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APPENDIX A
SURFACE OWNERSHIP

The following persons have, or will have all rights and privileges to the surface acreage overlying Federal Coal Lease #U-5287. (See accompanying Surface Ownership Map).

Alonzo Olsen
Post Office Box 74
Emery, Utah 84522
Telephone: (801)-286-2263
NE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

Bureau of Land Management
NW $\frac{1}{4}$ SE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

Bureau of Land Management
SW $\frac{1}{4}$ NE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

David M. & Jeanne M. Horne
145 West 4500 South
Salt Lake City, Utah 84107
Telephone: (801)-262-6222 (Business)
(801)-756-7818 (Home)
Part of SE $\frac{1}{4}$ NE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

Earl R. & Dixie Olsen
Manti, Utah
Telephone: (801)-835-7661
Part of SE $\frac{1}{4}$ NE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

David M. & Jeanne M. Horne
145 West 4500 South
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Telephone: (801)-262-6222 (Business)
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Part of NE $\frac{1}{4}$ SE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

Earl R. & Dixie Olsen
Temple Trailers
Manti, Utah 84642
Telephone: (801)-835-7661
Part of NE $\frac{1}{4}$ SE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

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145 West 4500 South
Salt Lake City, Utah 84107
Telephone: (801)-262-6222 (Business)
(801)-756-7818 (Home)
SE $\frac{1}{4}$ SE $\frac{1}{4}$, Section 19, Township 22 South, Range 6 East

Partner of Horne
Joseph L. & Lorraine S. Henriod
410 Newhouse Building
Salt Lake City, Utah 84111
Telephone: (801)-521-3350 (Business)
(801)-581-9092 (Home)

Earl R. & Dixie Olsen
Manti, Utah
Telephone: (801)-835-7661
NW $\frac{1}{4}$ SW $\frac{1}{4}$, Section 20, Township 22 South, Range 6 East

Alton Jensen
Post Office Box 102
Emery, Utah 84522
Telephone: (801)-286-2339
SW $\frac{1}{4}$ SW $\frac{1}{4}$, Section 20, Township 22 South, Range 6 East

Dermis & Venice Jensen
Post Office Box 525
Emery, Utah 84522
SE $\frac{1}{4}$ SW $\frac{1}{4}$, Section 20, Township 22 South, Range 6 East

Dermis & Venice Jensen
Post Office Box 525
Emery, Utah 84522
Telephone: (801)-286-2388
29 Acres Part of SW $\frac{1}{4}$ SE $\frac{1}{4}$, Section 20, Township 22 South, Range 6 East

David M. & Jeanne M. Horne
145 West 4500 South
Salt Lake City, Utah 84107
Telephone: (801)-262-6222 (Business)
(801)-756-7818 (Home)
11 Acres Part of SW $\frac{1}{4}$ SE $\frac{1}{4}$, Section 20, Township 225, Range 6 East

Partner of Horne
Joseph L. & Lorraine S. Henriod
410 Newhouse Building
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Alton Jensen
Post Office Box 102
Emery, Utah 84522
Telephone: (801)-286-2339
NW $\frac{1}{4}$ NW $\frac{1}{4}$, Section 29, Township 22 South, Range 6 East

Earl B. & Patricia S. Bryant
100919 Bordeaux Avenue
Arleta, California 91331
Telephone: (213)-899-3166
NW $\frac{1}{4}$ SE $\frac{1}{4}$, W $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, Section 29, Township 22 South, Range 6 East

APPENDIX B-1
GROUNDWATER FLOW INTO
THE EMERY UNDERGROUND MINE

All of the water in the Emery underground mine is discharged to the surface by two (2) pumps. One is a centrifugal pump and the other is a deepwell turbine pump. The average flow of groundwater into the mine was determined by calculating the amount of water discharged by these two pumps.

The centrifugal pump periodically discharges water from the mine to a reverse osmosis unit located on the surface next to the bath house. This water is used for drinking and shower purposes. According to Tim O'Conner, a mining engineer at the mine, the reverse osmosis unit purifies 50 percent of the water it receives and rejects the other 50 percent to a small evaporation pond located near the turbine pump borehole. The purified water is conveyed to a 5000 gallon storage tank located adjacent to the reverse osmosis unit. AT the end of each working day (Monday through Friday) the tank is empty. From this information, the average pumping rate of the centrifugal pump was determined as follows:

$$Q = Q' C$$

Where Q = average pumping rate in gpd,
 Q' = water usage rate, 5,000 gpd X 2, and
 C = daily usage ratio, $\frac{5 \text{ days}}{7 \text{ days}}$

$$Q = 5,000 \text{ gpd} \times 2 \times \frac{5 \text{ days}}{7 \text{ days}}$$

$$Q = 7,143 \text{ gpd (or 4.96 gpm)} = 955 \text{ ft}^3/\text{day}$$

The turbine pump periodically discharges water from inside the mine to a sedimentation pond located on the surface. A schematic flow diagram of this system is shown in Figure B-1, Flow Diagram- Emery Deep Mine Discharge. The pumping rate was determined by locating the intersection of the manufacturer's pump curve and a derived system head curve.

The manufacturer's pump curve is shown in Figure B-2, Pump Curve.

The system head curve was derived by calculating values of total dynamic head for the system under varying flow conditions. The total dynamic head is the summation of the static head, minor head losses, column head loss, plus the pipe head loss. As shown in Figure B-1, Flow Diagram - Emery Deep Mine Discharge, the static head is 5940 feet - 5730 feet = 210 feet. The minor head losses, which include an elbow and pipe fittings, were estimated to be no more than 10 feet total. Values for the column head loss were determined using a TAIT, Inc. Engineering Catalog column friction loss table. These values are shown in the table, Column Head Loss Values.

Values for the pipe head loss were calculated using the Hazen-Williams formula as shown below:

$$2.228 \times 10^{-3} Q = AC \left(\frac{D}{4}\right)^{0.63} \left(\frac{h_L}{L}\right)^{0.54} (0.001^{-0.004})$$

where

Q = flow in gpm
 A = cross sectional area of the pipe, $\frac{(8/12)^2}{4}$
 C = Hazen-Williams Coefficient for new pvc pipe, 140,
 D = pipe diameter, 8/12 ft,
 h_L = head loss in ft, and
 L = pipe length, 2000 ft.

The calculated pipe head loss values are shown in the table, Pipe Head Loss.

Values of the total dynamic head for the system under varying flow conditions were then determined by adding the static head, minor head losses, column head loss values, and pipe head loss values. The total dynamic head values are presented in the table, Total Dynamic Head Values.

The system head curve was plotted from the total dynamic head values and is shown in the Figure B-3, Pump and System Head Curve Plot. Also shown in the figure is a replot of the manufacturer's pump curve. The intersection of these two curves represents the pumping rate of the turbine pump. That rate is 1685 gpm.

The pumping time of the turbine pump was metered from January 3, 1977 to April 4, 1977 (91 days). The meter reading on January 3, 1977 was 39,368 min. The meter reading on April 4, 1977 was 67,152 min. Therefore, the total pumping time during this 91 day period was 67,152 min. - 39,368 min. = 27,784 min.

The average pumping rate of the turbine pump (Q) was then calculated as follows:

$$Q = \frac{27,784 \text{ min.} \times 1685 \text{ gpm}}{91 \text{ days} \times 24 \text{ hrs.} \times 60 \text{ min.}}$$

$$Q = 357.27 \text{ gpm} = 68,778.3 \text{ ft}^3/\text{day}$$

The average amount of groundwater flowing into the mine during the 91 day monitoring program is equal to the sum of the average flows from the centrifugal pump and the turbine pump. This total flow was calculated as follows:

(average centrifugal pump flow)	955	ft ³ /day
(average turbine pump flow)	+ 68,778.3	ft ³ /day
	69,733.3	ft ³ /day

Thus, the average amount of groundwater flowing into the underground mine from January 3, 1977 to April 4, 1977 was 69,733.3 ft³/day.

Figure B-1
**FLOW DIAGRAM,
EMERY UNDERGROUND MINE DISCHARGE**

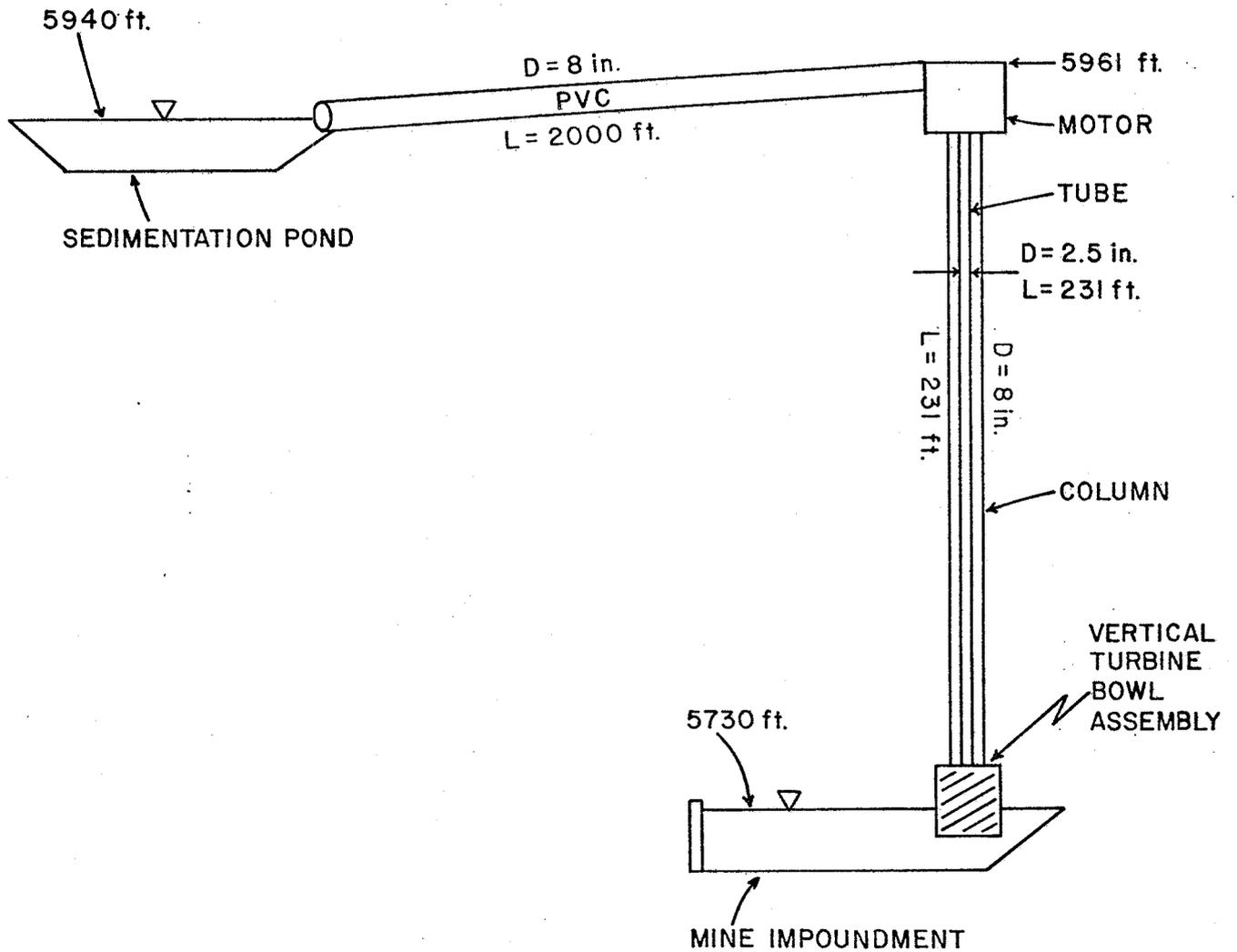


Figure B-2

Section 2-210
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Byron Jackson Pump Division
BORG-WARNER CORPORATION



Effective JAN. 73
Supersedes July 72

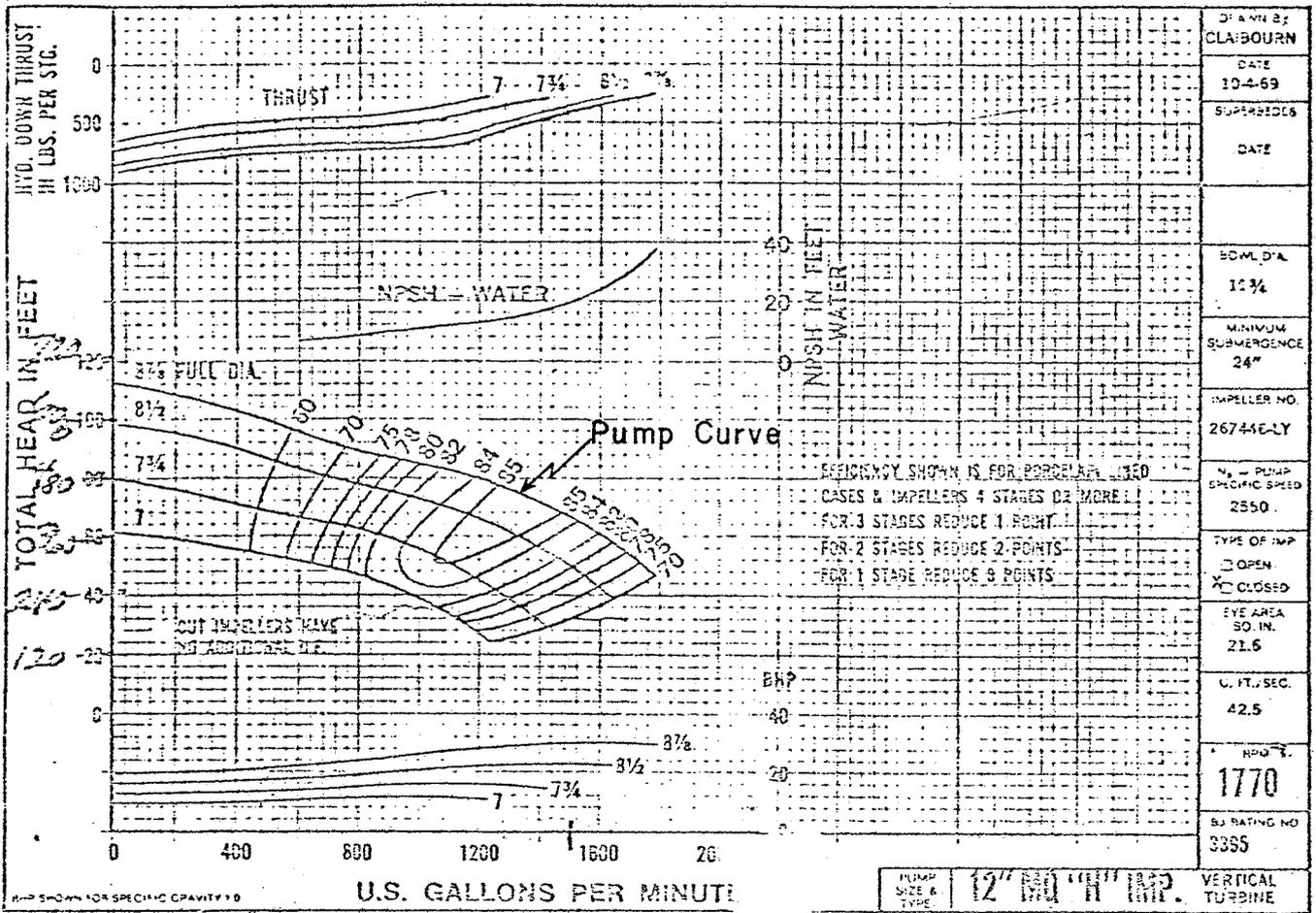
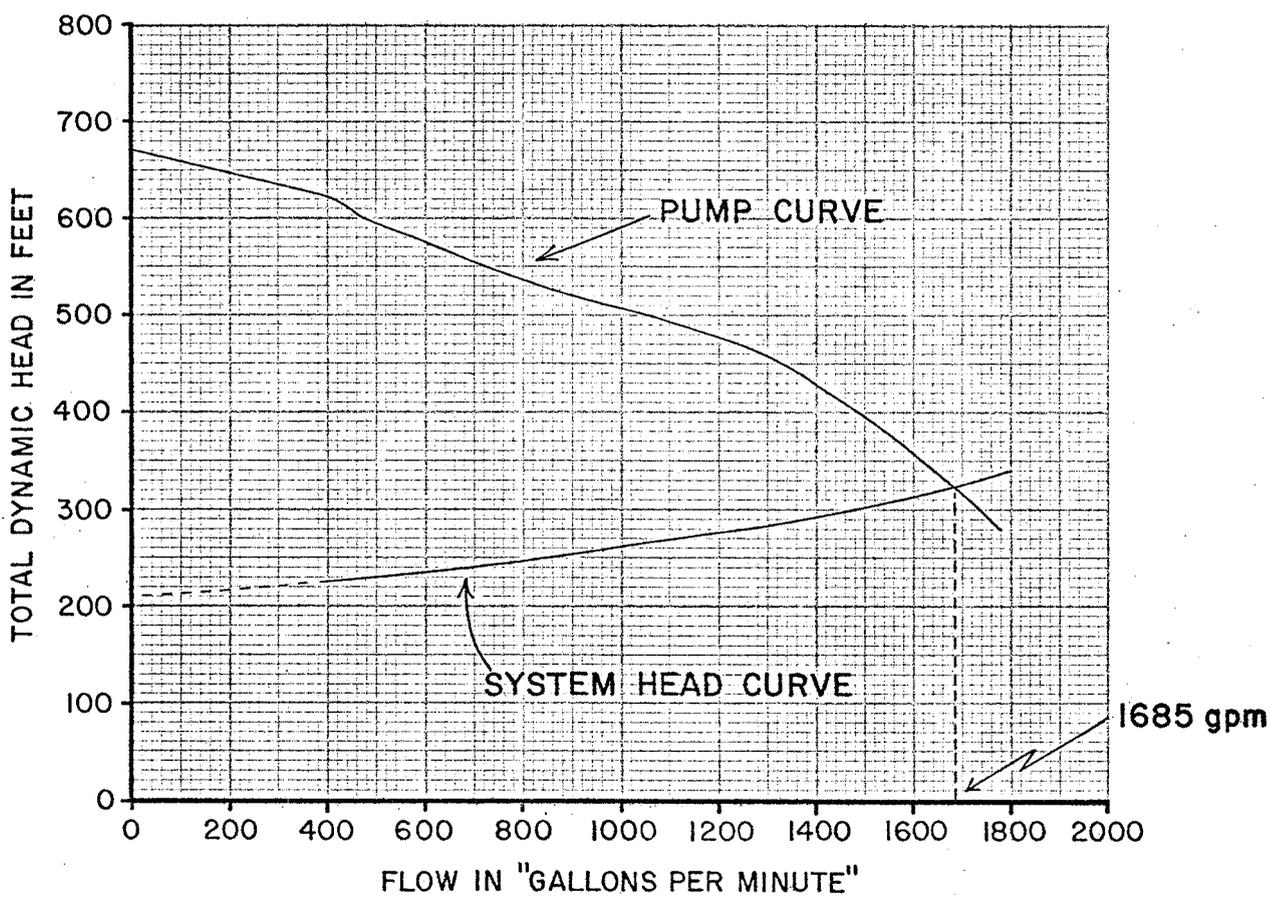


Figure B-3

PUMP AND SYSTEM HEAD CURVE PLOT



COLUMN HEAD LOSS VALUES /

Column Diameter = 8 in.

