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United States Department of the Interior

SL-062453 et al.

GEOLOGICAL SURVEY

Office of the Area Mining Supervisor
Conservation Division
8426 Federal Building
125 South State Street
Salt Lake City, Utah 84138

*file in Trail Mtn
Blum*

May 9, 1977

Mr. Cleon B. Feight, Director
Division of Oil, Gas, and Mining
1588 West North Temple
Salt Lake City, Utah 84116

Dear Mr. Feight:

Enclosed is one copy of addendum number 1 to the Trail Mountain mining and reclamation plan.

Also enclosed is one copy of the additional information submitted by Coastal States covering its mining and reclamation plan.

The above information was prepared to bring the plans into compliance with 30 CFR 211.

Sincerely yours,

Ralph J. Blumer

Ralph J. Blumer
Mining Engineer

Enclosure



Trail Mountain Coal Company
Mining and Reclamation Plan
Orangeville, Utah

ADDENDUM No. 1

John L. Bell, Lessee
U-082996

April 22, 1977



9m

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Manti-LaSal National Forest

350 East Main Street

Price, Utah 84501

2820

April 21, 1977

Mr. Jackson Moffitt, Area Mining Supervisor
U.S. Geological Survey, Conservation Division
8426 Federal Building
125 South State Street
Salt Lake City, Utah 84138



Lease No. U-082996

Dear Jack:

This is in response to Mr. Blumer's request for a letter from the surfacing managing agency, Forest Service, concerning threatened and endangered plant and animal species and archeological information on the Trail Mountain Coal Company's Federal Coal Lease U-082996. As stated in our Environmental Analysis Report on page 5, there are no known threatened or endangered plant or animal species on the lease area.

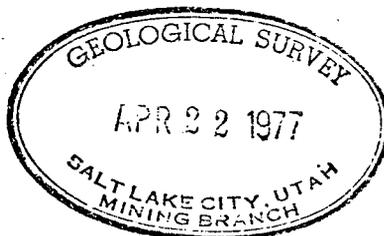
Paleontological and archeological sites were also covered by the report.

Possible subsidence of the ground surface and its related effects is the major anticipated surface disturbance to the area from mining the lease.

Sincerely,

A handwritten signature in cursive script that reads "William H. Deley".

for
REED C. CHRISTENSEN
Forest Supervisor



ADDENDUM NO. 1
Trail Mountain Mining and Reclamation Plan

The following information is being added as an addendum to the mining plan to bring it in compliance with 30 CFR 211.

211.10 Soils
(c) (2)

The soils are, for the most part, developed from parent materials derived from sandstone, mudstone, and shales. In texture they range mostly from medium to heavy, with usually a high percentage of stones. Alkalinity in varying degrees, but usually light, is common. The soils are of medium to high erodibility. Generally they are shallow to medium in depth, with shallowness typical on the ridges and greater depths common in the valley bottoms.

Geologic Conditions, and Potential Geologic Hazards

Physiography and Surface Features - The leasehold lies in the central portion of the Wasatch Plateau, a part of the highland rim of the Colorado Plateau Physiographic Province. Chiefly underlain by sandstone and shale units ranging from Cretaceous to Eocene in age, the rocks of the Wasatch Plateau have been gently warped into a system of broad, gently plunging, folds and monoclines locally complicated by north trending rift faults. Structurally, the Wasatch Plateau can be considered transitional ground occurring between the San Rafael Swell to the east and the highly faulted region of the Basin and Range Physiographic Province to the west.

Surface features and siting of the leasehold are shown on figure 1, adapted from the Hiawatha, Utah 15' quadrangle. The principal drainage, Cottonwood Creek, cuts deeply into the plateau from the southeast, forming steep canyon walls and V-shaped valleys with a general relief that ranges from about 6,000-10,000 feet above sea level. Relief within the tract is 600 feet, the altitude ranging from about 7,040 feet on the east in Cottonwood Canyon to about 7,650 feet on the west. Hillsides with average grades of from 60-90 percent over slope distances to 1,000 feet and more are prevalent, and essentially vertical cliffs 50 feet and greater in height are common. Excepting local deposits of colluvium including landslide and talus deposits, the surface of the leasehold is entirely of rocks belonging to the Star Point Sandstone, Blackhawk, and Price River Formations of the Mesaverde Group.

