MUDDY SILTSTONE with Sandstone laminae Sandstone is calcareous, fine grained, very pale grey.
102.41	102.98	MUDSTONE - massive dark grey
102.98	103.56	MUDDY SILTSTONE - dark brown-grey, very slightly calcareous where more silty. .1mm very very thin calcite veinlets (shells) band 2mm at 103.30 individuals also throughout.
103.56	103.98	MUDDY SILTSTONE and very fine grained Sandstone Sandstone increases towards base is very pale grey and calcareous. Mudstone dark brown grey.

FROM	TO	DESCRIPTION
103.98	104.03	SANDSTONE - fine grained salt and pepper, calcareous medium chips at base.
104.03	104.12	MUDSTONE with Sandstone blebs, slightly calcareous.
104.12	104.21	SANDSTONE - fine grained and medium salt and pepper, crossbeds shallow interbedded troughs Muddy laminae up to 1cm at base
104.21	104.52	SANDSTONE - medium grained salt and pepper, calcareous 104.26 to 104.34 Mud and Siltstone chips 1.5cm x .1cm to 1.6cm x .5cm Calcite shelly bands or wavy veinlets .2mm thick. Muddy blebs 6cm x 2cm
104.52	104.69	SANDSTONE very fine grained, medium grey calcareous Muddy laminae Crossbeds trough shallow up to 45 Several individual calcite shells or wavy veinlets parallel bedding.
104.69	105.50	SANDSTONE - salt and pepper, medium grained coarsens slightly downward, Calcareous. 105.16 to 105.24 Mudstone and Siltstone chips up to 1.6cm x .5cm.
105.50	106.14	SANDSTONE very fine grained, Mudstone and Siltstone interlaminated, Sandstone medium grey. Mudstone dark grey Siltstone dark medium grey Slightly bioturbated, bedding ~85° to C/A. Vertical worm burrows Paly #6, 106, .11 to 106.14. towards base Muddier
106.14	106.85	COAL - 0.71 metres thick, Ro #11, 3 EST #5, Reg. #5 Pyrite band up to 1.2cm thick at 106.18 not a solid band. 50% shiny black cleated to conchoidal fracture 50% metallic grey cleated to conchoidal fracture. All moderately soft, occasional muddy blebs 1mm x 2mm
106.85	106.88	MUDSTONE - dark grey, massive non-calcareous.
106.88	106.92	MUDDY SILTSTONE -calcareous, medium-dark grey

FROM	TO	DESCRIPTION
106.92	106.96	SANDSTONE very fine grained pale grey calcareous, slightly muddy
106.96	107.01	MUDDY SANDSTONE very very fine grained, laminae of darker grey and medium grey
107.01	107.05	SANDSTONE pale grey, very fine grained, few muddy streaks
107.05	107.74	MUDDY SILTSTONE - very calcareous, medium grey
107.74	108.08	MUDSTONE with silty calcareous bands, siltier towards base, dark grey in colour
108.08	108.42	SANDSTONE, MUDDY SANDSTONE AND MUDDY SILTSTONE inter-laminated and interbedded. Sandstone is fine and medium grained interlaminated, pale to medium grey. All of unit is very calcareous, slightly bioturbated.
108.42	108.57	SANDSTONE pale grey, fine grained Calcareous, bedding 60° to 75° to 86° to 90° to C/A.
108.57	109.41	SANDSTONE AND MUDSTONE AND SILTSTONE interlaminated and interbedded. Sandstone is fine grained pale to medium grey Mudstone is dark brown-grey Siltstone medium grey, very shallow trough crossbeds very small vertical and horizontal crossbeds 2mm x 5mm All calcareous.
109.41	109.91	MUDSTONE with pale grey Siltstone laminae, very small burrows horizontal and vertical up 20 1mm x 2mm.
109.91	110.05	MUDSTONE massive dark brownish grey.
110.05	110.14	COAL - 0.09 metres thick Ro #12 40% black shiney cleated, soft 60% metallic grey, moderately hard.
110.14	110.29	Very Muddy Siltstone - massive dark grey slightly calcareous
110.29	110.47	MUDDY SANDSTONE - very very fine grained, well mixed
110.47	111.80	SANDSTONE - pale grey to medium grey, muddy beds and laminae, very calcareous, crossbeds planar and trough shallow. Fractures from 111.17 to 111.52 at 88° to C/A lined with calcite crystals.

HOLE# WCC-SO-3From, 110.47 To 118.81

FROM	TO	DESCRIPTION
110.47	111.80	10° to C.A with slight calcite, fine to medium grained coarsens downwards.
111.80	112.56	SANDSTONE, SILTY MUDSTONE AND MUDDY SILTSTONE - interbedded Sandstone medium grey Siltstone and Mudstone dark grey All calcareous Sandstone is crossbedded shallow troughs Calcite veinlet at 83° to C/A at 112.56 2mm thick.
112.56	113.94	INTERBEDDED MUDDY SILTSTONE AND SILTY MUDSTONE Carbonaceous at base Palyn #7 113.92 to 113.94
113.94	114.07	COAL - 0.132 metres thick Ro#13 metallic cleated and conchoidal fracture moderately hard.
114.07	114.46	SILTY MUDSTONE - dark grey
114.46	114.61	CARBONACEOUS MUDSTONE - dark brown black.
114.61	114.66	SILTY MUDSTONE - dark grey brown
114.66	114.98	SANDSTONE AND MUDDY SILTSTONE Convoluted bedding, Sediment Sample #8 Sandstone is fine grained, very pale to pale grey worm burrow 3cm x 0.3cm.
114.98	115.23	SILTY MUDSTONE - dark grey brown, worm burrows 3cm x 0.3cm, Sandstone slightly calcareous.
115.23	115.67	MUDDY SILTSTONE with sandy blebs mixed in fine grained pale grey, calcareous.
115.67	116.81	SANDSTONE - fine grained, interbedded and interlaminated also some silty mudstone laminae.
116.81	117.98	MUDSTONE with Siltstone laminae dark brown-grey, black towards base, Pyritized Siltstone laminae, Sediment Sample #9 Worm burrow cuts through laminae below and into pyrite band and also pyritized in this band. 1cm coal band at 117.96.
117.98	118.81	Sandstone white to medium grey where muddy trough crossbeds shallow medium grained. Muddy bed 117.52 to 117.61 = Mudstone, Muddy Siltstone and fine grained Sandstone mixed.

HOLE# WCC-80-3

From 117.98 To 125.89

FROM.	TO	DESCRIPTION
117.98	118.81	Sandstone below to 117.72 not crossbedded
(Continued)		Muddy again to 118.81?
		Several burrows horizontal up to 4mm x 2mm
118.81	119.15	SILTY MUDSTONE, MUDDY SILTSTONE AND SANDSTONE - interbedded and interlaminated, some laminae mostly well mixed convoluted, slightly calcareous
119.15	120.10	Sandstone - fine grained and medium grained interbedded trough crossbeds shallow, large 6cm wide and small 2cm wide fine grained is medium grey, medium grained very pale few mafics scouring by medium grained Sandstone, Sediment Sample #10 Also some muddy laminae, Medium grained Sandstone often erodes underlying Muddy Sandstone irregularly, slightly calcareous
120.10	120.61	MUDDY SILTSTONE with very fine grained Sandstone blebs 1mm ² to 3.5cm x .5cm
120.61	122.39	MUDSTONE massive dark brown-grey Silty at top, sandy at base
122.39	122.79	SANDSTONE and MUDDY SILTSTONE interbedded and inter- laminated in convoluted bedding, few burrows vertical 2cm x .7cm Sandstone is fine grained, very pale grey, calcareous. Muddy Siltstone is slightly calcareous, dark brown
122.79	123.98	MUDDY SILTSTONE convoluted with Sandstone blebs - calcareous Sandstone is fine grained pale grey, very muddy at top.
123.98	125.15	SANDSTONE with Silty Mudstone laminae increasing to beds towards base Sandstone is fine and medium grained interbedded trough and planar crossbeds shallow, very pale to pale grey to medium grey where muddy very calcareous vertical burrows 1mm ² x 6cm x .3cm
125.15	125.89	MUDSTONE with Sandstone laminae and blebs decreasing towards base. Mudstone is dark brown-grey, calcareous.

HOLE#

WCC-80-3

From 125.15

To 134.21

FROM	TO	DESCRIPTION
125.15	125.89	Sandstone is very pale grey, fine grained, calcareous continued
		Paly #7, 125.86 to 125.89.
125.89	126.04	COAL - 0.15 metres thick Ro. #1.4 Muddy with pyrite bleb 2.5cm x 1cm at top 3cm and Sandstone blebs .2cm x 1cm. 60% shiney black well cleated soft 40% metallic grey to shiney very dark grey, moderately hard, cleated.
126.04	126.19	MUDSTONE dark brown, coaly streaks \leq 1mm with calcite surrounding, very calcareous.
126.19	126.27	COAL and coaly Mudstone interbanded, Paly #8 Coal \leq 4cm thick, black shiney cleated
126.27	126.35	SANDY MUDSTONE - dark grey-black
126.35	127.49	SANDSTONE and Silty Mudstone and Muddy Siltstone interbedded. Sandstone is fine to medium grained salt and pepper Mudstone dark brown-grey. Small trough crossbeds shallow.
127.49	128.89	MUDSTONE - Silty with Sandstone laminae and blebs to 128.11 calcareous, was silty towards base. Coal band 4cm thick 128.70 to 128.74 shiney black and cleated. Coal bands .5 to 2cm thick at 128.81 and 128.88
128.89	129.07	MUDDY AND COALY SANDSTONE Sandstone is very fine grained, medium grey to dark brown, coaly streaks .1mm thick and bleb 1cm x 2cm
129.07	133.44	SANDSTONE - fine and medium grained interbedded, massive and crossbedded, interbedded pale to medium grey, calcareous, very very thin .2mm bands of carbonized plant fragments, few calcite veinlets 85° to C/A and 05° to C/A. \leq 4mm thick, some large 7cm wide planar crossbeds slight bioturbation. Vertical burrow 6cm x 1cm and smaller burrows horizontal 4mm ² . Muddy beds increasing towards base.
133.44	134.21	MUDSTONE, SANDSTONE, MUDDY SILTSTONE AND SILTY MUDSTONE interlaminated, much bioturbation, burrows vertical and horizontal 1cm x 1mm to 2.5cm x 1cm.

HOLE# WCC-80-3

From 133.44 To 140.36

FROM	TO	DESCRIPTION
133.44	134.21	Sandstone is pale grey, fine grained planar crossbedded calcareous, Mudstone is dark brown-black Siltstone brown-grey, calcareous
134.21	135.18	Dark brown Silty Mudstone with very very fine grained Sandstone to Siltstone laminae, pale grey, calcareous bedding ~ 90° to C/A.
135.18	135.41	Mudstone carbonaceous, very dark brown-black.
135.41	135.62	COAL - 0.21 metres thick Ro#15 60% shiney black well cleated, easily broke 40% metallic grey conchoidal fracture, moderately hard.
135.62	136.09	MUDSTONE massive dark brown-black
136.09	136.28	MUDDY SILTSTONE - dark brown grey, calcareous
136.28	136.65	SILTY TO SANDY MUDSTONE - calcareous Sandy blebs mixed in
136.65	136.84	MUDDY SILTSTONE - Calcareous, dark brown-grey
136.84	137.38	SANDSTONE with a couple of Mudstone beds 2cm to 6cm thick. Sandstone is pale to medium grey fine grained, calcareous Muddy towards base, calcite veinlets at base .1mm thick
137.38	137.85	CARBONACEOUS MUDSTONE - Sandy at top
137.85	138.06	COAL - 0.21 metres thick, Ro#16, metallic grey to black, moderate hard claro-durain, little vitrain.
138.06	138.10	VERY COALY MUDSTONE
138.10	138.25	MUDDY SANDSTONE - calcareous fine grained, pale to medium brown-grey worm burrow 5cm c 0.5cm.
138.25	138.53	MUDDY AND SANDY SILTSTONE - calcareous dark brown-grey.
138.53	138.74	SANDSTONE -pale to medium grey, fine grained, calcareous muddy laminae
138.74	140.36	MUDSTONE - dark grey brown and calcareous to 139.53 brown-black and non calcareous to 139.67, Silty laminae very calcareous to 139.80, dark grey brown and calcareous to 140.19, brown-black, non calcareous and sandy to 140.36

HOLE#

WCC-80-3

From 140.36 To 147.76

FROM	TO	DESCRIPTION
140.36	140.92	SANDSTONE, moderately calcareous, very pale grey, fine grained, carbonaceous streaks and calcite veinlets .4mm thick $\leq 5^\circ$ to C/A.
140.92	141.18	MUDDY SANDSTONE - pale grey, fine grained Sandstone with Muddy laminae and blebs moderately mixed, slightly calcareous.
141.18	144.44	SANDY MUDSTONE - dark grey brown, Mudstone with sand mixed in and Sandstone laminae and beds $\sim 15\%$ of unit Sandstone is pale grey fine grained, calcareous Mudstone is calcareous where sandy, Mudstone is not sandy and is dark brown-black from 143.58 to 144.00. Mudstone is very sandy, almost to muddy Sandstone from 144.27 to 144.44.
144.44	145.40	MUDSTONE - Carbonaceous increasing towards base to very coally Mudstone, Paly #9
145.40	145.60	COAL - 0.20 metres thick, Ro #7, 145.40 to 145.44 clarodurain, dark grey, conchoidal fracture, very hard. 145.44 to 145.60 dull to shiney black 20% cleated, soft 25% very hard 5% fusain, very dull black gritty
145.60	146.02	CARBONACEOUS MUDSTONE - Dark brown-black, coally at 145.72, 2cm coal band, black, shiney cleated. Calcite veinlet .5mm thick at 145.97m
146.02	146.11	SILTY MUDSTONE - massive dark brown-grey
146.11	146.23	SANDY MUDSTONE - massive, calcareous
146.26	146.96	SANDSTONE - massive medium grained salt and pepper Muddy laminae up to 2cm thick at top and base, burrows of sand in mud horizontal. Calcareous occasional mud chips 1cm x .5cm.
146.96	147.76	VERY FINE, FINE GRAINED AND MEDIUM GRAINED SANDSTONE - Mudstone and Siltstone interlaminated, medium grained Sandstone is massive, calcareous, fine grained to very fine grained. Sandstone is in shallow trough crossbeds, Calcareous, Mudstone is dark brown black Siltstone is dark brown-grey calcareous. Section is less sandy, more muddy towards base.

FROM	TO	DESCRIPTION
147.76	148.73	SILTY MUDSTONE - dark brown grey Mudstone with Siltstone laminae decreasing towards base, carbonaceous dark brown black at base.
148.73	150.18	SILTY MUDSTONE - calcareous, well mixed up to 149.42. Silty laminae and blebs slightly convoluted up to 150.18.
150.18	150.67	VERY FINE GRAINED SANDSTONE, FINE GRAINED SANDSTONE, MUDDY SILTSTONE AND SLIGHT MUDSTONE INTERLAMINATED. Sandstone is pale grey to medium grey, planar crossbeds shallow and small at base 1cm tall x 2cm wide. Small ripple marks seen in muddy laminae, all calcareous bedding appear ~ horizontal.
150.67	151.64	SANDSTONE - fine grained, medium grey, very calcareous, small scale plunging ripple marks, few muddy laminae increasing towards base. Shallow planar trough crossbeds, slight bioturbation, burrows up to 4cm x 1cm.
151.64	153.81	MUDSTONE, MUDDY SILTSTONE, VERY FINE GRAINED SANDSTONE interlaminated, calcareous, Sandstone is pale grey, crossbedded in shallow troughs bedding is moderately mixed by bioturbation and currents bedding is ~ horizontal.
153.81	154.14	SILTY-MUDSTONE Mudstone is dark brown-black with calcareous Siltstone laminae
154.14	154.50	VERY COALY MUDSTONE - Black very hard massive. Palv #10
154.50	155.63	COAL - 1.13 metres thick, #R0, 2 FSI #6, Req #6 25% shiney black cleated soft. 75% metallic grey, very hard.
155.63	155.79	COALY MUDSTONE - black massive
155.79	155.85	SANDSTONE very pale grey, fine grained, laminae disturbed by carbonized plants fragments vertical in section $\leq .5\text{mm}$ thick.
155.85	156.37	MUDSTONE - dark brown black massive
156.37	156.59	MUDDY SANDSTONE - well mixed due to currents
156.59	158.14	SANDSTONE - wale grey, fine to medium grained, files upward, trough crossbeds shallow, $\leq 1\text{mm}$ coaly and

HOLE+

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From 156.59

To 162.65

FROM	TO	DESCRIPTION
156.59	158.14	< 1cm muddy laminae to 157.04, burrows and bioturbation to 157.04 also calcareous.
(Continued)		
158.14	158.94	MUDSTONE - Silty to 158.33 laminae burrows and blebs and above 158.74, calcareous above 158.74
158.94	159.32	SANDSTONE and MUDDY SANDSTONE to varying degrees slight muddy Siltstone.
		Much bioturbation and current mixing vertical burrows, 1mm ² to 1cm ² , very calcareous.
159.32	159.59	MUDDY SILTSTONE with convoluted bedding and a clump 8cm x 4cm of Sandstone which looks like it has been rolled into the muddy Siltstone, both very calcareous Sedimentary structure sample #1, 159.47 to 159.57.
159.57	159.70	SANDSTONE with Mudstone and muddy Siltstone laminae very calcareous, moderately bioturbated - still recognize bedding as v horizontal Sandstone is fine to medium grained, interlaminated slightly crossbedded.
159.70	159.76	MUDSTONE - slightly silty, very calcareous, burrow from upper sand layer and totally enclosed in Mudstone 1cm x 0.3cm.
159.76	159.90	SANDSTONE and Muddy Sandstone and Muddy Siltstone interlaminated, fine grained, pale grey, calcareous.
159.90	160.04	MUDSTONE dark brown-grey, very calcareous
160.04	160.32	SANDSTONE, MUDDY SILTSTONE AND MUDSTONE - Interlaminated and mixed due to bioturbation and current mixing very calcareous.
160.32	161.90	MUDSTONE - dark brown-black, silty and calcareous to 160.58, silty bands near base
161.90	162.28	SANDY MUDSTONE - dark grey-brown, slightly calcareous Sandstone is very pale grey, fine grained at top, well mixed to bottom.
162.28	162.65	SANDSTONE with Mudstone and silty Mudstone laminae Sandstone is pale to medium grey, fine to medium grained, calcareous; Silty Mudstone dark brown, Mudstone brown black slight current mixing and bioturbation medium planar crossbeds. 1.5cm wide x .6cm tall.

HOLE* _____

From 162.65 To 167.33

FROM	TO	DESCRIPTION
162.65	164.36	MUDSTONE - above 163.62 very hard and carbonaceous sandy at base.
164.36	164.63	SANDSTONE - fine grained and medium grained interbedded and laminated, very pale to pale to medium grey, very calcareous. Muddy at top and carbonaceous, coaly streaks .1mm thick. Slight bioturbation, vertical burrow 7cm x 3mm
164.63	164.66	SILTY MUDSTONE - medium brown very calcareous
164.66	164.77	SANDSTONE - massive to very faintly crossbedded, salt and pepper medium grained
164.77	165.14	SANDSTONE - contact bedding & horizontal fine grained pale grey to medium grey interlaminated (where muddy) Coaly streaks .2mm x 1 to 3cm carbonaceous slickensides at 164.88 with calcite crystals on fracture surface at 65° to C/A, very calcareous, bioturbated at base, carbonaceous slickensides and calcite also at 164.98 Muddy towards base below 165.00
165.14	165.46	SILTY MUDSTONE - dark grey-brown Mudstone with Siltstone laminae, very slightly calcareous.
165.46	165.50	MUDSTONE - dark brown-black to black, below 166.03 also sandy below.
166.50	166.67	SANDSTONE very calcareous, fine grained pale to medium grey where muddy convoluted bedding creating an S fold from 166.54 to 166.58 cut off at top
166.67	166.78	SANDSTONE and SILTY MUDSTONE interlaminated Sandstone is fine grained, pale grey Mudstone is dark brown-black, calcareous Vertical burrows 1cm x 2mm, small ripple marks coaly streaks 1mm x 1cm.
166.78	166.96	SANDSTONE - very calcareous, very pale to pale grey, fine grained massive with faint muddy bands, coaly streaks 0.1mm x 3mm
166.96	167.33	SANDSTONE and SILTY MUDSTONE and MUDSTONE - interlaminated, very calcareous, bedding horizontal, vertical burrows 1.5cm x 2mm Sandstone is fine grained, pale grey Mudstone dark brown grey to black.

FROM	TO	DESCRIPTION
167.33 (Continued)	167.86	MUDSTONE WITH SILTSTONE laminae down to 167.63, dark brown black at base, dark grey where silty and calcareous
167.86	168.00	SANDSTONE very calcareous, pale grey fine grained, Muddy laminae 1-2mm thick, coaly streak 1mm x 1cm
168.00	168.08	MUDSTONE - dark brown grey.
168.08	168.43	SANDSTONE very calcareous, fine grained pale grey, muddy laminae 1-2mm thick, planar crossbeds, slight bioturbation.
168.43	168.69	SILTY MUDSTONE - very calcareous, mostly massive dark grey-brown, mostly massive dark grey-brown, few Sandstone blebs and burrows 3cm x 1mm
168.69	168.84	SANDSTONE, MUDDY SANDSTONE, SILTY MUDSTONE - inter- laminated, very calcareous, moderately bioturbated vertical and horizontal burrows usually .1m ²
168.84	169.12	MUDSTONE - dark brown-grey, slightly silty, carbonized plant debris on bedding planes horizontal.
169.12	169.31	MUDDY SILTSTONE - Calcareous, well mixed, dark brown grey.
169.31	169.79	MUDSTONE massive dark brown grey, slightly silty calcareous
169.79	170.07	COALY MUDSTONE - dark brown-black coaly streaks \leq 1mm x 1cm.
170.07	170.11	SANDY MUDSTONE - dark brown massive, very slightly calcareous, calcite veinlet .1mm.
170.11	170.20	SANDSTONE AND MUDDY SANDSTONE at base and Sandy Mudstone interlaminated calcareous. Sandstone is pale grey to medium grey, fine grained, bioturbated sand into mud laminae burrows horizontal and vertical. 1.5cm x 0.5cm 2.5cm x 0.75cm.
170.20	170.39	SANDSTONE - very calcareous, very pale grey, faint trough crossbeds pale to medium grey where slightly muddy, carbonaceous slickensides 60° to C/A, pyrite in carbonaceous band calcite on top of slickensides.

HOLE*

WCC-80-3

From 170.39 To 173.79

FROM	TO	DESCRIPTION
170.39	170.59	SANDY MUDSTONE - dark brown black, 3cm Sandstone band at top, rest is massive sand well mixed in Mudstone.
170.59	170.71	SANDSTONE - very calcareous, very pale grey fine grained, muddy laminae and blebs at base and top, extreme bioturbation burrows up to 5cm x 2cm vertical several horizontal 0.8cm ² .
170.71	170.74	VERY SANDY MUDSTONE - slightly calcareous burrows.
170.74	170.82	SANDSTONE and MUDDY SILTSTONE - interlaminated Sandstone is pale grey, fine grained calcareous, several burrows vertical and horizontal up to 1.5cm long.
170.82	170.91	SANDSTONE, MUDDY SILTSTONE AND MUDSTONE - extremely mixed by bioturbation and convoluted bedding, carbonaceous bands, very very thin 0.2mm burrows 8cm long 1cm wide, Sedimentary structure Sample #2, Calcareous.
170.91	171.21	SANDSTONE - medium grained very pale grey, with muddy Siltstone bands, laminae, extremely bioturbated, large sand clumps in Muddy laminae, several small burrows 1cm x 1mm, very calcareous.
171.21	171.33	MUDDY SILTSTONE and SANDSTONE interbedded and laminated but bioturbation has mixed. Sandstone is pale grey to medium grey where muddy fine grained, calcareous, Muddy Siltstone dark brown-grey
171.33	171.79	SILTY MUDSTONE - dark brown-grey, few laminae and tiny blebs mostly massive, burrow 7cm long x .3cm
171.79	171.99	SANDSTONE very calcareous, fine grained, pale grey, shallow trough crossbeds Coal chunks 9cm x 0.4cm, shiny black soft.
171.99	172.32	SILTY MUDSTONE with very very fine grained Sandstone laminae and small blebs, very calcareous.
172.32	172.52	MUDSTONE - massive, very slightly calcareous.
172.52	173.13	SANDSTONE and MUDDY SANDSTONE in convoluted bedding, pale to medium grey, fine grained very small to 2cm x .5cm sandy Mudstone chips possible slight bioturbation.
173.13	173.79	SANDSTONE, MUDDY SILTSTONE AND SILTY MUDSTONE - interlaminated.

FROM	TO	DESCRIPTION
173.13	173.79	Sandstone decreases and Mudstone increases towards
(Continued)		base.
		Sandstone is salt and pepper, fine medium grained and
		medium grey fine grained, very calcareous, few planar
		crossbeds, few small vertical crossbeds \leq 1cm long
		\leq 2mm wide.
173.79	174.35	SILTY MUDSTONE - very calcareous, Siltstone blebs 1mm x
		2mm and laminae 2mm thick, burrow 2cm x 0.4cm wide
		of slightly calcareous Sandstone enclosed in Mudstone.
174.35	174.68	COAL - 0.33 metres thick, Ro#19
		2cm Mudstone split at 174.55 to 174.57
		90% shinev black well cleated soft vitrain.
		10% muddy blebs and claro-durain. metallic grey hard
174.78		VERY COALY MUDSTONE - dark brown-black. bands of 0.5 cm
		or less coal shinev black cleated.
174.77	174.84	SILTY MUDSTONE - Siltstone laminae and silt mixed in.
174.84	175.02	MUDSTONE, SILTSTONE, very very fine grained Sandstone,
		Interlaminated.
		Mudstone is very dark brown black and is predominant
		but decreases towards base.
		Sandstone and Siltstone are medium grey, slightly cal-
		careous calcite veinlets .1mm thick occur throughout.
		70° to 90° to C/A.
175.02	175.07	MUDSTONE and very fine grained Sandstone interlaminated
		Sandstone slightly calcareous, carbonaceous laminae
		.1mm thick, horizontal, slight bioturbation very small
		burrows.
175.07	175.30	SANDSTONE slightly calcareous; medium grey fine grained
		coaly streaks 2mm thick
		Mudstone laminae and bands moderate bioturbation
175.30	175.34	VERY COALY MUDSTONE dark brown with coal bands \leq 1cm
		thick shinev black cleated. Palv #11.
175.34	175.40	COAL - 0.06 m thick. Ro #20.
175.40	175.85	MUDSTONE dark brown black, coaly streaks .2mm thick
		calcite veinlets .2mm thick horizontal

HOLE* WCC-80-3From 175.85 To 180.34

FROM	TO	DESCRIPTION
175.85	176.25	VERY SILTY MUDSTONE - massive dark brown grey calcareous
176.25	176.56	SANDY.MUDSTONE very calcareous with Sandstone blebs and laminae.
176.56	177.38	SANDSTONE with Muddy Sandstone mixed in, very calcareous convoluted and bioturbated Sandstone is very pale grey to medium grey, fine grained
177.38	177.78	VERY SILTY MUDSTONE - calcareous Siltstone well mixed in and in blebs very small coaly streaks and blebs 1mm thick.
177.78	177.88	COAL - 0.10 metres thick Ro#21, 60% bottom part shinev black well cleated, vitrain 40% top part metallic grey hard cleated.
177.88	178.71	MUDSTONE dark brown-grey, very slightly silty and calcareous increasing calcareous towards base.
178.71	178.98	COALY MUDSTONE - black, coaly bands 1mm to 1cm thick, shiney black cleated.
178.98	179.36	SILTY MUDSTONE dark brown-grey, very calcareous, coal from root or wood chunk. 21cm long up to 1.3cm wide at 20° to C/A in middle of Mudstone.
179.36	179.65	MUDDY SANDSTONE - Mud decreases towards base, very calcareous Sandstone is pale grey to brown, fine grained
179.65	179.85	SANDSTONE very calcareous, very pale grey, fine grained to medium grained, Muddy laminae increasing towards base, very small trough crossbeds, medium grained salt and pepper Sandstone band at base 0.6cm thick.
179.85	180.02	MUDDY SILTSTONE, MUDSTONE, SANDSTONE interbedded and interlaminated, horizontal burrows 3mm x 2mm trough crossbeds, all very calcareous, bedding 85° to C/A
180.02	180.34	SANDSTONE very calcareous, fine grained pale to medium grey, massive. several calcite veinlets ~ 1mm thick in top 4cm.