Column Length = 231 ft.

Tube Diameter = 2.5 in.

<u>Flow</u> <u>gpm</u>	<u>Head Loss/100 Ft.</u> <u>ft</u>	<u>Total Head Loss</u> <u>ft</u>
400	0.7	1.62
600	1.5	3.47
800	2.6	6.01
1000	3.9	9.01
1200	5.4	12.47
1400	7.2	16.63
1600	9.1	21.02
1800	11.0	25.41

PIPE HEAD LOSS VALUES
FOR 8 INCH PVC PIPE

<u>Flow</u> <u>gpm</u>	<u>Total Head Loss</u> <u>ft</u>
400	5.84
600	12.37
800	21.07
1000	31.85
1200	44.65
1400	59.40
1600	76.06
1800	94.60

TOTAL DYNAMIC HEAD VALUES

<u>Flow</u> <u>gpm</u>	<u>Static</u> <u>Head</u> <u>ft</u>	<u>Minor</u> <u>Head</u> <u>Losses</u> <u>ft</u>	<u>Column</u> <u>Head</u> <u>Loss</u> <u>ft</u>	<u>Pipe</u> <u>Head</u> <u>Loss</u> <u>ft</u>	<u>Total</u> <u>Dynamic</u> <u>Head</u> <u>ft</u>
400	210	10	1.62	5.84	227
600	210	10	3.47	12.37	236
800	210	10	6.01	21.07	247
1000	210	10	9.01	31.85	261
1200	210	10	12.47	44.65	277
1400	210	10	16.63	59.40	296
1600	210	10	21.02	76.06	317
1800	210	10	25.41	94.60	340

APPENDIX B-2 MONITORING PROGRAM

The U.S. Geological Survey Water Resources Division in Salt Lake City, Utah, in cooperation with the U. S. Bureau of Land Management and Consol, is planning to conduct a detailed surface and ground water monitoring program at and around the Emery Mine. Final arrangements between the survey and Consol for the monitoring program are nearing completion. A copy of the Survey's project proposal is found in Attachment B-2-1, U. S. Geological Survey Monitoring Program. The proposal discusses: (1) the need for the study, (2) the objectives, (3) the technical approach, and (4) the planned reports.

The main objective of the study is to determine the effects of surface mining on surface and ground water resources. However, at the same time, the study should provide sufficient data for measuring the progress of anticipated impacts resulting from the underground mine and for detecting any unanticipated environmental impacts which could magnify the short-term effects or which could lead to long-term effects.

The Survey plans to conduct the monitoring program for three years starting in 1978. However, with additional federal funding the study may last longer. Nevertheless, when the Survey completes its study, Consol will continue on with the monitoring program. All monitoring data will be submitted as a formal report to the Mining Supervisor on an annual basis. Interim status reports will be prepared every six months to indicate monitoring progress and any problems requiring review by the Mining Supervisor.

PROJECT PROPOSAL
(cover sheet)

District or Project Office: Utah District

Project No. UT 78-134 I

Project title: Hydrology of the Ferron Sandstone
in Castle Valley and effects of
strip mining near Emery, Utah

Begin October 1977
(Month) (Year)

Short title: Ferron SS, Castle Valley, Utah

End September 1980
(Month) (Year)

Project Chief: Gregory Lines

Source of funds:

Fed Co-op OFA
Other

Cooperating agency, US Bureau of Land
Management

Customer No(s). C222

Expenditures by fiscal year:

	<u>Total</u>	<u>(Direct)</u>
19 <u>78</u>	<u>\$100,000</u>	<u>()</u>
19 <u>79</u>	<u>100,000</u>	<u>()</u>
19 <u>80</u>	<u>100,000</u>	<u>()</u>
19 <u> </u>	<u> </u>	<u>()</u>
19 <u> </u>	<u> </u>	<u>()</u>
Total	<u>\$300,000</u>	<u>()</u>

Narrative--Attach descriptive statement using (but not limited to) the following headings:

- | | |
|---|--|
| <p>1. Problem or need for study)</p> <p>2. Objective)</p> <p>3. Approach)</p> | <p>Include sufficient detail for technical and priority evaluation.</p> |
| <p>4. Report plans</p> | <p>Include types of reports and anticipated dates for their transmittal to Region.</p> |
| <p>5. Cost estimates</p> | <p>Identify costs such as project planning, data collection, laboratory analyses, test drilling; report preparation, district support, WOTSC, etc., or explain basis of total cost estimate.</p> |
| <p>6. Personnel requirements and availability</p> | <p>Identify disciplines, approximate grades, full or part time, if available, etc. Highlight additional needs.</p> |

Location and size of area (attach map showing location): Central Utah; approximately 350 square miles in Emery, Carbon, and Sevier Counties.

Proposed by: Kidd Waddell and Gregory Lines

Endorsed by: T. Arrow

Approved by: JM Carter

May 11, 1977

6-29 1977

Aug 10 1977

EXPLANATION

 Approximate boundary of Castle Valley

 Proposed strip mining area

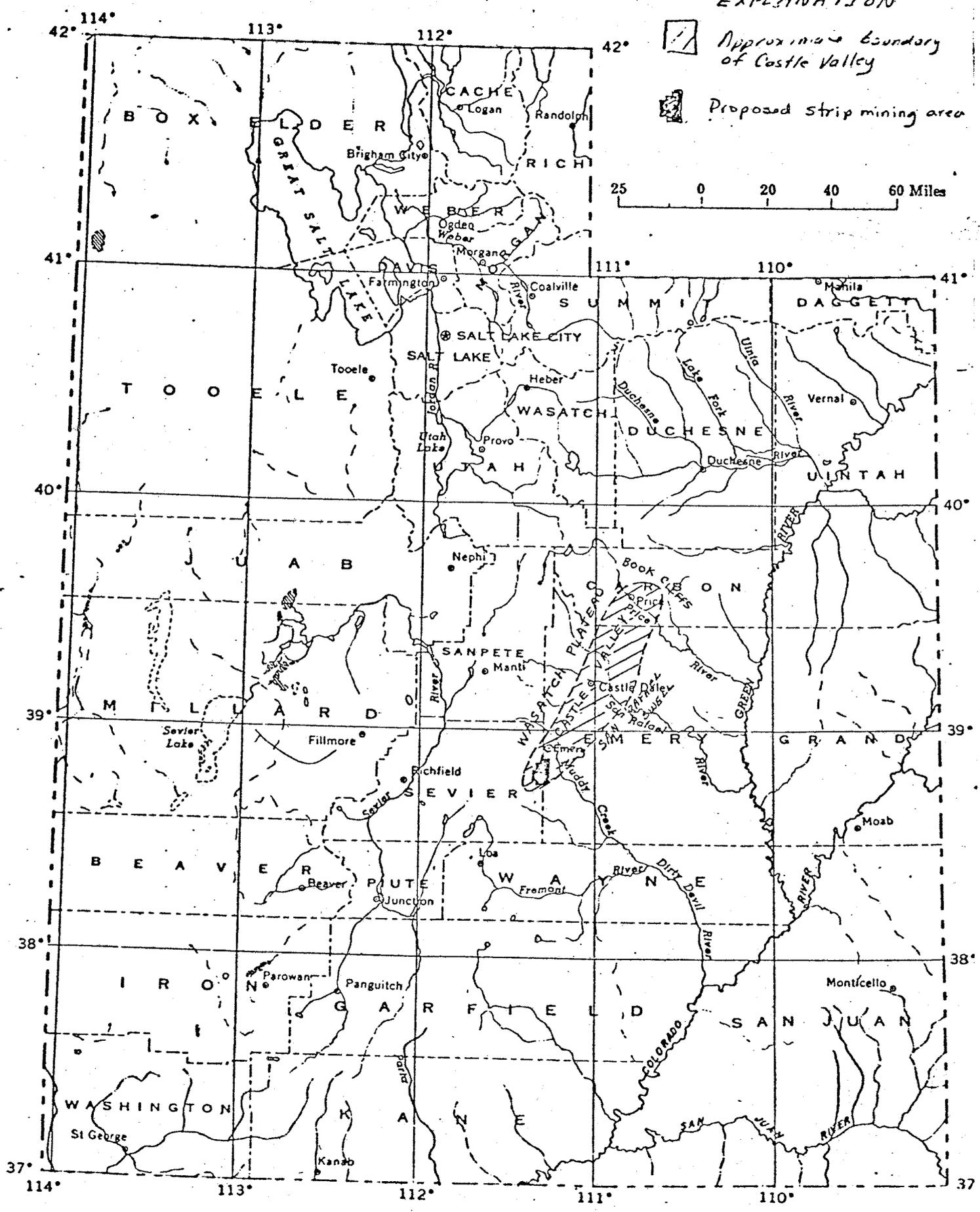
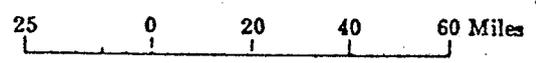


Figure 1. -- Location of the proposed project area in Castle Valley and circled area of study in strip mining.

1. Problem or need for study

Coal mining is increasing in central Utah, and it is expected that from 0.5 to 1.5 million tons of coal per year will be strip mined from the Ferron Sandstone Member of the Mancos Shale (Cretaceous age) in the southern part of Castle Valley near Emery (see figure 1). Strip mining in this area will require the removal of as much as 100 feet of the Blue Gate Shale Member of the Mancos to expose the coal. The Blue Gate Shale contains large amounts of soluble minerals.

Shale in the Blue Gate is probably the confining layer of the Ferron Sandstone aquifer, which is used by the City of Emery and local stockmen for water supplies. Removal of the Blue Gate will probably induce upward leakage from the Ferron into the mined area. Some water will undoubtedly leak from the Blue Gate along the walls of the mine. Head differences between water in the Ferron Sandstone and water in the confining shales of the Blue Gate may also change; and over a long period of time, a large amount of water removed from the mine will probably come from the confining layers. With dewatering of the Ferron in the mine area, upward leakage into the Ferron from Mancos shale below the aquifer may also be induced. Water quality in the Ferron Sandstone and the quality of water pumped from the strip mine may also change with time. The mine water will have to be pumped into streams on the Muddy Creek drainage. The areal effects of dewatering strip mines on existing wells and springs, the base flow of streams, and quality of water in the Ferron Sandstone aquifer are unknown.

Water in the Ferron Sandstone is believed to be of better quality than water in the underlying and overlying shales and water in streams (Muddy Creek and tributaries), although quality differences are not well defined. There is not enough information regarding the aquifer characteristics of the Ferron Sandstone and the hydraulic connection between the aquifer and surrounding shales to determine the amount and quality of water that will leak into the strip mine. Nor is there enough information to determine the amount of salt that will be leached from the stockpiled overburden. Large amounts of soluble salts and sediment may be added to the Muddy Creek drainage and eventually add to the salt and sediment load of the Colorado River. The aquatic life in streams may be seriously affected by an increased silt load.

Public-water supplies in Carbon and Emery Counties will be stressed as coal mining and population increase. Water supplies will also be needed for industry that will be located close to coal supplies. Scanty information suggests that the Ferron Sandstone may have potential for development throughout much of Castle Valley. But not enough information is available to effectively evaluate the quantity and quality of water available from the Ferron or to assess the impact of developing the aquifer.

2. Objectives

(1) Determine the effects of stripping the upper confining layers of shale from the Ferron Sandstone aquifer and mine dewatering on:

- a. existing wells and springs;
- b. the base flow and inorganic quality of water in affected streams;
- c. quality of water in the Ferron Sandstone aquifer; and
- d. rates and directions of leakage between the aquifer and the confining layers.

(2) Determine the effects that erosion and solution of stockpiled overburden may have on the sediment and chemical characteristics of streams and the stream aquatic life.

(3) Determine the recharge-discharge relationships, aquifer characteristics, and the quantity and quality of water available from the Ferron Sandstone throughout Castle Valley.

3. Approach

1st year → (1) A literature and file search of previous studies and hydrologic data that are already available for the Castle Valley area, and studies in other strip mine areas that have transfer value.

1st year → (2) Contact coal and gas companies and other Federal and State agencies doing exploratory drilling in Castle Valley to define data that is available from these sources. Where possible, coordinate future work to avoid duplication of effort and to assure availability of data.

1st year → (3) An extensive well and spring inventory to define existing use and points of discharge from the Ferron Sandstone.

1st & 2nd year → (4) Determine the hydraulic properties and quality of water in the Ferron Sandstone and the overlying Blue Gate Shale with drilling, aquifer tests, and sampling in the proposed strip mine area. These tests will be carried out primarily by private companies with Geological Survey field cooperation.

(5) Where possible, conduct aquifer tests on existing municipal and private wells.

(6) After an assessment of available test-hole data, additional water-level, chemical quality, and aquifer and confining-layer data to be obtained from auger holes drilled with Survey augering equipment mainly in outcrop areas of the Ferron Sandstone. Some holes will also be augered to shallow depths (less than 150 feet) into the Blue Gate Shale to define variations in water quality and head relationships with streams.

(7) Conduct seepage runs on streams that cross Castle Valley to define losing and gaining reaches of streams and their relation with heads in both the Ferron Sandstone and Blue Gate Shale. Seepage runs will help

define natural points of recharge to and discharge from the ground-water system and will provide base-line data on streamflow and quality of water prior to strip mining.

(8) From all sources of well data, map and define the extent, the potentiometric surface, aquifer properties, quality of water and recharge-discharge relationships of the Ferron Sandstone aquifer.

(9) To varyify the conceptual model of the Ferron Sandstone and to predict the effects of strip mining and removing water from both the aquifer and the confining shale on the base flow of streams, on existing wells and springs, and the quality of water in both the aquifer and the streams, digital modeling will probably be used. A two-dimensional model is probably adequate to simulate and varyify aquifer responses on a large scale. But in the concentrated area of study in the strip-mine area, a three-dimensional model will probably be necessary to adequately simulate head changes and changes in storage in the confining shales, head changes in the aquifer, and rates and directions of leakage between the two water-bearing zones.

(10) Make an aquatic biota survey of streams in the strip-mine area to determine the dominant species and their seasonal variation.

(11) Devise laboratory methods to simulate leaching of the stripped overburden to determine the types and quantities of salts that may be yielded by leaching with different types of water, namely rainwater (and snowmelt), water from the Ferron Sandstone, and water in streams.

(12) Monitor effects of increased coal development on the base flow of streams, quality of water, and sediment load in the Muddy Creek drainage with gaging stations above and below the area of development. This will involve three gaging stations.

(13) Monitor effects of stripping the overburden and dewatering the mine on both the potentiometric surface and water quality in both the Ferron Sandstone and overlying Blue Gate Shale with observation wells constructed in both water-bearing zones near the strip mining area.

(14) Monitor the quantity and quality of water discharge from the mine.

4. Reports Planned:

An interpretive report that summarized the field data and digital modeling and that meets the stated objectives would be prepared mainly during the last year of the project. Interim progress reports on various phases of the project would be prepared as the District and cooperators require.

If basic data collected during the project exceeds the amount that can be adequately included in the interpretive report, then a separate open-file basic data report would be prepared, probably while the interpretative report is in the review process.