The climate of the area varies with altitude from semi-arid to semi-humid. Although annual precipitation may average only 10-14 inches in the immediate area of the mining plan,

in nearby high plateau areas the annual precipitation ranges from 20 to 30 or more inches. In the higher areas snowfall accounts for much of the precipitation but, throughout the entire region, heavy summer showers (cloudbursts) are characteristic. Maps found in the "Precipitation-Frequency Atlas of the Western United States" (Miller and other, 1973) show that the area of interest lies in a region where a 1.8 to 2 inch rainfall within 6 hours is expected within a 25 year period and a 2.2 to 2.4 inch rainfall in 6 hours is expected within a 100 year period. During the May through October thundershower period, the probability of 1.2 to 1.3 inches of rain within a 6 hour period is one in ten.

Stratigraphy and Structure - The commercial coal beds occur in the Blackhawk Formation, which is the middle unit of the Mesaverde Group of Late Cretaceous age, the upper unit is the Price River Formation and the lower unit is the Star Point Sandstone. The Blackhawk Formation, consisting of sandstone, shale, and coal seams, ranges from 700 to 900 feet thick. The most persistent and economically important coal seams in the district are the Hiawatha seam, which lies at the base of the Blackhawk Formation, and the Blind Canyon seam, occurring from 75 to 125 feet above the base of the Blackhawk. The Hiawatha seam is the only seam that has been traced from its type locality into the district by detailed mapping.

At the leasehold the structure evidently is simple. Spieker (1931) shows no faults closer than 3 miles to the west and no significant faults have been encountered in the mining nearby. Bedding within the tract strikes north-northwest and dips west-southwestward at the rate of about $3\frac{1}{2}$ percent.

Nature of the Coal Deposits - Nine sections of the targeted Hiawatha seam measured by Spieker (1931) within about one-half mile of the federal leasehold ranged in thickness from 3.9 to 9 feet, and averaged 7.5 feet (in the solid). A core hole drilled in 1975 about one mile north, at Roans Canyon, penetrated 8.9 feet of coal in the same seam. No other seams in the area are known to contain coal 4 feet or greater in thickness in minable quantities. Within the federal leasehold the Hiawatha seam is expected to average about $7\frac{1}{2}$ feet in thickness.

At the Trail Mountain mine, where the Hiawatha seam is exposed by high wall and entry areas, the seam is made up of common banded, bright and dull coal, fusain is sparse, and resin is rare. Locally, irregularly shaped dikes of very tough fine-grained clayey sandstone crosscut the seam, but partings of rock or impure coal are very rare. Non-banded (cannel) coal does not appear to be present in the seam. Where examined the floor of the seam was poorly exposed, but it appears to

directly overlies a tough siltstone. The roof rock varies laterally from a fine-grained sandstone up to 10 feet or greater in thickness to a thinly bedded sequence of inter-stratified siltstone, shale, and coal up to 10 feet or more in thickness.

As received, the combined average of the assays of four samples of coal obtained from mine run in 1976 and of three face samples of freshly exposed coal taken in 1975-76, was 4.69% moisture, 8.38% ash, 39.64% volatile matter, 47.28% fixed carbon, 0.57% sulfur, and 12,517 Btu/lb (files of the District Geologist, Salt Lake City, Utah). Standard deviations among the data, respectively 0.67, 2.41, 1.53, 1.72, 0.02, and 400, indicated good consistency among the samples. On a dry mineral-matter-free basis this composite sample is 50.90% fixed carbon and 45.10% volatile matter, on a moist mineral-matter-free basis it yields 13,778 Btu/lb, and the sample ranks as a high-volatile B bituminous coal (cf ASTM D 388-66, reapproved 1972).

Overburden and Depth of Cover - Within the mining projection, the Hiawatha coal seam is chiefly overlain by consolidated sandstone, siltstone, shale, and sub-commercial coal beds belonging to the Blackhawk Formation. The depth of cover will range from less than 100 feet near the outcrop in the northeastern part of the tract, to a maximum of about 500 feet on the west.

Other Mineral Resources - In addition to coal, the lands of the area are also valuable prospectively for oil and gas. The lands under coal lease U-082996 are also covered by oil and gas lease U-10849, but the value of this land for oil and gas has not been established. The nearest test for oil and gas, located about 4 miles east in sec. 25, T. 17 S., R. 17 E., has been plugged and abandoned.