FROM	TO	DESCRIPTION
180.02	180.34	Convolutd bedding at base 180.29 to 180.34, Sediment (Continued) Sample #3. Sandstone and Muddy Sandstone.
180.34	180.39	SILTY MUDSTONE very calcareous
180.39	181.12	MUDSTONE, very fine grained, Sandstone and Muddy Siltstone interlaminated, very calcareous Sandstone is very pale to pale grey, trough crossbeds, ripple marks bioturbation burrows are small horizontal 2mm ²
181.12	181.46	MUDSTONE with Siltstone and very very fine grained Sandstone laminae and blebs. Mudstone is dark brown-black Siltstone and Sandstone is pale grey, all very calcareous
181.46	181.57	CARBONACEOUS MUDSTONE - black with few Sandstone laminae and burrows. Sandstone is slightly calcareous, very fine grained, very pale grey.
181.57	181.62	COAL - 0.05 metres thick Ro #22 50/50 shiney black cleated vitrain, metallic grey, hard claro-durain.
181.62	182.80	MUDSTONE -silty, increasing towards base, coaly at very top.
182.80	185.36	SANDY MUDSTONE AND MUDDY SANDSTONE - mixed and inter- bedded in convoluted bedding. Sandstone is very fine to fine grained, all very calcareous and pale to medium. Slight bioturbation is also evident.
185.36	185.45	SANDSTONE - very calcareous, very pale grey, very fine grained trough crossbedded.
185.45	185.65	VERY FINE GRAINED SANDSTONE, SILTSTONE, MUDDY SILTSTONE AND MUDSTONE - interbedded and interlaminated, calcareous Sandstone is very pale grey, Siltstone pale medium grey, Mudstone brown-grey, slightly bioturbated.
185.65	185.76	SANDSTONE - very calcareous, very pale grey to white fine grained, muddy laminae .2mm.
185.76	187.44	SILTY MUDSTONE, MUDDY SILTSTONE, SANDSTONE, AND MUDDY SANDSTONE interbedded and interlaminated, slight planar crossbedding, predominantly Muddy Siltstone and silty Mudstone medium grey current mixed carbonized plant debri

HOLE+

WCC-80-3

From 185.76 To 196.89

FROM	TO	DESCRIPTION
185.76 (Continued)	187.44	Silty Mudstone chips below 187.08 increasing silty towards base.
187.44	188.70	SILTSTONE - medium brown-grey, very calcareous laminae of salt and pepper medium grained Sandstone 2mm thick at 188.40, few other medium grained Sandstone laminae slickensides and calcite at 75° to C/A at 188.60 carbonaceous and calcite veinlet 0.6cm, burrow 3cm x 0.5cm.
188.70	188.82	MUDSTONE - dark brown-black, Sandstone at top.
188.82	188.95	SILTSTONE medium brown-grey, very calcareous.
188.95	189.17	MUDSTONE dark brown black, with Sandstone laminae Sandstone is medium grained salt and pepper and fine grained pale grey, large burrows 4cm x 1.5cm.
189.17	196.70	SANDSTONE massive, slightly coarse to medium grained salt and pepper, high quartz to bands of white very high quartz. Mudstone clasts and laminae and coaly laminae \leq 1mm thick stylolitic carbonaceous bands 1 to 3mm thick at Sediment Sample #4. 189.98 to 190.06 only slightly calcareous to 191.48 very calcareous to 194.72 slightly calcareous to 196.46 very calcareous to 196.70 Faint bedding appears to be at 70° to C/A. Sandstone is slightly coarse at top, becomes medium to fine grained, from 193.00 to 194.46. Calcite veinlet at 80° to C/A at 193.38 faulting between 193.95 and 194.17 fracture at 40° to C/A. Calcite veinlets .5mm thick at 05° to C/A to 90° to C/A. Carbonaceous slickensides at 65° to C/A at 194.17. Sandstone becomes granular and includes mudclasts and coaly streaks up to 3mm thick from 196.36 to 196.53. Clasts up to 1cm ² sandstone grains up to 1mm ² .
196.70	196.89	MUDDY SILTSTONE, VERY FINE GRAINED SANDSTONE AND MUDSTONE, interbedded and interlaminated, convoluted at base.

HOLE+

WCC-80-3

From 196.89 To 206.00

FROM	TO	DESCRIPTION
196.89	196.96	SANDSTONE fine grained, very pale grey carbonaceous streaks 1mm thick, slightly calcareous, muddy laminae 1mm to 1cm.
196.96	197.04	SANDSTONE and MUDDY SANDSTONE - interbedded micro faults displacement 3mm on each block between laminae in a set of 5 blocks bioturbated at top.
197.04	197.28	MUDSTONE dark brown-black with Siltstone and very fine grained Sandstone laminae and blebs and burrows up to 4cm x 2cm.
197.28	197.81	MUDSTONE black, silty at top, Paly #12.
197.81	198.44	COAL - 0.63 metres thick, Ro#23, 2 FSI #7, Reg. #7 90% hard metallic grey slightly cleated to conchoidal fracture 10% shiney black claro-durain, well cleated - vitrain
198.44	198.81	MUDSTONE dark brown grey, very slightly silty.
198.81	199.53	MUDDY SILTSTONE, very fine grained Sandstone and Mudstone interlaminated Sandstone calcareous, slight crossbeds most bedding horizontal.
199.53	202.94	SANDSTONE - very calcareous, pale grey fine grained, grades downward into medium grained salt and pepper by 201.20. Crossbedded in troughs almost width of core - mudclasts 4.5cm x 1.2cm.
202.94	203.36	MUDSTONE - dark grey to black, silty at top.
203.36	203.62	COAL - 0.26 metres thick, Ro#24, 85% very hard metallic grey, slightly cleated, claro-durain 15% shiney black well cleated vitrain.
203.62	203.71	COALY MUDSTONE - black bands up to 1.5cm of shiney black cleated vitrain.
203.71	205.72	SANDSTONE - very pale grey-white fine grained. Muddy Sandstone Muddy Siltstone - moderately bioturbated, calcareous.
205.72	206.00	MUDSTONE - black coaly at base.

HOLE#

WCC-80-3

From 206.00

To 213.88

FROM	TO	DESCRIPTION
206.00	206.13	COAL - 0.13 metres thick Ro#25
206.13	207.42	MUDSTONE - silty at coaly bands down to 206.42, calcareous where silty.
207.42	208.16	MUDDY SILTSTONE - Calcareous medium to dark grey, fine grained, very pale grey Sandstone blebs and laminae
208.16	208.61	SILTY MUDSTONE - medium to dark grey, few Sandstone blebs.
208.61	209.09	CALCAREOUS { Sandstone pale grey, very fine grained (Muddy Siltstone Mudstone - interbedded and interlaminated extreme bioturbation vertical burrows.
209.09	209.25	MUDDY SILTSTONE - dark grey.
209.25	209.42	MUDSTONE - black
209.42	209.69	COAL - 0.27 metres thick, Ro#26 65% metallic grey hard claro-durain, conchoidal fracture to cleated. 25% shiney black, well cleated vitrain 10% dull black gritty fusain
209.69	210.11	MUDDY SANDSTONE - very fine grained, medium grey Sandy Mudstone Mudstone brown-black, interlaminated and interbedded, slightly calcareous.
210.11	210.45	SANDSTONE - very calcareous, fine grained, pale grey to medium grey trough crossbeds 2cm wide, shallow hairlike calcite veinlets. Slightly Muddy.
210.45	213.65	SANDSTONE - very fine grained, pale grey trough crossbeds Mudstone Muddy Siltstone - interlaminated, small burrows 175cm x .2cm, very calcareous. Mudstone increases towards base to Silty Mudstone.
213.65	213.88	COAL - 0.23 metres thick, Ro#27 60% metallic grey hard claro-durain 40% shiney black cleated vitrain.

CORE DESCRIPTION

HOLE* W.C.C.-80-4 From 0.00 To 10.14m
 Area West Carbon Creek By J. C. Ridley

FROM	TO	DESCRIPTION
0.00	5.19	Overburden and broken bedrock
5.19	5.80	Sandstone - very calcareous, fine to very fine grained pale to medium grey, muddy laminae, slight cross beds Core well broken and Fe stained. Mudstone and Siltstone bands at base.
5.80	5.96	Coaly Mudstone and Coal. Core all broken here so hard to say how much of each. Coal pieces are metallic grey, hard, slightly cleated claro-durain.
5.96	7.49	Sandstone - calcareous pale grey very fine grained massive occasional coaly streaks .2mm thick. Increasing coaly and muddy streaks and laminae up to 1cm below 7.13m.
7.49	7.85	Siltstone and Mudstone - interlaminated. Siltstone pale grey slightly calcareous. Mudstone dark brown-black. 2 burrows 2-5cm x 4cm long and smaller ripple marks.
7.85	7.87	Coaly Sandstone-fine grained, pale grey to black.
7.87	7.96	Coal - 0.09 metres thick. Mostly shiny black well cleated - vitrain. Ro #1
7.96	8.17	Mudstone-dark grey Paly # 1
8.17	8.24	Coal - 0.07 metres thick Ro #2 Mostly very hard, metallic grey to black - one fracture surface.
8.24	8.54	Coaly Mudstone - medium grey silty at base. Coaly streaks 90° and 35° to C/A. Calcite veinlets with coal, ≤ .2mm thick.
8.54	8.63	Coaly Mudstone - bands of coal 1-2cm - shiny black cleated.
8.63	9.51	Siltstone - very very fine grained sandstone interbedded and mixed, medium grey, calcareous, blbe of sandstone from above, 1cm x 5cm.
9.51	9.61	Sandstone-massive, medium grained, salt and pepper, very calcareous.
9.61	10.14	Siltstone and very fine grained Sandstone - very calcareous

CORE DESCRIPTION

HOLE* W.C.C.-80-4 From 10.14m To 16.74m
 Area _____ By _____

FROM	TO	DESCRIPTION
9.61	10.14	Sandstone - pale to medium grey. Siltstone - medium grey. Very slightly muddy. Sandstone increases towards top. Burrows at top 1.5cm x 4cm.
10.14	10.52	Sandstone - very calcareous. Very pale grey-white, some mafics, massive to faintly bedded. Cross bedded from 90° to 70° to C/A. Calcite veinlet on carbonaceous slickensides 60° to C/A at 10.18m.
10.52	11.81	Siltstone, Sandstone and muddy Siltstone. Interbedded and interlaminated. Sandstone is very pale grey-white with darker laminae, cross beds-shallow troughs, fine grained, bedding up to 80° to C/A. Siltstone is medium grey, very calcareous. Some current mixing of beds. Burrows vertical ~ 1cm x .4cm
11.81	12.95	Silty Mudstone - calcareous, no silt between 11.86 and 12.29 and slightly darker colour, medium grey, brown in places. More calcareous where silty - burrows of sandstone within mudstone 1cm x .2cm
12.95	14.34	Muddy Siltstone with very very fine grained Sandstone laminae, medium grey - very pale grey, very calcareous, moderately bioturbated, burrows 1cm x .2cm Coaly streaks 0.5mm thick at top.
14.34	14.89	Mudstone - black to very dark brown. Silty band near top -6 cm thick, coaly streaks ≤ 1mm thick increasing towards top. Paly #2
14.89	15.21	Coal - 0.32 metres thick, Ro #3 only 67% recovery. 70% metallic grey, hard cleated to conchoidal fracture claro-durain 25% shiny black cleated - vitrain 5% dull black grainy fusain.
15.21	15.35	Mudstone - dark brown black, carbonaceous at top.
15.35	16.03	Silty Mudstone - dark grey, massive, slightly to very calcareous.
16.03	16.74	Muddy Siltstone, slightly muddy Sandstone,

HOLE#

W.C.C.-80-4

From 16.74m

To 22.36

FROM	TO	DESCRIPTION
		and silty Mudstone, interbedded. Very carbonaceous, Sandstone - fine grained, pale grey. Siltstone - medium grey, Mudstone - medium dark grey
		Very calcareous Sandstone fine grained, pale grey. Siltstone medium grey
		Mudstone medium dark grey.
16.74	17.07	Sandstone - very pale grey to medium grey where muddy. Fine grained, cross bedded troughs, vertical burrows 1cm x 2mm.
17.07	17.81	Siltstone and Silty Mudstone - interbedded, calcareous where silty, medium to dark grey. Little sandstone in blebs and burrows-horizontal .5cm ² decreasing towards base, very calcareous. Burrows 3cm x 0.3cm. Coaly streaks 1mm thick.
		Sandstone is fine grained pale to medium grey where moderately bioturbated, more massive towards base.
18.49	19.39	Muddy Sandstone and Sandstone mixed in convoluted bedding below 19.09.
19.39	19.59	Sandstone and muddy Sandstone interlaminated. Sandstone is very pale grey, fine grained, calcareous.
19.59	20.94	Sandstone - very calcareous - fine grained to medium grained, pale grey - salt and pepper, fines upward. Occasional mud clast 1.2cm and 0.4cm coaly laminae < 1mm thick. Often slickensided 90° to C/A. Mostly from 20.67 to 20.94 faint cross beds - mostly massive.
20.94	21.21	Sandstone - very fine grained, Siltstone, and Mudstone interlaminated and bioturbated to 21.07 - extremely convoluted and bioturbated 21.07 to 21.22 very calcareous. Coaly at 21.07.
21.21	21.30	Sandstone - very very fine grained, very pale grey, very calcareous, muddy laminae.
21.30	21.96	Mudstone - dark grey. Poly #3
		Silty at top in laminae.
21.96	22.36	Coal - 0.40 metres thick. Ro #4
		65% metallic grey, hard, conchoidal fractures, claro-durain.
		35% shiny black, well cleated, vitrain vitreous.

FROM	TO	DESCRIPTION
		Top 12cm mostly vitrain.
22.36	22.56	Mudstone - dark brown-black.
22.56	22.70	Muddy Sandstone laminae of very muddy and only slightly muddy, ripple marks.
22.70	22.83	Sandstone - very fine grained, pale to medium grey, slightly muddy bands, very calcareous.
22.83	23.74	Coaly Mudstone - dark brown-black, coaly streaks up to 4mm thick.
23.94	24.05	Muddy Sandstone - calcareous, very fine grained.
24.05	28.13	Sandstone - calcareous fine to fine medium grained, salt and pepper, high quartz, muddy at top. Calcite veinlet 40° to C/A. .5mm thick slightly lighter and darker bands, 24.86 to 25.10 core fractured in several directions with calcite coating. 25.34 to 25.75 Sandstone is fine grained, slightly muddy. Faint large planar cross beds but sandstone is mostly massive.
28.13	28.39	Mudstone-dark brown black, broken and mushy = fault gauge? Calcareous at 28.15 - Mudstone is calcareous in cracks.
28.39	28.56	Mudstone-black with Sandstone laminae, blebs and horizontal burrows up to 1.2cm x 0.7cm. Sandstone is very pale grey, fine grained, slightly calcareous.
28.56	28.69	Sandstone and Mudstone and Muddy Sandstone interbedded and interlaminated. Sandstone is very pale grey, fine grained, calcareous Mudstone is dark brown - coaly streaks 1mm thick - top 6cm very muddy.
28.69	29.11	Coal - 0.42 metres thick. Ro #5 80% metallic grey, very hard, cleated, claro-durain 20% very shiny black well cleated - vitrain.
29.11	29.26	Coaly Mudstone and Coal 0.04cm thick - shiny black well cleated vitrain.
29.26	29.57	Mudstone dark brown black - coaly streaks 1mm thick. Pyritized Siltstone band .8cm thick and pyrite nodule 3cm x 2cm at 29.74.'

HOLE#

W.C.C.-80-4

From 29.57

To 37.57

FROM	TO	DESCRIPTION
29.57	29.97	Sandy Mudstone, Muddy Sandstone, and Silty Mudstone interbedded and mixed, bioturbated and convoluted in bottom 10cm.
29.97	33.39	Sandstone-very calcareous, pale to medium grey, very fine grained, crossbedded. Large scale through entire core \geq 6cm wide trough and planar slightly muddy in places - few burrows.
33.38	33.95	Sandstone same as above - calcareous. Mudstone-black and medium brown-grey, calcareous, muddy sandstone-calcareous interbedded and interlaminated towards base. Several small burrows 1.3cm x 0.2cm.
33.95	34.04	Sandstone same as 29.97 to 33.39.
34.04	34.72	Sandstone very fine grained, medium grey, calcareous Mudstone-black. Muddy Siltstone-dark grey, calcareous, cross beds 85° to 90° to C/A, interbedded and interlaminated but extremely bioturbated down to 34.32, slight bioturbation below 34.32, trough crossbeds, carbonized plant debris, very sandy at base, very pale grey, fine grained calcareous.
34.72	35.26	Carbonaceous Mudstone - dark brown-black, massive, carbonized plant debris.
35.26	35.80	Sandstone-pale grey to white, fine grained, calcareous Muddy Sandstone-medium grey, calcareous. Sandy Mudstone-dark brown to black, very slightly calcareous, slightly bioturbated, interbedded.
35.80	36.81	Sandstone, pale grey, fine grained. Mudstone Muddy Siltstone Sandy Mudstone All mixed by convoluted bedding, all very calcareous.
36.81	37.14	Muddy Siltstone and Muddy Sandstone-mixed, calcareous. Coaly streaks up to .5cm thick but extend 26cm vertically in core.
37.14	37.57	Sandstone - very pale grey to white, fine grained Muddy Sandstone - dark brown, interbedded, very calcareous. Coaly streaks up to 0.5cm thick and 2cm long.

HOLE* W.C.C.-80-4From 37.57 To 45.13

FROM	TO	DESCRIPTION
37.57	38.00	Mudstone dark brown and black, coaly streaks up to 0.5cm thick horizontal through core.
38.00	38.12	Sandstone very fine grained, very pale grey, calcareous Muddy laminae and mixed in.
38.12	38.37	Muddy Sandstone and Muddy Siltstone mixed. Sandstone is medium grained, pale grey to brown. Siltstone medium brown, very calcareous.
38.37	39.31	Sandstone, Muddy Sandstone, Muddy Sandstone, Muddy Siltstone and slight Mudstone interbedded and interlaminated, all very calcareous. Sandstone predominates - very fine grained pale grey to salt and pepper with Muddy Siltstone and Mudstone laminae - trough cross beds, burrows vertical 9cm x 1cm calcite veinlet 3mm thick 85° to C/A at 40.18 Bottom 20cm = massive Sandstone all very calcareous,
40.38	41.62	Mudstone - medium grey to black interlaminated. Siltstone laminae and blebs decreasing towards base to 41.27 calcareous.
41.62	43.82	Sandy Mudstone - pale to medium grey fine grained. Muddy Sandstone Muddy Siltstone Mudstone dark brown black All very calcareous. All interbedded.
43.82	44.05	Sandstone and Mudstone mixed in convoluted bedding, very calcareous.
44.05	44.37	Sandstone - very calcareous, medium grained, very pale grey - white calcite veinlet 80° to C/A at 44.10, carbonaceous laminae at top.
44.37	44.71	Sandstone - very fine grained pale grey } Siltstone - pale to medium grey. } interlaminated Mudstone, very calcareous
44.71	45.13	Mudstone-dark brown and dark grey with silty laminae calcareous.

HOLE#

W.C.C.-80-4

From 45.13

To 50.21

FROM	TO	DESCRIPTION
45.13	46.58	Sandstone - fine grained medium grey and salt and pepper Muddy Siltstone - medium brown grey.
		Slightly silty Mudstone grey-black, interbedded and interlaminated, calcareous.
		Sandstone is crossbedded in shallow troughs, few burrows vertical 2-3cm x 0.2cm.
		Sandstone increases towards base.
46.58	47.59	Sandstone - fine to medium grained, fines upward. Muddy and coaly laminae down to 46.86. Crossbeds from 60° to 90° to C/A above 46.86 few calcite veinlets hairline thickness below 46.86. Sandstone is massive to very faintly corssbedded in troughs, very calcareous. Beds of Silty Mudstone from 47.15 to 47.30.
47.59	47.97	Sandstone - fine grained pale grey to salt and pepper. Siltstone Muddy Siltstone Mudstone - interlaminated, very calcareous, shallow trough crossbeds. Horizontal and vertical burrows up to 1cm x 1cm.
47.97	48.59	Silty Mudstone, calcareous grey black and brown inter- laminated with Siltstone laminae.
48.59	49.01	Mudstone dark brown black - 48.98 to very hard, few carbonaceous plant debris, few sandstone 49.01 fine grained blebs and laminae pyrite blebs 2.5cm x 1.2cm. Coaly streaks increasing towards base below 48.86 up to 0.5cm thick. Paly #4
49.01	49.31	Coal - 0.30 metres thick Ro #6 90% very hard metallic grey clar-durain 5% shiny black well cleated vitrain 5% dull black gritty fusain
49.31	49.78	Mudstone-dark brown to black, coaly down to 49.48. Hairline calcite veinlets 49.48 to 49.78
49.78	50.21	Sandstone-pale grey fine grained. Siltstone-pale brown. Muddy Sandstone - dark brown-grey.

FROM	TO	DESCRIPTION
50.21	50.60	Mudstone-dark brown-black, very hard.
50.60	50.85	Coal - 0.25 metres thick. Ro #7 80% shiny black cleated well, moderately soft vitrain 15% metallic grey very hard claro-durain 5% black dull gritty fusain.
50.85	50.90	Mudstone-dark brown black - very hard.
50.90	51.00	Mudstone with siltstone laminae, ripple marks show tops right side up.
51.00	51.49	Sandstone with Mudstone mixed in and coaly streaks. Sandstone is pale medium grey, fine grained, calcareous moderately bioturbated. Calcite veinlet 85° to C/A at 51.09 muddier towards base 51.33 to 51.49.
51.49	52.85	Sandstone - pale medium grey, fine grained, slightly calcareous, large scale (entire diameter of core) planar crossbeds, coaly at base with hairline calcite.
52.85	53.08	Coal - 0.23 metres thick around coal chunks. Ro #8 Mudstone dark grey-black, silty Mudstone band convoluted at base.
53.89	55.25	Sandstone very calcareous pale to medium grey, fine grained, shallow trough crossbeds. Muddy at top Muddy Siltstone Laminae at base
55.25	56.46	Mudstone-dark grey-black 70% core loss and medium brown bands with Siltstone and very very fine grained Sandstone laminae, Siltstone and Sandstone calcareous.
56.46	56.69	Muddy Sandstone and Sandy Mudstone-well mixed slightly convoluted.
56.69	56.93	Silty Mudstone-dark brown-black. Coaly streaks 2cm x 0.2cm Hairline calcite veinlets.
56.93	57.27	Sandstone and Muddy Sandstone interbedded. Sandstone is very calcareous, pale grey to medium grey, fine grained. Crossbeds 75° to 05° to C/A.

FROM	TO	DESCRIPTION
57.27	57.43	Mudstone-dark brown black
57.43	57.57	Siltstone - muddy at base
57.57	58.28	Sandstone - very calcareous, very fine grained to fine grained, moderately bioturbated, slightly muddy. Bottom 19cm massive.
58.28	61.57	Silty Mudstone. Sandstone fine grained very pale to pale grey Muddy Sandstone-dark brown Mudstone-dark brown-black
		Siltstone-medium brown. ^{All} Interbedded and interlaminated and mixed all very calcareous. Slight bioturbation and current mixing
61.57	62.40	Mudstone - very coaly from 62.15 to 62.40 bands up to 0.5cm thick, shiny black, cleated-vitrain, medium brown-grey to 62.15, dark brown black below.
62.40	62.48	Coal - 0.08 metres thick Ro #9 Only 40% recovery, all shiny black, well cleated
62.48	62.87	Coaly Mudstone dark brown-black Paly #5 Banks up to .7cm thick shiny, black, cleated-vitrain
62.87	63.01	Coal - 0.14 metres thick Ro # 10 Mostly all soft shiny black cleated vitrain.
63.01	63.06	Mudstone dark brown-black
63.06	63.97	Mudstone brown black, sandstone fine grained pale grey Silty Mudstone and Siltstone medium brown-grey Muddy Siltstone interbedded all very calcareous and current mixed, moderate bioturbation.
63.97	64.15	Mudstone dark brown-black massive
64.15	64.66	Mudstone pale medium brown-grey, silty towards base, very calcareous.
64.66	64.98	Siltstone and very very fine grained Sandstone interbedded, pale medium brown grey, calcite veinlets .5cm up to 0.4cm thick at 67° to 83° to C/A. 64.83 to 64.98
64.98	65.22	Mudstone pale medium brown grey sandy bands up to 0.5cm thick, very slight silt content in Mudstone, very calcareous.

HOLE* W.C.C.-80-4From 64.95To -74.77

FROM	TO	DESCRIPTION
		Several hairline calcite veinlets horizontal and carbonaceous streaks below 65.00
65.22	65.30	Mudstone, Muddy Siltstone and Siltstone mixed, very calcareous.
65.30	65.79	Sandstone, very fine grained, very pale grey. Mudstone-brown to black.
65.79	66.08	Siltstone-medium grey. Interlaminated very calcareous. Mudstone-very calcareous, dark grey, medium brown and medium grey, interlaminated. Few siltstone laminae very pale grey-white.
66.08	72.27	Mudstone - dark brown-grey to black and calcareous to 66.29 medium brown very hard band 66.29 to 66.32 fractured vertically 4mm bands. Hairline calcite fitting fracture, very slightly silty below 66.60 to 67.21 silty below 67.69 to 68.98 with a few calcareous sandstone laminae and sandstone mixed in convoluted bedding at 69.51 to 69.76.
		70.26 to 70.44
		Sandstone bed-pale grey, fine grained, very calcareous with mudstone laminae \leq 1cm and Mudstone mixed in, bioturbated.
		Calcareous sandy laminae in the Mudstone below this and sand in matrix increasing towards base
		Laminae: 40% of core from 71.87 to 71.06
72.27	74.40	Sandstone with Muddy Sandstone and Siltstone and Mudstone laminae extremely bioturbated, bedding \sim 85 $^{\circ}$ to 90 $^{\circ}$ to C/A.
		Sandstone is white to very pale grey, very fine to very very fine grained.
		Mudstone bed 73.66 to 74.05 with silty blebs.
74.40	74.77	Muddy Sandstone and Sandstone in convoluted bedding and extremely bioturbated.
		Sandstone is pale grey, very fine grained coaly streaks 1mm thick 3cm long few hairline calcite veinlets and coal streaks very muddy towards base.

FROM	TO	DESCRIPTION
74.77	74.81	Mudstone-very dark brown-black Paty #6
74.81	75.93	Coal - 1.12 metres thick total split 6 cm <u>Ro #11</u> Muddy streaks and band 1cm thick at 75.13 and 75.49 and split 75.53 to 75.57 = Mudstone.
74.81	74.88	metallic grey, very hard, conchoidal fracture - claro durain
		74.88 to 74.94 vitreous - shiny black very well cleated - vitrain.
		The rest is alternating bands of 13% vitrain 75% claro- durain, slight fusain 2%
		shiny black gritty coal and <u>Reg. #1</u> metallic grey waxy 10% <u>2-Fsi#1</u>
75.93	76.06	Coaly Mudstone black Coal - streaks 50% of core at top
76.06	76.23	Mudstone - dark grey-black
76.23	76.36	Muddy Coal - 0.12 metres thick, metallic grey-brown, very hard, muddy, claro-durain
76.36	76.66	Mudstone-dark grey black, several coaly streaks \leq 3cm long.
76.61	76.94	Coaly Mudstone - coal bands up to 1.5cm thick x diameter of core, black, shiny, cleated vitrain
76.94	77.53	Mudstone - dark grey-black, massive
77.53	77.57	Coal - 0.04 metres thick
		Metallic grey, claro-durain, pyrite band 2mm thick
77.57	78.12	Mudstone - dark brown black, coaly bank 0.8cm thick shiny black cleated vitrain at 77.72 Sandy towards base.
78.12	78.22	Siltstone - very very hard Scratches knife, medium brown grey, seems to be highly cemented with silica, very calcareous
78.22	80.02	Sandstone - very pale grey to white, few mafics and very slightly muddy in laminae. Fines upward, very calcareous shallow trough crossbeds, coaly streaks hairline to 2mm thick and slightly stylolitic where hairline. Beds of sandy mudstone and muddy sandstone mixed 78.31 to 78.45 and 73.56 to 73.59.