5. Cost estimates:

Work item:	FY78	FY79	FY80
Planning	6,000	2,000	2,000
Data-collection (including operation of 3 gaging stations)	^{26,500} 30,000	22,000	10,000
Central laboratory	5,000	5,000	4,000
Computer time	3,000	10,000	16,000
1 on project 129 - Gaging station installation (3 stations)	^{6,000} 6,000	-	-
Test drilling and well supplies	⁵⁵⁰⁰ + 12,000	15,000	-
Travel and per diem	6,000	6,000	3,000
Report preparation	3,000	10,000	36,000
District support	16,000	16,000	16,000
WOTSC (13.5%)	13,500	13,500	13,500
Total (rounded)	100,000	100,000	100,000

6. Personnel requirements and availability:

The project would require the near full-time assignment of one hydrologist and one technician. In addition, other District personnel would be called upon to assist in some phases of the field work such as the seepage runs, construction of gaging stations, and the aquatic biota survey. It is assumed that the project chief and technician that are assigned to the project would also assist in different phases of other coal-hydrology studies and monitoring in the immediate area. Cost estimates made in the following section assume that, on the average, one professional and one technician would be working on the project.

The technician that would be needed for this project is not available in the Utah District; the proposed project chief is available.

Salaries	25,000	}	6,000
	15,000		30,000
	5,000		3,000
	3,000		39,000
	6,000		
	12,000		
	6,000		
	16,000		
	13,500		

MOTT CORE DRILLING COMPANY
 MAIN OFFICE
 HUNTINGTON, W. VA.
DIAMOND CORE DRILL HOLE RECORD

FOR Kemmerer Coal Company ADDRESS Frontier, Wyoming DATE February 15, 1963

ON NEAR Emery COUNTY Emery STATE Utah

HOLE No. 2 EL6016.0 DRILLER James C. Jackson DRILL No.

CLASSIFICATION	THICKNESS OF STRATA		DEPTH FROM SURFACE	
	FEET	INS.	FEET	INS.
Dark Sandy Fill & Top Soil	21	0	21	0
Dark Gray Shale	94	0	115	0
Dark Gray Mancos	160	0	275	0
Dark Sandy Shale w/some Fossils	20	0	295	0
Dark Shale - Broken	1	0	296	0
Dark Firm Shale	14	0	310	0
Dark Shale-Firmer	5	0	315	0
Dark Shale (Mancos) w/ Fossils	69	0	384	0
Light Gray Sandstone	38	4	422	4
Coal - - - - -	2	8	425	0
Dark Shale	1	5	426	5
Dark Fossilized Shale	0	11	427	4
Light Gray F. Sandstone w/Irregular Dark Laminated Shale	2	8	430	0
Coal - - - - -	4	2	434	2
Light Sandstone w/ Shale Streaks	30	10	465	0
Coal - - - - -	1	0	466	0
Dark Gray Shale	1	9	467	9
Coal - - - - -	0	7	468	4
Pyritic Sandstone	0	1 $\frac{1}{2}$	468	5 $\frac{1}{2}$
Coal - - - - -	1	7	470	5 $\frac{1}{2}$
Sandy Clay Shale	2	6 $\frac{1}{2}$	472	7
Coal - - - - -	5	4	477	11
Pyritic Coal	0	1	478	0
Coal - - - - -	0	4	478	4
Pyritic Coal	0	2	478	6
Coal - - - - -	4	4	482	10
Pyritic Coal	0	1 $\frac{1}{2}$	482	10 $\frac{1}{2}$
Coal - - - - -	1	6 $\frac{1}{2}$	484	5
Shale	0	7	485	0
Light Sandstone w/ Streaks	2	5	487	5
Coal - - - - -	8	2	495	7
Soft Clay	2	8	498	3
Light Sandstone w/ Fine Grain	6	9	505	0
Dark Gray Shale	20	0	525	0
Clay & Shale	1	0	526	0
Dark Gray Shale	4	0	530	0
Dark Shale w/ Streaks	0	8	530	8
Coal - - - - -	5	0	535	8
Gray Shale	0	8	536	4
Light Gray Sandstone	0	7	536	11

STARTED 19

COMPLETED 19

MOTT CORE DRILLING COMPANY
 MAIN OFFICE
 HUNTINGTON, W. VA.
DIAMOND CORE DRILL HOLE RECORD

FOR Kemmerer Coal Company ADDRESS Frontier, Wyoming DATE February 15, 1963

ON _____ NEAR Emery COUNTY Emery STATE Utah

HOLE No. 2 EL6016.0 DRILLER James C. Jackson DRILL No. _____

CLASSIFICATION	THICKNESS OF STRATA		DEPTH FROM SURFACE	
	FEET	INS. THICK	FEET	INS. THICK
Gray Shale	0	8	537	7
Light Gray Sandstone w/few Shale Bands	7	5	545	0
Light Sandstone - Med. Grain	19	0	564	0
Light Sandstone w/ Shale Streaks	1	0	565	0
Light Sandstone w/few Scattered Streaks	23	0	588	0
Light Fine Grain Sandstone w/Cork Streaks	1	8	589	8
Dark Shale	0	11	590	7
Coal - - - - -	4	5	595	0
Dark Shale	1	1	596	1
Coal - - - - -	5	6	601	7
Light Sandy Shale	0	2	601	9
Coal - - - - -	1	1	602	10
Gray & Dark Shale	6	7	609	5
Light Fine Grain Sandstone	4	6	613	11
Gray Sandstone	1	1	615	0
Sandstone Med. Grain Pepper Marked	7	0	622	0
Light Gray Sandy Shale	7	0	629	0
Dark Shale w/few Coal Streaks	3	0	632	0
Dark Sandy Shale	3	0	635	0
Sandstone	10	0	645	0
Dark Shale	3	0	648	0
White Sandstone Med. Grain-Coal & Carb. Streaks	13	0	661	0
Dark Shale w/ Sandy Bands	4	0	665	0
Dark Shale	10	0	675	0
Dark Shale w/ Sandy Streaks	1	6	676	6
Gray Sandstone	2	0	678	6
Gray Sandstone w/ Small Holes	3	0	681	6
Gray Sandstone w/few Coal Streaks	13	6	695	0
Gray Med. Grain Sandstone	1	1	696	1
Gray Med. to Coarse Grain Sandstone-Porous	8	6	704	7
Dark Gray Fine to Med. Sandstone	3	0	707	7
Dark Shale w/ Sandy Streaks	1	4	708	11
Dark Shale w/ Coal Lines	5	9	714	8
Dark Sandy Shale	1	0	715	8
Gray Med. to Coarse Grain Sandstone	1	4	717	0
Dark Gray Sandy Shale	0	6	717	6
Light to Gray Med. to Coarse Grain Sandstone	6	0	723	6
Light Gray Massive Med. Grain Sandstone	3	11	727	5
Dark Gray Coarse Sandstone	0	5	727	10
Light Gray Med. Grain Sandstone	3	9	731	7
Light to Dark Med. to Coarse Grain Sandstone	3	5	735	0

STARTED 19
 COMPLETED 19

MOTT CORE DRILLING COMPANY
 MAIN OFFICE
 HUNTINGTON, W. VA.
DIAMOND CORE DRILL HOLE RECORD

FOR Kemmerer Coal Company ADDRESS Frontier, Wyoming DATE February 15, 1963

ON NEAR Emery COUNTY Emery STATE Utah

HOLE No. 2 EL 6016.0 DRILLER James C. Jackson DRILL No.

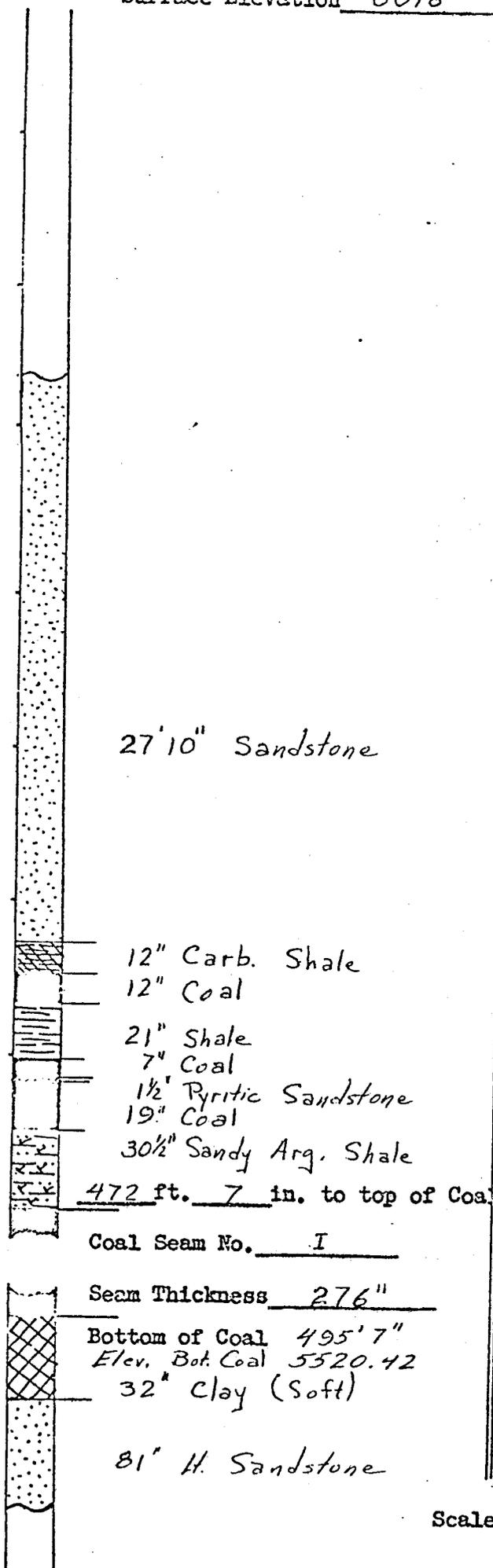
CLASSIFICATION	THICKNESS OF STRATA		DEPTH FROM SURFACE	
	FEET	INS.	FEET	INS.
Light Gray Fine to Med. Grain Sandstone	2	$\frac{1}{2}$	737	$\frac{1}{2}$
Gray Med. Grain Sandstone w/some Dark Lines	3	$\frac{1}{2}$	740	1
Fine Grain Sandstone	7	8	747	9
Light Gray Fine Grain Sandstone	1	$1\frac{1}{2}$	748	$10\frac{1}{2}$
Med. Light Gray Fine Sandstone	1	$7\frac{1}{2}$	750	6
Dark Sandy Shale	4	4	754	10
Light Gray Fine Sandstone w/some Dark Streaks	1	0	755	10
Light Gray Sandstone & Dark Gray Sandy Shale	4	7	760	5
Dark Gray Sandstone	15	6	775	11

Total Depth 775'11"

STARTED December 30, 1962

COMPLETED February 13, 1963

FORM 1



27' 10" Sandstone

12" Carb. Shale
 12" Coal
 21" Shale
 7" Coal
 1 1/2" Pyritic Sandstone
 19" Coal
 30 1/2" Sandy Arg. Shale

472 ft. 7 in. to top of Coal

Coal Seam No. I
 Seam Thickness 276"

Bottom of Coal 495' 7"
 Elev. Bot. Coal 5520.42

32" Clay (Soft)
 81' H. Sandstone

27' 10" Sandstone
 12" Carbonaceous Shale
 12" Coal
 21" Shale
 7" Coal
 1 1/2" Pyritic Sandstone
 19" Coal
 30 1/2" Sandy Argillaceous Shale

64" Coal
 1" Pyritic Coal
 4" Coal
 2" Pyritic Coal

52" Coal
 1/2" Pyritic Coal
 18 1/2" Coal
 7" Shale

29" Sandstone w Coal Strks.

98" Coal

32" Clay (Soft)

Total Seam Thickness 276"

DETAIL COAL SECTION, SEAM NO. I

Farm _____

Loc. H-17 S. 29 T. 22S R. 6E

County Emery State Utah

Scale 1" = 5'

UTAH

DRILL CORE NO. FC-2

DATE 2-1-63
~~91837N - 102717E~~
LOCATION T-22S, R-6E, S-29
TOWNSHIP
COUNTY EMERY

SURF. ELEVATION 6016
BOTTOM OF COAL 495'-7"
BOTTOM OF HOLE
DRILLER JACKSON

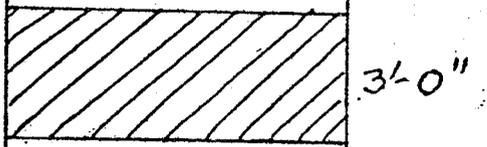
~~1.30F~~ 1.30F ~~1.40F~~ 1.40F ~~1.60F~~ 1.60F R.C.



E. A. 3.2 7.2 7.8 10.5
S. 0.52 0.48 0.47 0.46 4'-0"

D A. 4.7 6.6 8.3 14.6
S. 0.33 0.31 0.30 0.28 4'-0"

C A. 3.4 5.1 5.9 7.4
S. 0.35 0.35 0.35 0.34 3'-10"



B A. 3.6 6.0 7.6 9.9
S. 0.46 0.42 0.41 0.40 4'-0"

A. A. 3.6 5.3 6.3 8.5
S. 0.46 0.45 0.44 0.46 4'-2"

OVERALL SEAM
A+B+C+D+E Δ 3.7 6.0 7.1 10.2
S. 0.41 0.40 0.40 0.39 23'-0" (20'-0" COAL)

PERCENT RECOVERY * 38.5 85.5 93.5 100.0

* EXCLUDING 3'-0" SANDSTONE

C+D+E A. 3.8 6.3 7.3 10.8 11'-10"
S. 0.37 0.38 0.38 0.36

A+B A. 3.6 5.6 6.9 9.2 8'-2"
S. 0.46 0.43 0.42 0.43

UTAH

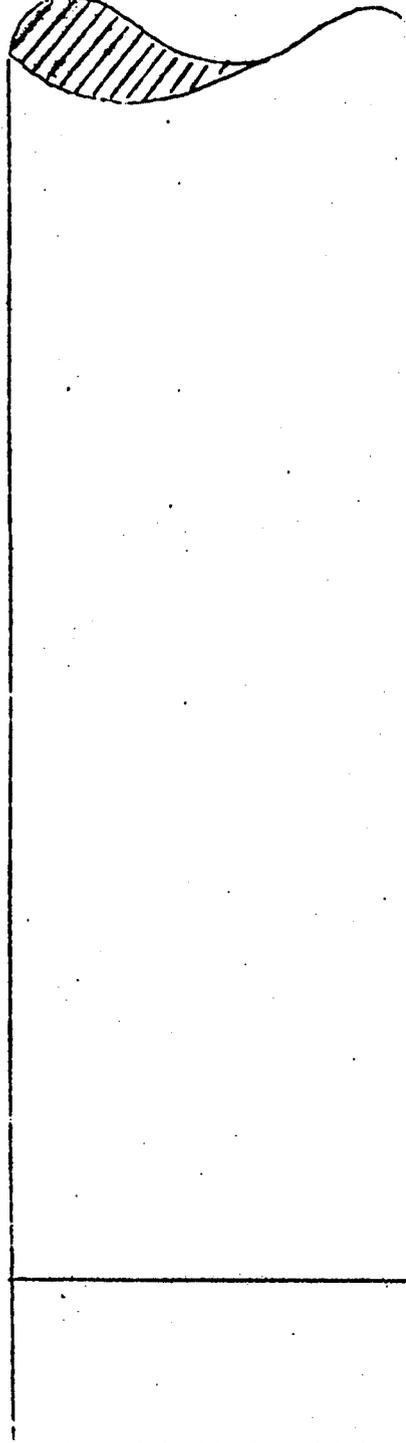
DRILL CORE NO. FC-2

DATE 2-1-63
PROPERTY _____
LOCATION _____
TOWNSHIP _____
COUNTY _____

SURF. ELEVATION 6016'
BOTTOM OF COAL 425'-9"
BOTTOM OF HOLE _____

DRILLER _____

1.30F 1.40F 1.60F R.C.
~~1.30F~~ ~~1.40F~~ ~~1.60F~~



3'-5"

OVERALL SEAM	A	3.1	5.2	6.4	8.3	3'-5"
	S	1.99	2.61	3.36	4.18	
PERCENT RECOVERY		47.3	85.1	95.3	100.0	

(6)

UTAH DRILL CORE NO. FC-2

DATE 2-1-63
PROPERTY _____
LOCATION _____
TOWNSHIP _____
COUNTY _____

SURF. ELEVATION 6016
BOTTOM OF COAL 434'-2"
BOTTOM OF HOLE _____

DRILLER _____

1.30F 1.40F 1.60F RC.



4'-2"

OVERALL SEAM	A	2.9	5.7	7.6	8.5	4'-2"
	S	1.49	1.83	2.28	2.66	
PERCENT RECOVERY		45.9	84.1	96.7	100.0	

UTAH DRILL CORE NO. FC-2

DATE _____
PROPERTY _____
LOCATION _____
TOWNSHIP _____
COUNTY _____

SURF. ELEVATION 6016
BOTTOM OF COAL 5351-8"
BOTTOM OF HOLE _____

DRILLER _____

130F 140F 160F R.O.