Paleontologic Values - Terrestrial and aquatic animal and plant fossils of interest to stratigraphic study are widespread in the rocks of the Wasatch Plateau coal field. Fossil occurrences within U-082996 of unusual interest are unknown to the writer. Probably, by the production of fossil bearing waste rock, the proposed operation would do more to advance than to hinder or destroy knowledge concerning the fossils of the region.

Geologic Hazards and Potential Geologic Disturbances of the Mining and Reclamation Plans - The surface facilities and mine entry areas of the mining and reclamation plan are sited entirely on fee land and direct surface impact of the natural rock terrain leased under U-082996 will not occur. Natural geologic hazards common to the Wasatch Plateau coal field

include cloudburst floods and mud-rock flows, boulder and ledge falls, and land slides, all possibilities that experienced operators normally meet by appropriate location and design of surface facilities.

The greatest potential for generating geologic hazards and disturbances within the Federal tract lies in the extraction of the coal. Under the mining plan about 20 acres of the land included in U-082996 will be undermined by a room and pillar system carried out in a single seam having an average thickness of about 7½ feet. Because the mining will be done under a shallow rock cover (maximum of 500 feet), ground control during the life of the mine should present few problems. Owing to this relatively thin cover however, following full retreat and abandonment of the workings, subsidence generated displacements may arrive at the surface in a relatively short time and prove the most damaging aspect of the action. Effects at the surface caused by the downward collapse and lateral flow of the overburden rocks into the mining voids may include tension fractures and funnel shaped pits potentially hazardous to livestock or the unwary human. To the writer's knowledge, however, subsidence over mined out areas within the district have not developed uncontainable features of a scope that are dangerous to life or detrimental to the present surface uses. In view of the steepness of the hillside and the area frequency of torrential rainfalls accompanied by rapid runoffs, the eventual weakening of the surface rocks by subsidence could lead to significantly accelerated rates of erosion and land sliding.

The leasehold area is within a belt of "greater seismic activity" where four shocks of Richter Magnitude 5.0 or greater per decade per square degree are expected (fig. 2, Simon, 1972 and fig. 2, Smith and Sbar, 1974), which fact increases the possibility of damage and loss of life through landslides or roof falls.

Literature Cited for Geologic Date

- Miller, J. F., Frederick, R. H., and Tracey, R. J., 1973, *Precipitation-Frequency Atlas of the Western United States: NOAA Atlas 2*, 17 p. (text), 42 figs.
- Simon, R. B., 1972, *Seismicity: p. 48-51 in Geologic atlas of the Rocky Mountain region, Rocky Mountain Association of Geologists.*

Vegetation

See letter from Forest Service for endangered species clearance.

Climatological Data - Monthly range of temperature and precipitation from Climatological Data 1975, U.S. Dept. of Commerce. Castle Dale is the closest data station to the operation which is approximately 6 miles from the mine.

	Temperature (°F)	Precipitation (inches)
January	20.8	.29
February	28.9	.23
March	36.8	.85
April	39.7	.06
May	52.1	.21
June	60.8	1.01
July	71.4	1.34
August	67.4	.11
September	60.3	.31
October	47.5	.13
November	33.5	.36
December	27.1	.02
Annual Average	45.5	

The prevailing winds are generally from the southwest with the normal up and down canyon variations. No average wind direction has been determined.

Wildlife

See letter from Forest Service for endangered species clearance.

211.10 Prior Alternate Use

(c)(3)ii

The terrain of the lease is steeply sloping. Rainfall annually is low. The soil is thin and rocky. Vegetative cover is sparse or non-existent. All of these in combination result in a land form that is non-productive for vegetation and wildlife. No prior alternate land uses are feasible.

211.10 Extent of the Coal Deposit

(c)(6)i

The immediate area has had little exploratory drilling for coal. One hole was drilled about 3 miles away in Straight Canyon. It indicated a coal thickness of 7.5 feet thick. Another hole was drilled in Roans Canyon about 1 mile away.

It indicated 8.9 feet of coal. Coal sections of the outcrop were measured by Spieker (1931) within one half mile of the lease. Thicknesses of 4 to 9 feet were measured. The mine is presently operating in a 7 feet seam.

The coal fields in the Wasatch Plateau are generally lenticular. Taking this and the above information into account, it may be fairly accurate to say that the coal extends to the west at a regular thickness of 7 to 9 feet. The lease definitely contains this thickness of coal, but it would only be a conjecture to state the areal extent of the coal.