HOLE* WCC-80-4From 80.02 TO 99.18

FROM	TO	DESCRIPTION
80.02	80.60	Sandstone-very slightly calcareous. Medium grained salt and pepper. Massive to very faint crossbeds, stylolitic carbonaceous bands 1mm thick.
80.60	80.98	Sandy Mudstone, Mudstone, Sandstone and Muddy Siltstone interbedded and mixed. Sandstone is calcareous.
80.98	87.79	Sandstone-calcareous, fine to fine-medium grained. Pale to medium grey - salt and pepper, coaly, streaks in bands coal streak hairline to 1mm thick often stylolitic. Fines upward slightly, calcite veinlets below 85.35.0 ⁰ to 8 ⁰ to C/A 1mm thick.
87.79	88.60	Mudstone-dark grey-black, brown mud speckles 1mm ² .
88.60	89.13	Siltstone and Mudstone interbedded, medium grey and medium brown, calcareous, very siliceous and hard - 89.05 to 89.11 - vertical burrow 3cmx1cm.
89.13	90.79	Mudstone - dark grey and black, sandy 89.16 to 89.28. Coaly streaks and bands up to 0.6cm thick.
90.79	94.25	Siltstone - Muddy siltstone, slight Mudstone, Sandstone very very fine grained - interbedded and mixed in convoluted bedding down to 92.65, all very calcareous.
94.25	96.32	Siltstone and Muddy Siltstone interbedded - pale medium to dark medium grey, very calcareous.
96.32	97.55	Mudstone-massive, dark grey-black-brown. Calcareous in spots. Paly #12
97.55	97.86	Coal - 0.31 metres thick Ro#12 97.55 to 97.75 metallic grey, moderate hardness cleated to conchoidal fracture, claro-durain. 97.75 to 97.78 gritty dull black soft fusain 97.78 to 97.86 claro-durain.
97.86	98.09	Mudstone-dark brown black, coaly at top.
98.09	98.65	Muddy Siltstone very calcareous - sharp classes of siltstone in mudstone matrix - both very calcareous. Several burrows vertical and horizontal up to 9cmx1cm.
98.65	99.02	Muddy Sandstone very fine grained - medium grey calcareous Muddy Siltstone mixed in.
99.02	99.18	Mudstone massive dark brown-black.

HOLE# W.C.C.-80-4From 99.18 To, 103.44

FROM	TO	DESCRIPTION
99.18	99.30	Sandstone - very fine grained, very calcareous, shallow trough crossbeds.
99.30	100.09	Muddy Siltstone - grading downwards to silty Mudstone and few bands of mudstone, very calcareous.
100.09	100.19	Coaly Mudstone - black-brown coaly streaks up to 2mm thick. Ro.#13
		Mostly black shiny well cleated, moderately soft well cleated.
100.35	100.49	Sandy Mudstone-massive very dark brown - no sand above 100.38.
100.49	100.82	Sandstone - white to very pale grey, very calcareous, bioturbated in top half. Muddy laminae increasing towards base.
100.82	101.13	Mudstone-very dark brown and black, silty and sandy towards base.
101.13	101.70	Sandstone-pale to medium grey on core surface very fine grained, very smooth and very hard, looks like metaquartzite on broken surface, dark grey and medium brown very calcareous, very hard to scratch with knife on outside of core. Few muddy siltstone chips and muddy laminae up to 2cm thick. Carbonaceous bands hairline to 0.5mm thick ~ 60° to C/A. Sed. Sample #1
101.70	101.96	Siltstone and very very fine grained sandstone interbedded - bedding 90° to C/A, very calcareous.
101.96	102.00	Mudstone - dark grey-black.
102.00	102.31	Mudstone, silty mudstone, muddy siltstone, Siltstone and very fine grained sandstone interlaminated.
		Mudstone dominant dark grey-black.
		Siltstone medium grey-brownish.
		Sandstone very pale grey.
102.31	102.79	Mudstone - brown, dark grey-black.
102.79	103.33	Silty Mudstone - dark grey mud content increases towards base.
103.33	103.44	Coaly Mudstone-dark brown-black. Coal band 0.5cm thick at 103.95 - vitrain coal streaks throughout up to 1mm thick.

HOLE#

W.C.C.-80-4

From

103.44

To

107.89

FROM	TO	DESCRIPTION
103.44	103.97	Sandy Mudstone - calcareous dark grey coal bleb .5cm x 2cm vitrain. Sandstone is generally mixed in mudstone few laminae.
103.97	104.41	Silty Mudstone calcareous, few very very fine grained sandstone laminae, dark grey.
104.41	104.61	Coaly Mudstone dark brown -black, vitrain band 2cm thick at 104.54 to 104.56
104.61	104.78	Coal - 0.17 metres thick, very soft shiny to dull black, well cleated.
104.78	104.82	Coaly Mudstone - dark brown-black streaks hairline to 1mm thick.
104.82	105.60	Sandy Mudstone - only very slightly sandy at top increases towards base. Sandstone is calcareous, very fine grained.
105.60	106.07	Sandstone - very calcareous, medium grained, white with dark brown and black grains and specs, massive. Much fracturing with calcite crystals on fractures and in vugs at 105.95 to 106.07. Muddy laminae and beds decreasing towards base.
106.07	106.17	Sandstone - very fine grained, very pale grey, calcareous muddy beds 1-2cm thick, small burrows 2mm x 7mm, vertical.
106.17	107.14	Sandy Mudstone - dark brown-black. Mudstone - dark brown-black. Sandstone - very fine grained laminae and blebs, interbedded, inter laminated and mixed one sandstone bed 106.74 to 106.81, medium grained with mud mixed in. White salt and pepper, calcareous coaly streak 2cm long 1mm thick.
107.14	107.33	Sandstone, very calcareous, white to very pale grey convoluted one siltstone bleb in middle hard silicified? 4cm.
107.33	107.49	Mudstone - massive dark brown-black slightly coaly.
107.49	107.75	Silty Mudstone - dark grey laminae of higher silt content at 85° to C/A, very calcareous.
107.75	107.89	Sandstone - very slightly muddy pale grey to medium where muddy small trough crossbeds, very calcareous.

HOLE#

WCC-80-4

From 107.89

To 114.62

FROM	TO	DESCRIPTION
107.89	108.33	Mudstone dark grey, pale brown very hard (siliçified?) band 108.10 to 108.15 - very fine grained sandstone laminae and blebs and burrows towards base - carbonaceous below 108.27.
108.33	108.64	Coaly Mudstone - black bands and clumps of vitrain at angles up to 2cm thick.
108.64	109.28	Mudstone - very dark grey-brown streak.
109.28	109.35	Very Muddy Sandstone - well cleated dark grey.
109.35	109.51	Very slightly Muddy Sandstone - very calcareous, salt and pepper, fine medium grained.
109.51	109.63	Very Muddy Sandstone - dark grey - well mixed, few sandstone blebs and burrows.
109.63	109.71	Sandy Mudstone - dark grey-brown massive.
109.71	109.86	Mudstone - brown-black one coal streak 1.5cm x 0.5cm to 109.77 - dark grey to 109.86.
109.86	109.98	Muddy Siltstone - medium and dark grey massive calcareous
109.98	110.85	Sandstone - calcareous, fine to very fine grained at base and Muddy Siltstone medium grey interbedded, slightly bioturbated, very pale to medium grey, fines downward.
110.85	111.35	Mudstone - slightly silty at top, dark grey to black-brown at base. Paly #13
111.35	112.12	Coal - 0.87 metres thick. <u>Ro#15</u> . <u>2-FSi#2</u> . <u>Reg#2</u> Only 57% recovery Mudstone Split - 5cm thick, 112.82 to 112.87 (?) 80% vitreous - shiny black well cleated to conchoidal fracture - easily broken - vitrain.10%, dull black gritty-fusain, 10% metallic grey conchoidal fracture claro-durain.
112.12	112.44	Mudstone - dark grey massive.
112.41	114.62	Muddy Siltstone with silty Mudstone and Sandstone increasing towards base. Laminae and beds all very calcareous. Sandstone is white to very pale grey very very fine grained. Section is slightly convolut ^{ed} and bioturbated, bedding is 85° to 90° to C/A.

HOLE#

WCC-80-4

From 114.62

To 120.24

FROM	TO	DESCRIPTION
114.62	114.95	Mudstone - dark brown and black - 1 medium brown band very hard. 1.5cm thick, several hairline calcite veinlets 114.87 to 114.94.
114.95	115.54	Sandy Mudstone - dark brown well mixed to 115.33 very sandy below this, some convoluted sandstone beds, white to very pale grey, very fine grained, very calcareous.
115.54	116.33	Mudstone - dark grey to black at base, very slightly calcareous. Soft sediment fold seen from 115.54 to 116.05.
116.33	6 . 5 7	Coal - 0.24 metres thick, 70% metallic grey hard cleated to conchoidal fracture - claro-durain.20% very shiny black well cleated - vitrain.10% dull black gritty-fusain.
116.57	117.00	Siltstone - dark medium brown, very hard and very heavy. Sed. structure Carbonaceous bands hairline bands of ? meta quartzite Sample #2. show soft sediment folds where there are also calcite veinlets hairline and 1mm thick in all directions, very calcareous. Sed. structure, Sample #2.
117.00	117.78	Coal - 0.78 metres thick. <u>Ro. #17, 2 Fsi #3. 1 Rec. #3</u> Ro #17 117.00 to 117.25 : 2 FSI #3 85% claro-durain - hard metallic grey cleated to conchoidal fracture - 10% shiny black well cleated - vitrain, 5% dull black gritty fusain 117.25 to 117.56. 90% shiny black well cleated, soft-vitrain, 10% claro-durain metallic grey hard, 117.56 to 117.78 extremely hard metallic grey.
117.78	119.95	Sandstone - very fine grained very pale to pale to medium grey, hairline muddy laminae and coaly streaks especially at top. Massive, very slightly calcareous.
119.95	120.10	Coal - 0.15 metres
Ro#18	Paly #14	119.950 to 119.965 - Muddy and gritty 119.965 to 120.10 - shiny black to metallic grey soft-easily broken well cleated.
120.10	120.24	Coaly Mudstone - very dark brown-black, fault gauge horizontal at 120.18 and 120.20. Paly #14

HOLE#

WCC-80-4

From 120.24

To

123.89

FROM	TO	DESCRIPTION
120.24	120.70	Mudstone - brown-black
		Muddy Siltstone - dark grey-brown
		Silty Mudstone - dark grey-brown
		Muddy Sandstone - medium grey-brown
		Sandstone - very pale grey white very fine grained
		all interbedded and mixed, moderate bioturbation.
120.70	122.43	Only 60% core recovery here due to detaching of
		core tube from barrel. Core is well grounded.
		Mostly Sandstone pale to medium grey salt and pepper
		very fine grained.
		Muddy at base and top, bedding 60° to C/A near top at
		~ 120.95 core in middle is massive sandstone at
		bottom bedding is convoluted, calcite veinlets hairline
		to 2mm thick occur throughout.
122.43	122.87	Sandstone - salt and pepper, more salt (very white)
		shallow trough crossbeds to 122.51, massive to 122.63.
		Muddy and coaly hairline streaks increasing towards
		base from 122.63 to 122.87. One burrow .3cm wide
		2.5cm long, calcite veinlets hairline to 2mm thick.
122.87	123.00	Silty Mudstone - with sandstone laminae
		pale grey, very fine grained.
123.00	123.13	Convoluted Muddy Sandstone and Sandstone
		Sandstone is very pale grey
		Muddy Sandstone is medium dark brown.
123.13	123.56	Sandstone with Silty Mudstone and carbonaceous laminae
		hairline to 1cm at 70° to C/A.
		Sandstone is very fine grained, very pale to white -
		muddier towards base.
123.56	123.89	Sandstone -
		salt and pepper (very white)
		fine to medium grained
		massive
		one clump of slightly coarse grained sandstone with
		few mud chips 1mm ²
		slightly calcareous
		coaly streaks hairline wavy to stylotitic

HOLE#

WCC-80-4

From

123.89

To

132.70

FROM	TO	DESCRIPTION
123.89	124.62	Sandstone - white to very pale grey, calcareous
		Muddy Siltstone - dark brown
		Mudstone - dark brown-black
		interlaminated and extremely bioturbated very sandy at top decreases towards base.
124.62	125.81	Silty Mudstone - dark brown and black
		Siltstone is mixed in, very fine grained Sandstone in laminae and blebs and small burrows.
125.81	126.80	Mudstone - dark brown black, occasional Siltstone laminae and very small blebs.
126.80	127.04	Coal - 0.24 metres thick Ro.#19 only 62.5% recovery
		some of loss could be in Mudstones above and below - well broken. Solid metallic grey - conchoidal fracture waxy - claro-durain very hard.
127.04	127.81	Mudstone - slightly silty Mudstone - interbedded, calcareous where silty and medium brown-dark grey, Mudstone is dark brown-black, hairline calcite veinlets at 127.59.
127.81	128.19	Very fine grained Sandstone and Siltstone - interbedded very calcareous, pale to pale medium grey, vertical burrow 2.5cm x 0.5cm.
128.19	128.39	Siltstone - massive, very calcareous, pale medium grey
128.39	128.69	Silty Mudstone - medium grey calcareous. Siltstone laminae and blebs decreasing towards base.
128.69	128.96	Mudstone - dark brown black
128.96	130.19	Silty Mudstone
		Sandstone - very fine to fine grained
		Muddy Siltstone - very calcareous, all interbedded and interlaminated, hairline calcite veinlets 90° to C/A, bedding 85° to 90° to C/A.
130.19	131.28	Sandstone - fine grained, salt and pepper, shallow trough crossbeds, very slightly muddy, very calcareous, muddy siltstone laminae in bands, calcite veinlets 80° to C/A.
131.28	132.70	Silty Mudstone - with Sandstone, Siltstone, and Muddy Siltstone laminae.

HOLE+

WCC-80-4

From

131.28

To

138.23

FROM	TO	DESCRIPTION
CONTINUED		Sandstone decreases towards base, is fine grained, salt and pepper, very calcareous, moderately bioturbated only very occasional Siltstone laminae below 131.88 Only slightly silty below 132.08.
132.70	132.80	Mudstone - dark brown-black.
132.80	133.33	Coal - 0.53 metres, 132.80 to 133.91 soft and mushy where not wet it is black shiny well cleated, vitrain 133.91 to 133.33 50% metallic grey hard cleated conchoidal fracture 30% shiny black cleated vitrain 133.91 to 133.33 - 50% metallic grey hard cleated to conchoidal fracture. 30% shiny black cleated vitrain <u>RoE20</u> , <u>2ESI#4</u> , <u>Reg #4</u> 20% dull black gritty fusain.
133.33	133.65	Mudstone - very slightly silty, dark grey at top, coaly and dark brown black at base.
133.65	133.93	Coal - 0.28 metres thick. Ro #21 50% metallic grey hard claro-durain 25% dull black gritty fusain 25% shiny black well cleated vitrain.
133.93	134.13	Coaly and sandy Mudstone - dark brown black, well mixed coal streaks 1mm thick, 2cm long.
134.13	134.41	Muddy Sandstone - calcareous, pale grey to medium grey, very fine to fine grained, muddy laminae \leq 2cm thick, coaly laminae hairline to 0.5mm thick.
134.41	136.86	Sandstone - very calcareous, shallow trough crossbeds and massive at top, very pale grey, fine grained and medium grey, more crossbedded.
136.86	137.18	Muddy Siltstone - brown-grey, Silty Mudstone - brown-grey Sandstone - pale medium grey, very fine grained cross-bedded, interlaminated, very calcareous, slightly bioturbated.
137.18	138.07	Mudstone - very slightly silty, medium brown-grey at top to dark brown-grey at base.
138.07	138.23	Muddy Siltstone - slightly calcareous, dark brown.

HOLE#

WCC-80-4

From

138.23

To

144.48

FROM	TO	DESCRIPTION
138.23	138.74	Muddy Siltstone, Muddy Sandstone and Sandstone interbedded and interlaminated and mixed. Sandstone increases towards base is very fine grained, pale to medium grey, very calcareous crossbeds, shallow troughs, small ripple marks, carbonaceous plant debris.
138.74	139.08	Muddy Siltstone - dark brown, very slightly calcareous.
139.08	139.37	Sandstone with muddy sandstone mixed in wavy bedding, very slightly convoluted. Sandstone is medium grained slightly carbonaceous.
139.37	139.47	Muddy Siltstone - dark brown.
139.47	140.48	Sandstone - very pale to medium grey, very fine to fine to fine medium grained interlaminated, very calcareous muddy laminae to 140.12, bedding 80° to C/A, shallow trough crossbeds, large crossbeds below 140.12 - planar and a few trough shallow to moderate hairline calcite veinlets 80° to C/A.
140.48	140.61	Sandstone and Muddy Siltstone - interlaminated, very calcareous, few burrows 4mm ² . Sandstone is fine to fine medium grained at base.
140.61	141.99	Muddy Siltstone - Siltstone laminae and burrows to 140.74 below this mud and siltstone are well mixed, very calcareous. 3cm Mudstone band, dark brown - grades into silty Mudstone at ~ 141.35.
141.99	142.25	Mudstone - dark brown grey to black, very coaly from 142.04 to 142.08, streaks up to 0.15cm thick, slightly coaly to 142.25 very slightly sandy towards base.
142.25	143.01	Sandy Mudstone and Muddy Sandstone mixed, slightly convoluted at base, dark medium to medium brown, slightly calcareous, much carbonaceous plant debris.
143.01	143.78	Sandstone - very calcareous, pale grey to salt and pepper, faint planar crossbeds, coaly streak hairline to 0.5 mm. Muddy and silty band 1.5cm near base.
143.78	143.88	Sandstone - pale grey, very fine grained, slightly muddy, very calcareous.
143.88	144.48	Interbeds of (a) Sandstone, fine to medium grained, salt and pepper, shallow trough crossbeds, slightly coaly streaks hairline to 1mm and (b) interlaminated

FROM	TO	DESCRIPTION
(continued)		Mudstone, Muddy Siltstone. Sandstone fine to very fine grained at base.
144.48	144.86	Sandstone - fine to very fine grained at base, Silty Mudstone
		Siltstone, interlaminated, moderate bioturbation, slightly calcareous, coaly streaks hairline to 0.5mm thick.
144.86	145.08	Muddy Siltstone - dark brown with siltstone laminae increasing towards base.
145.08	145.18	Muddy Coal - 0.10 metres thick, 80% recovery.
Ro #22		Mostly metallic grey gritty, 10% shiny black vitrain.
145.18	145.83	Mudstone - dark brown black, coaly streaks 1mm thick decrease towards base - hairline calcite veinlets towards base.
145.83	146.46	Muddy Siltstone - very calcareous, medium brown-grey.
146.46	146.66	Mudstone - brown-black massive very calcareous.
146.66	146.70	Coal and Mudstone - contact is 50° to C/A and 85° to C/A.
Paly #15		Calcite veinlets associated 1mm thick and clump of Mudstone in coal part.
146.70	146.95	Coal - 0.25 metres thick, only ~ 60% recovery,
Ro #23		70% shiny black well cleated vitrain, 29% metallic grey, soft hard cleated to conchoidal fracture, clau-durain 1% muddy.
146.95	147.23	Mudstone - dark brown black.
147.23	147.67	Muddy Siltstone - medium brown-grey, sandy in middle, very calcareous.
147.57	147.97	Silty Mudstone - slightly calcareous, dark brown black, massive.
147.97	148.07	Sandy Mudstone - dark brown, calcareous, carbonaceous bands and streaks with slickensides at top, calcite on top of slickensides.
148.07	148.12	Muddy Sandstone - very calcareous, very fine grained, pale grey, mud mixed in.
148.12	148.18	Mudstone - very dark grey-black, calcareous.

FROM	TO	DESCRIPTION
148.18	149.56	Sandstone - very calcareous, muddy and mixed at top, fine grained at top to medium at base fines upward. Very pale grey to salt and pepper, very fine grained, muddy and crossbedded in shallow troughs from 148.86 to 148.94 - calcite veinlets in this interval ≤ 0.5 cm fracture with large calcite crystals 3mm^2 on surface at 148.97 below 148.97. Sandstone is massive to very faintly crossbedded. Mud clasts at base up to 3cm x 0.7cm.
149.56	150.39	Muddy Siltstone - with Siltstone laminae pale to medium grey, laminae 1cm at top to 1mm at base.
150.39	150.84	Mudstone - very calcareous, slightly silty at top, dark brown hairline calcite veinlets at base.
150.84	150.95	Sandy Mudstone - dark brown, coaly bleb at base 4cm x 0.3cm.
150.95	151.47	Muddy Sandstone - calcareous well mixed, slightly convoluted at base.
151.47	151.80	Coal - 0.34 metres, only 50% core recovery, pyrite at top 1cm thick, muddy and pyrititic band 2cm thick in middle of seam. Very hard claro-durain at base, Ro.#4 rest of coal is metallic grey, gritty and soft.
Ro # 24		
151.80	151.92	Sandy Mudstone - dark brown well mixed.
151.92	152.02	Muddy Sandstone and Sandstone with muddy laminae, calcareous. Sandstone is white to very pale grey, ripple marks, coaly streaks hairline.
152.02	152.33	Mudstone and Sandy Mudstone - interbedded, dark brown black to dark brown-grey, occasional coaly streaks 1-3mm thick.
152.33	152.52	Muddy Sandstone - well mixed, few sandstone blebs, calcareous, pale to medium grey.
152.52	154.57	Sandstone - very calcareous with muddy siltstone laminae increasing towards base. Sandstone is very pale grey-white with some mafics, very fine grained. Coaly streaks hairline to 1mm, burrows 2.5cm x 0.3cm, moderate bioturbation.

HOLE# WCC-80-4 From 154.57 To 162.13

FROM	TO	DESCRIPTION
154.57	155.28	Silty Mudstone with Siltstone laminae calcareous, medium brown-grey vertical burrows at top 2-3cm x 0.2cm. Siltstone laminae decrease towards base.
155.28	155.64	Mudstone - black, massive, slightly silty.
155.64	155.86	Mudstone - with very fine grained sandstone laminae Mudstone is dark brown black. Sandstone is very fine grained pale grey-brown, several burrows mostly horizontal.
155.86	156.20	Sandy Mudstone, Muddy Sandstone, Sandstone - interbedded and mixed, 3cm Sandstone bed in middle, white very fine grained very calcareous horizontal burrows 0.5cm ² .
156.20	156.52	Mudstone - massive dark brown-black.
156.52	157.14	Sandy Mudstone, Sandstone, Muddy Sandstone, dark medium brown, Muddy Siltstone - dark brown. Interbedded convoluted at top and interlaminated. Sandstone is calcareous salt and pepper (very white).
157.14	159.49	Sandstone - very calcareous, very fine grained to fine grained, pale to medium grey. Muddy Sandstone and Muddy Siltstone laminae increasing towards base, some of Sandstone is in shallow trough crossbeds, extreme bioturbation. Calcite veinlets \approx 1mm thick, horizontal to 45° to C/A between 158.93 and 159.22 little sandstone mostly Muddy Siltstone.
159.49	159.62	Slightly Muddy Siltstone, calcareous, medium grey-brown.
159.62	159.98	Silty Mudstone - with very very fine grained sandstone laminae, slightly calcareous fault gauge at 159.75.
159.98	161.21	Mudstone - dark brown-grey black, very slightly silty.
161.21	161.40	Muddy Sandstone and Sandy Mudstone interbedded and mixed, calcareous, calcite veinlet 2mm thick at 70° to C/A.
161.40	161.62	Mudstone - slightly calcareous, dark brown grey massive.
161.62	162.13	Sandy Mudstone Muddy Sandstone interbedded and interlaminated. Sandstone Less sand more mud towards base. Sandstone is fine to medium grained.

FROM	TO	DESCRIPTION
161.62	162.13	Pale grey to salt and pepper, bioturbated and very slightly convoluted, very calcareous.
162.13	163.81	Sandstone - fine grained pale grey, very calcareous, Muddy and bioturbated to 162.16 crossbedded in shallow troughs to 162.20 convoluted bedding mixes Sandstone with Mudstone and Silty Mudstone to 162.40. Muddy and coaly laminae hairline to 0.5mm thick. Occur in crossbedded (shallow troughs). Sandstone to 163.07 Sandstone is very slightly Muddy bedding is 90° to C/A to 163.37. Mudstone laminae and beds make up 35% of core and are up to 4cm thick to 163.81.
163.81	164.59	Mudstone with very fine grained Sandstone and Siltstone laminae which decrease towards base. Mudstone is dark brown black. Sandstone very fine grained pale grey calcareous:
164.59	164.94	Coal - 0.25 metres thick, only 40% core recovery.
Ro#25		Metallic grey to black shiny all cleated moderately hard to soft. Ro#25
164.94	165.11	Sandy Mudstone - dark brown, coaly at base streaks 3mm thick, calcite veinlet 70° to C/A. < 1mm thick.
165.11	166.36	Sandstone - very calcareous, Muddy at top mostly well mixed, a few laminae, coaly streaks - hairline, medium grained salt and pepper at top, some beds of very fine grained Sandstone further down below 165.96 Mud clasts up to 7mm x 3mm in the medium grained Sandstone beds below 165.91.
166.36	167.20	Muddy Siltstone - with fine grained sandstone laminae dark grey Siltstone pale grey, Sandstone calcareous - fewer laminae towards base.
167.20	167.64	Mudstone - dark brown black, very slightly sandy - coaly bands up to 4cm black shiny cleated.
167.72	168.35	Sandy Mudstone, Muddy Sandstone and Sandstone interbedded and slightly laminated and slightly convoluted, calcareous.
168.35	173.27	Sandstone - very calcareous, pale grey fine grained, massive to 169.47 - Muddy laminae small trough crossbeds with few muddy bands to 172.60.

FROM	TO	DESCRIPTION
168.35	173.27	One Siltstone clast 4cm x 1.5cm
(continued)		Increasing Muddy bands, burrows and bioturbation to 173.27.
173.27	173.79	Sandy Mudstone and Muddy Sandstone - mixed and slightly convoluted, very calcareous.
173.79	173.85	Sandstone - very calcareous, pale medium grey, cross-bedded planar. Mudstone laminae with burrows.
173.85	174.77	Mudstone with Siltstone laminae, Siltstone laminae 20% to rock. Mudstone is dark brown-black, Siltstone is pale-medium grey and calcareous.
174.77	175.11	Mudstone - dark brown-black, pyrite at base 0.5cm band coaly bands 1cm at base.
175.11	175.17	Coal 0.06 metres thick - muddy and shiny black well cleated vitrain.
175.17	175.40	Coaly Mudstone - dark brown-black several coaly streaks hairline to 2cm thick.
175.40	175.60	Muddy Sandstone and Sandy Mudstone - mixed calcareous.
175.60	175.89	Mudstone - black carbonaceous with Sandstone laminae Sandstone is calcareous fine grained white.
175.89	176.27	Sandstone - fine grained pale grey to salt and pepper shallow trough crossbeds one vertical burrow 13cm long x .5cm wide.
176.27	176.51	Sandstone and Mudstone - interlaminated, very calcareous vertical burrows, less sandy more muddy towards base
176.51	176.67	Coaly Mudstone - black silty at top, Sandstone burrows horizontal - Coal - 0.04 metres thick vitrain.
176.67	176.94	Sandstone and Muddy Sandstone - interlaminated and bedded, calcareous Sandstone is very fine grained, pale grey.
176.94	177.31	Carbonaceous Mudstone - black coaly streaks up to .4cm thick.
177.31	177.82	Silty Mudstone - dark grey brown, few Siltstone laminae calcareous and blebs.
177.82	177.90	Carbonaceous Mudstone - black with hairline calcite bands and plant debris on bedding surface. Sed. Sample#4
177.90	178.31	Muddy Sandstone - very fine grained, very convoluted medium to pale grey calcareous.