5'-0"

OVERALL SEAM

A 3.6 6.1 7.1 13.4 5'-0"
S 0.79 1.06 1.16 1.21

PERCENT RECOVERY

26.5 82.7 88.4 100.0

Seam

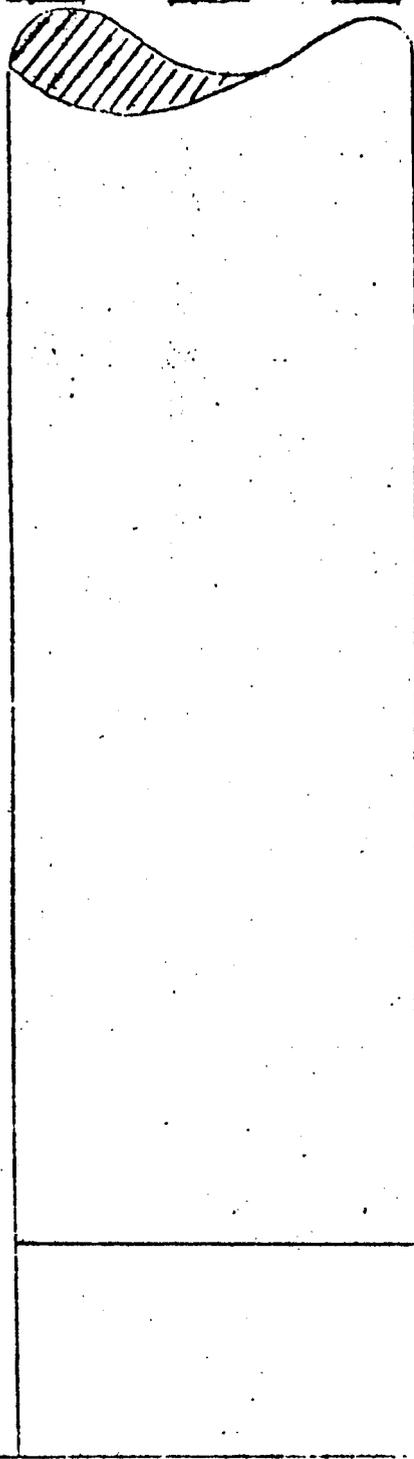
UTAH DRILL CORE NO. FC-2

DATE _____
PROPERTY _____
LOCATION _____
TOWNSHIP _____
COUNTY _____

SURF. ELEVATION 6016'
BOTTOM OF COAL 595"
BOTTOM OF HOLE _____

DRILLER _____

1.30F 1.40F 1.60F RC.



4'-5"

OVERALL SEAM	A 3.1	7.8	14.4	19.0	4'-5"
	S 0.81	0.76	0.68	0.64	

PERCENT RECOVERY	13.3	54.9	88.4	100.0
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UTAH DRILL CORE NO. FC-2

DATE _____
PROPERTY _____
LOCATION _____
TOWNSHIP _____
COUNTY _____

SURF. ELEVATION 6016'
BOTTOM OF COAL 602'-10"
BOTTOM OF HOLE _____

DRILLER _____

1.30F 1A0F 160F R.C.



7'-10"

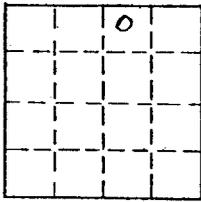
OVERALL SEAM

A 5.1 8.0 11.6 36.4 7'-10"

S 0.66 0.60 0.61 0.54

PERCENT RECOVERY

15.7 46.3 59.6 100.0



CONSOLIDATION COAL COMPANY

Section # 29

Project: Emery, Utah
Hole No.: FC-58, Vertical

Location: 440'FNL, 2320'FEL,
Sec. 29-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal
Company
Address: Denver, Colorado

Elevation: 6169.09

Driller: L. Gilland & D. Dale

Date: June 24, 1969

Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

Geologist: Driller's Log

Fluid:

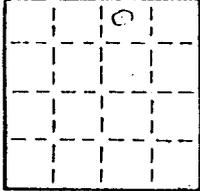
Run #	Recovery	From	To	Description	Th.(ft)	Sample #
		0.0	25.0	Sand, brown	25.0	
		25.0	33.0	Gravel, small	8.0	
		33.0	43.0	Shale, soft, brown	10.0	
		43.0	50.0	Gravel, small	7.0	
		50.0	60.0	Gravel & boulders	10.0	
		60.0	150.0	Shale, gray	90.0	
				Set casing at 60.0'		
		150.0	159.0	Shale, drk. gray	9.0	
1		159.0	168.0	Shale, drk. gray	8.0	
2		168.0	178.0	Shale, drk. gray	9.9	<u>loss 1.0</u>
3		178.0	188.5	Shale, drk. gray	10.5	<u>loss 0.1</u>
4		188.5	198.8	Shale, drk. gray	10.3	
5		198.8	208.8	Shale, drk. gray	10.0	
6		208.8	218.8	Shale, drk. gray	10.0	
7		218.8	228.8	Shale, drk. gray	10.0	
8		228.8	238.8	Shale, drk. gray	10.0	
9		238.8	248.8	Shale, drk. gray	10.0	
10		248.8	258.8	Shale, drk. gray	9.8	
11		258.8	268.8	Shale, drk. gray	10.2	
12		268.8	278.8	Shale, drk. gray	10.0	
13		278.8	289.0	Shale, dark gray, sandy	10.2	
14		289.0	299.3	" " " "	10.3	
15		299.3	309.3	" " " "	10.0	
16		309.3	319.4	" " " "	10.1	
17		319.4	329.4	" " " "	10.0	
18		329.4	339.4	" " " "	10.0	
19		339.4	349.4	" " " "	10.0	
20		349.4	359.4	Shale, dark	10.0	
21		359.4	369.4	" "	10.0	
22		369.4	379.4	" "	10.0	
23		379.4	389.4	" "	10.0	
24		389.4	399.4	" "	9.9	<u>loss 0.1</u>
25		399.4	409.4	" "	10.1	<u>gain 0.1</u>
26		409.4	419.4	" "	10.0	

Run #	Recovery	From	To	Description	Th.(ft)	Sample #
27		419.4	429.4	Shale, dark gray, sandy	10.0	
28		429.4	439.4	" " " "	9.9	
29		439.4	449.4	" " " "	10.1	
30		449.4	459.5	" " " "	10.1	
31		459.5	469.5	" " " "	10.0	
32		469.5	478.7	" " " "	9.2	
33		478.7	488.7	Shale, dark	10.0	
34		488.7	498.7	" " " "	9.9	
35		498.7	508.7	" " " "	10.1	
36		508.7	518.7	" " " "	10.0	
37		518.7	528.7	" " " "	10.0	
38		528.7	539.1	Shale, dark gray, sandy	10.4	
39		539.1	549.3	" " " "	10.2	
40		549.3	559.3	" " " "	10.0	
41		559.3	569.3	Shale, dark	10.1	
42		569.3	579.3	" " " "	9.9	
43		579.3	589.3	" " " "	10.0	
44		589.3	599.3	" " " "	10.0	
45		599.3	609.3	Shale, dark gray, sandy	10.0	
46		609.3	619.3	" " " "	10.0	
47		619.3	629.3	" " " "	10.0	
48		629.3	637.4	" " " "	8.1	
		637.4	637.6	Shale, soft, gray	0.2	
		637.6	639.3	Shale, dark gray, sandy	1.7	
49		639.3	649.3	" " " "	10.0	
50		649.3	659.3	" " " "	9.8	
51		659.3	669.3	" " " "	10.0	
52		669.3	679.3	Shale, dark	10.0	
53		679.3	681.0	Shale, dark	1.7	Roof #1
						671.0 -
						681.0
		681.0	684.7	<u>COAL</u>	3.7	Sample#1
		684.7	684.9	Bone	0.2	681.0 -
		684.9	688.6	<u>COAL</u>	3.7	688.6
		688.6	689.5	Shale	0.9	Floor #1
54		689.5	698.5	Shale, w/ss. layers	9.0	688.6 -
		698.5	699.5	Ss.	1.0	698.6
55		699.5	699.7	Shale, carb	0.2	
		699.7	705.5	Ss.	5.8	
		705.5	705.6	<u>COAL</u>	0.1	
		705.6	709.5	Shale	3.9	Roof #2
56		709.5	715.5	Shale, dark	6.0	706.5 -
		715.5	716.5	Shale, carb	1.0	716.5
		716.5	717.0	<u>COAL</u>	0.5	Sample#2
		717.0	717.9	Bone	0.9	716.5 -
		717.9	719.4	<u>COAL</u>	1.5	726.5
57		719.4	720.3	<u>COAL</u>	0.9	
		720.3	721.3	Shale	1.0	

Run #	Recovery	From	To	Description	Th.(ft)	Sample #
		721.3	729.4	<u>COAL</u>	8.1	Sample#3
		729.4	735.2	<u>COAL</u>	5.8	726.5 - 729.4
		735.2	736.4	Shale, gray	1.2	Sample#4 729.4 - 735.2
58		736.4	746.4	Shale, gray, sandy	10.0	Floor #4 735.2 - 745.2
		746.4	751.7	Shale, gray	5.3	
59		751.7	751.9	<u>COAL</u>	0.2	Sample#5 751.7 - 756.4
		751.9	752.3	Shale, carb	0.4	
59		752.3	756.4	<u>COAL</u>	4.1	
60		756.4	759.9	<u>COAL</u>	3.5	Sample#6 756.4 - 759.9
		759.9	761.2	Shale, gray, soft	1.3	Floor #6 759.9 - 769.9
		761.2	764.2	Shale, dark gray	3.0	
61		764.2	771.0	Shale, dark gray, sandy	6.8	
62		771.0	779.6	Shale, gray	8.6	
63		779.6	789.6	Shale, gray	10.0	
64		789.6	794.1	Ss.	4.5	Roof #7 791.7 - 801.7
		794.1	795.6	Shale carb	1.5	
		795.6	797.1	Ss.	1.5	
		797.1	797.8	Shale, soft	0.7	
		797.8	799.6	Ss.	1.8	
65		799.6	801.7	Shale, carb	2.1	
		801.7	807.2	<u>COAL</u>	5.5	Sample#7 801.7 - 807.2
		807.2	809.6	Shale	2.4	Floor #7 807.2 - 817.2
66		809.6	819.6	Shale, sandy w/traces of ss.	9.8	
67		819.6	829.6	Shale, sandy w/traces of ss. <u>loss 0.2</u>	10.2	Roof #8 824.2 - 834.2
		829.6	831.3	Shale as above	1.7	
68		831.3	831.5	<u>COAL</u>	0.2	
		831.5	834.2	Shale, carb	2.7	
		834.2	834.4	<u>COAL</u>	0.2	Sample#8 834.2 - 838.1 with 0.7' shale included

Run #	Recovery	From	To	Description	Th.(ft)	Sample #
		834.4	834.7	Shale, carb	0.3	
		834.7	835.2	<u>COAL</u>	0.5	
		835.2	835.6	Shale, carb	0.4	
		835.6	838.1	<u>COAL</u>	2.5	Sample#9
						838.1 -
						845.9
						with 1.2'
						ss
		838.1	839.1	Ss	1.0	included
		839.1	839.6	<u>COAL</u>	0.5	
69		839.6	844.4	<u>COAL</u>	4.8	
		844.4	844.6	Ss.	0.2	
		844.6	845.9	<u>COAL</u>	1.3	
		845.9	848.9	Ss.	3.0	
		848.9	849.6	Shale, gray	0.7	
70		849.6	850.0	Shale, carb	0.4	
		850.0	852.9	Ss.	2.9	
		852.9	854.7	Shale, carb	1.8	
		854.7	858.7	Shale	4.0	
		858.7	860.0	Shale, carb	1.3	
		860.0		TOTAL DEPTH		

Hole plugged with 40 bags of cement.



CONSOLIDATION COAL COMPANY

Hole No. FC-58
Detail Log

Project: Emery, Utah

Hole: FC-58, Detail Log
Vertical

Section #29

Location: 440 FNL, 2320 FEL,
Sec. 29-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal
Company

Elevation: 6169.09

Address: Denver, Colorado

Date: June 24, 1969

Driller: L. Gilland & D. Dale

Geologist: F. Williams

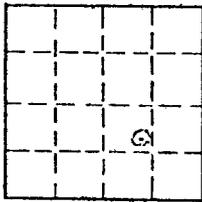
Core Size: Winter-Weiss Portadrill
Barrel: NQ Wireline Core Barrel

<u>Interval</u>	<u>Core</u>	<u>Description</u>	<u>Th.(ft)</u>	<u>Sample #</u>
671.0 - 681.0	9.87	Shale, dark gray, fine, massive	7.80	Roof #1
		Conglomerate, ss. pebbles	0.19	" "
		COAL and black shale	0.13	" "
		Shale, black, coaly	0.40	" "
		Shale, dark gray to black, poorly laminated,		" "
681.0 - 688.6	7.30	Occasional light gray, silty bands	1.15	" "
		Shale, dark gray w/coal streaks	0.20	" "
		COAL, core broken	2.00	Sample #1
		COAL, one vertical fracture	1.45	" "
		Shale, black	0.30	" "
688.6 - 698.6	10.0	COAL, one vertical fracture	1.28	" "
		Shale, black to brown	0.04	" "
		COAL, one vertical fracture	2.23	" "
		Shale, black, w/coal stringers	0.85	Bottom #1
		Shale, dark gray, coaly	0.15	" "
		Ss., light gray bands	0.20	" "
		Shale, black w/num. coal streaks	0.63	" "
706.5 - 716.5	9.73	Shale, dark gray, silty	2.27	" "
		Ss., dark gray, fine grain w/light gray mottling	0.40	" "
		Shaly & silty, occas. coal streak (could be called a siltstone, sandy	5.50	" "
		Shale, dark gray, occas. coal Streak, silty in lwr	0.3	Roof #2
		Shale, drk. gray, occas. coaly plnt	0.90	" "
		Frag. prly. laminated	7.40	" "
		Shale, dark gray, clayey occas.		" "
		COAL frag. in lwr prt.	1.18	" "
		Shale, black w/coal streaks	0.25	" "

Interval	Core	Description	Th. (Ft)	Sample #
716.5 - 726.6	10.05	<u>COAL</u>	0.65	Roof #2
		Shale, black, coaly streaks	0.75	" "
		<u>COAL</u>	0.80	" "
		<u>COAL</u> , bony	0.10	" "
		<u>COAL</u> , broken in lwr 0.4'	1.45	" "
		Occas. pyrt. on vert. ptgs.		
		Shale, black, mass.	0.40	" "
		Shale, dark gray, prly. laminated, weak	0.65	" "
		Shale, black	0.10	" "
		<u>COAL</u> , vertical fractures	1.60	" "
		<u>COAL</u> , w/bony streaks	0.45	" "
<u>COAL</u> , core broken in lwr 0.5'	3.10	" "		
726.6 - 729.4	3.30	<u>COAL</u>	1.50	Roof #3
		Shale, black, coaly	0.35	" "
		<u>COAL</u> , core broken in upper 0.8	1.45	" "
729.4 - 735.2	5.14	<u>COAL</u> , core broken	1.50	Roof #4
		Bone	0.15	" "
		<u>COAL</u> , core broken	1.22	" "
		Shale	0.02	" "
		<u>COAL</u>	2.25	" "
735.2 - 745.2	9.70	Shale, dark gray, laminated, weak grades into	0.80	Floor #4
		Shale, med. to dark gray, lamntd.	1.15	" "
		Shale, Med. gray w/num. irreg. light gray ss. bnds. & ptgs., slty.	7.75	" "
745.2 - 751.7	6.90	Shale, as abv.	1.55	Roof #5
		Shale, dark gray to black, pyrite		
		Mass. occas coaly frag., fairly hard	5.35	" "
751.7 - 756.4	4.70	<u>COAL</u>	0.20	Sample #5
		Shale, black	0.40	" "
		<u>COAL</u> , hard, good core	4.10	" "
756.4 - 759.9	^{3.5} <u>3.15</u>	<u>COAL</u> , core broken	^{3.50} <u>3.15</u>	Sample #6
759.9 - 769.9	9.80	Clay shale, gray, soft, grades into	2.70	Floor #6
		Sh. med gray, hard, mass	1.70	" "
		Shale, med. to dark gray, occas. coal frag., silty in lwr prt	5.40	" "

Interval	Core	Description	Th.(ft.)	Sample #
791.7 - 801.7	9.69	Ss., light to med. gray, very fine grnd,		Roof #7
		Shaly	1.20	" "
		Shale, med. gray	1.75	" "
		Ls. nod(?)Light gray	0.07	" "
		Clay, shale, dark gray	0.35	" "
		Shale, black, coaly	0.15	" "
		<u>COAL</u> , shaly	0.30	" "
		Shale, black, coaly	0.30	" "
		Shale, dark gray, slty., grades into	0.50	" "
		Sts., light gray, shaly	0.60	" "
		Shale, med to dark gray, clayey grades into	3.60	" "
		Shale, black, coaly streaks	0.50	" "
		<u>COAL</u> , shaly	0.12	" "
		Shale, med. gray, mass	0.15	" "
		801.7 - 807.2	5.72	<u>COAL</u>
<u>COAL</u> , core broken	1.80			" "
<u>COAL</u>	2.92			" "
807.2 - 817.2	9.75	<u>COAL</u> , bony	0.20	Floor #7
		Shale, gray, clayey	2.15	" "
		<u>COAL</u>	0.10±	" "
		Ss., light gray, fn grnd, grades into		" "
		Shale, dark gray, slty., w/irreg. fn.	1.00	" "
		Ss., mottling	6.30	" "
824.2 - 834.2	10.00	Ss., light gray, fn. grnd, w/wavy dark gray shale ptgs.	3.00	Roof #8
		Ss, light gray, med. to crs	1.00	" "
		Shale, med. to dark gray w/light gray	2.65	" "
		Ss., ptgs.		" "
		Ss., light gray, fn. grnd., shaly at base	0.65	" "
		Shale, dark gray, sandy	0.10	" "
		Shale, black, coaly	0.60	" "
		Shale, black, w/coal ptgs.	1.80	" "
834.2 - 838.1	4.26	<u>COAL</u>	0.35	Sample #8
		<u>COAL</u> , bony	0.33	" "
		<u>COAL</u>	0.63	" "
		Shale, black, coaly	0.45	" "
		<u>COAL</u>	2.50	" "