211.10
(c) (6) iv Engineering Techniques Proposed to be Used in Mining

The basic engineering techniques are those necessary to safely extract the coal. A 50 foot barrier pillar will be left adjacent to neighboring Federal land. Proper roof support techniques will be used where deemed necessary. All practices will be as prescribed by MESA regulations.

211.10
(c) (6) v List of Major Equipment

<u>Equipment</u>	<u>Quantity</u>
Continuous Mining Units	2
Cutting Machines	1
Coal Drill	1
Shuttle Cars	6
Loading Machine	1
Roof Bolter	3
Feeder Breaker	2
Maintenance and Man-Trip Carts	4
Rock Duster	1

211.10
(c) (6) vi Estimate of Reclamation Cost

All surface facilities are on fee land and will be reclaimed in accordance with the 1975 Mining and Reclamation Act of Utah.

211.10
(c) (6) vii Methods and Measures to Comply with Sec. 211.4 and 211.40

211.4 (d) Measures to Control or Prevent Soil Erosion - drainage channels will be rip - rapped when their original course has been changed. All fills have been compacted. There will be no surface disturbance on the Federal lease.

Air pollution - Mine machines are equipped with water sprays to hold down dust. Yard areas will be watered down when dusty.

Surface or ground water pollution - No water will be discharged unless approved by a State discharge permit. Sanitary facilities have been constructed to eliminate discharge of sewage.

Diminution of normal water flow - No impoundments will be constructed across Cottonwood Creek. Adverse impacts upon fish and wildlife - Operations will be limited to a small area. All necessary precautions will be taken to protect the fish and wildlife. Permanent damage to vegetation, crops, or timber - All activities will be so designed to damage as little flora as technically possible.

Creation of Unsafe or Hazardous Conditions - All MESA and State, as well as USGS stipulations, will be adhered to. Mining will be so conducted as to control subsidence in areas where the affects could be damaging.

Damage to Improvements - All possible means will be utilized to protect improvements.

Damage to Recreation, Archeological, etc. - Care will be taken to protect any identifiable artifacts and any other resources encountered. The USGS will be notified upon any significant find. Adverse impacts on adjacent land uses. Mining techniques will be such that subsidence should be restricted to the lease area.

211.40 (a) Performance Standards

- (1) All lands shall be reclaimed when they are no longer needed. All surface facilities are on fee land and are under the authority of the State.
- (2) Acceptable mining techniques will be followed to prevent the discharge of toxic wastes and to protect the structural integrity of the operation.
- (3) All surface areas will be designed to protect them from any adverse effects of mining.
- (4) Topsoil will be stockpiled separately when removed and protected against erosion.
- (5) Any water impoundment will be so designed to serve their designated purpose. Acceptable safety and engineering standards will be followed to protect the impoundment and its surroundings.
- (6) There will be no auger mine holes.
- (7) All possible measures will be utilized to protect the quantity and quality of any water flows. No discharge will occur unless approved by a State EPA Class "C" discharge permit.

(8) All waste and noxious substance disposal shall comply with State and Federal standards.

(9) Blasting and excavations shall not be conducted within 200 feet of abandoned mine workings.

(10) Explosives shall be used only as State and Federal standard permit.

(11) All roads, powerlines and similar utilities will be designed using acceptable engineering standards, and shall be removed when no longer required.

(12) No toxic material will be used on road surfaces. Engineering surveys and designs will be conducted prior to the construction of any road. No roads will be built in streams.

(13) All areas will be revegetated with acceptable cover upon completion of operations.

(14) Public access shall be permitted in areas where no dangers exist.

(15) Coal piles will be designed to eliminate spontaneous combustion.

(16) Coal faces will be covered with an incombustible material upon temporary or permanent abandonment.

(17) No auger mining methods will be utilized.