HOLE# WCC-80-4

From 178.31 To 181.66

FROM	TO	DESCRIPTION
178.31	179.35	Mudstone and Silty Mudstone interbedded, some black carbonaceous.
179.35	179.55	Carbonaceous Mudstone black, calcite veinlets up to 3mm thick 70 ^o to 90 ^o to C/A.
179.55	180.13	Sandstone and Mudstone - interbedded and laminated, extremely bioturbated.
180.13	180.75	Sandstone is white to very pale grey, very fine grained
		Sandstone - white very fine grained, very calcareous, massive, burrows, slight mud to 180.43. Muddy laminae at base, bioturbated.
180.75	181.66	Silty Mudstone - massive dark grey brown.
End of Hole		

WEST CARBON CREEK PROPERTY

HOLE+ WCC-80-S From 0.00 To 11.78

J.C. Ridley

FROM	TO	DESCRIPTION
0.00	2.20	Over burden
2.20	2.52	Sandstone - salt & pepper, coarse, medium grain size, calcareous, Fe stains massive, calcite veinlet < .5mm thick
2.52	4.88	Muddy Siltstone - Slight muddy sandstone at top silty mudstone and mudstone, interbedded, also siltstone laminae through cross beds, bedding ~ horizontal, very calcareous, Fe stains
4.88	6.47	Mudstone and Silty Mudstone - Interbedded very calcareous, medium grey, Fe stains muddier towards base
6.45	6.47	Sandstone - laminae and blebs at base. Paly #1
6.47	7.02	COAL - 0.55 metres thick only 70% recovery. Ro#1, 2-Fsi#1, Reg #1. Upper half very hard, metallic grey Claro-durain, some vitrain towards middle lower half, mostly soft easily broken well cleated, shiny, vitrian, some claro-durain at middle
7.02	7.17	Mudstone - 4cm grades into sandy mudstone 11 cm, dark brownish grey coal blebs 1mm x 2cm at top
7.17	11.25	Muddy Siltstone and Sandstone interbedded - only slight mud below 9.08m Sandstone is salt and pepper to pale med. grey fine grained at top slightly bioturbated, ripples and siltstone chips .6mm ² to 8.56 through crossbeds beds of medium grey sandstone occur below 8.56 all sandstone is medium grey below 9.25 shallow through crossbeds, all very calcareous
11.25	11.78	Mudstone and Siltstone - and very very fine grained Sandstone slightly calcareous muddier towards base
11.76	11.78	Slightly bioturbated - Paty #2

FROM	TO	DESCRIPTION
11.78	12.19	COAL - 0.41 metres thick Ro#2 20% dull black soft waxy fusain 40% metallic grey, hard, clarodurain 40% shiny black well cleated vitrain more vitrain at top, more claro durain at base fusain in middle
12.19	12.36	Coaly mudstone - dark brown black coaly blebs 1-2mm x 4 cm
12.36	12.57	Muddy Sandstone, mixed and bioturbated, Sandstone is 8 gr white to dark brown, slightly calcareous
12.57	14.34	Mudstone - Silty mudstone, sandy mudstone and carbonaceous sandy mudstone interbedded, calcareous where sandy sandstone is mixed or in laminae blebs and small burrows 2mm ² Mudstone crumbly possible fault gauge at 14.67 and 14.73 slicken sides and calcite veinlets 1mm thick at 13.84 and 14.19 83° to core axis
14.34	15.20	Sandstone - with mudstone laminae, increasing toward ^s base, very calcareous, white to very pale grey, fine grained shallow through crossbeds coaly streaks hairline ripple marks, worm burrows 1mm x 1.3 cm bedding are 85 ² to C/A
15.20	15.90	Silty Mudstone - with sandstone laminae and blebs, calcareous where silty, dark medium grey to dark brown siltstone decreases towards base
15.90	16.05	Carbonaceous Mudstone, dark brown-black
16.05	16.30	Sandy mudstone, coaly blebs, .5mm x 1cm and pyrite disseminated at top calcareous where sandy. Sandstone is mixed in
16.30	16.66	Carbonaceous Mudstone, dark brown black few coaly streaks hairline to 0.4 mm thick

FROM	TO	DESCRIPTION
16.66	16.95	Sandy Mudstone and Muddy Sandstone, interbedded and interlaminated, sandstone is fine grained few ripple marks and slight bioturbation hairline coaly steaks, most vertical
16.95	17.17	Sandstone, with mudstone laminae Sandstone is white to very pale grey, ripple marks, horizontal and vertical, mm ² or <mm x 2 cm
17.17	20.87	Sandstone - slightly muddy and hairline carbonaceous streaks, white to very pale grey to salt and pepper fine grained at top to medium grained at middle to fine at base, shallow through crossbeds, slightly calcareous to calcareous at base, vertical burrows 1mm x 2cm, very ruggy calcite veinlet at 19.58 0.4 to 1.0 cm thick
20.87	21.29	Mudstone, dark grey brown, massive, sandstone blebs and laminae at top down to 20.11 calcite bleb 2 cm x 1 cm x 2 cm with pwrite in it at 20.24, hairline coaly streaks at base
21.29	21.57	Sandy mudstone grading to muddy sandstone, at base calcareous, dark brown, ss is well mixed in mudstone
21.57	23.21	Sandstone with interbeds of silty mudstone and muddy sandstone, ss is white, very pale grey with slight mafics, very calcareous fine grained trough crossbeds, small ripple marks vertical burrows, 0.5 cm x 5 cm, hairline coaly streaks, horizontal burrows 1mm ²
23.21	23.61	Sandstone and Mudstone interbedded, sandstone is very calcareous, white to very pale grey, very fine grained Mudstone is dark grey brown calcareous
23.61	24.22	Mudstone with siltstone laminae and blebs, dark grey brown black, carbonaceous below 24m, calcareous above 24m
24.22	24.42	Coal - 0.20 metres thick 90% metallic grey very hard claro durain Ro#3 5% shiny black cleated soft vitrain 5% dull black gritty soft fusain

FROM	TO	DESCRIPTION
24.42	24.54	Sandy coaly mudstone, dark brown-black, coaly blebs 1 cm ² and hairlike streaks
24.54	25.51	Sandstone & silty mudstone & siltstone interbedded very calcareous, sandstone is very pale grey-white, some mafics, fine medium grained to medium grained, siltstone is medium grey, mudstone is dark grey, vertical burrows : 4cm x 1-2cm, faint planar cross beds
25.51	26.78	Very fine grain sandstone and siltstone interbedded, less sandstone more siltstone towards base very calcareous, medium grey hairline calcite veinlets, 20° to C/A to 0° C/A, carbonaceous streaks hairlike
26.78	27.97	Mudstone, slightly carbonaceous and slickensided soft and gouged in several places usually ~ horizontal. <u>Fault Zone:</u> Fault gouge, broken rock and slicken sides occur from 27.25m to 31.30, especially from 29.93 to 31.30, core is still identifiable
27.97	28.46	Sandy Mudstone, very well mixed, dark grey and brown, slightly calcareous
28.46	29.30	Sandstone - slight mud in matrix very calcareous, fine grain, medium grey, massive fracturing and calcite veinlets hairline near base, Fe stains
29.30	30.35	Sandstone and Sandy Mudstone - interbedded Sandstone is fine grained very pale grey, very calcareous Mudstone dark grey, calcareous, well bioturbated, rock well broken Fe stains, fault gouge at 30.28 to 30.35
30.35	30.79	Sandstone, fine grained pale medium grey, very calcareous calcite veinlet 4mm thick 30% to C/A.
30.79	31.79	Sandstone and Sandy Mudstone, interbedded, sandstone - fine grained, very pale grey, very calcareous. Mudstone dark grey, calcareous, well bioturbated. Fault gouge and broken rock to 31.30.

HOLE#

W.C.C. 80-5

From 31.79

TO

49.93

FROM	TO	DESCRIPTION
31.79	34.68	Sandstone - Medium grey, fine grained, very calcareous, bedding 75° to C/A planar x beds Few burrows, medium size, (cmx3cm) slickensides and calcite veinlet at 33.43m at 72° to C/A and same at 33.65m, carbonaceous slicken sides at 34.23 at 73° to C/A, fine muddy beds
34.68	35.36	Sandstone and Mudstone interbedded and mixed, very calcareous, slightly bioturbated one large burrow 1 cm x 6 cm with sandstone, is in though crossbeds, medium grey, Sed Sample #1
35.36	35.76	Silty mudstone with siltstone laminae and blebs, dark grey, calcareous, siltstone is pale grey
35.76	36.44	Coal - 0.68 metres thick, only 44% recovery 1 cm pyrite band at top Ro#4 1 cm muddy band at base
36.44	37.32	Muddy siltstone - dark medium grey, massive, very calcareous
37.32	38.13	Calcareous mudstone, slightly silty, dark brown black, slightly calcareous
38.13	40.12	Sandstone - fine grained, pale to very pale grey, muddy at top, very calcareous, few burrows, shallow trough crossbeds, fines towards top
40.12	41.60	Mudstone & Silty Mudstone - interbedded, coaly streaks, hairline throughout, soft & gouged intermittently ~ horizontally, w/calcite veinlets, hairline, sandy below 41.28
41.60	48.84	Muddy Sandstone and Sandy Mudstone - interbedded and mixed, slight convoluted bedding, Sandstone is fine to very fine grained, pale to medium grey, both very calcareous, Mudstone is medium to dark grey-brown, quite muddy from 43.33 to 44.46, hairline coaly streaks throughout, burrows horizontal and vertical, filled with sand, some cleaner sandstone beds towards base, slight trough cross beds in sandstone
48.84	49.93	Sandstone with silty mudstone laminae. s a n - is medium grey and fine grained, inter laminate very calcareous, crossbeds, ripple marks, burrows

HOLE# W.C.C. 8 0 - 5 From 49.93 TO 58.67

FROM	TO	DESCRIPTION
		horizontal and vertical
49.93	50.60	Sandstone - Siltstone and Mudstone interlaminated. All very calcareous, sandstone is fine grained, medium grey, bioturbated, burrows vertical & horizontal
50.60	51.32	Mudstone with siltstone laminae, all very calcareous, siltstone decreases towards base, mudstone is coaly and very dark grey-black at base
51.32	51.62	Muddy siltstone, massive, dark medium grey, very calcareous
51.62	52.66	Sandstone & Siltstone - interbedded and interlaminated, very calcareous, moderately bioturbated Sandstone is pale grey, fine to very fine grained Siltstone is pale medium grey Few vertical burrows
52.66	53.22	Silty mudstone with siltstone laminae and blebs, sandy at top, very calcareous.
53.22	53.45	Mudstone, carbonaceous, black and pyrite at top
53.45	55.86	Silty Mudstone, moderately hard black and medium brown laminae, sandy towards base, very calcareous
55.86	56.19	Sandstone, sandy mudstone and muddy sandstone, interbedded sandstone is fine grained, pale grey, all very calcareous, slightly bioturbated
56.19	56.69	Sandstone, massive, fine medium grained with carbonaceous and muddy laminae at 85° to core axis very calcareous
56.69	57.12	Muddy siltstone, very calcareous, dark medium grey
57.12	57.60	Sandstone, siltstone & muddy siltstone, interlaminated, very calcareous, sandstone is fine grained, very pale grey Convolute bedding 57.18 to 57.32. Sed Sample #2
57.60	57.89	Mudstone & Sandstone interlaminated, very calcareous Sandstone is pale grey, very fine grained Mudstone - dark grey-brown, moderately bioturbated
57.89	58.67	Mudstone, massive dark grey-black, brown Silty down to 58.42 Paty #2

HOLE+

W.C.C. 80-5

From 58.67

TO 66.92

FROM	TO	DESCRIPTION
58.67	59.28	Coal - 0.61 metres thick. Ro#5, 2 Fsi.2, Reg. #2, very hard. 100% recovery
		85% metallic grey cleated claro-durain
		15% shiney black cleated vitrain
59.28	59.50	Mudstone very hard dark brown several hairline calcite veinlets
59.50	59.53	Coal 0.03 metres thick soft, cleated, shiney black, vitrain
59.53	60.70	Silty mudstone, mudstone, sandy mudstone and muddy sandstone interbedded and mixed by convoluted bedding ss is calcareous, fine gr. pale med. grey
60.20	66.08	Sandstone, slightly muddy, very calcareous salt & pepper, shallow planar crossbeds, fines upward, calite veinlet smmx3cm
61.08	61.19	Mudstone, dark grey brown, sandy at base
61.19	61.54	Sandstone, med. gr. salt & pepper, very calcareous, trough crossbeds. slightly muddy
61.54	62.61	Silty & sandy mudstone, dark grey brown, mostly mixed, some siltstone and sandstone laminae sandstone & siltstone are calcareous sandstone is fine grained, very pale grey
62.61	63.17	Mudstone, massive dark grey-brown
63.17	64.13	Muddy sandstone, sandstone, sandy mudstone interbedded and interlaminated, bioturbated very calcareous sandstone is very fine grained, pale grey decreasing towards base
64.13	65.73	Mudstone, massive, silty and calcareous at top carbonaceous towards base and coaly streaks, 1mm thick also sandstone laminae in bottom, 10 cm
65.73	66.92	Sandstone, muddy sandstone and sandy mudstone interbedded & interlaminated, very calcareous moderate bioturbation sandstone fine grained pale grey to dark grey-brown where muddy

FROM	TO	DESCRIPTION
66.92	67.69	Mudstone, slightly silty, dark grey-brown, massive
67.69	69.26	Muddy sandstone & sandy mudstone, interbedded & mixed, slightly convoluted, sandstone is fine grain. pale grey to med. grey-brown, calcareous
69.26	70.14	Sandstone, with muddy sandstone laminae, sandstone is fine grained to medium grained, white to very pale grey, very calcareous, well bioturbated, slightly convoluted, 1mm to hairline, coaly streaks, burrows horizontal and verticle, muddier towards base.
70.14	71.13	Sandy Mudstone, dark brown, sandier at top, some laminae & burrows, well mixed to base
71.13	71.39	Mudstone, calcareous, dark brown black-massive
71.39	71.60	Muddy sandstone, fine grained, pale med. grey to med. brown, very calcareous, convoluted, slightly bioturbated
71.62	72.21	Sandstone, pale red grey, fine medium grained, massive, very calcareous, muddy streaks
72.21	72.58	Mudstone, slightly silty Sed. Sample #3 with a blob of very fine grained sandstone 10cmx7cm pale grey, very calcareous and some sandstone at base.
72.58	72.45	Mudstone, dark grey-black, massive, silty at base
72.72	72.85	Siltstone, med. grey, very calcareous, calcite veinlet, .5 to .7 cm thick at 85° to C/A at 72.80
72.85	72.93	Mudstone, dark grey-black, massive,
72.93	73.67	Muddy sandstone, and sandstone, interlaminated & mixed, very calcareous, sandstone is very fine grained, pale grey to dark brown, slight bioturbation, few burrows
73.67	73.97	Sandstone, massive, med. grained, salt & pepper very calcareous, upper 6 cm, filled with calcite, veinlet stockwork, silty at base
73.97	74.58	Sandstone and muddy sandstone, interlaminated and mixed sandstone is very fine grained, pale to med. grey, very calcareous, slight bioturbation
74.58	75.03	Sandstone, pale med. grey, fine grained, very calcareous, medium grained at base, very slightly muddy, few

FROM	TO	DESCRIPTION
		siltstone chips at base, .5cm ² , calcite veinlet at 74.98 at 70° to C/A
75.03	75.44	Muddy sandstone, laminae of less muddy Sandstone, very fine grained, med. grey-brown, very calcareous, slightly bioturbated
75.44	75.97	Sandy mudstone, dark grey-brown, mostly well mixed very calcareous
75.97	76.56	Sandstone with muddy sandstone mixed in extremely bioturbated, very calcareous, slight trough crossbeds, muddier towards base, 1 coal bleb, sandstone is fine grained, pale grey 1 cm x 0.5 cm
76.56	76.96	Mudstone with siltstone, laminae & blebs, very calcareous, siltstone mixed in most at top
76.96	77.10	Coaly mudstone, dark brown-black
76.96	76.98	Coaly blebs 1mm thick 3 cm long Paly #3
77.10	77.80	Sandstone, muddy sandstone & sandy mudstone, interbedded & interlaminated, bioturbated & convoluted, burrows sandstone is pale to pale grey, fine to very fine grained, hairline calcite veinlets, coaly streaks in mudstone
77.80	78.24	Silty mudstone, dark grey-brown, massive, calcareous
78.24	74.61	Sandstone, slightly muddy, pale med. grey, very calcareous, crossbeds planar & trough, muddy laminae towards base
74.61	80.62	Silty mudstone, dark grey-brown, very calcareous, siltstone & very fine grained sandstone laminae
80.62	82.82	Sandstone & sandy mudstone & mudstone, interlaminated and interbedded, sandstone is fine grained, slightly muddy, very calcareous, white to pale grey, muddy sandstone is med. brown, mudstone moist dark brown-grey, shallow trough crossbeds in some beds, bioturbated, ripple marks, more muddy towards base
82.82	83.57	Mudstone with siltstone laminae, bioturbated, bedding on horizontal dark brown mudstone, pale med grey siltstone, very calcareous

HOLE*

W.C.C. 80-5

From 83.57

To 91.68

FROM	TO	DESCRIPTION
83.57	84.59	Coal - 1.02 metres thick, 2-Fsi, 1 Reg #3, 1 Ro#6 95% recovery
		80% metallic grey, very hard, to cleated claro-durain 20% shiny black well cleated vitrain
84.59	84.78	Mudstone, massive dark brown & black
84.78	84.83	Coal 0.05 metres thick Ro#7 100% recovery
		shiny black, well cleated, moderate to easily broken, vitrain
84.83	85.28	Sandy Mudstone, well mixed, dark grey-brown, slightly calcareous, hairline, coaly streaks
85.28	86.10	Muddy sandstone and sandstone interbedded & mixed very calcareous, 1 coal bleb, 2mm thick, 2 cm long
86.10	86.63	Sandstone & Mudstone, Siltstone & Muddy Sandstone, interlaminated, very calcareous, well bioturbated sandstone is very fine grained, pale medium grey
86.63	87.05	Coal 0.42 metres thick 2-Fsi#4, Reg #4, Ro#8 60% recovery
		top 20cm, very hard, solid, claro-durain, Metallic grey, increasing vitrain, softer towards base
87.05	87.17	Mudstone, carbonaceous, dark brown-black
87.17	87.21	Coal - 0.04 metres thick, very shiny black, very easily broken, conchoidal to cleated
87.21	87.54	Mudstone, dark brown black, coaly streaks, hairline to 2mm x 2 cm one sandstone bed 87.40 to 87.46 fine grained white to very pale grey, several mud chips in sandstone 1mm x 4mm, mudstone is silty at base Paly #4
87.54	88.85	Silty mudstone, dark grey, silt decreases towards base
88.85	91.68	Sandy mudstone, silty mudstone, mudstone & sandstone interbedded and interlaminated Sandstone is white to very pale grey, fine grained, very calcareous, shallow through crossbeds, few burrows above 90.52

FROM	TO	DESCRIPTION
		extremely bioturbated below 90.52
91.68	102.41	Sandstone, massive, muddy laminae at top, coaly & streaks, wavy hairline to 1mm thick 55° to 90° to C/A, medium grained to coarse grained, fines upward, salt & pepper but more white, very high quartz, only very slightly calcareous in spots, muddy bands at top from 10° to 88° to C/A, rock fragments occur from 99.64 to 100.23 .2cm x .5cm to 6 cm x 4 cm x 3 cm frags of siltstone, Med. brown, calcareous, mudstone dark grey-black, silty mudstone black - interlaminated sandstone & siltstone w/burrows and convoluted bedding. Sed. Samples 4&5 Coaly frags from 101.88 to 102.41, hairline to 2cm thick x 6cm (diameter of core). Sed Sample #6 Mudstone frags. here also, sandstone is very coarse to granular at base, grains 1 mm ²
102.41	103.21	Silty mudstone, sandstone & muddy sandstone interbedded & interlaminated, sandstone is med. grey, calcareous, very fine grained, shallow trough crossbeds, burrows 8cm long 3mm wide, moderate bioturbation
103.21	103.69	Mudstone, dark grey-brown, one sandstone burrow 4 cm long, 3mm wide, sandstone is calcareous, mudstone is not calcareous
103.69	105.12	Sandy mudstone, muddy sandstone and sandstone interbedded & mixed in convoluted bedding, all very calcareous, sandstone is fine to very fine grained, pale grey
105.12	107.43	Sandstone, very calcareous, fine grained, medium pale grey, occasional muddy beds show bioturbation, med. grained below 106.76, mostly massive, few coaly streaks hairline to 1mm thick
107.43	107.58	Very coaly mudstone, black siltstone blebs, very hard and very light, shiny on broken surface, conchoidal fracture.

HOLE+

W.C.C. 80-5

From 107.58

To 115.06

FROM	T O	DESCRIPTION
107.58	197.88	Sandstone with coaly and muddy streaks, 10% of core 80° to 90° to C/A, Sandstone is white to very pale grey, very very fine grained.
107.88 I/	107.92	Coal 0.04 metre thick, 90% shiny black well cleated vitrain
107.92	108.29	Very coaly mudstone black few siltstone burrows & blebs at top
108.29	108.64	Coal 0.35 metres thick
Ro#9		100% recovery, 100% metallic grey, very hard, conchoidal fracture, claro-durain, slightly cleated at base
108.64	110.35	Silty mudstone, muddy sandstone & sandy mudstone interbedded mixed and in convoluted bedding, very calcareous, sandstone is fine grained, pale grey, slight pepper
110.35	181.19	Sandy mudstone dark brown massive very calcareous hairline coaly streaks, one 4cm sandstone bed near base fine grain, pale grey, very calcareous
111.19	113.12	Sandstone, fine grain, medium grey, usually massive, very calcareous, mudstone laminae, increasing at base and top, trough crossbeds and bioturbated at base
113.12	114.11	Mudstone with siltstone laminae and blebs only 1% of core, all very calcareous.
114.11	114.18	very coaly mudstone, white sandstone laminae, very calcareous, fine grained.
114.18	114.40	Coal 0.22 metres thick Ro#10 Upper half very hard, metallic grey, claro-durain, slight vitrain, lower half 40% clarodurain, 60% shiny black, easily broken, well cleated
114.40	114.61	Coaly mudstone, black coaly streaks, hair line to 2mm thick
114.61	115.06	Coal 0.67 metres thick 2 Fsi#5, 1-Reg #5, 1-Ro#1 upper 23 cm mostly clarodurain, very hard metallic grey, slight vitrain & fusain, middle 20cm 40% claro-durain 40% vitrain shiny black 20% fusain dull soft lower 24 cm 80% vitrain, 15% fusain, .5% clarodurain

HOLE# W.C.C. 80 - 5 From 115.06 To 123.46

FROM	TO	DESCRIPTION
115.06	116.88	Silty sandstone, carbonaceous mudstone and sandy mudstone, interbedded, all massive, calcareous where silty. Coaly bands up to 0.5 cm thick
116.88	117.21	Coal 0.33 metres thick Ro#12 100% recovery, few muddy streaks, 80% shiny black, well cleated vitrain, coaly broken 20% hard metallic grey clarodurain
117.21	117.29	Silty mudstone, dark grey, massive
117.29	117.65	Sandstone and sandy mudstone interlaminated Sandstone is very fine grain, med. grey, slightly calcareous, 1 coal bleb 2mm x 1.5 cm, moderate bioturbation
117.65	118.17	Sandstone, fine grain pale grey, tough cross beds slightly convoluted and muddy, ruggy calcite veinlet 80° to C/A
118.17	118.81	Sandstone with mudstone, laminae Sandstone is very fine grained, pale medium grey, calcareous. Sed. Sample #7 trough cross beds, bioturbated, soft sediment fold - monocline, bedding 80° to C/A
118.81	121.08	Mudstone with sandstone laminae at top, half and half siltstone and sandstone but sandstone decreases towards base, sandstone is very fine to fine grained calcareous, pale grey, mudstone is dark grey brown calcareous, all well bioturbated, coaly streaks at base. 1mm thick
121.08	121.47	Coaly mudstone, dark brown-black, coaly streaks up to 2mm thick, sandy below 121.38m
121.47	122.46	Sandstone - fine grain, very pale grey, muddy to 121.90 slightly muddy below this very calcareous, few ripple marks, mostly well mixed.
122.46	122.65	Sandy mudstone and sandstone mixed in convoluted bedding, sandstone is fine grain and pale grey calcareous
122.65	123.46	Mudstone slightly silty, coaly dark brown black coaly streaks up to 3mm x 3 mm

FROM	TO	DESCRIPTION
123.46	123.75	Sandy mudstone with a bed of sandstone, sandy mudstone is dark brown stictly calcareous burrows filled with sandstone below bed
123.75	124.68	Sandstone, fine grained, pale grey, mostly massive, very calcareous, muddy sandstone and mudstone beds & laminae, slightly bioturbated
124.68	127.78	Mudstone, massive dark grey black silty at top Coaly to carbonaceous, fossil Sample #1, Paly #5 a-c Few modules of slightly calcareous med, very hard follils of plants & shells (peleypods)? and coal frags.
127.78	128.57	Coal 0.79 metres thick 2-Fsi #6, 1-Reg #6, 1-Ro#13 Few muddy laminae and blebs aroung 128.10 75% metallic grey hard cleated to conchoidal fracture, claro-durain 15% shiny black well cleated vitrain 10% dull black soft fusain vitrain and fusain increase towards base.
128.57	129.00	Mudstone, coaly, dark brown black, streaks hairline sandy at base
129.00	130.62	Sandstone calcareous, muddy at top, very clean white from 130.49 to 130.62, medium grained at base, fines upwards to fine grained, convoluted from 129.84 to 130.24, calcite veinlets hairlike up to 1cm thick at 130.49
130.62	130.87	Mudstone and sandstone, interlaminated Sandstone is fine grained and pale grey, few crossbeds, Mudstone dark brown to med. brown, bioturbated, general burrows
130.87	131.55	Sandstone with muddy sandstone, laminae, well bioturbated, sandstone is pale med grey, fine grained, calcareous
131.55	131.74	Mudstone, with sandstone blebs laminae and sandstone mixed in dark brown black carbonaceous mudstone

HOLE* W.C.C. 80-5From 131.74 To 141.38

FROM	TO	DESCRIPTION
131.74	132.15	Mudstone, dark brown black, carbonaceous, few coal blebs up to 1cm x 1.5 cm
132.15	133.57	Sandstone and muddy sandstone interbedded and inter laminated, sandstone is fine grained, pale to pale medium grey, very calcareous
133.57	136.10	Mudstone dark grey, silty at top, occasional sandy beds, calcareous where silty or sandy
136.10	137.56	Silty mudstone with sandstone beds Sandstone is fine grain to medium grain, vv pale grey, very calcareous, one bed is sandstone to coarse grained, grey chert and white quartz. 3 cm thick, very calcareous.
137.80	137.80	Mudstone, massive dark grey - black, carbonaceous
137.80	137.85	Coal 0.05 metres thick Ro#14 Shiny black well cleated vitrain
137.85	137.92	very coaly sandstone 0.07 metres thick streaks of vitrain in mud matrix
137.92	138.99	Sandstone, very calcareous, fine grained, white to very pale grey, muddy at top and in spots throughout, convoluted and bioturbated
138.99	139.60	Sandstone with mudstone beds, bioturbated Sandstone is fine grained, pale grey, very calcareous, some of sandstone is muddy faint trough crossbeds. one coal chunk (.5 cm x 3 cm) coaly streaks at base 1 mm thick with silty mudstone clasts.
139.60	140.50	Siltstone, sandstone and si-lty mudstone interbedded and interlaminated, -laminae or 73° to C/A siltstone is very calcareous, medium brown grey Sandstone is slightly calcareous, fine grained pale grey to white, one bed at base is med. grained 3 cm thick, salt & pepper
140.50	141.38	Mudstone with sandstone and siltstone laminae and blebs, all very calcareous, bedding 87° to C/A extremely bioturbated

HOLE#

W.C.C. 80-5

From 141.38

To 148.01

FROM	TO	DESCRIPTION
141.38	141.84	Coal 0.51 metres thick total 0.19 metres split. 0.32 metres actual coal
		141.33 to 141.55 Coal Ro#15
		80% metallic grey, very hard cleated, claro-durain
		20% vitrain well cleated, shiny black
		151.55 to 141.64 mudstone split
		141.64 to 141.84 Coal 25% vitrain Ro#16
		5% muddy 70% with claro-durain, hard metallic grey
141.84	141.94	Coaly mudstone, dark brown-black, coaly streaks, 2mm thick
141.94	144.58	Muddy siltstone, silty mudstone, mudstone & sandstone interbedded and mixed, all very calcareous, dark grey, sandstone is fine grained, pale grey mixed with mud, occasional coaly streaks and calcite hairlike to 1mm thick.
144.58	144.79	Silty mudstone and sandstone interbedded but mixed by convoluted bedding and bioturbation. Sandstone is medium grained, salt and pepper, all very calcareous
144.79	145.91	Sandstone, high quartz, medium grained salt and pepper, very calcareous, few muddy beds and beds of muddy fine grained sandstone, wavy streaks, knobby on broken surface, parallel bedding appears due to load pressure, few mudstone and siltstone clasts, slight bioturbation
145.91	146.78	Mudstone with siltstone and sandstone in beds, laminae and mixed in, all very calcareous, moderate bioturbation, burrowsn, sandstone is fine grained, very pale grey, siltstone and mudstone clasts in sandstone
146.78	146.93	Sandstone fine to medium grained, very calcareous, laminae of mudstone and siltstone, few clasts of siltstone.
146.93	148.01	Coal 1.08 m thick, split .17m Ro#17, 2Fsi#7a, 1Reg#7 Coal total 0.91m 146.93 to 147.64 coal at 147.08 mudstone blob. 4 cm x 6 m