<u>Interval</u>	<u>Core</u>	<u>Description</u>	<u>Th.(ft)</u>	<u>Sample #</u>
838.1 - 845.9	7.93	Shale, dark gray to black, grades into	0.50	Roof #9
		Ss., med. to dark gray, slty., fine to med. gray, irreg. contact at base	0.60	" "
		Shale, <u>black, grades into</u>	0.10	" "
		<u>COAL</u> , core broken	1.15	Sample #9
		<u>COAL</u>	0.77	" "
		Shale, black	0.15	" "
		<u>COAL</u>	0.78	" "
		Shale, black	0.17	" "
		<u>COAL</u>	0.85	" "
		<u>COAL</u> , bony	0.13	" "
		<u>COAL</u>	1.00	" "
		<u>COAL</u> , bony	0.08	" "
		Shale, med. gray	0.25	" "
		Shale, black grades into	0.20	" "
845.9 - 855.9	10.2	<u>COAL</u>	1.20	" "
		Ss., gray, slty., coal frags. in upper 0.3, grades into	0.90	Floor #8
		Ss., light gray, very fine grades into	1.80	" "
		Ss., as abv. wavy shale ptgs. & bnds.	0.80	" "
		Shale, dark gray, slty. & sandy	0.75	" "
		Shale, dark gray	1.00	" "
		Shale, gray	2.50	" "
		Shale, black w/coaly stringers	1.85	" "
		Clay shale, light gray, slickensided	1.30	" "



CONSOLIDATION COAL COMPANY

Section # 19

Project: Emery, Utah
Hole No.: FC-59, Vertical

Location: 1780 FSL, 1540 FEL,
Sec. 19-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal
Company
Address: Denver, Colorado

Elevation: 1003'

Driller: L. Gilland & D. Dale

Date: June 23 to 30, 1969

Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

Geologist: Driller's Log

Fluid: Water

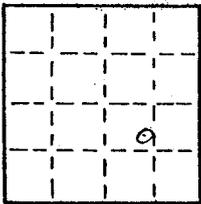
Run #	Recovery	From	To	Description	Th. (ft)	Sample #
		0.	5.0	Overburden	5.0	
		5.0	25.0	Shale, light	20.0	
		25.0	40.0	Shale, dark	15.0	
				Note: casing set at 40.0'		
		40.0	135.0	Shale, dark	95.0	
		135.0	300.0	Shale, dark gray	165.0	
		300.0	435.0	Shale, dark	135.0	
		435.0	600.0	Shale, dark gray	165.0	
1		600.0	606.0	Shale, dark	6.0	
2		606.0	614.0	Shale, dark	8.0	
3		614.0	624.0	Shale, dark	10.0	
4		624.0	633.0	Shale, dark	9.0	
5		633.0	643.0	Shale, dark gray	loss 0.6 gain 0.6 9.4	
6		643.0	652.5	Shale, dark gray	10.1	
7		652.5	658.0	Shale, dark gray	loss 3.1 gain 3.1 2.4	
8		658.0	665.0	Shale, dark gray	10.1	
9		665.0	675.0	Shale, dark gray	10.0	
10		675.0	685.0	Shale, dark	10.0	
11		685.0	695.0	Shale, dark	10.0	
12		695.0	705.0	Shale, dark	10.0	
13		705.0	715.0	Shale, dark	9.9	
14		715.0	725.0	Shale, dark	10.1	
15		725.0	735.0	Shale, dark	10.0	
16		735.0	741.5	Shale, dark	6.5	
17		741.5	751.5	Shale, dark	10.0	Roof #1
18		751.5	752.3	Shale, dark	0.8	742.3 - 752.3
		752.3	754.8	<u>COAL</u>	2.5	Sample #1
		754.8	755.1	Shale	0.3	" "
		755.1	756.3	<u>COAL</u>	1.2	" "
		756.3	761.5	Ss., shaly	5.2	Floor #1
						756.3 - 766.3
19		761.5	768.0		6.5	
19		768.0	771.5	Shale, sandy	3.5	

Run #	Recovery	From	To	Description	Th.(ft)	Sample #
20		771.5	779.2	Shale, dark gray	7.7	
		779.2	781.5	Shale, gray, sandy	2.3	
21		781.5	786.5	Shale, gray, sandy	5.0	
		786.5	787.9	Shale, gray, soft	1.4	
		787.9	791.5	Shale, gray, sandy	3.6	
22		791.5	794.5	Shale, gray, sandy	3.0	
		794.5	801.7	Ss., gray	7.2	
23		801.7	811.7	Ss., gray	10.0	
24		811.7	821.7	Ss., gray	10.0	Roof #2
25		821.7	825.7	Ss., gray	4.0	816.0 -
		825.7	826.0	Shale, carb	0.3	826.0
		826.0	831.7	COAL	5.7	Sample#2
26		831.7	832.7	COAL	1.0	Sample#3
		832.7	834.7	Shale, gray	2.0	Floor #3
		834.7	841.7	Shale, gray, sandy	7.0	832.7 -
27		841.7	851.9	Ss., w/some shale bands	10.2	842.7
28		851.9	862.1	Ss., as above	10.2	
29		862.1	872.3	Ss., as above	10.2	
30		872.3	882.4	Ss.	10.1	
31		882.4	892.5	Ss.	10.1	
32		892.5	902.6	Ss.	10.1	
33		902.6	912.8	Ss.	10.2	
34		912.8	923.0	Ss.	10.2	
35		923.0	933.0	Ss.	10.0	
36		933.0	943.0	Ss.	10.0	
37		943.0	953.0	Ss.	10.0	Roof #4
						944.2 -
						954.2
38		953.0	953.7	Ss.	0.7	
		953.7	954.2	Shale, carb	0.5	
		954.2	960.3	COAL	6.1	Sample#4
		960.3	960.7	Shale, carb	0.4	Floor #4
		960.7	962.7	Ss.	2.0	960.3 -
39		962.7	963.6	Ss.	0.9	970.3
		963.6	964.4	Shale	0.8	
		964.4	967.9	Shale, carb	3.5	
		967.9	972.2	Ss.	4.3	
		972.2	972.7	Shale, carb	0.5	
40		972.7	982.7	Ss.	10.0	
41		982.7	984.7	Shale	2.0	
		984.7	992.7	Ss.	8.0	
42		992.7	1002.7	Ss.	10.0	
		1003.0		TOTAL DEPTH		

Note: Got overflowing water at 990'.

Note: Hole cemented with 60 bags of cement, pumped in.

Section # 19



CONSOLIDATION COAL COMPANY

Project: Emery, Utah
Hole No.: FC-59, Detail
Vertical

Location: 1780 FSL, 1540 FEL,
Section 19-22S-6E,
Emery Co., Utah

Drilling Contractor: Consolidation Coal Co.

Address: Denver, Colorado

Elevation: 6078.25

Drillers: L. Gilland & D. Dale

Date: 2 July 1969

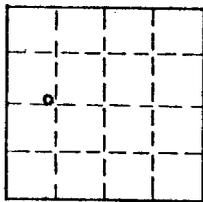
Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

Geologist: F. Williams

Fluid: Water

Interval	Core	Description	Th. (ft)	Sample #
742.3 - 752.3	10.00	Shale, drk.gry, silty to sndy, occas. ss. nod.	10.00	Roof #1
752.3 - 756.3	3.95	<u>COAL</u> Clay sh. <u>COAL</u>	2.42 0.38 1.15	Sample #1 " " " "
756.3 - 766.3	9.78	<u>COAL</u> , bony Sh, drk gry, clayey Ss., lt gry, w/num. sh.ptgs & strks Sh., drk gry, sndy, grades into Ss., drk gry, med.grnd, shaly, mottled Ss., lt. to med.gry mottled, med to crs <u>COAL</u> Ss., lt gry, fn grnd, w/coal frags	0.15 0.30 1.55 0.50 1.45 5.50 0.03 0.30	Floor #1 " " " " " " " " " " " " " "
816.0 - 826.0	10.48	Ss., lt gry, med. grnd. Ss., as abv. w/num. irreg. coal inclusions, clay & sh.pebbles near base Sh. blk, some coal strks	7.40 2.80 0.28	Roof #2 " " " "
826.0 - 831.7	5.80	<u>COAL</u>	5.80	Sample #2
831.7 - 832.7	1.00	<u>COAL</u>	1.00	Sample #3
832.7 - 842.7	9.70	Clay sh. drk gry, slknsided, grades into Ss., lt & med gry mottled, sh ptgs. Sh. drk gry Ss. as next abv. grades into	1.62 1.63 0.15 2.10	Floor #2 " " " " " "

Interval	Core	Description	Th. (ft)	Sample #
		Sh., blk.	3.25	Floor #2 (Cont'd)
		Siderite bnd	0.05	" "
		Ss., lt gry, med. grnd	0.90	" "
944.2 - 954.2	10.03	Ss., lt gr, med to crs	9.25	Roof #4
		Sh. blk, v. carb.	0.33	" "
		COAL	0.15	" "
		Clay, lt gry, bentonitic	0.05	" "
		Clay, lt gry, coal strks, brkn, bentonitic	0.25	" "
954.2 - 960.3	6.05	COAL	5.92	Sample #4
		Bone	0.13	" "
960.3 - 970.3	10.06	Sh. blk, carb. w/coal strks	0.38	Floor #4
		Sh. gry, slksdd at top, grades into	0.20	" "
		Ss., lt gry, w/num. drk wavy sh. ptgs, grades into	2.45	" "
		Sh. med to drk gry, clayey	1.12	" "
		Sh. blk. occas. coaly ptg.	1.97	" "
		COAL	0.04	" "
		Sh. blk	0.05	" "
		COAL	0.06	" "
		Sh. blk	0.02	" "
		COAL	0.07	" "
		Sh. blk	1.20	" "
		Ss., lt to drk gry, shaly	0.83	" "
		Ss. lt gry, med grnd. occas. small coal frag.	1.67	" "



CONSOLIDATION COAL COMPANY

Section # 20

Project: Emery, Utah
Hole No.: FC-61,
Vertical

Location: 2660 FSL, 1068FWL
Sec. 20-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal
Company
Address: Denver, Colorado

Elevation: 6216.51

Driller: D. Dale & L. Gilland

Date: July 16-23, 1969

Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

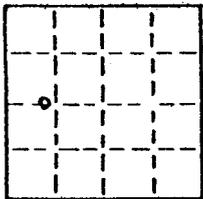
Geologist: Driller's Log

Fluid: Water

Run #	Recovery	From	To	Description	Th. (ft)	Sample #
		0.0	12.0	Sand & small gravels	12.0	
		12.0	32.0	Shale, gray, soft	20.0	
		32.0	195.0	Shale, dark gray	163.0	
		195.0	396.0	Shale, dark	201.0	
		396.0	585.0	Shale, dark gray	189.0	
		585.0	600.0	Shale, dark	15.0	
<u>STARTED CORING AT 600.0</u>						
1		600.0	608.0	Shale, dark	8.0	
2		608.0	618.0	" "	10.0	
3		618.0	628.0	" "	10.0	
4		628.0	638.0	" "	9.9	<u>lost 0.1</u>
5		638.0	648.0	" "	10.1	<u>gain 0.1</u>
6		648.0	658.0	" "	10.0	
7		658.0	668.0	" "	10.0	
8		668.0	678.0	" "	10.0	
9		678.0	688.0	Shale, dark gray	8.3	<u>lost 1.7</u>
10		688.0	696.5	" " "	6.4	<u>lost 2.1</u>
11		696.5	703.2	" " "	10.2	<u>gain 3.5</u>
12		703.2	713.4	Shale, dark, hard to drill	10.0	<u>lost 0.2</u>
13		713.4	723.4	Shale, dark	10.0	
14		723.4	733.4	Shale, dark	10.0	
15		733.4	738.4	Shale, dark	5.0	
17		738.4	748.4	Shale, dark gray	9.8	<u>lost 0.2</u>
18		748.4	758.4	Shale, dark gray	9.6	<u>lost 0.4</u>
19		758.4	768.4	Shale, dark gray	10.2	<u>gain 0.2</u>
20		768.4	778.4	Shale, dark gray	10.2	<u>gain 0.2</u>
21		778.4	788.4	Shale, dark	10.0	
22		788.4	798.4	Shale, dark	9.9	<u>lost 0.1</u>
23		798.4	808.4	Shale, dark	10.1	<u>gain 0.1</u>
24		808.4	813.9	Shale, dark	5.5	
		813.9	818.4	Sandstone	4.5	
25		818.4	828.4	Sandstone, shaly	10.0	

Run #	Recovery	From	To	Description	Th.(ft)	Sample #
26		828.4	838.4	Sandstone, shaly	10.0	
27		838.4	848.4	Sandstone	10.0	
28		848.4	858.4	Sandstone	10.0	
29		858.4	868.4	Sandstone	10.0	
30		868.4	873.1	Sandstone	4.7	
		873.1	878.4	Shale, dark	5.3	
31		878.4	883.9	Shale, dark	5.5	
		883.9	888.4	Sandstone	4.5	
32		888.4	898.4	Sandstone	10.0	
32		898.4	905.6	Sandstone, gray	7.2	Roof#1,
		905.6	905.9	Shale, carb	0.3	899.0 -
		905.9	908.4	Sandstone	2.5	909.0
33		908.4	909.0	Shale, gray	0.6	
		909.0	912.6	<u>COAL</u>	3.6	Sample#1
		912.6	913.1	Shale, carb	0.5	909.0 -
		913.1	917.3	<u>COAL</u>	4.2	917.3
		917.3	918.4	Shale	1.1	Floor #1,
34		918.4	928.4	Sandstone	10.0	917.3 -
		928.4		TOTAL DEPTH		927.3

Cemented with 50 bags of cement.



CONSOLIDATION COAL COMPANY

Section # 20

Project: Emery, Utah
Hole No.: FC-61, Detail Log
Vertical

Location: 2660 FSL, 1068 FWL
Sec. 20-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal
Company
Address: Denver, Colorado

Elevation: 6216.51

Driller: D. Dale & L. Gilland

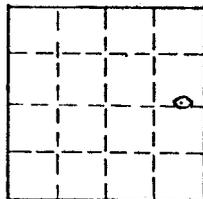
Date: July 29, 1969

Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

Geologist: F. Williams

Fluid: Water

Interval	Core	Description	Th. (ft)	Sample #
899.0 - 909.0	9.90	Ss., lt. gry., med. grnd. grades into	2.00	Roof #1
		Ss., lt. gry., crs. grnd. w/sh. & ss. pebbles & frags. occas. coal frags.	1.45	" "
		Ss., lt. gry. w/num. drk. gry. sh. ptgs. & frags	2.90	" "
		Ss., lt. gry. fr. grnd. & sh. drk. gry., irreg. intrmxd.	1.10	" "
		Ss., lt. to med. gry. irreg. mxd., thn. sh. ptgs.	1.90	" "
		Sts. med. gry., mxd. w/lt. gry ss. & drk. gry. sh.	0.55	" "
		<hr/>		
909.0 - 917.3	8.48	<u>COAL</u> , occas. bony strk., core brkn.	0.50	Sample #1
		<u>COAL</u>	1.80	" "
		Bone	0.03	" "
		<u>COAL</u>	1.30	" "
		Shale, blk. coaly & bony	0.55	" "
		<u>COAL</u>	3.23	" "
		Bone	0.07	" "
<u>COAL</u> , occas. thin, bony bnd.	1.00	" "		
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917.3 - 927.3	10.20	Shale, drk. gry., v. slty. w/coal frags.	1.50	Floor #1
		Ss., lt. gry., w/numerous drk. gry. sh. ptgs. & bnds. up to 0.3' thk.	5.45	" "
		Ss., lt. gry., fn. to med. grnd. w/num. thin sh. ptgs.	3.25	" "



Section #20

Hole No. FC-62

CONSOLIDATION COAL COMPANY

Project: Emery, Utah
Hole No.: FC-62, Vertical

Location: 2590'SNL, 4477'EWL,
Sec. 20-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal
Company
Address: Denver, Colorado

Elevation: 6185.52'

Driller: L. Gilland & D. Dale

Date: July 25-31, 1969

Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

Geologist: Driller's Log

Fluid: Water

Run #	Recovery	From	To	Description	Th. (ft)	Sample #
		0.0	8.0	Sand, gravel and boulders	8.0	
		8.0	30.0	Shale, gray	22.0	
		30.0	245.0	Shale, dark	215.0	
		245.0	405.0	Shale, dark gray	160.0	
		405.0	540.0	Shale, dark	135.0	
		540.0	580.0	Shale, hard, dark gray	40.0	
	STARTED CORING AT		580.0			
1		580.0	583.0	Shale, hard, dark gray	3.0	
2		583.0	588.0	Shale, hard, dark gray	5.0	
3		588.0	598.0	Shale, hard, dark gray	9.8	lost 0.2
4		598.0	608.0	Shale, hard, dark gray	10.2	gain 0.2
5		608.0	618.0	Shale, hard, dark gray	10.0	
6		618.0	628.0	Shale, hard, dark gray	10.0	
7		628.0	638.0	Shale, dark	10.0	
8		638.0	648.0	Shale, dark	9.9	lost 0.1
9		648.0	658.0	Shale, dark	10.1	gain 0.1
10		658.0	660.5	Shale, dark	2.5	
		660.5	664.5	Sandstone, shaly	4.0	
		664.5	668.0	Sandstone	3.5	
11		668.0	668.5	Sandstone	0.5	
		668.5	669.0	Shale, carb	0.5	
		669.0	677.0	Sandstone, shaly	8.0	
		677.0	678.0	Sandstone	1.0	
12		678.0	688.0	Sandstone	10.0	
13		688.0	698.0	Sandstone	10.0	
14		698.0	708.0	Sandstone	10.0	
15		708.0	718.0	Sandstone	10.0	
16		718.0	728.0	Sandstone	10.0	
17		728.0	738.0	Sandstone	10.0	
18		738.0	748.0	Sandstone	10.0	
19		748.0	753.2	Sandstone	5.2	
						Roof #1,
						Roof #1,
						743.2 -
						753.2