HOLE' W.C.C. 80-5From 146.93158.85

FROM	TO	DESCRIPTION
continued		147.03 to 147.64 20% fusain-dull black soft 40% vitrain - shiny black well cleated. increasing towards base, 40% clarodurain - metallic grey very hard, 147.64 to 147.81, mudstone split coaly streaks, hairline to 0.5 cm thick 147.81 to 148.01 coal 80% vitrain shiny black well cleated. 15% clarodurain 5% fusain Ro#8, 2Fsi #7b
148.01	148.77	Sandstone fine grained whitgrey very pale very calcareous, muddy in bands, slight bioturbation.
148.77	150.23	Mudstone, very coaly from 149.30 to 149.78, bands up to 2mm thick
150.23	151.45	Silty mudstone, muddy siltstone and muddy sandstone, interbedded, laminated and mixed, very calcareous, sandstone is fine grained, very pale grey
151.45	152.02	Sandstone, fine grained to medium grained at base Mod. bioturbation, very calcareous, some trough crossbeds, burrows, slightly muddy
152.02	153.06	Mudstone, silty in parts with sandstone beds and laminae, fine grained calcareous, white to very pale grey
153.06	153.34	Carbonaceous mudstone, dark brown-black, sandy at top
153.34	153.31	Coal 0.17 m thick Ro#19 90% vitrain shiny black, well cleated, 10% clarodurain, metallic grey, hard
153.51	155.70	Mudstone, silty and coaly interbedded, calcareous where silty, coaly streaks and blebs up to 1cm x 4 cm few sandstone beds white to pale grey, fine grained, calcareous, burrows, bioturbated
155.70	157.18	Sandstone, muddy and fine grained interbedded with white medium grained trough crossbeds, very slightly muddy, slightly convoluted
157.18	158.04	Silty mudstone, with siltstone laminae and blebs, siltstone is very pale grey, calcareous
158.04	158.85	Carbonaceous Mudstone, sandy at base

HOLE+

W.C.C. 80-5

From - 158.85 To 170.55

FROM	TO	DESCRIPTION
158.85	160.67	Sandstone, muddy siltstone, muddy sandstone, Interbedded and interlaminated, sandstone is white to pale grey, fine to medium, grained interbedded, some beds with trough crossbeds
160.67	161.50	Silty mudstone, dark grey to dark medium grey, sandy at base, very calcareous Paly #6
161.50	162.66	Sandstone pale grey to very pale grey, fine to medium grained, very calcareous, mudstone in laminae and mixed in siltstone clasts 0.5 cm ²
162.66	163.48	Mudstone, silty at top, increasing carbonaceous towards base, coal bleb 2cm x 1.5 cm
163.48	164.81	Coal 1.33 m thick, 100% recovery 2 Fsi #8, 1 Reg #8, 1 Ro #20 63% clarodurain metallic grey very hard, cleated 25% vitrain well cleated, shiny black, easily broken, 10% fusain in blebs, soft dull black
164.81	165.42	Muddy sandstone and silty mudstone interbedded, both dark medium grey, sandstone fine grained, slightly calcareous
165.42	165.70	Coaly mudstone, bands up to 3 cm thick of vitrain
165.70	166.32	Muddy Sandstone, fine grained, medium grey, very calcareous, convoluted
166.32	167.08	Sandstone, fine grained, white and muddy grey, trough crossbeds
167.08	168.45	Muddy sandstone and sandy mudstone, dark medium grey, calcareous, sandstone is fine grained
168.45	169.13	Mudstone, dark brown black to medium brown slightly calcareous
169.13	169.41	Coal 0.28 m thick Ro #21 95% very hard metallic grey, clarodurain 5% vitrain shiny black, well cleated
169.41	170.15	Mudstone massive, dark grey-black, very calcareous, occasional hairlike calcite, veinlets
170.15	170.55	Sandstone and sandy mudstone, interbedded and mixed, very calcareous, bioturbated, sandstone is white, fine grained

HOLE+

W.C.C. 80-5

From 170.55 To 177.52

FROM	TO	DESCRIPTION
170.55	172.58	Mudstone - dark brown-black, carbonaceous and soft, silty between 170.87 and 172.12 calcareous where silty
172.58	173.26	Muddy sandstone and sandy mudstone, interbedded and mixed convoluted and bioturbated, sandstone is fine grained, pale grey to brown
173.86	175.18	Sandstone with mudstone laminae Sandstone is fine grained, very pale grey with slight mud, convoluted, few mudstone clasts calcareous where convoluted, some through crossbeds
175.18	175.56	Mudstone with siltstone laminae and blebs calcareous, dark brown-black with siltstone
175.56	175.72	Very coaly mudstone, Coaly streaks of vitrain hairlike to 2mm thick
175.72	176.00	Mudstone dark grey and brown, sandy at top
176.00	176.27	Sandstone, medium grained, white and medium grey where muddy and slightly calcareous shallow trough crossbeds
176.27	176.57	Very coaly mudstone, dark brown to black bonds of vitrain up to 3 mm thick
176.57	176.90	Silty mudstone, dark grey, massive
176.90	177.00	Coal and coaly mudstone Coal up to 4 cm thick vitrain
177.00	177.52	Coal 0.52 metres thick total 100% recovery Ro #27 3 cm split mudstone only 0.49 metres coal 177.00 to 177.09 Coal 50% clarodurain, hard metallic grey 50% vitrain, shiny black, well cleated 177.09 to 177.12 split mudstone dark brown black coaly 177.12 to 177.52 coal 50% clarodurain metallic grey, very hard 50% vitrain, shiny black, well cleated

HOLE* W.C.C. 80-5From, 177.52 To 181.22

FROM	TO	DESCRIPTION
177.52	177.81	Mudstone, massive dark grey-black Paly #7
177.81	177.91	Coal 0.10 metres thick, sandstone laminae and burrows, metallic grey, very hard, cleated
177.91	178.26	Mudstone with sandstone, laminae and burrows bioturbated, sandstone is very pale grey, calcareous, fine grained
178.26	178.42	Sandstone with mudstone, interbeds Sandstone is fine grained, very pale grey Planar x beds, very calcareous Sandstone burrows occur in mudstone beds
178.42	178.67	Sandy mudstone and mudstone with sandstone blebs, well mixed
178.67	178.82	Sandstone, with muddy laminae Sandstone is fine grained, pale grey, very calcareous, some steep bedding 45° to 60° to C/A most bedding above and below is 580° to C/A
178.82	179.17	Sandstone, salt and pepper, medium grained very calcareous. massive, one 2cm mudstone bed and laminae associated
179.17	179.28	Sandstone, fine grain, medium grey, slightly muddy one mudstone filled burrow 3 cm long 0.5 cm wide
179.28	179.55	Mudstone dark grey-black slightly coaly , hairlike streaks
179.55	179.85	Sandy mudstone, grading downwards into muddy sandstone
179.85	180.10	Sandstone, slightly muddy, very calcareous, pale to medium grey, fine grained , bioturbated
180.10	180.25	Mudstone, dark grey black, massive , v. slightly coaly
180.25	181.22	Sandstone, muddy snadstone and sandy mudstone, interbedded and mixed. slight pyrite disseminated less sandy, more muddy towards base sandstone is very pale grey, fine grained

FROM	TO	DESCRIPTION
181.22	181.52	Coal 0.30 metres thick Ro#23
		100% recovery
		50% vitrain shiny black well cleated,
		easily broken, 50% clarodurain, metallic grey
		hard cleated to conchoidal fracture
181.52	181.72	Carb. mudstone, dark brown-black
		pyrite disseminated
186.72	181.95	Muddy coal 0.23 metres thick Po#24
181.95	185.37	Mudstone, dark grey-black Paly #8, 182.15
		carbonaceous 8b 183.90
		8c 184.71
		slightly sandy below 184.70 in laminae and blebs
185.37	185.83	Coal 0.45 metres thick 100% recovery Ro #24
		60% clarodurain very hard, metallic grey
		40% shiny black, well cleated
185.83	185.08	Very coaly mudstone, dark brown black
		coal bands vitrain up to 1cm thick
186.08	187.13	Mudstone, dark grey black
		coaly bands up to 1cm thick-vitrain from
		186.41 to 186.56, one siltstone laminae with burrows
187.13	188.35	Sandy mudstone, increasing sandstone towards base
		Mudstone is medium dark grey
		Sandstone is fine grained pale to medium grey
188.35	188.67	Sandstone, fine grained, very pale grey to white
		slightly muddy, one mudstone bed, 3.5 cm thick
		slight bioturbation
188.67	189.40	Sandy Mudstone and muddy sandstone
		interbedded and interlaminated
189.40	198.43	Quart Zose lithic sandstone, salt and pepper
		very coarse at top, fines to a medium grain at base
Monach		Sed. Sample #8 198.60 to 198.635 and
Formation		190.42 to 190.50.

FROM	TO	DESCRIPTION
(continued)		granular conglomeratic in bands
		above 190.75
		Grains up to 0.6 cm x 0.4 cm
		large grains mostly grey chert and white quartz
		80% Quartz 20% dark chert mafics and feldspar
		carbonaceous bands on 70° to C/A
		a few beds of fine grained sandstone
		and mudstone 8cm to 14cm
		occassional coaly streaks hairline to 1mm thick
		from 194.00 to 196.25 bedding
		changes from massive to 40° to C/A to 20° to C/A
		to 30° to C/A to 50° to C/A to massive
		indicative of foreset beds
198.43	198.60	Coal 0.17 metres thick Ro#25
		65% vitrain, shiny black, well cleated, easily broken
		35% clarodurain metallic grey, hard interbanded
		large burrow filled with sandstone Sed Sample #9
198.60	201.89	Muddy sandstone fine grained medium grey,
		more muddy at top, bioturbated to 199.49,
		slightly calcareous, planar and trough
		crossbeds below 199.49, medium and large
201.89	202.07	Sandstone and mudstone interbedded
		Sandstone is medium grey, fine grained to
		very fine grained, trough crossbeds
		small burrows in mudstone beds
202.07	202.42	Sandstone, with few muddy laminae and burrows
		medium grey, very fine grained
		all crossbeds trough and planar
202.42	204.38	Sandstone and mudstone interbedded
		and interlaminated, muddier towards base
		moderate bioturbation
		sandstone is medium to pale grey, fine grained

FROM	TO	DESCRIPTION
(continued)		some trough crossbeds
		calcareous
		mudstone is dark grey - black
204.38	204.44	Coal - 0.11 metres thick Ro #26
		80% vitrain and shiny black, well cleated, easily broken
		20% clarodurain, metallic grey, hard
204.49	204.79	Mudstone, massive, dark brown-black
204.79	204.90	Sandy mudstone, dark brown
204.90	205.40	Sandstone, very calcareous, fine grain, very pale to medium grey, slightly muddy towards base
		extremely bioturbated
205.40	206.21	Sandstone and mudstone interbedded and interlaminated but extreme bioturbation
		has mixed beds
		Sandstone is very pale to pale grey
		calcareous
		Mudstone is dark brown-grey
206.21	206.32	Mudstone with siltstone laminae and blebs
206.32	206.95	Sandstone, muddy sandstone and sandy mudstone mixed by convoluted bedding and in narrows and interbedded
		Sandstone is very fine grained, very pale grey
206.28	207.29	Coal 0.37 metres thick, 100% recovery Ro#27.
		50% clarodurain metallic grey, hard, 50%, shiny black, well cleated vitrain
		more clarodurain at top
		more vitrain at base
207.29	210.61	Sandy mudstone, muddy sandstone and sandstone interbedded and interlaminated
		convoluted below 209.64
		sandstone is fine grain, very pale grey to white
		very calcareous
		occasional burrows
		sandy mudstone is dark grey-brown
		slightly calcareous

FROM	TO	DESCRIPTION
210.61	215.26	Sandy mudstone and sandstone interlaminated and interbedded Sandstone is white to very pale grey fine grained, very calcareous, in trough crossbeds, very slightly muddy, bedding is 70° to C/A moderate bioturbation
215.26	216.51	Sandstone and sandy mudstone interbedded and mixed by slight convoluted bedding and bioturbation Sandstone is pale grey, fine grained calcareous, very convoluted and calcite veinlets at base in horizontal and at 45° angle in steps \leq 2mm thick
216.51	217.00	Sandstone white to very pale grey slightly muddy, fine grained calcareous, small trough crossbeds
217.00	217.10	Sandstone and sandy mudstone interlaminated sandstone is pale to medium grey calcareous
217.10	217.24	Mudstone, brown very hard and calcareous to 217.15 dark grey-black, silty to 217.24
217.24	218.95	Sandstone with muddy sandstone and sandy mudstone laminae sandstone is fine grained pale to medium grey, very calcareous shallow through crossbeds, muddier towards base
218.95	219.53	Mudstone with sandstone laminae Mudstone is dark grey-brown and black Sandstone is pale grey, fine grained, calcareous
219.53	220.60	Mudstone with occasional sandstone beds and laminae, moderately bioturbated Mudstone is dark grey - black, carbonaceous

803

McElburn Carbon Wells 2013/1A

Widco WELL LOG

COMPANY: Utah Minerals
 AREA: West Carbon Creek
 WELL: W.C.C. 8031
 COUNTY: Land District STATE

507

COORDINATES: 417060 N
 N: 33,450 E
 ELEVATION: 1453m
 D.F. K.B.
 G.I.

WELL: W.C.C. 8031
 LOCATION: WEST CARBON CREEK
 COMPANY: Utah Minerals
 STATE: U.T.A.

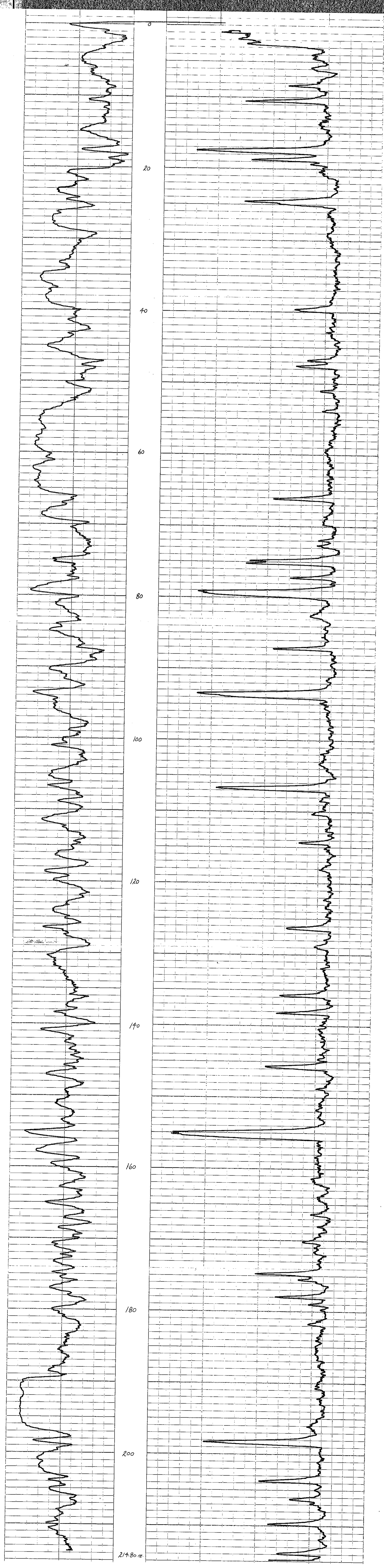
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	July 2, 1980				
First Reading	214.8m		Nature		
Last Reading	0		Density		
Footage Logged	0		Viscosity	@	PF
Bottom (Driller)	214.8m		Resistivity	@	PF
Casing (From Log)	215.1m		Res. @ BHT	@	PF
Casing (Driller)	6.4m		pH		
Casing Size	HW-114.3mm		Cl/A Temp		
Bit Size	HO-96.0m		B.H. Temp		
Bit Size			Logged by	J. Ridley	
			Witnessed by	K. Vign	

REMARKS

Reg. U.S. Pat. Off.

GAMMA
100cps

DENSITY
500cps



214.80m

FO-130

Widco WELL LOG

COMPANY: Utah Mines Ltd.
 AREA: West Carbon Creek
 WELL: W.C.C. 80-3
 COUNTY: Grand District STATE: B.C.

507

COORDINATES: 41,060 N
 N: 33,450
 S: ELEVATION: 1455m
 D.F.:
 K.B.:
 G.I.:

COMPANY: Utah Mines Ltd.
 WELL: W.C.C. 80-3
 LOCATION: WEST CARBON CREEK

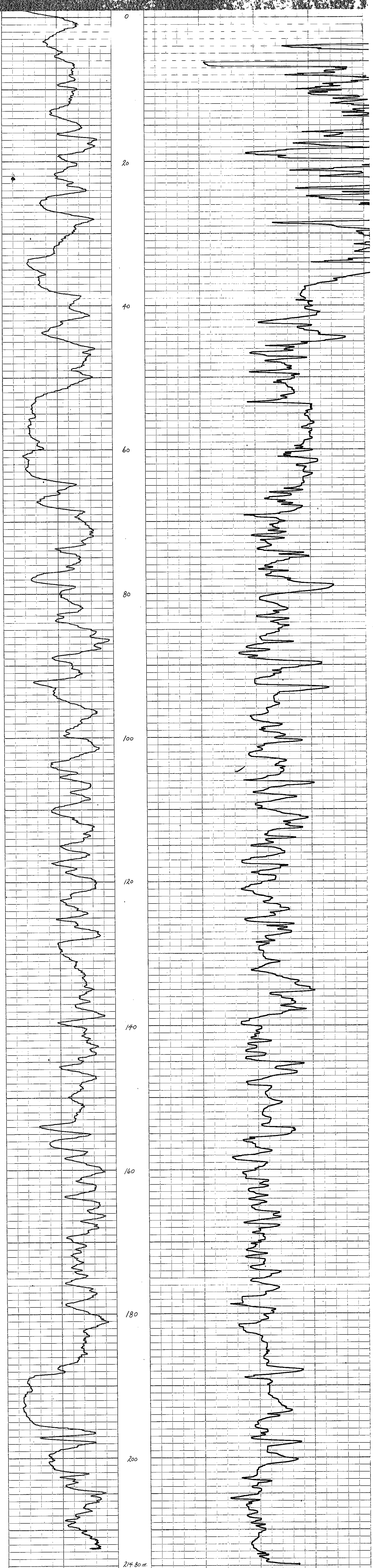
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	July 2, 1980		Nature		
First Reading	212.8m		Density		
Last Reading	0		Viscosity	@ °F	@ °F
Footage Logged	214.18m		Resistivity	@ PF	@ PF
Bottom (Driller)	215.1m		Res. @ BHT	@ °F	@ °F
Casing (From Log)	8.0m		pH		
Casing (Driller)	8.2m		Circ. Temp.		
Casing Size	HW 114.3mm		B.H. Temp.		
Bit Size	10.96cm		Logged by	J. Ridley	
Bit Size	10.96cm		Witnessed by	K. Yip	

REMARKS

* Reg. U.S. Pat. Off.

GAMMA
100cps

RESISTIVITY
10 ohms/in.



214.80 m.

80-4

PC-Carbon Creek - West, 80(3)A

Widco WELL LOG

COMPANY: Utah Mines Ltd.
 WELL: W.C.C. 80-4
 LOCATION: WEST CARBON CREEK

COMPANY: Utah Mines Ltd.
 AREA: West Carbon Creek
 WELL: W.C.C. 80-4
 COUNTY: Kane District STATE: B.C.

507

COORDINATES: 40,970' N
 N: 34,750' E
 S: 1348m
 D.F.
 K.B.
 G.I.

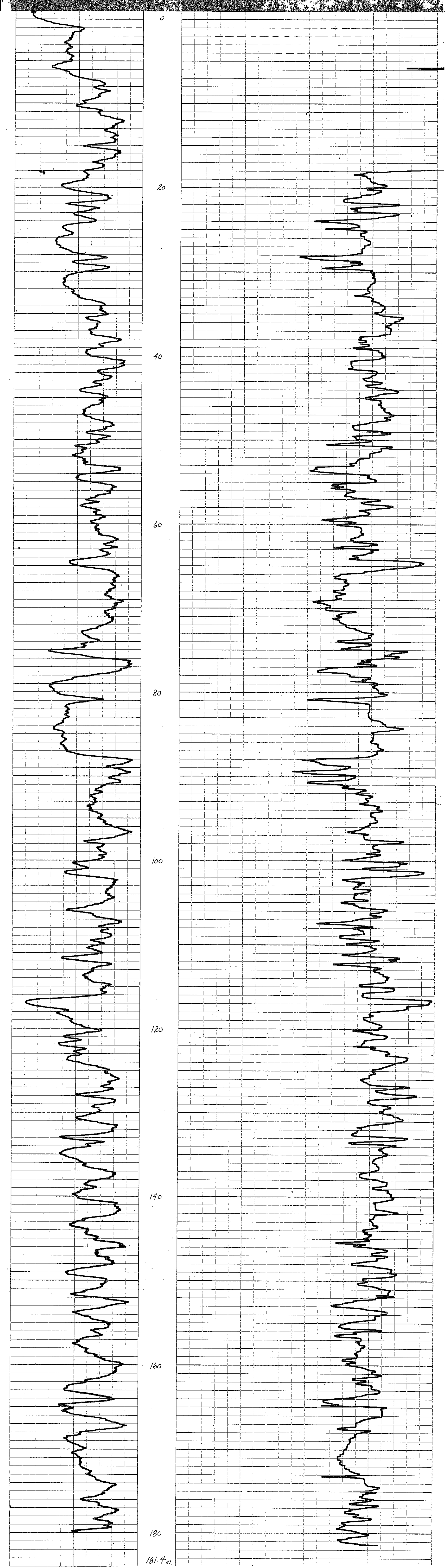
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	July 10		Nature		
First Reading	181.40m		Density		
Last Reading	0		Viscosity	@ °F	@ °F
Footage Logged	181.40m		Resistivity	@ °F	@ °F
Bottom (Driller)	181.66m		Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH:		
Casing (Driller)	5.19m		Circ. Temp.		
Casing Size	HW-114.3mm		B.H. Temp.		
Bit Size:	HQ-96.0mm				
Bit Size:					
			Logged by:	R.B. Anderson	
			Witnessed by:	N. Duncan	

REMARKS:

* Reg. U.S. Pat. Off.

GAMMA
100cps

RESISTIVITY
50ohms/in



FO-139

80-4

W-Carbon Creek West 80(3)A

Widco WELL LOG

COMPANY: Utah Mines Ltd.
 WELL: W.C.C.-80-4
 LOCATION: WEST CARBON CREEK

COMPANY: Utah Mines Ltd.
 AREA: West Carbon Creek
 WELL: W.C.C.-80-4
 COUNTY: Land District STATE B.C.

COORDINATES: 40,870 N
 N: 34,750 E
 S
 ELEVATION: 1348m
 D.F.
 K.B.
 G.L.

507

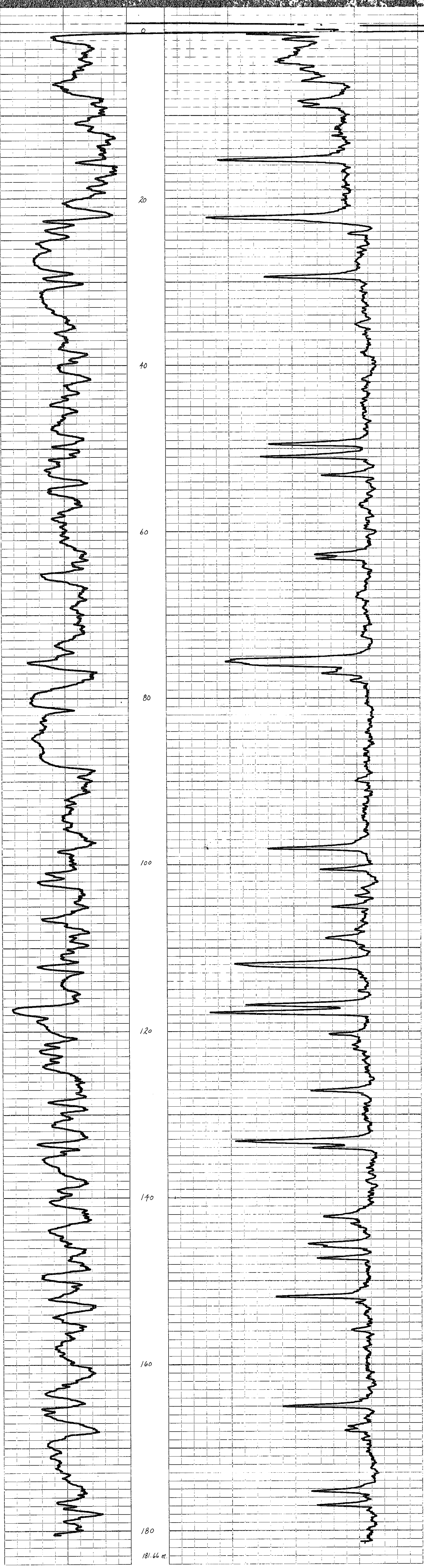
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	July 10, 1980		Nature		
First Reading	181.66m		Density	@ °F	@ °F
Last Reading	0		Viscosity	@ °F	@ °F
Footage Logged	181.66m		Resistivity	@ °F	@ °F
Bottom (Driller)	181.66m		Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH		
Casing (Driller)	5.19m		Circ. Temp.		
Casing Size	HW=114.3mm		B.H. Temp.		
Bit Size	HC=96.0mm				
Bit Size					
			Logged by	R. E. Anderson	
			Witnessed by	N. Duncan	

REMARKS

Reg. U.S. Pat. Off.

GAMMA
100cps

DENSITY
500cps



0
20
40
60
80
100
120
140
160
180
181.66 m

FO-13

80-5
P.P. Carbon Creek West 80(B)A

Widaco WELL LOG

COMPANY: Utah Mines, Inc.
 AREA: West Carbon Creek
 WELL: W.C.C. - 80-5
 COUNTY: Grand
 STATE: H.C.

COORDINATES: 41,960 N
 52,230 E
 ELEVATION: 1315m
 D.F.
 K.B.
 G.L.

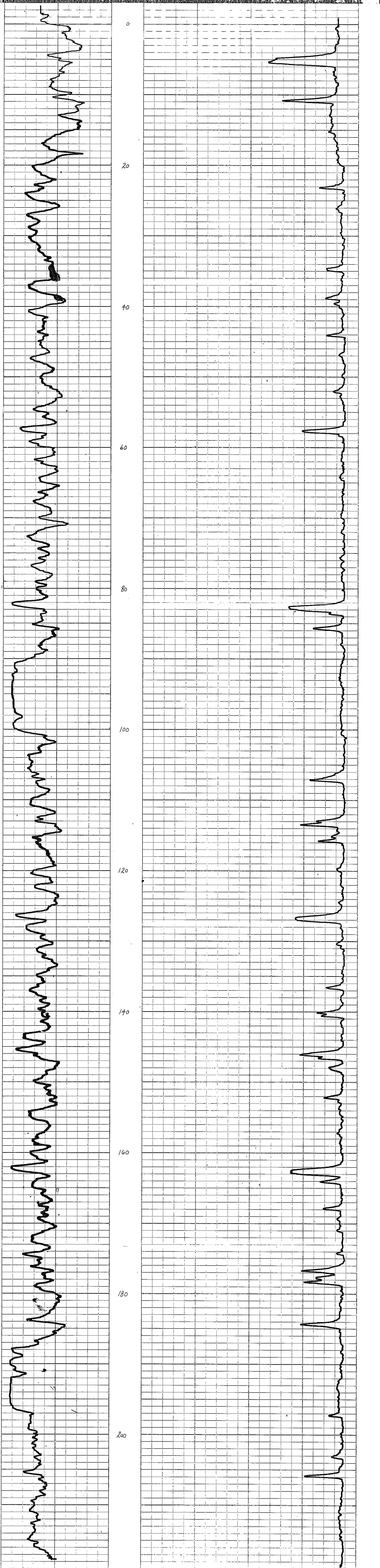
LOCATION: WEST CARBON CREEK
 WELL: W.C.C. - 80-5
 COMPANY: Utah Mines, Inc.

507

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	July 26, 1980				
First Reading	219.34m		Nature		
Lost Reading	0.00m		Density		
Footage Logged	219.34m		Viscosity	@ °F	@ °F
Bottom (Driller)	221.25m		Resistivity	@ °F	@ °F
Casing (From Log)	2.20m		Res @ BHT	@ °F	@ °F
Casing (Driller)	2.20m		pH		
Casing Size	Hd. 114.3mm		Circ. Temp.		
Bit Size	HO 96.0mm		S.H. Temp.		
Bit Size			Logged by	J. Ridley	
			Witnessed by	K. Yip	

REMARKS

GAMMA 100cps
 DENSITY 500cps



219.34 m

80-5

Pls Carbon Creek West 80(3)A

Wideo WELL LOG

COMPANY Utah Mines Ltd.
WELL M.C.C. 80-5
LOCATION WEST CARBON CREEK

COMPANY Utah Mines Ltd.
AREA West Carbon Creek
WELL M.C.C. 80-5
COUNTY Peace River PROV. Land District STATE B.C.

COORDINATES: 41,950 N
N 35,230 E
ELEVATION: 1315 m
D.F.
K.B.
G.L.

507

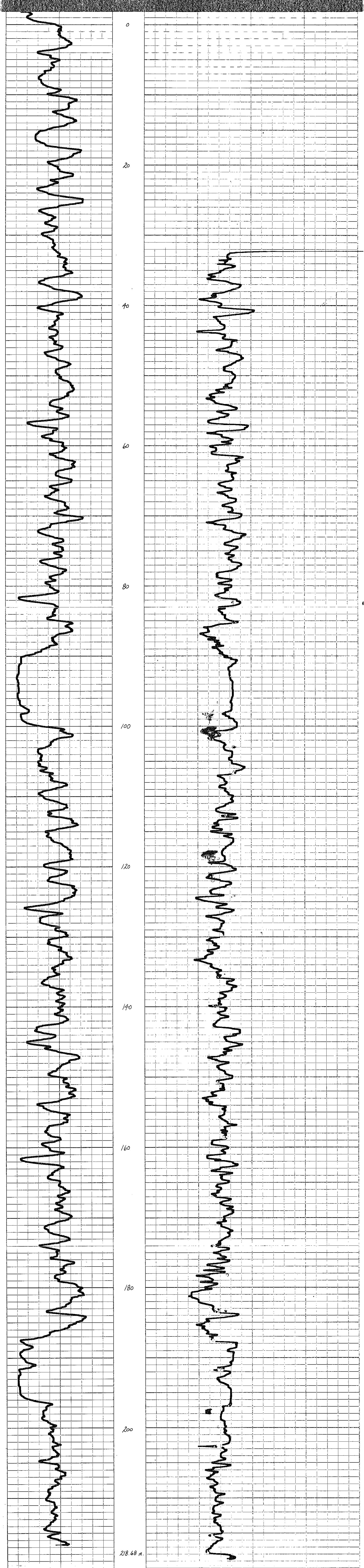
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	July 26, 1980		Nature		
First Reading	218.68m		Density		
Last Reading	0m		Viscosity	@ °F	@ °F
Footage Logged	218.68m		Resistivity	@ °F	@ °F
Bottom (Driller)	221.25m		Res. @ BHT	@ °F	@ °F
Casing (From Log)			pH		
Casing (Driller)	HW 114.2mm		Circ. Temp.		
Casing Size	HO 96.0mm		B.H. Temp.		
Bit Size:					
			Logged by	J. Ridley	
			Witnessed by	K. Yip	

REMARKS

* Reg. U.S. Pat. Off.

GAMMA
100 cps

RESISTIVITY
500 ohms/in



UTAH MINES LTD. GRAPHIC CORE LOG

HOLE NO. WCC-80-3

HOLE NO. WCC-80-3

LOG BY: K.YIP + R.OLAUSSON

ELEV: 1455 m

HOLE SIZE: HQ-96.0 m

PROJECT:

DATE: JULY 6, 1980

N: 41,060 m

AIR WATER

LEASE:

% REC	DEPTH	STRIP LOG	THICK	SAMPLE NO.	GRAN.

E: 33,450 m

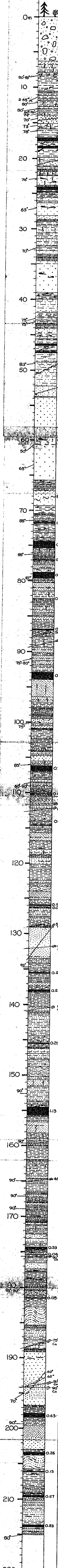
T.D. 215.19 m P.D.

SEC. T. R.

LITHOLOGY

ANALYSIS

507



DEPTH	LITHOLOGY	ANALYSIS
0m		
10		
20		
30		
40		
50		
60		
70		
80		
90		
100		
110		
120		
130		
140		
150		
160		
170		
180		
190		
200		
210		
220		

PR-Carbon Creek - West 80/31A
80-4

UTAH MINES LTD. GRAPHIC CORE LOG

HOLE NO. WCC-80-4

HOLE NO. WCC-80-4

LOG BY: R. OLANSON

ELEV: 1348 m

HOLE SIZE: HQ-96.0mm

PROJECT:

DATE: JULY 15, 1980

N: 40.870 m

AIR WATER

LEASE: 4120

E: 34.750 m

T.D. 181.66m P.D.

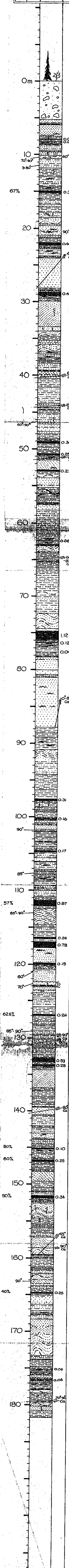
SEC. T. R.

% REC DEPTH STRIP LOG THICK SAMPLE NO. GRAY.

LITHOLOGY

ANALYSIS

507



UTAH MINES LTD

GRAPHIC CORE LOG

HOLE NO. WCC-80-5

HOLE NO. WCC-80-5

LOG BY: R. OLAFSON

ELEV: 1316 m

HOLE SIZE: HQ-96.0 mm

PROJECT:

DATE: JULY 31, 1980

N: 41,960 m

AIR WATER

LEASE: 41/B

E: 35,230 m

T.D. 221.25 m P.D.

SEC. T. R.

% REC.	DEPTH	STOP LOG	THICK	SAMPLE NO.	GRAY.	LITHOLOGY	ANALYSIS
	0m						
	70%		0.51m				
	10		0.41				
	55°		0.20				
	20		0.20				
	30		0.20				
	75°		0.68				
	44%						
	40						
	50						
	100%						
	60						
	70						
	80						
	90°		1.02				
95%	100%		0.05				
	60%		0.58				
	90						
	100						
	100%		0.04				
	110		0.35				
	100%		0.22				
	100%		0.33				
	120						
	130		0.79				
	140		0.05				
	61°		0.51				
	150		1.08				
	160		0.17				
	100%		1.33				
	170		0.28				
	100%		0.52				
	100%		0.10				
	100%		0.30				
	100%		0.45				
	190						
	200		0.17				
	100%		0.11				
	100%		0.37				
	210						
	70°						
	220		0.10				

507

OPEN FILE

~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

APPENDIX II

4104-74123

ANALYTICAL DATA FOR

D.D.H. W.C.C.-80-3, W.C.C.-80-4, and W.C.C.-80-5

~~CONFIDENTIAL~~
ASSESSMENT REPORT

00 507

INTER-OFFICE CORRESPONDENCE

Date: December 30, 1980

cc: R. B. Anderson
E. W. Burchert
R. N. Hickman
J. R. Messineo
M. J. Young

To: A. W. Lanckenau

From: K. F. Chon

Sub: WASHABILITY TESTING OF THE WEST CARBON CREEK COAL

Ref:

Attached are the washability and flotation test results on the samples from the drill hole numbers WCC-80-3, 4, and 5 of the West Carbon Creek coal. Also attached are the sulfur forms, water soluble alkalies, Hardgrove grindability **indices**, **mineral** analyses of ash, fusion temperatures of ash, equilibrium moistures and the ultimate analyses run on the head samples. This completes the work on the West Carbon Creek coal project of 1980.

KFC:jb

Attachment

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

17.00-17.53 METERS

SAMPLE #1

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
HEAD	1.29	12.03	1.69	29.63	57.05	13036	7 1/2	12.19	1.71	30.02	57.79	13206

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>CUMULATIVE DATA</u>					
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	54.55	2.35	0.89	34.06	63.59	14915	9	54.55	2.35	0.89	34.06	63.59	14915
1.350F	20.93	6.38	0.87	33.08	60.54	14314	8	75.48	3.47	0.88	33.79	62.74	14748
1.400F	5.59	11.98	0.86	32.85	55.17	12987	8	81.07	4.05	0.88	33.72	62.23	14627
1.450F	1.57	15.91	0.82	32.74	51.35	12318	8	82.64	4.28	0.88	33.71	62.01	14583
1.500F	1.68	19.71	1.68	32.14	48.15	11407	7	84.32	4.59	0.90	33.67	61.74	14520
1.600F	1.48	24.79	1.36	29.05	46.16	10243	6	85.80	4.94	0.90	33.59	61.47	14446
1.800F	4.50	42.33	1.04	25.44	32.23	8699	2 1/2	90.30	6.80	0.91	33.19	60.01	14159
1.800S	9.70	59.22	10.11	20.94	19.84	4647	0	100.00	11.88	1.80	32.00	56.12	13237
TOTAL	100.00	11.88	1.80	32.00	56.12	13237							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #WCC-80-3

17.00-17.53 METERS

SAMPLE #1

28M x 0

FLOTATION TEST

STRUCTURES

e-m

SIZE	% WEIGHT	CUM. %WT.
3/8" x 28M	91.31	91.31
28M x 0	8.16	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

SP. GR. % WI'	ELEMENTARY DATA						% DISTRIBUTION				
	% ASH	% S	% VM	% FC	BTU	FSI e-s	ASH	S	VM	Fc	BTU
CONC I. 23.30	4.79	0.93	31.52	63.69	14399	7 1/2	13.47	16.94	24.11	24.23	24.20
CONC II. 60.00	6.04	1.01	30.94	63.02	14193	7	43.73	47.31	60.96	61.72	61.64
REFUSE 16.70	21.24	2.74	27.23	51.53	11646	4 1/2	42.80	35.75	14.93	14.05	14.08
TOTAL 100.00	8.29	1.28	30.46	61.26	13816		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #1

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	46.50
Alumina, Al ₂ O ₃	12.90
Titania, TiO ₂	0.73
Ferric oxide, Fe ₂ O ₃	21.10
Lime, CaO	3.08
Magnesia, MgO	3.95
Potassium oxide, K ₂ O	1.85
Sodium oxide, Na ₂ O	0.22
Sulfur trioxide, SO ₃	6.53
Phos. pentoxide, P ₂ O ₅	0.16
Undetermined	<u>2.98</u>
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.18

SILICA VALUE = 62.31

BASE: ACID RATIO = 0.50

FOULING INDEX = 0.11

SLAGGING INDEX = 0.86

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #1

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.29	--
% CARBON	12.29	73.23
% HYDROGEN	4.23	4.29
% NITROGEN	1.45	1.47
% CHLORINE	0.19	0.19
% SULFUR	1.69	1.71
% ASH	12.03	12.19
% OXYGEN (DIFF.)	<u>6.83</u>	<u>6.92</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2252	2078
Softening (H=W)	2360	2109
Softening (H=1/2 W)	2433	2172
Fluid	2540	2298

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

74.33-74.67 METERS

SAMPLE #2A

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.09	10.62	0.91	33.29	55.00	13477	8 1/2	10.74	0.92	33.66	55.60	13626

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		BASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	25.98	3.78	0.85	37.05	59.17	14799	9	25.98	3.78	0.85	37.05	59.17	14799
1.350F	41.40	7.80	0.72	36.53	55.67	14064	8 1/2	67.38	6.25	0.77	36.73	57.02	14348
1.400F	21.14	11.83	0.74	34.39	53.78	13256	8	88.52	7.58	0.76	36.17	56.25	14087
1.400s	11.48	30.26	2.36	29.33	40.41	10308	6 1/2	100.00	10.19	0.95	35.39	54.42	13653
TOTAL	100.00	10.19	0.95	35.39	54.42	13653							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #WCC-80-3

74.33-74.67 METERS

SAMPLE #2A

28M X 0

FLOTATION TEST

STRUCTURES

SIZE	% WEIGHT	CUM. %WT.
3/8" X 28M	93.12	93.12
28M X 0	6.88	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

SP. GR. % WT.	ELEMENTARY DATA						% DISTRIBUTION				
	% ASH	% S	% VM	% FC	BTU	FSI	ASH	S	VM	FC	BTU
CONC I. 50.39	6.27	0.69	36.72	56.51	14142	8	36.41	44.62	51.66	51.95	51.81
CONC II*. 49.61	12.01	0.87	34.90	53.09	13363	7 1/2	63.59	55.38	48.34	48.05	48.19
TOTAL 100.00	9.37	0.78	35.82	54.81	13755		100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 5.37 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #2A

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	44.10
Alumina, Al ₂ O ₃	12.20
Titania, TiO ₂	0.74
Ferric oxide, Fe ₂ O ₃	27.30
Lime, CaO	4.75
Magnesia, MgO	1.90
Potassium oxide, K ₂ O	1.51
Sodium oxide, Na ₂ O	0.44
Sulfur trioxide, SO ₃	5.97
Phos. pentoxide, P ₂ O ₅	0.48
Undetermined	0.61
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.15

SILICA VALUE = 56.50

BASE: ACID RATIO = 0.63

FOULING INDEX = 0.28

SLAGGING INDEX = 0.58

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #2A

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.09	---
% CARBON	15.69	76.52
% HYDROGEN	4.59	4.64
% NITROGEN	1.43	1.45
% CHLORINE	0.22	0.22
% SULFUR	0.91	0 . 9 2
% ASH	10.62	10.74
% OXYGEN (DIET.)	<u>5.45</u>	<u>5.51</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2305	1973
Softening (H=W)	2431	1991
Softening (H=1/2 W)	2529	2091
Fluid	2571	2227

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

74.79-75.25 METERS

SAMPLE #2B

3/a" x 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.23	16.88	0.78	30.92	50.97	12432	a	17.09	0.79	31.31	51.60	12587

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	56.66	2.91	0.74	35.29	61.80	15024	a	56.66	2.91	0.74	35.29	61.80	15024
1.350F	5.50	7.50	0.70	34.90	57.60	14084	7 1/2	62.16	3.32	0.74	35.25	61.43	14941
1.400F	3.94	12.45	0.78	33.95	53.60	13091	a	66.10	3.86	0.74	35.18	60.96	14831
1.450F	3.81	19.a7	1.60	32.66	47.47	12014	a	69.91	4.73	0.79	35.04	60.23	14677
1.500F	5.35	26.18.	1.15	31.13	42.69	11036	7 1/2	75.26	6.26	0.81	34.76	58.98	14418
1.550F	7.49	31.95	0.72	29.80	38.25	10160	6 1/2	82.75	8.58	0.80	34.31	57.11	14033
1.600F	2.94	35.52	0.74	29.30	35.18	9461	6	85.69	9.51	0.80	34.14	56.35	13876
1.800F	2.88	36.74	0.62	28.41	34.85	a447	5 1/2	88.57	10.39	0.80	33.95	55.66	13700
1.800S	11.43	74.25	0.50	18.89	6.86	2925	0	100.00	17.69	0.76	32.23	50.08	12468
TOTAL	100.00	17.69	0.76	32.23	50.08	12468							

0

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COALHOLE #WCC-80-374.79-75.25 METERSSAMPLE #2B28M x 0FLOTATION TESTSTRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" x 28M	91.96	91.96
28M x 0	8.04	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>mu</u>
CONC I.	66.44	7.23	0.74	34.93	57.84	14173	'8 1/2	32.01	65.86	68.11	75.48	71.82
CONC II.*	33.56	30.40	0.76	32.38	37.22	11010	J	67.99	34.14	31.89	24.52	28.18
TOTAL	100.00	15.01	0.75	34.07	50.92	13111		100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 5.78 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #2B

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica,	SiO ₂	59.90
Alumina,	Al ₂ O ₃	18.60
Titania,	TiO ₂	0.69
Ferric	oxide, Fe ₂ O ₃	8.90
Lime,	CaO	2.07
Magnesia,	MgO	1.91
Potassium	oxide, K ₂ O	3.10
Sodium	oxide, Na ₂ O	0.66
Sulfur	trioxide, SO ₃	2.33
Phos.	pentoxide, P ₂ O ₅	0.48
Undetermined		1.36
Total		100.00

ALKALIES AS Na ₂ O, DRY COAL BASIS	=	0.46
SILICA VALUE	=	82.30
BASE: ACID RATIO	=	0.21
FOULING INDEX	=	0.14
SLAGGING INDEX	=	0.17

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #2B

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.23	—
% CARBON	71.34	72.23
% HYDROGEN	4.55	4.61
% NITROGEN	1 . 5 2	1.54
% CHLORINE	0.20	0.20--
% SULFUR	0.78	0.79
% ASH	16.88	17.09
% OXYGEN (DIFF.)	<u>3.50</u>	<u>3.54</u>
TOTAL	100.00	100.00

NSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2263	2174
Softening (H=W)	-2475	23.12
Softening (H=1/2 W)	2486	2396
Fluid	2690	2600

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

78.74-79.66 METERS

SAMPLE #3

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.25	10.78	0.62	32.85	55.12	1.3109	7 1/2	10.92	0.63	33.27	55.81	13275

MOISTURE FREE BASIS

ELEMENTARY DATA

CUMULATIVE DATA

SP. GR.	% WT.	% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	19.41	2.59	0.70	35.95	61.46	14905	8	19.41	2.59	0.70	35.95	61.46	14905
1.350F	30.50	5.08	0.64	35.19	59.13	14444	8	49.91	4.11	0.66	35.49	60.40	14623
1.400F	24.11	10.59	0.62	34.58	54.83	13304	8	74.02	6.22	0.65	35.19	58.59	14193
1.450F	a.40	15.10	0.55	33.51	51.39	12416	8	82.42	7.13	0.64	35.02	57.85	14012
1.500F	7.17	19.98	0.53	32.37	47.65	11554	8	89.59	8.15	0.63	34.81	57.04	13815
1.550F	2.88	22.24	0.50	31.23	46.53	10861	7	92.47	a.59	0.63	34.70	56.71	13723
1.600F	2.23	26.44	0.47	29.06	44.50	10064	7	94.70	9.01	0.62	34.56	56.43	13637
1.800F	2.67	31.41	0.49	27.01	41.58	8897	6	97.37	9.63	0.62	34.36	56.01	13507
1.800S	2.63	55.33	0.45	19.63	25.04	5160	0	100.00	10.83	0.61	33.97	55.20	13288
TOTAL	100.00	10.83	0.61	33.97	55.20	13288							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #WCC-80-3

78.74-79.66 METERS

SAMPLE #3

28M X 0

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" x 28M	97.11'	97.11
28M X 0	2.89	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	50.19	7.68	0.66	36.60	55.72	1.3894	8	40.73	51.32	51.88	50.73	51.34
CONC*II	49.81	11.26	0.63	34.21'	54.53	13270	7	59.27	48.68	48.12	49.21	48.66
TOTAL	100.00	9.46	0.65	35.41	55.13	1.3583		100.00	100.00	160.00	100.00	100.00

* ALSO CONTAINS 2.52 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #3

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.25	-
% CARBON	76.70	77.67
% HYDROGEN	4.79	4.85
% NITROGEN	1.50	1.52
% CHLORINE	0.21	0.21
% SULFUR	0.62	0.63
% ASH	10.78	10.92
% OXYGEN (DIFF.)	4.15	<u>4.20</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2575	2110
-Softening (H=W)	>2777	2177
Softening (H=1/2 W)	>2777	2275
Fluid >	2777	2313

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

92.91-93.87 METERS

SAMPLE #4

3/8" X 28M

WASHABILITY TEST

I

AIR DRY BASIS

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% Ash</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
HEAD	1.37	7.94	0.76	28.90	61.79	13836	7	8.05	0.77	29.30	62.65	14028

MOISTURE FREE BASIS

ELEMENTARY DATA

CUMULATIVE DATA

<u>SP. GR.</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	46.62	1.72	0.80	31.62	66.66	15099	8 1/2	46.62	1.72	0.80	31.62	66.66	15099
1.350F	34.63	4.61	0.77	29.64	65.75	14635	3 1/2	81.25	2.95	0.79	30.78	66.27	14901
1.400F	7.32	10.83	0.81	29.15	60.02	13541	3 1/2	88.57	3.60	0.79	30.64	65.76	14789
1.450F	2.15	18.12	0.60	29.06	52.82	12262	4	90.72	3.95	0.78	30.60	65.45	14729
1.500F	1.31	23.45	0.51	27.82	48.73	11332	4	92.03	4.22	0.78	30.56	65.22	14680
1.550F	1.18	30.36	0.60	27.51	42.13	10386	3 1/2	93.21	4.56	0.78	30.53	64.91	14626
1.600F	0.97	33.67	0.46	25.75	40.58	9690	1 1/2	94.18	4.86	0.78	30.48	64.66	14575
1.800F	2.12	42.37	0.36	25.44	32.19	8201	1	96.30	5.68	0.77	30.37	63.95	14435
1.800S	3.70	71.45	0.03	14.94	13.61	3096	0	100.00	8.12	0.74	29.80	62.08	14015
TOTAL	100.00	8.12	0.74	29.80	62.08	14015							

BRI-DOWLING CREEK amHOLE #WCC-80-392.91-93.87 METERSSAMPLE #428M X 0FLOTATION TESTSTRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" x 28M	91.83	91.83
<u>28M x 0</u>	<u>a.17</u>	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>							<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>	
CONC I.	73.43	3.50	0.81	30.57	65.93	14727	7	44.51	75.41	76.16	74.76	75.38	
CONC*II	26.57	12.06	0.73	26.45	61.49	13292	4 1/2	55.49	24.59	23.84	25.24	24.62	
TOTAL	100.00	5.77	0.79	29.48	64.75	14346		100.00	100.00	100.00	100.00	100.00	

* ALSO CONTAINS 3.01 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #7

3/8" x 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	48.60
Alumina, Al ₂ O ₃	9.44
Titania, TiO ₂	0.62
Ferric oxide, Fe ₂ O ₃	10.30
Lime, CaO	20.40
Magnesia, MgO	2.51
potassiumoxide, K ₂ O	0.88
sodium oxide, Na ₂ O	0.56
Sulfur trioxide, SO ₃	0.17
Phos. pentoxide, P ₂ O ₅	0.56
Undetermined	5.96
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.12

SILICA VALUE = 59.41

BASE: ACID RATIO = 0.59

FOULING INDEX = 0.33

SLAGGING INDEX = 0.48

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #7

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.89	---
% CARBON	75.83	77.29
% HYDROGEN	4.49	4.58
% NITROGEN	1.20	1.22
% CHLORINE	0.17	0.17
% SULFUR	0.79	0.81
% ASH	9.99	10.18
% OXYGEN (DIFF.)	5.64	<u>5.75</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2158	2077
Softening (H=W)	2248	2173
Softening (H=1/2 W)	2263	2201
• Fluid	2483	2343

0

0

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

163.48-164.81 METERS

SAMPLE #8

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS						MOISTURE FREE BASIS					
	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEW	1.10	3.45	0.70	26.06	69.39	14742	7 1/2	3.49	0.71	26.35	70.41	14906

MOISTURE FREE BASIS

SP. GR.	GR. % WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	63.57	1.54	0.68	28.17	70.24	15211	7 1/2	63.57	1.59	0.68	28.17	70.24	15211
1.350F	30.27	3.99	0.67	27.34	68.67	14780	2	93.84	2.36	0.68	27.90	69.74	15072
1.400F	3.71	12.65	0.66	26.37	60.98	13326	2	97.55	2.76	0.68	27.84	69.40	15005
1.450F	1.09	19.08	0.64	25.82	55.10	12291	2	98.64	2.94	0.68	27.82	69.24	14975
1.450s	1.36	51.45	0.29	20.86	27.69	6981	1	100.00	3.60	0.67	27.73	68.67	14867
TOTAL	100.00	3.60	0.67	27.73	68.67	14867							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5
 163.48-164.81 METERS

SAMPLE #8 (28M X 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	86.64	86.64
28Mx 0	13.36	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

ELEMENTARY DATA

% DISTRIBUTION

<u>PRODUCT</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>mu</u>
CONC I.	72.95	2.48	10.68	27.35	70.17	15018	7	47.44	74.70	74.27	73.84	74.11
CONC II.	25.97	7.41	0.62	25.55	67.04	14151	4	52.56	25.30	25.73	26.16	25.89
REFUSE	1.08											
<u>TOTAL</u>	100.00	3.81	0.66	26.86	69.33	14783		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #8

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	48.90
Alumina, Al ₂ O ₃	26.40
Titania, TiO ₂	1.07
Ferric oxide, Fe ₂ O ₃	0.00
Lime, CaO	1.94
Magnesia, MgO	9.04
Potassium oxide, K ₂ O	0.28
Sodium oxide, Na ₂ O	0.40
Sulfur trioxide, SO ₃	1.97
Phosphorus pentoxide, P ₂ O ₅	1.13
Undetermined	8.87
Total	<u>100.00</u>

ALKALIES AS Na₂O, DRY COAL BASIS = 0.02

SILICA VALUE = 81.66

EASE: ACID RATIO = 0.15

FOULING INDEX = 0.06

SLAGGING INDEX = 0.11

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #8

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.10	---
% CARBON	83.92	84.85
% HYDROGEN	4.68	4.73
% NITROGEN	1.28	1.29
% CHLORINE	0.17	0.17
% SULFUR	0.70	0.71
% ASH	3.45	3.49
% OXYGEN (DIFF.)	4.70	4.76
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2368	2343
Softening (H=W)	2443	2422
Softening (H=1/2 W)	2493	2478
-Fluid	-2763	2673.