Run #	Recovery	From	To	Description	Th.(ft)	Sample #
		753.2	758.0	<u>COAL</u>	4.8	Sample#1, 753.2 - 758.0
20		758.0	762.5	<u>COAL</u>	4.5	Sample#2, 758.0 - 762.5
21		762.5	762.9	Shale	0.4	Floor #2, 762.5 -
		762.9	764.4	Sandstone	1.5	769.5
		764.4	767.4	Shale, sandy	3.0	
		767.4	768.0	Sandstone	0.6	
22		768.0	769.5	Sandstone	1.5	
		769.5	771.3	<u>COAL</u>	1.8	Sample#3, 769.5 - 771.3
		771.3	775.0	Shale	3.7	Floor #3, 771.3 - 772.5
23		775.0	778.0	Shale	3.0	Roof #4, 771.3 - 778.5
24		778.0	778.5	Shale	0.5	Sample#4 778.5 -
		778.5	784.5	<u>COAL</u>	6.0	784.5
		784.5	788.0	Shale	3.5	Floor#4, 784.5 - 794.5
25		788.0	796.9	Shale, sandy	8.9	
		796.9	798.0	Sandstone	1.1	
26		798.0	808.0	Sandstone	10.0	
27		808.0	818.0	Sandstone	10.0	
28		818.0	822.5	Sandstone	4.5	Roof #5, 821.9 -
		822.5	825.7	Shale, dark	3.2	821.9 -
		825.7	828.0	Shale, carb	2.3	831.9
29		828.0	831.9	Shale, dark	3.9	
		831.9	832.2	<u>COAL</u>	0.3	Sample#5, 831.9 -
		832.2	832.4	Shale, gray	0.2	831.9 -
		832.4	833.0	<u>COAL</u>	0.6	837.6
		833.0	833.5	Bone	0.5	
		833.5	837.6	<u>COAL</u>	4.1	
		837.6	838.2	Shale, dark gray	0.6	Floor #5, 837.6 -
30		838.2	841.2	Shale, sandy	3.0	837.6 -
		841.2	843.0	Shale, carb	1.8	847.6
		843.0	848.0	Sandstone	5.0	
		848.0		TOTAL DEPTH		

Cemented with 38 bags of cement.

CONSOLIDATION COAL COMPANY

Hole No. FC-62
Detail Log

Project: Emery, Utah

Hole: FC-62, Detail Log
Vertical

Section #20

Location: 2590'SNL, 4477'EWL,
Sec. 20-22S-6E
Emery Co., Utah

Drilling Contractor: Consolidation Coal Company

Elevation: 6185.52

Address: Denver, Colorado

Date: August 7, 1969

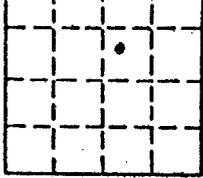
Driller: L. Gilland & D. Dale

Geologist: J. M. Vonfeld, Coal
F. Williams, Roof &
Floor

Type of Drill: Winter-Weiss Portadrill
NQ Wireline Core Barrel

<u>Interval</u>	<u>Core</u>	<u>Description</u>	<u>Th.(ft)</u>	<u>Sample #</u>
743.2 - 753.2	9.87	Ss., lt. gry. crs.	0.35	Roof #1
		Ss. as abv. w/shale pebbles	0.97	" "
		Ss., lit. gry. crs. occas. drk	8.55	" "
		Shale & coal frag.		
753.2 - 758.0	4.86	<u>COAL</u>	3.32	Sample#1
		Shale, coal strks.	0.11	" "
		<u>COAL</u>	1.43	" "
758.0 - 762.5	4.40	<u>COAL</u>	4.40	Sample#2
762.3 - 769.5	6.90	Shale, drk. gry. coal ptgs.	0.50	Floor #2
		Ss., lt. gry. fine grain, occas. drk shale ptg.	1.40	" "
		Shale, drk. gry. w/lt. gry. ss. ptgs., sandy in part	2.80	" "
		Ss., lt. & dark gray variegated, silty, w/small frags.	1.20	" "
		Shale, dark gray to black, coal frags.	1.00	" "
769.5 - 771.3	1.80	<u>COAL</u> , core broken	1.80	Sample#3
771.3 - 772.5	1.00	Shale, dark gray w/num. coal frags.	1.00	Floor #3
771.3 - 778.5	6.85	Sts. drk. gray, hard	4.90	Roof #4
		Shale, med. gry, coaly at base	1.95	" "
778.5 - 784.5	6.35 6.00	Shale lenses w/coal <u>COAL</u>	0.10 6.25	Sample#4 "
784.5 - 794.5	9.90	<u>COAL</u>	0.05	Floor #4
		Clay sh. med. gry., slknsdd	1.15	" "
		Clay shale, drk. gray	1.50	" "

<u>Interval</u>	<u>Core</u>	<u>Description</u>	<u>Th.(Ft)</u>	<u>Sample #</u>
		Shale, drk. gry to blk., clayey	0.35	Floor #4
		Shale, blk., num. coal strngrs.	0.60	" "
		Clay shale, med. gry.	6.25	" "
821.9 - 831.9	9.85	Ss., light gry., very fine, slty.	1.40	Roof #5
		Clay shale, gry., slknsdd	3.80	" "
		Shale, black, w/coal	0.37	" "
		<u>COAL</u> , shaly	0.35	" "
		Clay, gry., slty	0.33	" "
		Clay shale, med. gry., slknsdd	3.60	" "
831.9 - 837.6	5.98	<u>COAL</u>	0.34	Sample#5
		Shale, lt. gry	0.18	" "
		<u>COAL</u>	0.80	" "
		Shale, black	0.11	" "
		<u>COAL</u>	4.55	" "
837.6 - 847.6	9.77	Clay, shale gray	1.65	Floor #5
		Clay, gry.	0.72	" "
		Clay, shale gray	1.50	" "
		Shale, blk. num. coal strks to bnds.	2.35	" "
		<u>COAL</u> , w/resin spots, bony		
		Shale, blk., coaly	0.40	" "
		Ss., lt. gry. med. to crs. w/ occas. drk. shale ptgs.	2.60	" "
			0.55	" "



CONSOLIDATION COAL COMPANY

Section # 29

Project: Emery
Hole No.: FC-79

Location: Emery County, Utah
T 22 S, R 6 E

Drilling Contractor: Daniels

Address:

Driller: C. F. Daniels

Elevation: 5,968.30' *X 5722.14*

Date: July 6, 1971

Type of Drill: Damco

Geologist:

Fluid:

Run #	Recovery	From	To	Description	Th. (ft)	Sample #
		0.00	200.00	Plugged from 0.00' - 305.60'		
		200.00	302.60	Plugged	200.00	
		200.00	302.60	Shale w/clay bands	102.60	
		302.60	305.60	Sandstone	3.00	
				Cored from 305.60 - total depth		
1		305.60	313.00	Sandstone	7.40	
		313.00	317.20	Sandstone	4.20	
		317.20	317.50	Shale w/COAL bands	0.30	
		317.50	317.80	Shale, brown	0.30	
		317.80	319.20	Siltstone	1.40	
		319.20	319.45	Shale w/COAL bands	0.25	
		319.45	320.95	COAL	1.50	
		320.95	321.00	Pyrite	0.05	
2		321.00	323.00	COAL	2.00	
		323.00	323.75	COAL	0.75	
		323.75	324.55	Clay	0.80	
3		324.55	333.00	Shale, sandy	8.45	
		333.00	335.00	Shale, sandy	2.00	
4		335.00	343.00	Siltstone	8.00	
5		343.00	353.00	Shale, sandy	10.00	
		353.00	354.20	Siltstone	1.20	
		354.20	354.60	Shale, gray	0.40	
		354.60	356.70	COAL	2.10	
		356.70	357.50	Shale, brown	0.80	
		357.50	359.00	COAL	1.50	
		359.00	363.00	Siltstone	4.00	
6		363.00	364.80	Sandy Shale	1.80	
		364.80	369.00	Shale, black	4.20	
		369.00	370.20	Shale w/COAL streaks	0.80	
		370.20	373.70	Shale, gray	3.50	
7		373.70	375.70	COAL	2.00	
		375.70	376.80	Shale	1.10	

<u>Run #</u>	<u>Recovery</u>	<u>From</u>	<u>To</u>	<u>Description</u>	<u>Th. (ft)</u>	<u>Sample #</u>
8		376.80	396.60	COAL	19.80	
9		396.60	396.90	Shale, black	0.30	
		396.90	397.00	Shale, gray	0.10	
		397.00	403.00	Shale, gray w/clay	6.00	
10		403.00	410.40	Shale	6.40	
		410.40	412.90	Sandstone, gray, shaley.	2.50	
11		412.90	417.00	Shale, gray	4.10	

TOTAL DEPTH 417.00'

N. 198825.75
E2066588.73

sec. 29
Tp. 22S
Rg. 6E

Emery Date: 4-24-74

Pilot: Core:

Utah Shift:

Hole No. FC-279

County: Emery

Rig: Hole Elev. 6152.22

Core Recovery (Thickness)	From	To	Sample Description	Seam	Comments
15.0	0	15.0	Clay, sandy		
30.0	15.0	45.0	Gravel		
560.0	45.0	605.0	Shale, grey		
2.6	605.0	607.6	Shale, hard, sandy		
5.05	607.6	612.65	Sandstone, grey, hard		
.40	612.65	613.05	Coal	K	
1.05	613.05	614.1	Bone	K	Hole Cored
.60	614.1	614.7	Coal	K	From
.30	614.7	615.0	Loss, Prob. Coal	K	605.0 to 630.7
3.25	615.0	618.25	Coal	K	
4.4	618.25	622.65	Shale, carb.	K	
3.55	622.65	626.2	Coal	K	
4.5	626.2	630.7	Shale, carb, grey		
14.3	630.7	645.0	Sandstone, hard		
	645.0	646.15	Sandstone, hard, grey		
	646.15	652.0	Shale, dark grey		
	652.0	654.4	Sandstone, calc.		
.50	654.4	654.9	Coal	I-J	
.10	654.9	655.0	Loss, Prob. coal	I-J	
.60	655.0	655.6	Coal	I-J	
.90	655.6	656.5	Shale, dark grey, carb.	I-J	
3.05	656.5	659.55	Coal	I-J	
1.05	659.55	660.6	Siltstone, clayey	I-J	
.40	660.6	661.0	Bone	I-J	
11.2	661.0	672.2	Coal	I-J	
.10	672.2	672.3	Siltstone, brown	I-J	
1.10	672.3	673.4	Shale, carb., coaly	I-J	Hole Cored
.25	673.4	673.65	Sandstone, grey, hard	I-J	From
.20	673.65	673.85	Bone	I-J	645.0 to 690.0
1.10	673.85	675.00	Sandstone	I-J	
1.3	675.00	676.3	Sandstone, coaly	I-J	
8.4	676.3	684.7	Coal	I-J	

Footage Drilled w/Air _____
 Drilled w/Water _____
 Water Used _____

Total Footage Cored _____
 Total Footage Recovered _____
 Drilling Media _____

From _____ To _____ Hrs. _____
 Co. Rep. on Job Ed Kuhn Title _____

Foreman: _____ Driller Knight
 Helpers: _____

N. 198825.75

E. 2066588.73

sec. 29

Tp. 22S

Fig. 6E

Project: Emery Date: 4-24-74 Pilot: _____ Core: _____

State: Utah Shift: _____ Hole No. FC-279

County: Emery Rig: _____ Hole Elev. 6152.22

Core Recovery (Thickness)	From	To	Sample Description	Seam	Comments
.10	684.7	684.8	Loss, Prob. shale		
5.2	684.8	690.0	Shale, grey		
14.0	690.0	704.0	Shale		
16.0	704.0	720.0	Sandstone		
5.65	720.0	725.65	Shale, coaly, grey		
.10	725.65	725.75	Coal		
3.75	725.75	729.5	Shale, carb., coaly		
.20	729.5	729.7	Loss, Prob., shale		
.40	729.7	730.1	Coal	G	
.25	730.1	730.35	Siltstone	G	
5.75	730.35	736.1	Coal	G	
6.7	736.1	742.8	Shale, soft, grey, carb.		
3.2	742.8	746.0	Sandstone, coaly		
2.0	746.0	748.0	Sandstone and shale		
3.25	748.0	751.25	Shale, sandy, coaly		
.5	751.25	752.1	Coal	C-D	
.80	752.1	752.9	Shale, carb., coaly	C-D	Hole Cored
1.10	752.9	754.0	Coal	C-D	From
.15	754.0	754.15	Shale, carb., coaly	C-D	720.0 to 770.0
2.35	754.15	756.5	Coal	C-D	
.55	756.5	757.05	Shale, carb., coaly	C-D	
.55	757.05	757.6	Siltstone	C-D	
2.0	757.6	759.6	Coal	C-D	
.15	759.6	759.75	Siltstone, coaly	C-D	
2.65	759.75	762.4	Coal	C-D	
.10	762.4	762.5	Siltstone	C-D	
1.7	762.5	764.2	Coal	C-D	
2.85	764.2	767.05	Siltstone		
.55	767.05	767.6	Shale		
.10	767.6	767.7	Sandstone, hard, shaley		
.20	767.7	767.9	Siltstone		
2.10	767.9	770.0	Loss, siltstone and shale		

Footage Drilled w/Air _____	Total Footage Cored _____
Footage Drilled w/Water _____	Total Footage Recovered _____
Drilling Media Used _____	Drilling Media _____

From _____ To _____ Hrs. _____	Foreman: _____ Driller <u>Knight</u>
Co. Rep. on Job <u>Ed Kuhn</u> Title _____	Helpers: _____

N. 196790.28
E. 2066570.48

Sec. 29
Tp. 22S
Rg. 6E

Project: Emery Date: 4-27-74 Pilot: _____ Core: _____
 State: Utah Shift: _____ Hole No. FC-280 CR
 County: Emery Rig: _____ Hole Elev. 6014.36

Core Recovery (Thickness)	From	To	Sample Description	Comments
251.0	0	251.0	Shale, drk grey	
110.0	251.0	361.0	Shale, sandy, drk grey,	
14.45	361.0	375.45	Sandstone, clac, Lt grey	calc
3.25	375.45	378.7	Coal	Hole Cored From
2.15	378.7	380.85	Shale, carb, coaly	K 251.0 to 569.5
.15	380.85	381.0	Shale, drk grey	
3.65	381.0	384.65	Siltstone, med grey, calc	
.70	384.65	385.35	Sandstone, hard	
2.85	385.35	388.2	Siltstone, sandy, drk grey	
.60	388.2	388.8	Siltstone, shaley, carb, clac	
3.0	388.8	391.8	Coal	
1.2	391.8	393.0	Shale, carb, coaly	K
2.0	393.0	395.0	Shale, drk grey	
.85	395.0	395.85	Siltstone, grey, sandy	
.10	395.85	395.95	Sandstone, hard	
.05	395.95	397.0	Sandstone & siltstone	
3.0	397.0	400.0	Sandstone & siltstone	
.70	400.0	400.7	Siltstone, sandy, drk grey	
.30	400.7	401.0	Loss, Prob. siltstone	
30.45	401.0	431.45	Sandstone, Lt grey, hard	
1.85	432.45	433.3	Sandstone, calc, hard	
1.05	433.3	434.35	Coal	
1.75	434.35	436.1	Shale, coaly, carb.	IJ
2.25	436.1	438.35	Coal	IJ
.65	438.35	439.0	Shale, coaly, carb	IJ
.25	439.0	439.25	Siltstone, Lt brown, soft	IJ
20.6	439.25	459.85	Coal	IJ
1.15	459.85	461.0	Clay, grey, soft	
2.1	461.0	463.1	Shale, drk grey, soft	
4.8	463.1	467.9	Shale, med grey, sandy	
33.1	467.9	501.0	Sandstone, Lt grey, hard	
.20	501.0	501.2	Sanstone, shaley, med grey	

Footage Drilled w/Air _____	Total Footage Cored _____
Footage Drilled w/Water _____	Total Footage Recovered _____
Amount Water Used _____	Drilling Media _____
From _____ To _____ Hrs. _____	Foreman: _____ Driller <u>Krug</u>
Co. Rep. on Job <u>Ed Kuhn</u> Title _____	Helpers: _____

Coordinates

N. 196790.28

E. 2066570.48

sec. 29

Tp. 22S

Rg. 6E

Emery

Date: 4-27-74

Pilot:

Core:

Utah

Shift:

Hole No. FC-280 CR

County: Emery

Rig:

Hole Elev. 6014.36

Core Recovery (Thickness)	From	To	Sample Description	Seam	Comments
3.80	501.2	505.0	Sandstone, calc, Lt grey		
.90	505.0	505.9	Shale, carb, coaly		
.75	505.9	506.65	Loss, Prob. shale		
2.95	506.65	509.6	Shale, grey, soft		
.35	509.6	509.95	Coal		G
.15	509.95	510.10	Siltstone, brown		G
5.0	510.10	515.1	Coal		G
.15	515.1	515.25	Shale, carb, coaly		
3.75	515.25	519.0	Shale, drk grey		
1.0	519.0	520.0	Shale, grey, sandy, calc.		
10.0	520.0	530.0	Sandstone, calc, Lt grey, hard		
20.0	530.0	550.0	Sandstone, Lt grey, hard		
2.65	550.0	552.65	Sandstone, Lt grey, calc, hard		
1.2	552.65	553.85	Bone		C-D
	553.85	554.0	Shale, carb, hard		C-D
	554.0	554.4	Shale, carb, hard, boney		C-D
.0	554.4	555.6	Coal		C-D
.30	555.6	555.9	Shale, carb, boney		C-D
.10	555.9	556.0	Bone		C-D
2.0	556.0	558.0	Coal		C-D
.60	558.0	558.6	Shale, carb, boney		C-D
.80	558.6	559.4	Clay, sandy, soft		C-D
5.2	559.4	564.6	Coal		C-D
.70	564.6	565.3	Shale, sandy, Clayey		C-D
.70	565.3	566.0	Coal		C-D
.20	566.0	566.2	Sandstone, carb, hard		
2.20	566.2	568.4	Shale, Lt grey, sandy, hard,		
1.10	568.4	569.5	Shale, drk grey		

Footage Drilled w/Air

Drilled w/Water

Water Used

Total Footage Cored

Total Footage Recovered

Drilling Media

From _____ To _____ Hrs. _____

Co. Rep. on Job Ed Kuhn Title _____Foreman: _____ Driller Krug

Helpers: _____

WARDLAW CONTRACT DRILLING

State Coordinates

N. 197496.98
E. 2066392.08

	X		

sec. 29
Tp. 22S
Rg. 6E

Project: EMERY Date: 1-8-76-1-10-76 Pilot: _____ Core: _____
 State: UTAH Shift: _____ Hole No. FC-378
 County: EMERY Rig: _____ Hole Elev. 6049.66

Core Recovery (Thickness)	From	To	Sample Description	Comments
435	0.0	453.0	Shale, Dark Gray	
9.8	453.0	462.8	Sandstone, Medium Grain,	Hard, Gray
0.4	462.8	463.2	Coal, Pyrite Streaks, Dull	
0.25	463.2	463.45	Bone, Pyrite Streaks	K
2.70	463.45	466.15	Siltstone, Gray, Fractured	K
3.05	466.15	469.20	Sandstone, Fine Grained,	Hard, Light Gray
0.08	469.20	470.0	Lost	
2.05	470.0	472.05	Siltstone, Pyrite, Medium	Hard
0.45	472.05	472.50	Bone	
0.90	472.50	473.40	Coal, Calcite Fracture	K
0.02	473.40	473.60	Bone	K
1.20	473.60	474.80	Shale, Carbonaceous,	Fractured, Black
0.55	474.80	475.35	Siltstone, Medium Hard,	Carbonaceous, Dark Gray
4.65	475.35	480.0	Sandstone, Fine Grain, Hard,	Shaley
1.20	480.0	481.20	Siltstone, Hard, Sandy, Dark	Gray
3.05	481.20	484.25	Sandstone, Fine Grain,	Fractured, Light Gray
1.90	484.25	486.15	Siltstone, Hard, Gray	
3.75	486.15	490.90	Sandstone, Fine Grain,	Fractured, Light Gray
0.10	489.90	490.0	Lost	
1.15	490.0	491.15	Sandstone, Fine Grain, Hard,	Fractured, Light Gray
0.20	491.15	491.35	Siltstone, Black	
9.45	491.35	500.80	Sandstone, Medium Grain,	Hard, Fractured, Light Gray
0.20	500.80	501.00	Shale, Carbonaceous, Black	
1.85	501.0	502.85	Siltstone, Hard, Carbonaceous,	Dark Gray
3.95	502.85	506.80	Shale, Fissile, Sandy, Dark	Gray
0.50	506.80	507.30	Siltstone, Hard, Sandy, Dark	Gray
1.05	507.30	508.35	Coal, Pyrite Streaks, Boney,	Dull
0.35	508.35	508.70	Bone	IJ
0.45	508.70	509.15	Shale, Carbonaceous, Dark	Gray
2.35	509.15	511.50	Coal, Pyrite Streaks, Calcite	IJ
0.50	511.50	512.00	Bone	IJ

Footage Drilled w/Air _____	Total Footage Cored _____
Footage Drilled w/Water _____	Total Footage Recovered _____
Amount Water Used _____	Drilling Media _____

From _____ To _____ Hrs. _____ Foreman: _____ Driller: Jim Gordon
 Co. Rep. on Job Raymond McCormick Title Project Engineer Helpers: _____

DRILLER'S LOG

State Coordinates

WARDLAW CONTRACT DRILLING

N 197532.96
E 2065383.10

	X	

sec. 29
Tp. 22S
Rg. 6E

Project: EMERY Date: 11/12/75-12/16/75 Pilot: _____ Core: _____
 State: UTAH Shift: _____ Hole No. FC 382
 County: EMERY Rig: _____ Hole Elev. 6065.58

Core Recovery (Thickness)	From	To	Sample Description	Comments
20.0	0	20.0	Shale, Sandy, Gray	
80.0	20.0	100.0	Shale, Gray	
9.80	100.0	109.8	Shale, Medium Hard, Silty,	Fissile, Dark Gray
0.02	109.8	110.0	Lost	
90.0	110.0	200.0	Shale, Gray	
9.30	200.0	209.3	Shale, Hard, Silty, Dark Gray	
0.70	209.3	210.0	Lost	
90.0	210.0	300.0	Shale, Dark Gray	
9.30	300.0	309.3	Siltstone, Hard, Dark Gray	
0.70	309.3	310.0	Lost	
90.0	310.0	400.0	Shale, Dark Gray	
5.50	400.0	405.5	Shale, Medium Hard, Dark Gray	
4.50	405.5	410.0	Lost	
84.90	410.0	494.9	Shale, Dark Gray	
6.10	494.9	501.00	Sandstone, Gray	
32.78	501.0	533.78	Sandstone, Fine T. Medium Grain, Hard, Light Gray	
0.30	533.78	534.08	Coal, Fractured, Shaley	K
2.07	534.08	536.15	Shale Carbonaceous, Coaly, Medium Hard	K
0.66	536.15	536.81	Bone	K
2.10	536.81	538.91	Coal, Pyrite Streaks,	K
0.88	538.91	539.79	Shale, Carbonaceous, Dark, Gray, Hard	K
0.90	539.79	540.69	Bone	K
2.01	540.69	542.70	Coal, Pyrite Streaks, Calcite Fracture Filling	K
0.33	542.70	543.03	Shale, Carbonaceous	
0.40	543.03	543.43	Sandstone, Fine Grain, Carbonaceous in Part, Light Gray	
0.27	543.43	543.70	Shale, Carbonaceous	
0.38	543.70	544.08	Shale, Carbonaceous, Dark Gray	
2.17	544.08	546.25	Shale, Medium Hard, Gray	
0.89	546.25	547.14	Shale, Medium Hard, Dark Gray	
3.03	547.14	550.17	Sandstone, Fine Grain, Shaley, Light Gray	
0.83	550.17	551.0	Shale, Medium Hard, Sandy, Dark Gray	
0.90	551.0	551.9	Siltstone, Hard, Dark Gray	

Footage Drilled w/Air _____	Total Footage Cored _____
Footage Drilled w/Water _____	Total Footage Recovered _____
Amount Water Used _____	Drilling Media _____

From _____ To _____ Hrs. _____
 Co. Rep. on Job Raymond McCormick Title Project Eng.
 Foreman: _____ Driller Jim Gordon
 Helpers: _____

WARDLAW CONTRACT DRILLING

Coordinates

N. 197532.96
E. 2065383.10

		X	

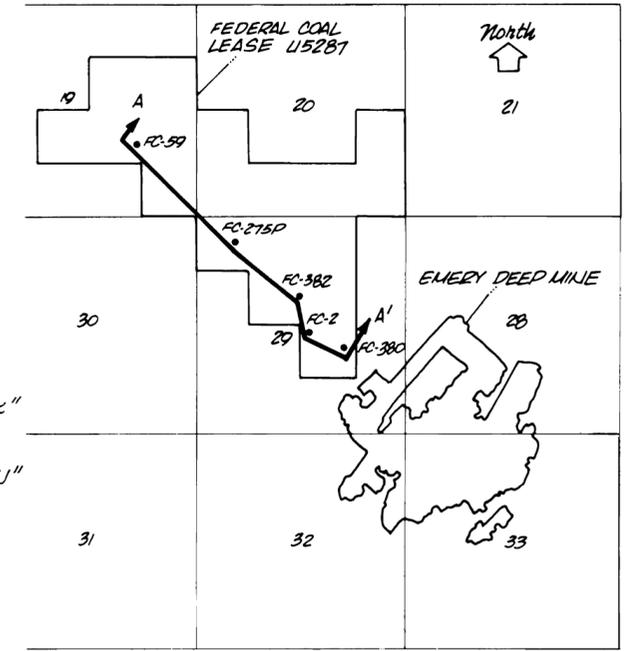
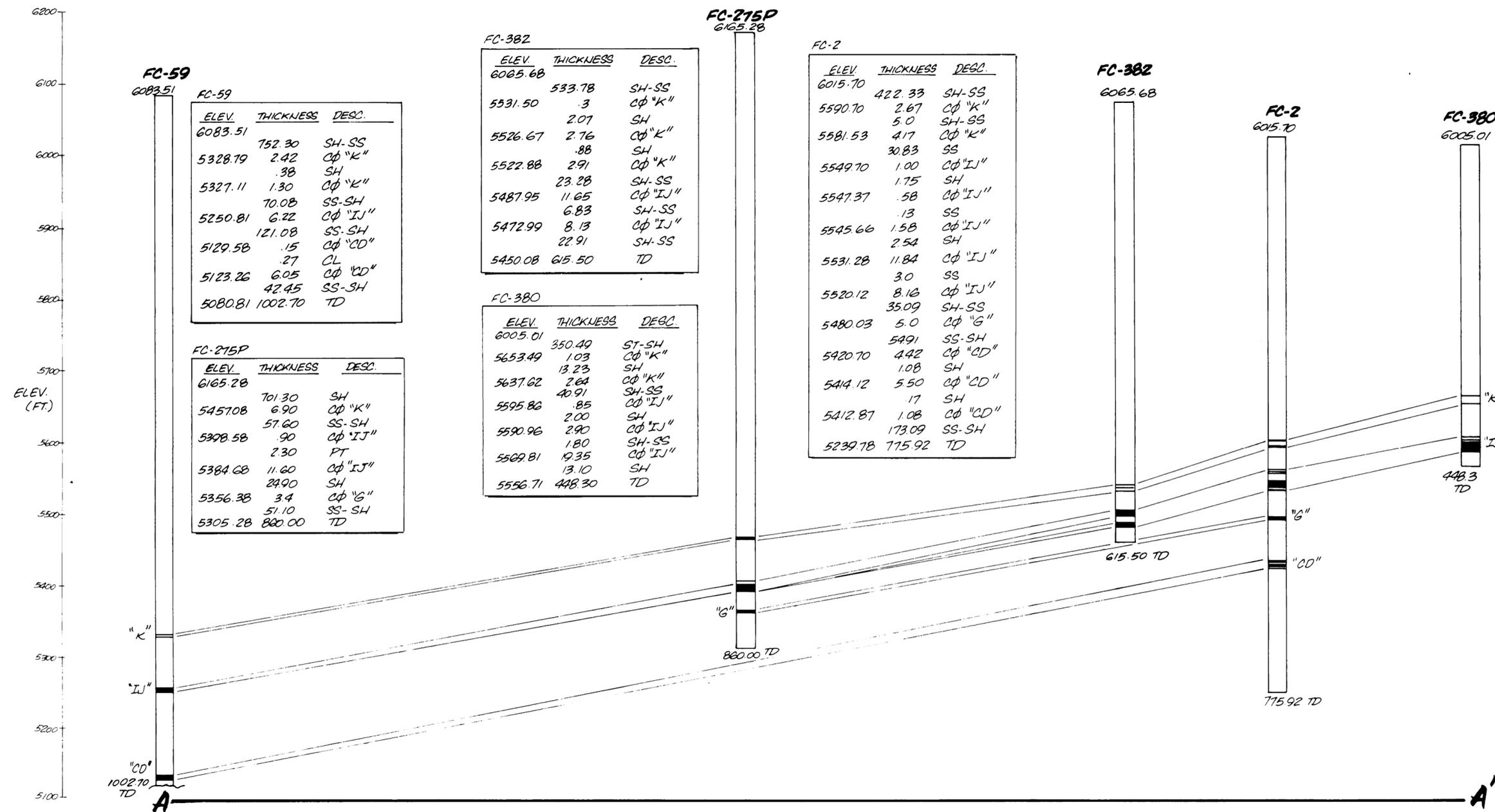
sec. 29
T.D. 22S
Rg. 6E

Project: EMERY Date: 11/22/75-12/16/75 Pilot: _____ Core: _____
 State: UTAH Shift: _____ Hole No. FC 382
 County: EMERY Rig: _____ Hole Elev. 6065.58

Core Recovery (Thickness)	From	To	Sample Description	Comments
1.89	557.9	553.79	Sandstone, Fine Grain, Fractured	Carbonaceous, Light Gray
3.99	553.79	557.78	Shale, Fissile, Medium Hard,	Dark Gray
0.35	557.78	558.13	Siltstone, carbonaceous,	Dark Gray
1.67	558.13	559.80	Shale, Carbonaceous, Medium	Hard
0.68	559.80	560.48	Bone	
2.32	560.48	560.48	Shale, Medium Hard, Gray to	Carbonaceous
1.85	562.80	564.65	Bone	
0.40	564.65	565.05	Shale, Medium Hard, Carbonaceous	
0.78	565.05	565.83	Sandstone, Medium Grain, Light	Gray
0.15	565.83	565.98	Shale, Medium Hard Carbonaceous	
5.18	565.98	571.16	Coal, Medium Hard, Calcite	Fracture Filling IJ
0.50	571.16	571.66	Bone Carbonaceous	IJ
0.50	571.66	572.16	Coal, Medium Hard Fractured	IJ
0.32	572.16	572.48	Bone	IJ
5.15	572.48	577.63	Coal, Medium Hard, Fractured	IJ
0.18	577.63	577.81	Shale, Medium Hard, Carbonaceous	
1.12	577.81	587.93	Siltstone, Hard, Gray	
4.99	587.93	583.92	Sandstone, Fine Grain, Light	Gray to Carbonaceous
0.54	583.92	584.46	Shale, Hard, Black	
8.01	584.46	592.47	Coal, Hard, Calcite Fracture	Filling IJ
0.12	592.47	592.59	Bone	
3.46	592.59	596.05	Shale, Medium Hard, Gray	
9.45	596.05	605.50	Siltstone, Sandy, Light Gray	to Carbonaceous
6.44	605.50	611.94	Shale, Medium Hard, Fractured,	Dark Gray
0.70	611.94	612.64	Sandstone, Fine Grain, Hard,	Light Gray
0.95	612.64	613.59	Siltstone, Medium Hard, Light	Gray
1.91	613.59	615.50	Shale, Medium Hard, Gray	

Footage Drilled w/Air _____	Total Footage Cored _____
Footage Drilled w/Water _____	Total Footage Recovered _____
Amount Water Used _____	Drilling Media _____
From _____ To _____ Hrs. _____	Foreman: _____ Driller: _____
Co. Rep. on Job _____ Title _____	Helpers: _____