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

3/8" X 0

HEAD ANALYSIS

SULFUR FORMS

AIR DRY BASIS

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>AIR DRY BASIS</u>				<u>MOISTURE FREE BASIS</u>			
	<u>SULFATE SULFUR AS % S</u>	<u>PYRITIC SULFUR W</u>	<u>ORGANIC SULFUR</u>	<u>TOTAL</u>	<u>SULFATE SULFUR AS % S</u>	<u>PYRITIC SULFUR</u>	<u>ORGANIC SULFUR</u>	<u>TOTAL</u>
SAMPLE #1	<0.01	0.08	0.66	0.74	<0.01	0.08	0.67	0.75
SAMPLE #2	<0.01	<0.01	0.64	0.64	<0.01	(0.01	0.64	0.64
SAMPLE #3	<0.01	(0.01	0.70	0.70	(0.01	(0.01	0.70	0.70
SAMPLE #4	(0.01	0.12	0.59	0.71	<0.01	0.12	0.60	0.72
SAMPLE #5	<0.01	0.04	0.65	0.69	<0.01	0.04	0.66	0.70
SAMPLE #6	<0.01	0.05	0.59	0.64	<0.01	0.05	0.60	0.65
SAMPLE #7	<0.01	0.02	0.77	0.79	<0.01	0.02	0.79	0.81
SAMPLE #8	<0.01	< 0.01	0.70	0.70	< 0.01	<0.01	0.71	0.71

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

P 3/8" X 0

HEAD ANALYSIS

WATER SOLUBLE ALKALIES

<u>PRODUCT</u>	<u>AIR DRY BASIS</u>			<u>MOISTURE FREE BASIS'</u>		
	<u>% K2O</u>	<u>% Na2O</u>	<u>% Cl</u>	<u>% K2O</u>	<u>% Na2O</u>	<u>% Cl</u>
SAMPLE #1	<0.01	0.01	0.09	<0.01	0.01	0.09
SAMPLE #2	0.01	0.02	0.09	<0.01	0.02	0.09
SAMPLE #3	0.01	0.01	0.09	<0.01	0.01	0.09
SAMPLE #4	0.01	0.01	0.05	<0.01	0.01	0.05
SAMPLE #5	<0.01	0.02	0.11	0.01	0.02	0.11
SAMPLE #6	0.01	0.01	0.09	<0.01	0.01	0.09
SAMPLE #7	<0.01	0.01	0.08	0.01	0.01	0.08
SAMPLE #8	<0.01	0.02	0.11	<0.01	0.02	0.11

<u>PRODUCT</u>	<u>% EQUILIBRIUM H MOISTURE</u>	<u>I</u>
SAMPLE #1	1.85	---
SAMPLE #2	2.80	48
SAMPLE #3	2.75	60
SAMPLE #6	4.34	64
SAMPLE #7	1.47	72
SAMPLE #8	4.63	67

APPENDIX III

THIN SECTION DATA

APPENDIX III

Spec. No. WCC-80-4-1 Formation Bickford
 Locality West Carbon Creek - Drill hole 4 101.13 metres
to 101.7 m and 116.57 m to 117.00m

MEGASCOPIC PROPERTIES: Colour [] dark grey

MICROSCOPIC PROPERTIES:

Grain size: Mode (s) .09 mm; range .003 to .3 mm

Sphericity .77 (.45-low .97-high)

Roundness .2 to .3 (.1 low - .9 high)

Types of grain contacts long, floating and concave-convex

Composition: framework grains 90%

Qz 14%

Mica 3%

Cht 5%

SRF 3% mudchips

MRF 15% metaquartzite, metasilstone

Bioclastics 50% Recrystallized shell fragments

Accessories, opaques, etc. Iron stains

cement/diagenetics 10% calcite - from shell fragments

ROCK NAME: Sandy Calcarenite

Spec. No. WCC-T-2 Formation BickfordLocality West Carbon CreekAge L. Cretaceous

MEGASCOPIC PROPERTIES:

Colour [N8 + 5Y7/2] very light gray and yellowish graySedimentary structures Graded bedding, alternating coloursSorting very well sorted

MICROSCOPIC PROPERTIES:

Grain size: Mode (s) .2 mm ; range .06mm to .5 mmSphericity .81 Roundness .6Types of grain contacts sutured and concave-convexComposition: framework grains 95%Qz grey 80 yellow 35 %SRF 5% mudchipsMRF gray layers 10 yellow layers 55% metachert, metaquartzite, metasilstonecement/diagenetics 5% SiO₂ overgrowth due to pressure solutionROCK NAME Quartz Arénite

Spec. No. WCC-80-T-4 Formation Bickford

Locality West Carbon Creek

Age L. Cretaceous

MEGASCOPIIC PROPERTIES: Colour [N6] medium light grey

Sorting well sorted

MICROSCOPIC PROPERTIES:

Grain size: Mode(s) .3 mm ; range .075 mm to .5 mm

Sphericity .77 Roundness .2

Types of grain contacts mostly sutured, some concave-convex

Composition: framework grains 95%

Qz 60%

Mica 1%

Cht 5%

SRF 7% mudchips

MRF 20% metachert, metasilstone, metaquartzite

Accessories, ooaques, etc. 1% Pyrite

cement/diagenetics 5% Si⁰2 overgrowths from pressure solution

Other microscopic information high porosity

ROCK NAME: Quartz Arenite

Spec. No. WCC-80-T-8 Formation Monach

Locality West Carbon Creek

Age L. Cretaceous

MEGASCOPIIC PROPERTIES:

Colour [N7-8] light grey to very light grey

MICROSCOPIC PROPERTIES: Grain size: Mode(s) 1.3mm; range .3mm to 3mm

Sphericity .83 Roundness .2 Sorting poorly sorted

Types of grain contacts mostly sutured, some concavo-convex

Composition: framework grains 95%

Qz 60%

Qzt 5%

Cht 5%

SRF 10% mudchips

MRF 10% metacherts, metasilstone, metaquartzite

Accessories, opaques, etc. Iron stains

cement/diagenetics 5% SiO₂ overgrowths from pressure solution

Other microscopic information Peculiar concentric zoning - silicified carbonate Fossil fragments, chalcedonic chert formed in place

ROCK NAME Quartz Wacke

Spec. No. WCC-88-T-10 Formation Bickford

Locality West Carbon Creek

Age L. Cretaceous

MEGASCOPIIC PROPERTIES:

Colour: [] salt and oopper with iron staining where,
oxidized

Sorting bi modal

MICROSCOPIC PROPERTIES:

Grain Size: Mode(s) .4mm & 6mm range .075 mm to .7 mm

Sphericity .73 and .85 and .02 mm to .15mm

Roundness .2 and .8

Types of grain contacts Concavo convex, some sutured

Composition: framework grains 95%

QZ 40%

Cht 5%

SRF 35% Siltstone & Sandstone & Mudchips

MRF 14% metasiltstone, metaquartz

cement/diagenetics 5% SiO₂ overgrowths - pressure solution

ROCK NAME pebbly Quartz. wacke

Spec. No. WCC-80-T-15 Formation MonachLocality West Carbon CreekAge L. Cretaceous

MEGASCOPIC PROPERTIES:

Colour: [5Y 4/1 1 olive greySedimentary structures rugs lined with quartz crystalsSorting moderatley sorted

MICROSCOPIC PROPERTIES:

Grain size: Mode(s) .1mm; range .02mm to .5 mmSphericity .79 Roundness .5Types of grain contacts mostly sutured some long and concavo
convexComposition: framework grains 80%Qz 50%

Cht 30%

cement/diagenetics 30% Si⁰2Other microscopic information silicified fossil fragmentschertification in placeROCK NAME Quartzite

Spec. No. WCC-80-T-20 Formation Bickford

Locality West Carbon Creek

MEGASCOPIC PROPERTIES:

Colour [N6-N8] medium light to very light grey

Sedimentary structures planar crossbeds

Sorting well sorted

MICROSCOPIC PROPERTIES:

Grain size: Mode(s) .1mm ; range .25 mm to .01 mm

Sphericity .81 Roundness .3

Types of grain contacts mostly sutured, some long and concavo-convex

Composition : framework grains 95%

Qz 63%

SRF 8% Mud -

MRF 20% metaquartzite

Accessories, opaques, etc. 1% chlorite opaques 3%

cement/diagenetics 5% Si⁰² overgrowths - pressure solution

ROCK NAME orthoquartzite

Spec. No. WCC-80-T-37 Formation Monach

Locality West Carbon Creek

MEGASCOPIIC PROPERTIES:

Colour : [N8-7⁻] very light to light grey

Sorting poor sorting

MICROSCOPIC PROPERTIES:

Grain size: Mode(s) .6mm range .1mm to 2 mm

Sphericity, .75 Roundness .4

Types of grain contacts sutured and concave-convex

Composition: framework grains 95%

Qz 80% Mica 1 %

Cht 2%

SRF 2% Mudchips

MRF 10% metachert, metasiltstone, metaquartzite, strained quartz

Accessories, opaques, etc. Pyrite in stringers 5%

cement/diagenetics 5% Si⁰2 overgrowth - pressure solution

ROCK NAME Quartz. wacke

APPENDIX IV

VITRINITE REFLECTANCE DATA

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #4

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	58.60
Alumina, Al ₂ O ₃	17.20
Titania, TiO ₂	0.86
Ferric oxide, Fe ₂ O ₃	17.85
Lime, CaO	4.53
Magnesia, MgO	2.63
Potassium oxide, K ₂ O	1.49
Sodium oxide, Na ₂ O	0.82
Sulfur trioxide, SO ₃	2.31
Phos. pentoxide, P ₂ O ₅	1.60
Undetermined	<u>2.11</u>
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.15

SILICA VALUE = 79.61

BASE: ACID RATIO = 0.23

FOULING INDEX = 0.19

SLAGGING INDEX = 0.17

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #4

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.37	—
% CARBON	78.71	79.80
% HYDROGEN	4.68	4.75
% NITROGEN	1.42	1.44
% CHLORINE	0.21	0.21
% SULFUR	0.76	0.77
% ASH	7.94	8.05
% OXYGEN (DIFF.)	<u>4.91</u>	4.98
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2259	2188
Softening (H=W)	2357	2280
Softening (H=1/2 W)	2430	2363
Fluid	2656	2646

WEST CARBON CREEK COALHOLE #WCC-80-3106.14-106.85 METERSSIMPLE #53/8" X 28MWASHABILI'Y TFSTAIR DRY BASISMOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>Em</u>	<u>FSI</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>Em</u>
HEAD	1.25	8.66	2.15	32.50	57.59	13599	8	8.77	2.18	32.91	58.32	13771

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>CUMULATIVE DATA</u>					
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% Wt.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	58.68	2.34	0.89	32.95	64.71	15004	8 1/2	58.68	2.34	0.89	32.95	64.71	15004
1.350F	18.73	6.79	0.88	32.22	60.99	14248	8	77.41	3.42	0.89	32.77	63.81	14821
1.400F	9.92	11.81	0.79	28.88	59.31	13371	6 1/2	87.33	4.37	0.88	32.33	63.30	14656
1.450F	2.78	17.28	0.78	27.68	55.04	12281	7	90.11	4.71	0.87	32.19	63.04	14583
1.550F	1.70	24.62	0.90	26.19	49.19	10932	7	91.81	5.14	0.87	32.08	62.78	14515
1.550S	8.19	52.36	15.52	15.66	31.98	5402	1	100.00	9.00	2.07	30.73	60.27	13769
m m	100.00	9.00	2.07	30.73	60.27	1.3769							

0

0

0

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COALHOLE #WCC-80-3106.14-106.85 METERSSAMPLE #528M x 0FLOTATION TESTSTRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" x 28M	92.25	92.25
<u>28M x 0</u>	<u>7.75</u>	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP.</u>	<u>GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>					<u>% DISTRIBUTION</u>					
			<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>EC</u>	<u>BTU</u>
m	I.	53.77	4.85	1.03	31.39	63.76	14564	8	30.00	36.79	53.88	57.16	56.33
CONC*II		46.23	13.16	2.06	31.25	55.59	13130	7	1/2 70.00	63.21	46.12	42.84	43.67
TOTAL		100.00	8.69	1.51	31.33	59.98	13901	100.00	100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 4.76 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #5

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	29.30
Alumina, Al ₂ O ₃	13.00
Titania, TiO ₂	0.45
Ferric oxide, Fe ₂ O ₃	30.30
Lime, CaO	8.03
Magnesia, MgO	3.99
Potassium oxide, K ₂ O	0.99
Sodium oxide, Na ₂ O	0.25
Sulfur trioxide, SO ₃	10.31
Phos. pentoxide, P ₂ O ₅	0.88
Undetermined	<u>2.50</u>
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.08

SILICA VALUE = 40.91

BASE: ACID RATIO = 1.02

FOULING INDEX = 0.25

SLAGGING INDEX = 2.22

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #5

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.25	—
% CARBON	77.13	78.11
% HYDROGEN	4.92	4.98
% NITROGEN	1.51	1 . 5 3
% CHLORINE	0 . 2 4	0.24
% SULFUR	2.15	2.18
% ASH	8.66	8 . 7 7
% OXYGEN (DIFF.)	4.14	<u>4.19</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2283	2102
Softening (H=W)	2305	2126
-Softening' (H=1/2 W)	2380	2137
Fluid	2561	2278

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

154.50-155.63 METERS

SAMPLE #6

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H ₂ O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.33	1.374	0.58	25.68	59.25	12754	5 1/2	13.93	0.59	26.03	60.04	12926

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	23.49	1.83	0.59	29.33	68.84	15113	8	23.49	1.83	0.59	29.33	68.84	15113
1.350F	42.52	3.12	0.70	28.26	68.62	14823	3 1/2	66.01	2.66	0.66	28.64	68.70	14926
1.400F	10.56	10.61	0.56	27.57	61.82	13586	3	76.57	3.76	0.65	28.49	67.75	14741
1.450F	3.82	17.60	0.61	27.30	55.10	12362	3 1/2	80.39	4.41	0.65	28.44	67.15	14628
1.500F	1.95	23.18	0.12	25.74	51.08	11479	4	82.34	4.86	0.63	28.37	66.77	14554
1.550F	1.14	28.40	0.52	24.07	47.53	10603	3 1/2	83.48	5.18	0.63	28.31	66.51	14500
1.600F	1.02	34.36	0.07	22.70	42.94	9651	1 1/2	84.50	5.53	0.62	28.25	66.22	14441
1.800F	2.12	39.82	0.38	21.72	38.46	8096	1 1/2	86.62	6.37	0.62	28.09	65.54	14286
1.8005	13.38	64.37	0.39	16.77	18.86	3991	0	100.00	14.13	0.59	26.57	59.30	12908
TOTAL	100.00	14.13	0.59	26.57	59.30	12908							

0

0

0

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COALHOLE #WCC-80-3154.50-155.63 METERSSAMPLE #628Mx 0FLOTATION TESTSTRUCTURES

<u>SIZE</u>	<u>%WEIGHT</u>	<u>CM. %WT.</u>
3/8" x 28M	92.83	92.83
<u>28M x 0</u>	<u>7.17</u>	100.00
<u>TOTAL</u>	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>s</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	73.98	5.79	0.63	30.05	64.16	14372	5 1/2	41.37	76.39	75.56	78.81	78.73
CONC II.	21.13	14.98	0.62	28.12	56.90	12523	3 1/2	30.58	21.48	20.20	19.96	19.60
REFUSE	4.89	59.36	0.27	25.53	15.11	4611	0	28.05	2.13	4.24	1.23	1.67
<u>TOTAL</u>	100.00	10.35	0.61	29.42	60.23	13504		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #6

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	48.80
Alumina, Al ₂ O ₃	19.70
Titania, TiO ₂	0.65
Ferric oxide, Fe ₂ O ₃	4.15
Lime, CaO	8.88
Magnesia, MgO	3.54
Potassium oxide, K ₂ O	2.23
Sodium oxide, Na ₂ O	0.38
Sulfur trioxide, SO ₃	5.28
Phos. pentoxide, P ₂ O ₅	2.18
Undetermined	<u>4.21</u>
Total	100.00

ALKALIES AS Na ₂ O, DRY COAL BASIS	= 0.26
SILICA VALUE	= 74.65
BASE: ACID RATIO	= 0.28
FOULING INDEX	= 0.11
SLAGGING INDEX	= 0.16

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #6

3/8" x 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.33	---
% CARBON	73.64	74.63
% HYDROGEN	4.34	4.40
% NITROGEN	1.33	1.35
% CHLORINE	0.20	0.20
% SULFUR	0.58	0.59
% ASH	13.74	13.93
% OXYGEN (DIET.)	<u>4.84</u>	<u>4.90</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2273	2263
Softening (H=W)	2368	2343
Softening (H=1/2 W)	2413	2373
Fluid	2721	2665

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

197.81-198.44 METERS

SAMPLE #7

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
HEAD	1.21,	2.68	0.71	26.42	69.69	14714	6 1/2	2.71	0.72	26.74	10.55	14894

MOISTURE FREE BASIS

ELEMENTARY DATA

CUMULATIVE DATA

<u>SP. GR.</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	42.40	1.26	0.85	27.80	70.94	15180	a 1/2	42.40	1.26	0.85	27.80	70.94	15180
1.350F	49.53	1.95	0.70	27.35	70.70	15006	3 1/2	91.93	1.63	0.77	27.56	70.81	15086
1.400F	5.98	7.43	0.78	26.39	66.18	14231	2 1/2	97.91	1.99	0.77	27.49	70.52	15034
1.4005	2.09	27.75	0.68	24.61	47.64	9978	1	100.00	2.52	0.77	27.43	70.05	14928
TOTAL	100.00	2.52	0.77	27.43	70.05	14928							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #WCC-80-3

197.81-198.44 METERS

SAMPLE #7

28M X 0

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	90.61	90.39
28M x 0	9.39	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>Ft.</u>	<u>BTU</u>
CONC I.	82.12	2.05	0.72	32.41	65.54	14923	6	58.01	83.83	82.80	82.86	82.90
CONC*II	17.88	6.81	0.64	30.92	62.27	14135	5 1/2	41.99	16.17	17.20	17.14	17.10
TOTAL	100.00	2.90	0.71	32.14	64.96	14782		100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 0.85 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #7

3/8" x 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	52.80
Alumina, Al ₂ O ₃	16.40
Titania, TiO ₂	0.88
Ferric oxide, Fe ₂ O ₃	15.20
Lime, CaO	3.27
Magnesia, MgO	3.63
potassium oxide, K ₂ O	0.64
Sodium oxide, Na ₂ O	1.68
Sulfur trioxide, SO ₃	2.40
Phos. pentoxide, P ₂ O ₅	0.37
Undetermined	<u>2.73</u>
Total	100.00

ALKALIES AS Na ₂ O, DRY COAL BASIS	= 10.06
SILICA VALUE	= 70.49
EASE: ACID RATIO	= 0.35
FOULING INDEX	= 0.59
SLAGGING INDEX	= 0.25

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

SAMPLE #7

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.21	—
% CARBON	82.50	83.51
% HYDROGEN	4.86	4.92
% NITROGEN	1.39	1.41
% CHLORINE	0.22	0.22
% SULFUR	0.71	0.72
% ASH	2.68	2.71
% OXYGEN (DIFF.)	6.43	<u>6.51</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing.</u>	<u>Reducing</u>
Initial deformation	2318	2192
Softening (H=W)	2448	2228
Softening (H=1/2 W)	2468	2278
Fluid	-2677	2565.

0

0

0



0

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

3/8" X 0

HEAD ANALYSIS

SULFUR FORMS

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS				MOISTURE FREE BASIS			
	SULFATE SULFUR AS % S	PYRITIC SULFUR	ORGANIC SULFUR	TOTAL	SULFATE SULFUR AS % S	PYRITIC SULFUR	ORGANIC SULFUR	TOTAL
SAMPLE #1	<0.01	1.25	0.44	1.69	(0.01	1.27	0.44	1.71
SAMPLE #2A	<0.01	0.61	0.30	0.91	<0.01	0.62	0.30	0.92
#2B	<0.01	0.25	0.53	0.78	(0.01	0.25	0.54	0.79
SAMPLE #3	(0.01	0.07	0.55	0.62	<0.01	0.07	0.56	0.63
SAMPLE #4	(0.01:	<0.01	0.76	0.76	<0.01	(0.01	0.77	0.77
SAMPLE #5	<0.01	1.42	0.73	2.15	<0.01	1.44	0.74	2.18
SAMPLE #6	(0.01	0.02	0.56	0.58	<0.01	0.02	0.57	0.59
SAMPLE #7	(0.01	<0.01	0.71	0.71	<0.01	(0.01	0.72	0.72

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SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-3

3/8" X 0

HEAD ANALYSIS

WATER SOLUBLE ALKALIES

PRODUCT	AIR DRY BASIS			MOISTURE FREE BASIS		
	% K ₂ O	% Na ₂ O	% Cl	% K ₂ O	% Na ₂ O	% Cl
SAMPLE #1	0.01	0.01	0.10	0.01	0.01	0.10
SAMPLE #2A	0.01	0.01	0.13	0.01	0.01	0.13
SAMPLE #2B	0.01	0.02	0.07	0.01	0.02	0.07
SAMPLE #3	0.01	0.01	0.09	0.01	0.01	0.09
SAMPLE #4	<0.01	0.02	0.10	<0.01	0.02	0.10
SAMPLE #5	<0.01	0.01	0.08	0.01	0.01	0.08
SAMPLE #6	0.01	0.03	0.12	0.01	0.03	0.12
SAMPLE #7	<0.01	0.01	0.12	<0.01	0.01	0.12

PRODUCT	% EQUILIBRIUM MOISTURE	HGI
SAMPLE #3	1.75	67
SAMPLE #4	-1.45	69
SAMPLE #6		65
SAMPLE #7	2.58	59

0

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

74.81-75.93 METERS

SAMPLE #1

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H ₂ O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.27	12.66	0.66	28.63	57.44	12999	7	12.82	0.67	29.00	58.18	13166

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	24.04	1.87	0.77	33.49	64.64	15033	8 1/2	24.04	1.87	0.77	33.49	64.64	15033
1.350F	32.87	4.75	0.79	31.63	63.62	14536	7 1/2	56.91	3.53	0.78	32.42	64.05	14746
1.400F	12.97	11.68	0.70	29.98	58.34	13405	6 1/2	69.88	5.05	0.77	31.96	62.99	14497
1.450F	11.75	17.29	0.66	29.06	53.65	12461	4 1/2	81.63	6.81	0.75	31.55	61.64	14204
1.500F	3.41	24.35	0.61	26.96	48.69	12427	6	85.04	7.51	0.75	31.36	61.13	14133
1.550F	2.19	30.0	0.58	25.42	44.39	10382	6 1/2	87.23	8.08	0.74	31.21	60.71	14039
1.600F	1.73	35.14	0.48	25.13	39.73	9618	6	88.96	8.61	0.74	31.09	60.30	13953
1.800F	5.22	44.53	0.34	23.36	32.11	8061	2 1/2	94.18	10.60	0.72	30.67	58.73	13626
1.800S	5.82	58.43	0.23	16.29	25.28	4264	1/2	100.00	13.38	0.69	29.83	56.79	13081
TOTAL	100.00	13.38	0.69	29.83	56.79	13081							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #KC-80-4

74.81-75.93 METERS

SAMPLE #1

28M X 0

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	96.28	96.28
28M X 0	3.72	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WJ!</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>F</u>	<u>S</u>	<u>I</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>
am I.	79.71	4.72	0.67	30.52	64.76	13973	7	37.57	84.09	80.91	86.15	84.16
CONC*II	20.29	30.81	0.50	28.29	40.90	10333	5	62.43	15.91	19.09	13.85	15.84
TOTAL	100.00	10.01	0.64	30.07	59.92	13234		100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 3.75 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #1

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	55.40
Alumina, Al ₂ O ₃	17.50
Titania, TiO ₂	0.76
Ferric oxide, Fe ₂ O ₃	11.50
Lime, CaO	3.78
Magnesia, MgO	0.30
Potassium oxide, K ₂ O	1.84
Sodium oxide, Na ₂ O	0.35
Sulfur trioxide, SO ₃	2.05
Phos. pentoxide, P ₂ O ₅	1.93
Undetermined	<u>4</u> . 5 9
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.20

SILICA VALUE = 78.05

EASE: ACID RATIO = 0.24

FOULING INDEX = 0.08

SLAGGING INDEX = 0.16

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #1

3/8" x 0

HEAD ANALYSIS
W V

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.27	---
% CARBON	73.76	74.71
% HYDROGEN	4.56	4.62
% NITROGEN	1.30	1.32
% CHLORINE	0.20	0.20
% SULFUR	0.66	0.67
% ASH	12.66	12.82
% OXYGEN (DIET.)	<u>5.59</u>	<u>5.66</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2238	2183
Softening (H=W)	2409	2254
Softening (H=1/2 W)	2458	2309
Fluid	2613	2602

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

111.35-112.22 METERS

SAMPLE #2

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H2O	% ASH	% S	% VM	% FC	Em	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.12	25.83	0.61	27.04	46.01	10934	7 1/2	26.12	0.62	27.35	46.53	11058

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	F S I	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	51.18	2.94	0.86	34.70	62.36	14707	9	51.18	2.94	0.86	34.70	62.36	14707
1.350F	10.76	7.84	0.79	33.79	58.37	13857	8 1/2	61.94	3.79	0.85	34.54	61.67	14559
1.400F	3.84	12.90	0.80	33.05	54.05	13200	8 1/2	65.78	4.32	0.85	34.45	61.23	14480
1.450F	1.60	19.73	0.77	31.72	48.55	11957	8 1/2	67.38	4.69	0.84	34.39	60.92	14420
1.500F	1.26	24.50	0.75	31.18	44.32	11231	8	68.64	5.05	0.84	34.33	60.62	14361
1.550F	2.18	29.78	0.73	27.14	43.08	10367	7 1/2	70.82	5.81	0.84	34.11	60.08	14238
1.600F	1.34	34.42	0.55	26.74	38.84	9612	7	72.16	6.35	0.83	33.97	59.68	14153
1.800F	6.98	45.01	0.53	23.29	31.70	8007	5 1/2	79.14	9.76	0.80	33.03	57.21	13611
1.8005	20.86	82.99	0.13	13.04	3.97	1921	0	100.00	25.03	0.66	28.86	46.11	11172
TOTAL	100.00	25.03	0.66	28.86	46.11	11172							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #KC-80-4

111.35-112.22 METERS

SAMPLE #2

28M X 0

FLOTATION TFST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	93.73	93.73
<u>28M x 0</u>	<u>6.27</u>	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>mu</u>	<u>F S I</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	77.43	7.46	0.78	33.64	58.90	14202	8	37.35	98.21	82.41	86.16	84.88
CONC*II	22.57	42.92	0.05	24.64	32.44	8681	6	62.65	1.79	17.59	13.84	15.12
TOTAL	100.00	15.46	0.62	31.61	52.93	12956		100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 6.7 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #2

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	69.60
Alumina, Al ₂ O ₃	16.50
Titania, TiO ₂	0.77
Ferric oxide, Fe ₂ O ₃	5.13
Lime, CaO	1.16
Magnesia, MgO	1.20
Potassium oxide, K ₂ O	3.20
Sodium oxide, Na ₂ O	0.33
Sulfur trioxide, SO ₃	1.21
Phos. pentoxide, P ₂ O ₅	0.41
Undetermined	0.49
Total	<u>100.00</u>

ALKALIES AS Na₂O, DRY COAL BASIS = 0.64

SILICA VALUE = 90.28

BASE: ACID RATIO = 0.13

FOULING INDEX = 0.04

SLAGGING INDEX = 0.08

- M I N E R A L S L A B O R A T O R Y

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #2

3/8" x 0

HEAD ANALYSIS'

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.12	--
% CARBON	57.61	58.26
% HYDROGEN	3.51	3.55
% NITROGEN	1.19'	1.20
% CHLORINE	0.17	0.17
% SULFUR	0.61	0.62
% ASH	25.83	26.12
% OXYGEN (DIFF.)	<u>9.96</u>	<u>10.08</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2348	2333
Softening (H=W)	<u>2673</u>	2533
Softening (H=1/2 W)	2714	266 ;
Fluid	j2777	>2777

n

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COALHOLE #WCC-80-4117.00-117.78 METERSSAMPLE #33/8" x 28MWASHABILITY TEST

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H ₂ O	% ASH	% S	% VM	% FC	BTU	FSI	% I?SH	% S	% VM	% FC	BTU
HEAD	1.10	12.13	0.82	28.52	58.25	13250	7 1/2	12.26	0.83	28.84	58.90	13397

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	54.66	1.52	0.83	31.81	66.67	14982	8	54.66	1.52	0.83	31.81	66.67	14982
1.350F	15.96	5.00	0.73	28.86	66.14	14517	8	70.62	2.31	0.81	31.14	66.55	14890
1.400F	4.13	14.47	1.16	27.40	58.13	13075	6	74.75	2.98	0.83	30.94	66.08	14790
1.450F	7.41	19.25	1.52	27.19	53.56	12216	6 1/2	82.22	4.46	0.89	30.60	64.94	14556
1.500F	1.87	24.21	1.38	25.71	50.08	11435	4 1/2	84.09	4.90	0.90	30.49	64.61	14487
1.550F	2.00	29.86	1.22	25.17	44.97	10543	3	86.09	5.48	0.91	30.36	64.16	14395
1.600F	1.21	34.54	1.06	24.82	40.64	9859	1 1/2	87.30	5.88	0.91	30.29	63.83	14332
1.800F	10.01	47.56	0.65	20.23	32.21	7858	1	97.31	10.17	0.88	29.25	60.58	13666
1.8005	2.69	60.89	0.46	15.69	23.42	5636	0	100.00	11.53	0.87	28.89	59.58	13450
TOTAL	100.00	11.53	0.87	28.89	59.58	13450							

SUNNYVALE MINERALS LABORATORY

ERI-DOWLING CREEK COAL

HOLE #WCC-80-4

117.00-117.78 METERS

SAMPLE #3

28M X 0

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %wt.</u>
3/8" X 28M	91.10	91.10
28M X 0	8.90	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR. %</u>	<u>WI!</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% Ash</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	56.63	5.87	0.84	35.31	58.82	14357	7 1/2	38.61	60.67	61.42	60.10	60.88
CONC*II	41.37	13.23	0.77	31.43	55.34	13076	6 1/2	61.39	39.33	38.58	39.90	39.12
TOTAL	100.00	8.92	0.81	33.71	57.38	1.3827		100.00	100.00	100.00	100.00	100.00

* ALSO CONTAINS 2.56 % OF REFUSE

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #KC-80-4

SAMPLE #3

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	73.40
Alumina, Al ₂ O ₃	18.50
Titania, TiO ₂	0.92
Ferric oxide, Fe ₂ O ₃	2.74
Lime, CaO	0.64
Magnesia, MgO	0.23
Potassium oxide, K ₂ O	1.58
Sodium oxide, Na ₂ O	0.70
Sulfur trioxide, SO ₃	0.21
Phos. pentoxide, P ₂ O ₅	0.15
Undetermined	<u>0.93</u>
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.21

SILICA VALUE = 95.31

BASE: ACID RATIO = 0.06

FOULING INDEX = 0.04

SLAGGING INDEX = 0.05

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #3

3/8" x 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.10	--
% CARBON	75.30	76.14
% HYDROGEN	4.62	4.67
% NITROGEN	1.42	1 . 4 4
% CHLORINE	0.00	0.00
% SULFUR	0.18	0.18
% ASH	0.82	0.83
% OXYGEN (DIFF.)	<u>16.56</u>	<u>16.74</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	> 2777	2593
Softening (H=W) *	> 2777	> 2777
Softening (H=1/2 W)	> 2777	> 2777
Fluid	> 2777	> 2777

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

132.80-133.33 METERS

SAMPLE #4

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
LEAD	1.13	11.57	0.72	25.76	61.54	13397	6 1/2	11.70	0.73	26.05	62.25	13550

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	F S I	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	36.24	2.04	0.90	31.30	66.66	15046	8	36.24	2.04	0.90	31.30	66.66	15046
1.350F	42.79	5.62	0.77	29.10	65.28	14546	6	79.03	3.98	0.83	30.11	65.91	14775
1.400F	6.69	11.31	0.76	28.10	60.59	13547	6	85.72	4.55	0.82	29.95	65.50	14679
1.450F	2.18	19.35	0.72	27.24	53.41	12357	5	87.90	4.92	0.82	29.89	65.19	14622
1.500F	1.64	29.16	0.69	26.08	44.76	11345	5	89.54	5.36	0.82	29.82	64.82	14562
1.550	1.42	32.21	0.61	23.48	44.25	10398	4 1/2	90.96	5.78	0.82	29.72	64.50	14497
1.600F	1.04	36.19	0.57	22.79	41.02	9740	4	92.00	6.13	0.81	29.64	64.23	14443
1.800F	1.57	43.74	0.50	21.76	34.50	8474	1	93.57	6.76	0.81	29.51	63.73	14343
1.800S	6.43	79.77	0.52	18.17	2.06	3728	0	100.00	11.45	0.79	28.78	59.77	13660
TOTAL	100.00	11.45	0.79	28.78	59.77	13660							

SUNNYVALE MINERALS LABORATORY

BRI-DOWLING CREEK COAL

HOLE #WCC-80-4

132.80-133.33 METERS

SAMPLE #4

28M X 0

FLOTATION TEST

STRUCTURES

<u>S</u> <u>I</u> <u>Z</u> <u>E</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	90.37	90.37
28M X 0	9.63	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>EC</u>	<u>BTU</u>
CONC I.	70.91	4.05	0.81	32.07	63.88	14667	7	37.02	73.03	73.34	73.98	73.87
CONC II.	25.66	16.80	0.73	28.42	54.78	12646	4 1/2	2.98	26.97	26.66	26.02	26.13
REFUSE	3.43											
TOTAL	100.00	7.76	0.79	31.01	61.23	14079		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #4

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	67.60
Alumina, Al ₂ O ₃	17.50
Titania, TiO ₂	0.96
Ferric oxide, Fe ₂ O ₃	3.15
Lime, CaO	3.72
Magnesia, MgO	1.28
Potassium oxide, K ₂ O	2.10
Sodium oxide, Na ₂ O	0.83
Sulfur trioxide, SO ₃	0.77
Phos. pentoxide, P ₂ O ₅	1.82
Undetermined	0.27
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.26

SILICA VALUE = 89.24

BASE: ACID RATIO = 0.13

FOULING INDEX = 0.11

SLAGGING INDEX = 0.09

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

SAMPLE #4

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.13	—
% CARBON	76.31	77.18
% HYDROGEN	4.59	4.64
% NITROGEN	1.32	1.34
% CHLORINE	0.20	0.20
% SULFUR	0.72	0.73
% ASH	11.57	11.70
% OXYGEN (DIFF.)	4.16	4.21
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2332	2268
Softening (H=W)	2622	2469
Softening (H=1/2 W)	2759	2623
Fluid	>2777	2773

- MINERALS LABORATORY

WEST CARBON CREEK COALHOLE #WCC-80-43/8" X 0HEW ANALYSISSULFUR FORMSAIR DRY BASISMOISTURE FREE BASIS

<u>PRODUCT</u>	<u>AIR DRY BASIS</u>				<u>MOISTURE FREE BASIS</u>			
	<u>SULFATE SULFUR AS % S</u>	<u>PYRITIC SULFUR</u>	<u>ORGANIC SULFUR</u>	<u>TOTAL</u>	<u>SULFATE SULFUR AS % S</u>	<u>PYRITIC SULFUR</u>	<u>ORGANIC SULFUR</u>	<u>TOTAL</u>
SAMPLE #1	<0.01	0.01	0.65	0.66'	<0.01	0.01	0.66	0.67
SAMPLE #2	<0.01	0.02	0.59	0.61	<0.01	0.02	0.60	0.62
SAMPLE #3	<0.01	0.11	0.71	0.82	(0.01	0.11	0.72	0.83
SAMPLE #4	(0.01	0.03	0.69	0.72	<0.01	0.03	0.70	0.73

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-4

3/8" X 0

HEAD ANALYSIS

WATER SOLUBLE ALKALIES

<u>PRODUCT</u> <small>in m</small>	<u>AIR DRY BASIS</u>			<u>MOISTURE FREE BASIS</u>		
	<u>% K2O</u>	<u>% Na2O</u>	<u>% Cl</u>	<u>% K2O</u>	<u>% Na2O</u>	<u>% Cl</u>
SAMPLE #1	< 0.01	0.02	0.09	co.01	0.02	0.09
SAMPLE #2	(0.01	0.04	0.06	(0.01	0.04	0.06
SAMPLE #3	(0.01	0.01	0.08	<0.01	0.01	0.08
SAMPLE #4	<0.01	0.02	0.12	(0.01	0.02	0.12

<u>PRODUCT</u>	<u>% EQUILIBRIUM MOISTURE</u>	<u>HGI</u>
SAMPLE #1	2.68	65
SAMPLE #3	1.61	71
SAMPLE #4	1.86	74

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

6.47-7.02 METERS

SAMPLE #1.

3/8" x 28M

WASHABILITY TEST

PRODUCT	AIR DRY BASIS						MOISTURE FREE BASIS					
	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.50	9.43	0.74	28.13	60.94	13493	2 1/2	9.57	0.75	28.56	61.87	13698

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WI.	% ASH	% S	% VM	% FC	BTU
1.300F	45.69	2.00	0.76	30.13	67.87	15076	7	45.69	2.00	0.76	30.13	67.87	15076
1.350F	35.77	4.32	0.69	28.71	66.97	14631	1	81.46	3.02	0.73	29.51	67.47	14881
1.400F	8.14	9.89	0.64	26.30	63.81	13758	1	89.60	3.64	0.72	29.22	67.14	14779
1.450F	1.74	16.32	0.70	25.41	58.27	12713	1	91.34	3.88	0.72	29.14	66.98	14739
1.450s	8.66	63.28	1.08	19.88	16.84	3259	0	100.00	9.03	0.75	28.34	62.63	13745
TOTAL	100.00	9.03	0.75	28.34	62.63	13745							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

6.47-7.02 METERS

SAMPLE #1 (28M x 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	88.72	88.72
28MX0	11.28	100.00
TOTAL	100.00	

----- 1 1 1 -----
MOISTURE FREE BASIS

ELEMENTARY DATA

% DISTRIBUTION

<u>PRODUCT</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	47.84	5.39	0.82	30.09	64.52	14386	2 1/2	14.89,	49.75	53.04	55.57	55.04
CONC II.	42.43	28.26	0.76	24.43	47.31	10778	1 1/2	85.11	50.25	46.96	44.43	44.96
REFUSE	9.73											
TOTAL	100.00	17.32	0.79	27.14	55.54	12504		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #1

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	58.60
Alumina, Al ₂ O ₃	20.70
Titania, TiO ₂	0.76
Ferric oxide, Fe ₂ O ₃	2.75
Lime, CaO	5.67
Magnesia, MgO	1.31
Potassium oxide, K ₂ O	2.60
Sodium oxide, Na ₂ O	1.15
Sulfur trioxide, SO ₃	1.10
Phos. pentoxide, P ₂ O ₅	2.56
Undetermined	2.80
Total	100.00

ALKALIES AS Na ₂ O, DRY COAL BASIS	= 0.27
SILICA VALUE	= 85.76
BASE: ACID RATIO	= 0.17
FOULING INDEX	= 0.19
SLAGGING INDEX	= 0.13

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #1

3/al* x 0_

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.50	---
% CARBON	77.35	78.53
% HYDROGEN	4.41	4.48
% NITROGEN	1.23	1.25
% CHLORINE	0.11	0.11
% SULFUR	0.74	0.75
% ASH	9.43	9.57
% OXYGEN (DIFF.)	<u>5.23</u>	<u>5.31</u>
TOTAL!	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2243	2193
Softening (H=W)	2448	2418
Softening (H=1/2 W)	2569	2 5 1 8
Fluid	> 2777	> 2777

0

0

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

58.67-59.28 METERS

SAMPLE #2

3/8" x 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	%ASH	%S	% VM	% FC	BTU
HEAD	0.60	7.00	0.64	30.29	62.11	14008	3 1/2	7.04	0.64	30.47	62.49	14093

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WI?	% ASH	% S	% VM	% FC	BTU
1.300F	22.42	1.91	0.78	31.28	66.81	15052	a	22.42	1.91	0.78	31.28	66.81	15052
1.350F	40.97	3.68	0.62	30.06	66.26	14601	2 1/2	63.39	3.05	0.68	30.49	66.46	14761
1.400F	21.55	10.96	0.60	28.11	60.93	13472	2	84.94	5.06	0.66	29.89	65.05	14434
1.450F	10.15	16.06	0.56	27.67	56.27	12614	2	95.09	6.23	0.65	29.65	64.12	14240
1.500F	3.48	19.9	0.50	26.41	53.64	11667	1	98.57	6.72	0.64	29.54	63.74	14149
1.500s	1.43	39.53	0.37	25.05	35.37	8701	0	100.00	7.19	0.64	29.47	63.34	14071
TOTAL	100.00	7.19	0.6	29.47	63.34	14071							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

58.67-59.28 METERS

SAMPLE #2 (28M x 0)

FLOTATION TEST

STRUCTURES

SIZE	% WEIGHT	CUM. %WT.
3/8" x 2aM	94.73	94.73
2aM x 0 mm	5.27	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

PRODUCT	% WT.	ELEMENTARY DATA						% DISTRIBUTION				
		% ASH	% S	% VM	% FC	BTU	FSI	ASH	S	VM	FC	BTU
CONC I.	9b.23	5.88.	0.63	26.31	67.81	14358	6	81.09	91.32	90.29	91.10	91.02
CONC II.	8.96	12.66	0.55	26.14	61.20	13075	3	18.91	8.68	9.71	a.90	8.98
REFUSE	0.81											
TOTAL	100.00	6.54.	0.62	26.29	67.16	14233		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #2

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	33.40
Alumina, Al ₂ O ₃	34.80
Titania, TiO ₂	0.69
Ferric oxide, Fe ₂ O ₃	0.48
Lime, CaO	10.20
Magnesia, MgO	0.11
Potassium oxide, K ₂ O	0.59
Sodium oxide, Na ₂ O	0.93
Sulfur trioxide, SO ₃	1.05
Phos. pentoxide, P ₂ O ₅	9.32
Undetermined	8.43
Total	<u>100.00</u>

ALKALIES AS Na₂O, DRY COAL BASIS = 0.09

SILICA VALUE = 75.58

BASE: ACID RATIO = 0.18

FOULING INDEX -- = 0.17

SLAGGING INDEX = 0.11

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #2

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	0.60	---
% CARBON	80.14	80.62
% HYDROGEN	4.59	4.62
% NITROGEN	1.31	1.32
% CHLORINE	0.18	0.18
% SULFUR	0.64	0.64
% ASH	7.00	7.04
% OXYGEN (DIET' .)	5.54	5.58
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2318	2269
Softening (H=W)	2408	2398
Softening (H=1/2 W)	2488	2443
Fluid	> 2777	> 2777

0

0

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COALHOLE #WCC-80-583.57-84.59 METERSSAMPLE #33/8" X 28MWASHABILITY TEST

PRODUCT	AIR DRY BASIS							MOISTURE FREE BASIS				
	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	0.65	2.51	0.70	31.74	65.10	14734	7 1/2	2.53	0.70	31.95	65.52	14830

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	75.56	1.65	0.75	31.15	67.20	15058	8	75.56	1.65	0.75	31.15	67.20	15058
1.350F	22.06	3.81	0.60	29.46	66.73	14706	7 1/2	97.62	2.14	0.72	30.77	67.09	14978
1.400F	1.18	11.40	0.57	27.41	61.19	13491	7	98.80	2.25	0.71	30.73	67.02	14960
1.400s	1.20	26.98	0.54	25.50	47.52	11135	5	100.00	2.55	0.71	30.67	66.78	14915
TOTAL	100.00	2.55	0.71	30.67	66.78	14915							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

83.57-84.59 METERS

SAMPLE #3 (28M X 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>cm. %WT.</u>
3/8" X 28M	85.96	85.96
28M x 0	14.04	100.00
<u>TOTAL</u>	<u>100.00</u>	

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>FSI</u>	<u>ASH</u>	<u>% DISTRIBUTION</u>			
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>S</u>			<u>VM</u>	<u>EC</u>	<u>BTU</u>	
CONC I.	89.89	1.82	0.69	31.38	66.80	15054	8 1/2	67.19	89.99	91.21	90.11	90.57	
CONC II.	9.53	7.90	0.68	26.90	65.20	13937	3	32.81	10.01	8.79	9.89	9.43	
REFUSE	0.58												
<u>TOTAL</u>	<u>100.00</u>	<u>2.44</u>	<u>0.69</u>	<u>30.93</u>	<u>66.63</u>	<u>14941</u>		<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #3

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	49.70
Alumina, Al ₂ O ₃	29.50
Titania, TiO ₂	1.73
Ferric oxide, Fe ₂ O ₃	3.48
Lime, CaO	6.18
Magnesia, MgO	0.20
Potassium oxide, K ₂ O	0.63
Sodium oxide, Na ₂ O	2.77
Sulfur trioxide, SO ₃	1.38
Phos. pentoxide, P ₂ O ₅	3.06
Undetermined	1.37
Total	100.~0

ALKALIES AS Na₂O, DRY COAL BASIS = 0.08

SILICA VALUE = 83.45

BASE: ACID RATIO = 0.16

FOULING INDEX -- = 0.45

SLAGGING INDEX = 0.11

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #3

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	0.65	--
% CARBON	84.34	84.89
% HYDROGEN	5.01	5.04
% NITROGEN	1.41	1.42
% CHLORINE	0.20	0.20
% SULFUR	0.70	0.70
% ASH	2.51	2.53
% OXYGEN (DIFF.)	5.18	<u>5.22</u>
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2373	2343
Softening (H=W)	2578	2513
Softening (H=1/2 W)	2718	2687
Fluid	> 2777	> 2711

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

86.63-87.05 METERS

SAMPLE #4

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
HEAD	0.90	26.78	0.71	27.82	44.50	10789	7	0.727	20207	44.91	10887	

MOISTURE FREE BASIS

ELEMENTARY DATA

CUMULATIVE DATA

<u>SP. GR.</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	9.99	4.78	0.87	34.35	60.87	14736	8	9.99	4.78	0.87	34.35	60.87	14736
1.350F	13.15	9.61	0.88	33.54	56.85	13793	8	23.14	7.53	0.88	33.89	58.58	14200
1.400F	4.18	14.1;	0.79	31.95	53.92	12868	7 1/2	27.32	8.54	0.86	33.60	57.86	13996
1.450F	8.12	20.39	0.65	29.21	50.40	12039	6 1/2	35.44	11.26	0.82	32.59	56.15	13548
1.500F	20.65	25.29	0.65	25.43	49.28	11461	4 1/2	56.09	16.42	0.75	29.96	53.62	12780
1.550F	14.50	31.62	0.58	24.96	43.42	10306	4	70.59	19.54	0.72	28.93	51.53	12272
1.600F	7.67	37.81	0.52	23.99	38.20	9288	3	78.26	21.33	0.70	28.44	50.23	11979
1.800F	12.55	45.07,	0.57	23.25	31.68	8003	2 1/2	90.81	24.61	0.68	27.73	47.66	1 1 4 3 0
1.8005	9.19	67.35.	0.61	13.11	19.54	4328	1	100.00	28.54	0.68	26.38	45.08	10777
TOTAL	100.00	28.54	0.68	26.38	45.08	10777							

0
SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

86.63-87.05 METERS

SAMPLE #4 (28M X 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>cm. %wJ!</u>
3/8" X 28M	90.82	90.82
2 8 M X 0	9.18	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>						<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>Em</u>
CONC I.	80.74	22.49	0.69	30.03	47.48	-11830	8 1/2	68.12	81.43	84.45	85.89	85.10
CONC II.	18.11	44.12	0.66	23.19	32.69	8681	4 1/2	31.88	18.57	15.55	14.11	14.90
REFUSE	1.15											
TOTAL	100.00	26.66	0.68	28.71	44.63	12224		100.00	100.06	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #4

3/8" X 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	82.00
Alumina, Al ₂ O ₃	5.11
Titania, TiO ₂	0.25
Ferric oxide, Fe ₂ O ₃	6.93
Lime, CaO	10.88
Magnesia, MgO	1.90
Potassium oxide, K ₂ O	0.75
Sodium oxide, Na ₂ O	0.11
Sulfur trioxide, SO ₃	0.13
Phos. pentoxide, P ₂ O ₅	0.17
Undetermined	1.17
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.16

SILICA VALUE = 89.41

BASE: ACID RATIO = 0.12

FOULING INDEX = 0.01

SLAGGING INDEX = 0.09

- MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #4

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	0.90	--
% CARBON	61.13	61.69
% HYDROGEN	3.78	3.81
% NITROGEN	1.12	1.13
% CHLORINE	0.10	0.10
% SULFUR	0.71	0.72
% ASH	26.78	27.02
% OXYGEN (DIFF.)	5.48	5.53
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	j 2777	>2777
Softening (H=W)	> 2777	>2777
Softening (H=1/2 W)	> 2777	>2777
-Fluid	> 2777	>2777

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

114.61-115.06 METERS

SAMPLE #5

3/8" X 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

PRODUCT	% H2O	% ASH	% S	% VM	% FC	BTU	FSI	% ASH	% S	% VM	% FC	BTU
HEAD	1.27	13.06	0.69	26.89	58.78	13017	7	13.23	0.70	27.24	59.53	13184

MOISTURE FREE BASIS

SP. GR.	% WT.	ELEMENTARY DATA						CUMULATIVE DATA					
		% ASH	% S	% VM	% FC	BTU	FSI	% WT.	% ASH	% S	% VM	% FC	BTU
1.300F	45.09	2.05	0.71	29.60	68.35	15201	8 1/2	45.09	2.05	0.71	29.60	68.35	15201
1.350F	29.00	4.52	0.64	27.59	67.89	14622	3	74.09	3.02	0.68	28.81	68.17	14974
1.400F	4.44	10.67	0.71	26.89	62.44	13525	3	78.53	3.45	0.69	28.70	67.85	14892
1.450F	1.89	17.33	0.82	26.27	56.40	12432	4	80.42	3.78	0.69	28.65	67.57	14834
1.500F	1.15	22.22	0.79	25.87	51.91	11509	4	81.57	4.04	0.69	28.61	67.35	14787
1.600F	1.79	28.96	0.63	25.06	45.98	10237	3	83.36	4.57	0.69	28.53	66.90	14690
1.800~	4.67	38.50	0.51	22.98	38.52	8430	1/2	88.03	6.37	0.68	28.24	65.39	14358
1.800S	11.97	65.02	0.38	17.11	17.87	3475	0	100.00	13.39	0.64	26.91	59.70	13055
TOTAL	100.00	13.39	0.64	26.91	59.70	13055							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

114.61-115.06 METERS

SAMPLE #5 (28M x 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	89.86	89.86
<u>28M x 0</u>	<u>10.14</u>	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

ELEMENTARY DATA

% DISTRIBUTION

<u>PRODUCT</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>iii-</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	90.58	5.02	0.61	31.38	63.60	14556	8	60.09	90.95	92.20	93.52	93.35
CONC II.	7.29	32.06	0.58	25.53	42.41	9978	4 1/2	39.91	9.05	7.80	6.48	6.65
REFUSE	2.13											
TOTAL	100.00	7.57	0.61	30.83	61.60	14125		100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #5

3/8" X 0

HERD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	53.40
Alumina, Al ₂ O ₃	15.60
Titania, TiO ₂	0.56
Ferric oxide, Fe ₂ O ₃	15.20
Lime, CaO	3.00
Magnesia, MgO	3.55
Potassium oxide, K ₂ O	2.46
Sodium oxide, Na ₂ O	0.82
Sulfur trioxide, SO ₃	3.38
Phos. pentoxide, P ₂ O ₅	0.49
Undetermined	1.54
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.32

SILICA VALUE = 71.06

BASE: ACID RATIO = 0.36

FOULING INDEX = **0.30**

SLAGGING INDEX = 0.25

- MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #5

3/8" x 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	1.27	--
% CARBON	75.23	76.20
% HYDROGEN	4.49	4.55
% NITROGEN	1.30	1.32
% CHLORINE	0.21	0.21
% SULFUR	0.69	0.70
% ASH	13.06	13.23
% OXYGEN (DIFF.)	3.75	3.79
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2293	2183
Softening (H=W)	2423	2265
Softening (H=1/2 W)	- 2403	2320
Fluid	-2538	2453

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

127.78-128.57 METERS

SAMPLE #6

3/8" x 28M

WASHABILITY TEST

AIR DRY BASIS

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>AIR DRY BASIS</u>							<u>MOISTURE FREE BASIS</u>				
	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
HEAD	0.85	16.11	0.64	28.87	54.17	11877	5	16.25	0.65	29.12	54.63	11979

MOISTURE FREE BASIS

<u>SP. GR.</u>	<u>% WC.</u>	<u>ELEMENTARY DATA</u>						<u>CUMULATIVE DATA</u>					
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	31.19	2.31	0.78	30.07	67.62	15020	7	31.19	2.31	0.78	30.07	67.62	15020
1.350F	35.43	4.34	0.74	29.14	66.52	14659	6	66.62	3.39	0.76	29.58	67.03	14828
1.400F	5.30	10.82	0.70	28.70	60.48	13312	6 1/2	71.92	3.94	0.75	29.51	66.55	14717
1.450F	2.05	16.58	0.69	28.47	54.95	12042	6 1/2	73.97	4.29	0.75	29.48	66.23	14642
1.500F	1.28	18.24	0.67	26.98	54.78	11756	5	75.25	4.52	0.75	29.44	66.04	14593
1.550F	1.01	22.49	0.63	26.56	50.95	11026	3	76.26	4.76	0.75	29.40	65.84	14546
1.600~	0.82	26.63	0.56	26.09	47.28	10156	2 1/2	77.08	4.99	0.75	29.37	65.64	14499
1.800F	1.85	40.08	0.38	22.79	37.13	7978	1 1/2	78.93	5.82	0.74	29.21	64.97	14347
1.8005	21.07	54.32	0.21	20.47	25.21	3346	0	100.00	16.03	0.63	27.37	56.60	12029
TOTAL	100.00	16.03	0.63	27.37	56.60	12029							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

127.78-128.57 METERS

SAMPLE #6 (28M X 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" x 28M	86.47	86.47
28Mx m _m 0	13.53	100.00
TOTAL	100.00	

MOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% WT.</u>	<u>ELEMENTARY DATA</u>					<u>% DISTRIBUTION</u>				
		<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>mu</u>
CONC I.	88.15	6.95	0.57	29.61	63.44	14066, 6 1/2	59.55	87.46	89.46	92.38	93.03
CONC II.	10.15	35.12	0.61	25.96	38.92	7837 1 1/2	40.45	12.54	10.54	7.62	6.97
REFUSE	1.70										
TOTAL	100.00	10.29	9.57	29.18	60.53	13328	100.00	100.00	100.00	100.00	100.00

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #6

3/8" x 0

HEAD ANALYSIS

MINERAL ANALYSIS OF ASH PERCENT WEIGHT IGNITED BASIS

Silica, SiO ₂	15.70
Alumina, Al ₂ O ₃	4.68
Titania, TiO ₂	0.20
Ferric oxide, Fe ₂ O ₃	41.50
Lime, CaO	28.50.
Magnesia, MgO	5.99
Potassium oxide, K ₂ O	0.54
Sodium oxide, Na ₂ O	0.18
Sulfur trioxide, SO ₃	0.15
Phos. pentoxide, P ₂ O ₅	0.31
Undetermined	<u>2.25</u>
Total	100.00

ALKALIES AS Na₂O, DRY COAL BASIS = 0.09

SILICA VALUE = 17.12

BASE: ACID RATIO = 3.73

FOULING INDEX = 0.67

- SLAGGING INDEX = 2.42

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

SAMPLE #6

3/8" X 0

HEAD ANALYSIS

ULTIMATE ANALYSIS

	<u>AIR DRY BASIS</u>	<u>MOISTURE FREE BASIS</u>
% MOISTURE	0.85	--
% CARBON	69.33	69.92
% HYDROGEN	3.88	3.91
% NITROGEN	1.16	1.17
% CHLORINE	0.15	0.15
% SULFUR	16.11	0.64 0.65
% ASH		16.25
% OXYGEN (DIET.)	7.88	7.95
TOTAL	100.00	100.00

FUSION TEMP. OF ASH

	<u>Oxidizing</u>	<u>Reducing</u>
Initial deformation	2268	2243
Softening (H=W)	2468	2320
Softening (H=1/2 W)	2518	2343
-Fluid	2758	2434

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WEST CARBON CREEK COAL

HOLE

#WCC-80-5

146.93-147.01 METERSSAMPLE #73/8" X 28MWASHABILITY TESTAIR DRY BASISMOISTURE FREE BASIS

<u>PRODUCT</u>	<u>% H2O</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
HEAD	1.89	9.99	0.79	30.54	57.58	13282	8	10.18	0.81	31.13	58.69	13538

MOISTURE FREE BASISELEMENTARY DATACUMULATIVE DATA

<u>SP. GR.</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>
1.300F	45.37	2.65	0.82	31.40	65.95	14997	8	45.37	2.65	0.82	31.40	65.95	14997
1.350F	29.82	5.80	0.77	29.53	64.67	14510	7	75.19	3.90	0.80	30.66	65.44	14804
1.400F	7.06	13.94	0.69	27.41	58.65	13161	7 1/2	82.25	4.76	0.79	30.38	64.86	14663
1.450F	4.27	19.95	0.72	27.20	52.85	12163	7	86.52	5.51	0.79	30.22	64.27	14540
1.500F	1.96	25.32	0.65	26.48	48.20	11283	6	88.48	5.95	0.79	30.14	63.91	14467
1.550F	1.09	28.93	0.65	25.56	45.51	10484	6	89.57	6.23	0.78	30.08	63.69	14419
1.600F	0.77	35.79	0.58	25.18	39.03	9550	6	90.34	6.48	0.78	30.04	63.48	14377
1.800F	3.45	45.78	0.64	23.68	30.54	7802	5 1/2	93.79	7.93	0.78	29.81	62.26	14136
1.800s	6.21	55.09	0.39	17.20	27.71	3668	0	100.00	10.86	0.75	29.03	60.11	13486
TOTAL	100.00	10.86	0.75	29.03	60.11	13486							

SUNNYVALE MINERALS LABORATORY

WEST CARBON CREEK COAL

HOLE #WCC-80-5

146.93-148.01 METERS

SAMPLE #7 (28M x 0)

FLOTATION TEST

STRUCTURES

<u>SIZE</u> <u>me</u>	<u>% WEIGHT</u>	<u>CUM. %WT.</u>
3/8" X 28M	86.34	86.34
28MX 0	<u>13.66</u>	100.00
<u>TOTAL</u>	<u>100.00</u>	

MOISTURE FREE BASIS

ELEMENTARY DATA

% DISTRIBUTION

<u>PRODUCT</u>	<u>% WT.</u>	<u>% ASH</u>	<u>% S</u>	<u>% VM</u>	<u>% FC</u>	<u>BTU</u>	<u>FSI</u>	<u>ASH</u>	<u>S</u>	<u>VM</u>	<u>FC</u>	<u>BTU</u>
CONC I.	66.56	5.40	0.42	28.79	65.81	14496	9	41.38	53.33	68.83	69.01	69.71
CONC II.	29.98	10.15	0.80	26.73	63.12	13652	7	35.03	45.71	28.79	29.81	29.57
REFUSE	3.46	59.23	0.15	19.13	21.64	2891	0	23.59	0.96	2.38	1.18	0.72
<u>TOTAL</u>	<u>100.00</u>	<u>8.69</u>	<u>0.53</u>	<u>27.84</u>	<u>63.47</u>	<u>13841</u>		<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>