White / Denver Blue / Billings Yellow / McMurray



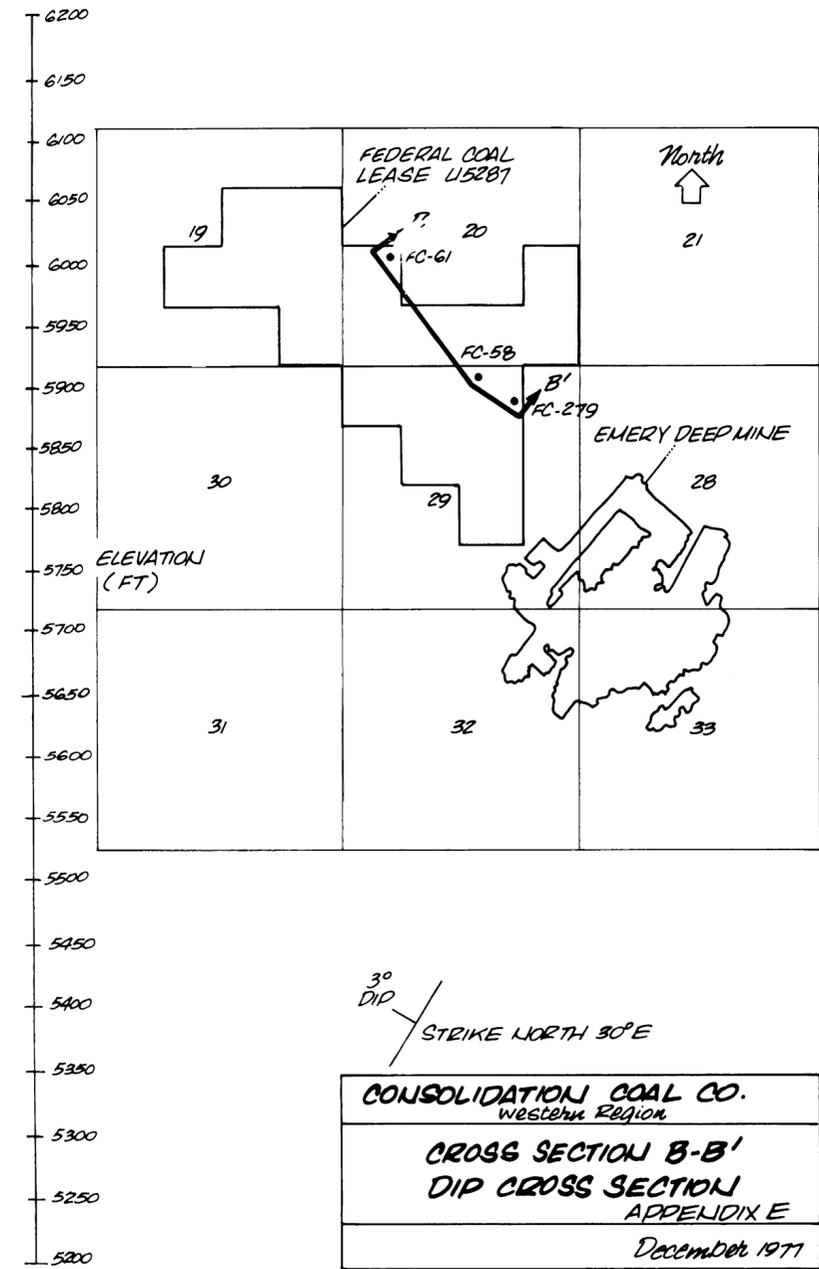
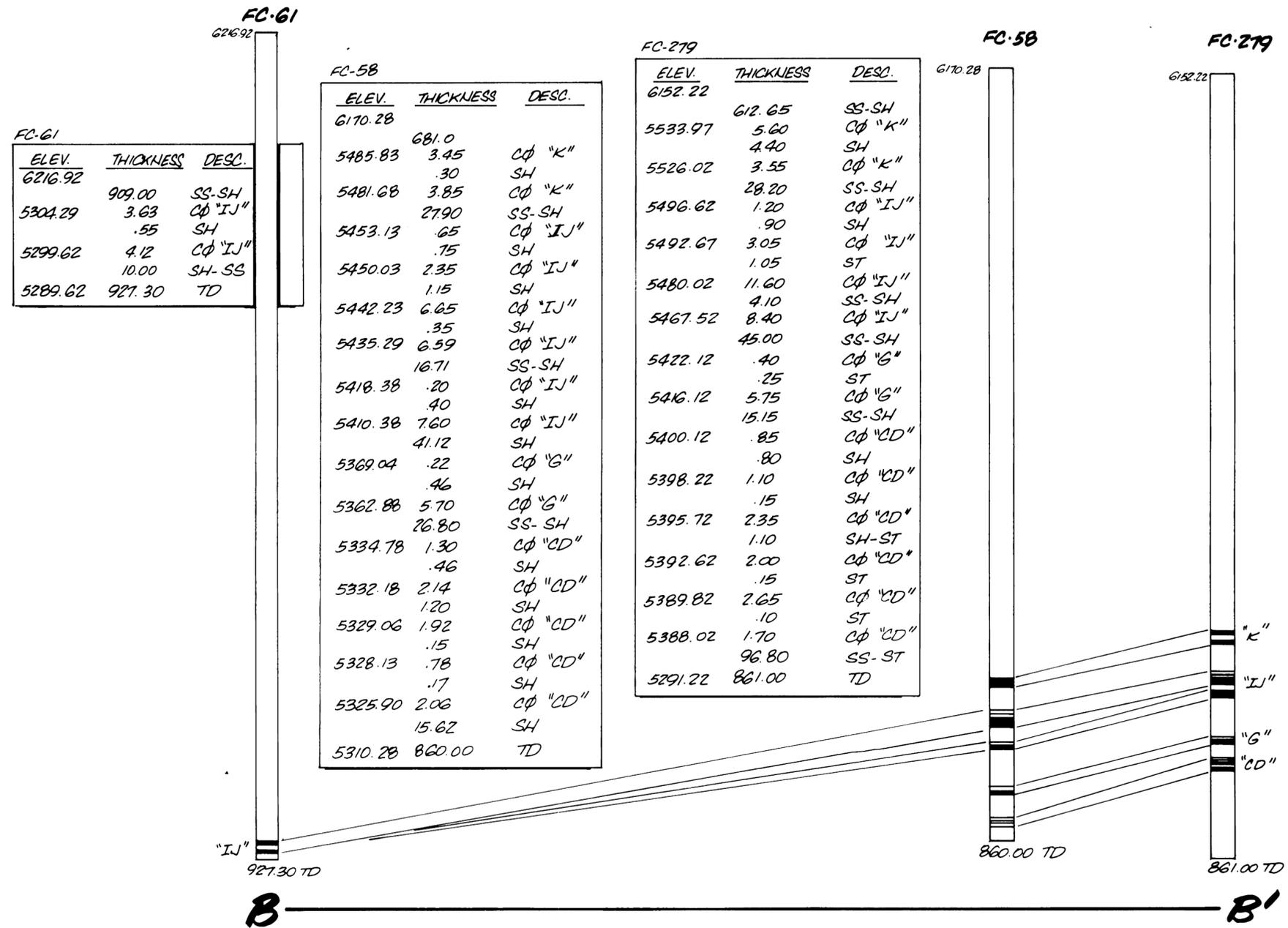
30°
DIP

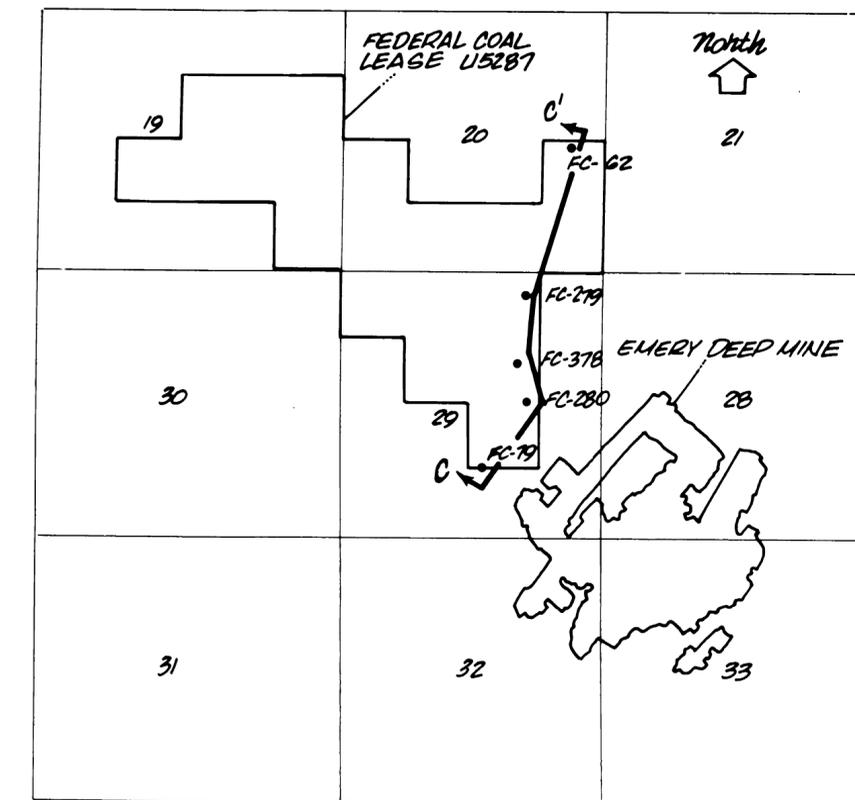
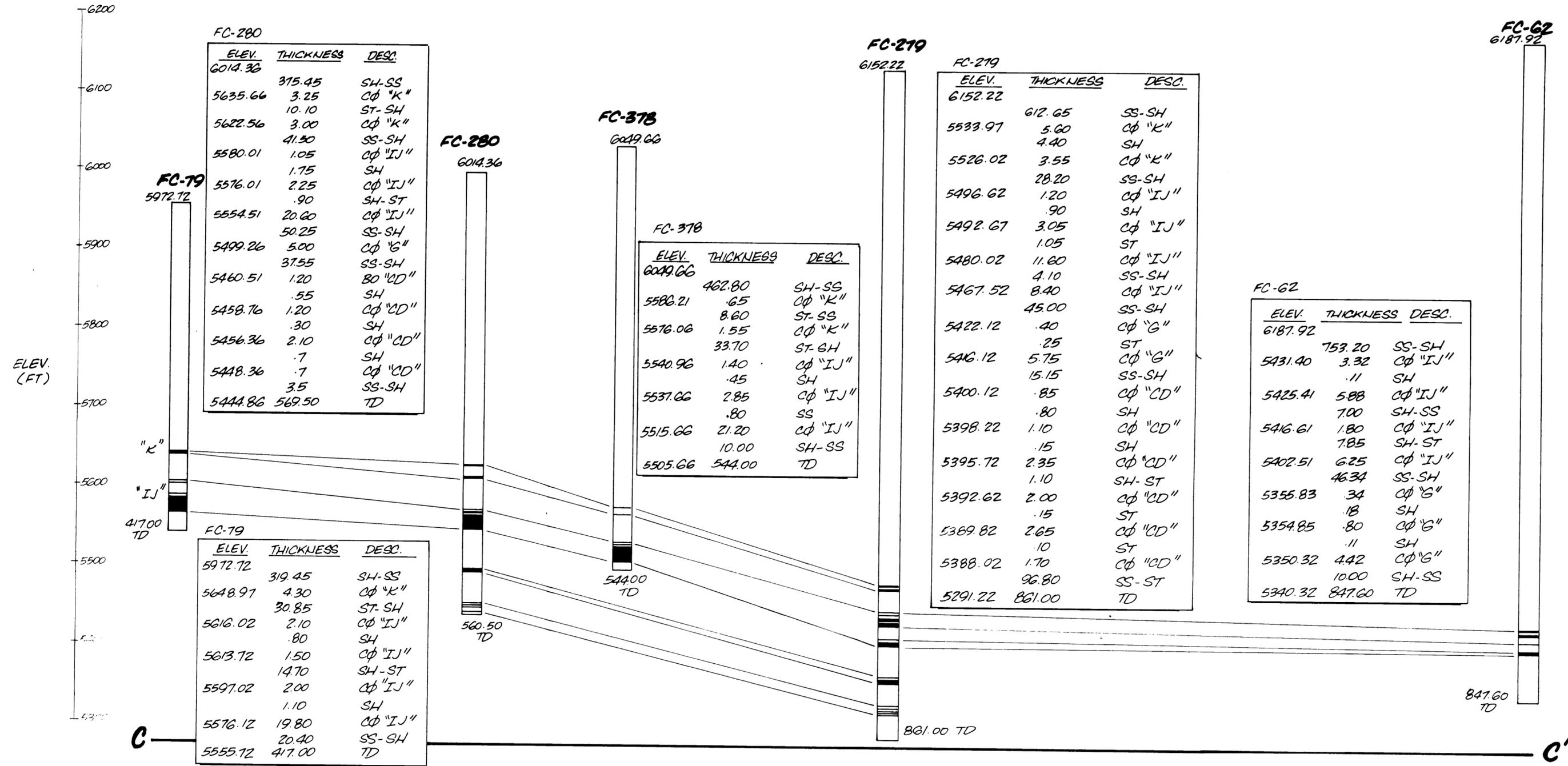
STRIKE NORTH 30°E

CONSOLIDATION COAL CO.
Western Region

CROSS SECTION A-A'
DIP CROSS SECTION
APPENDIX E

December 1977





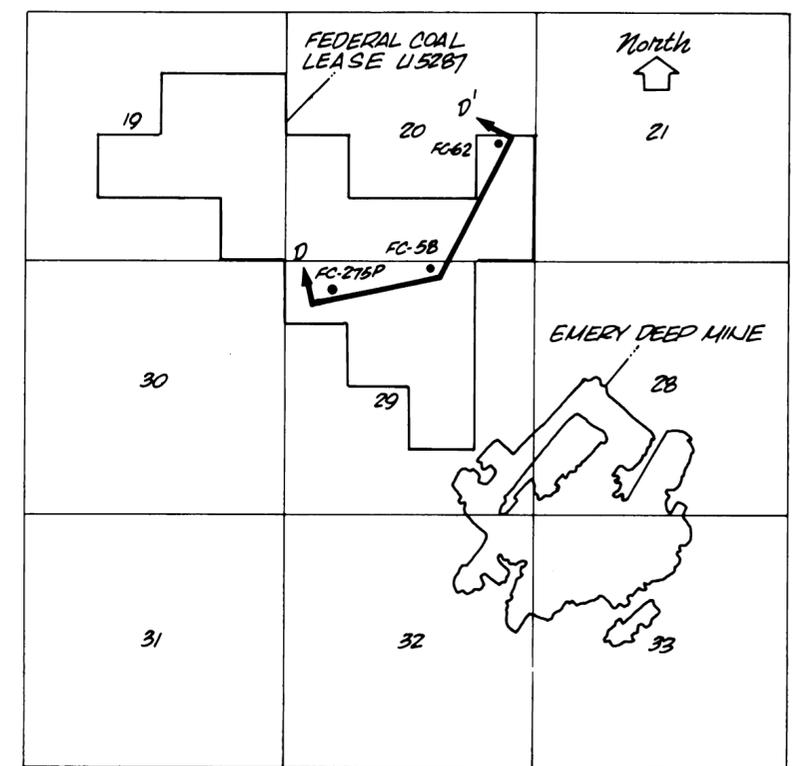
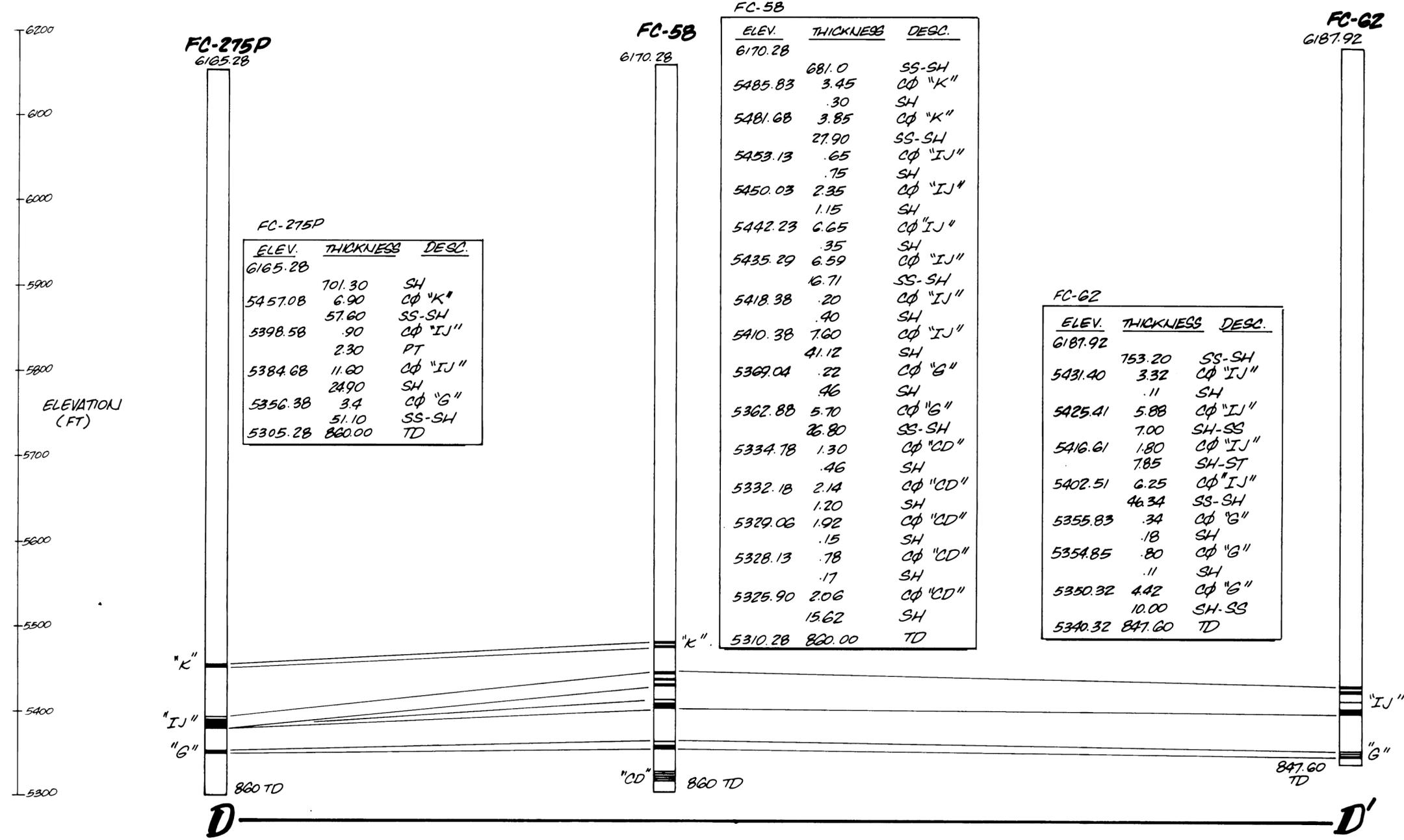
30° DIP
STRIKE NORTH 30° E

CONSOLIDATION COAL CO.
Western Region

CROSS SECTION C-C'
STRIKE CROSS SECTION

APPENDIX E

December 1977



3° DIP
STRIKE NORTH 30° E

CONSOLIDATION COAL CO.
Western Region
CROSS SECTION D-D'
STRIKE CROSS SECTION
APPENDIX E
December 1977