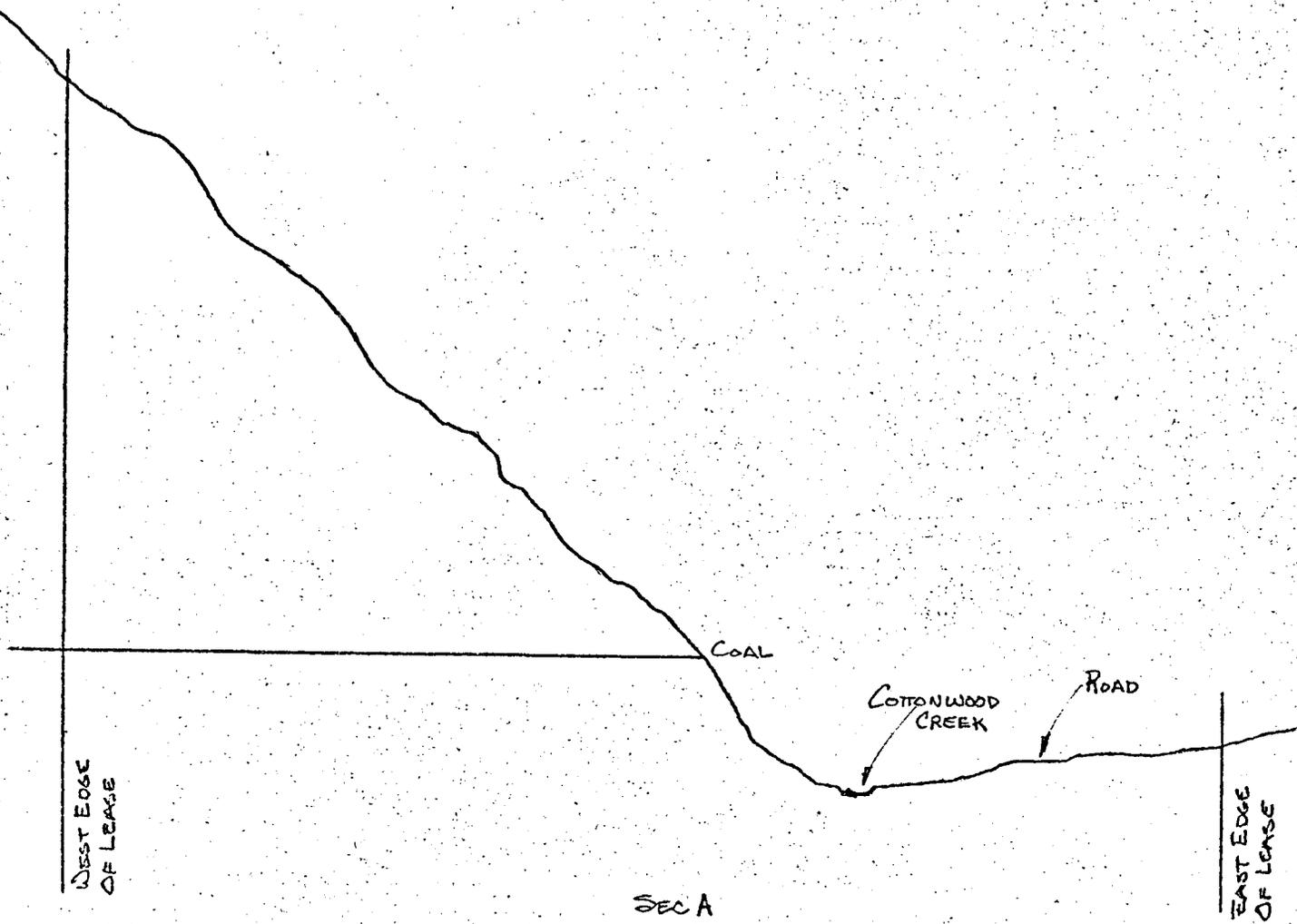
211.10 Compliance steps for air quality control. All steps will be
(c)(6)ix followed to eliminate air pollution. Water sprays will be used where necessary.

211.10 Maximum recovery of coal will be practiced. Top coal will
(c)(6)x not be left unless required for safety reasons. Pillars will be pulled in areas where subsidence will have no significant adverse effects. Pillars will not be pulled within 500 feet of the outcrop. No mining will occur within 50 feet of the outcrop.

Explanation of Figures A.1 thru A.10

- Figures A.1 Area of operations and strike and dip of beds.
- A.2 Cross section A along north boundary of U-082996.
- A.3 Cross section B at tippie on fee land.
- A.4 Samples taken at outcrop in Cottonwood Canyon. Location 36 is situated across the creek from the lease.
- A.5 Typical section in Cottonwood Canyon.
- A.6-10 Description of hole in Roans Canyon approximately 1 mile from the lease. Only the Hiawatha seam at an elevation of 7,109 is minable. This correlates with the section in A.5.

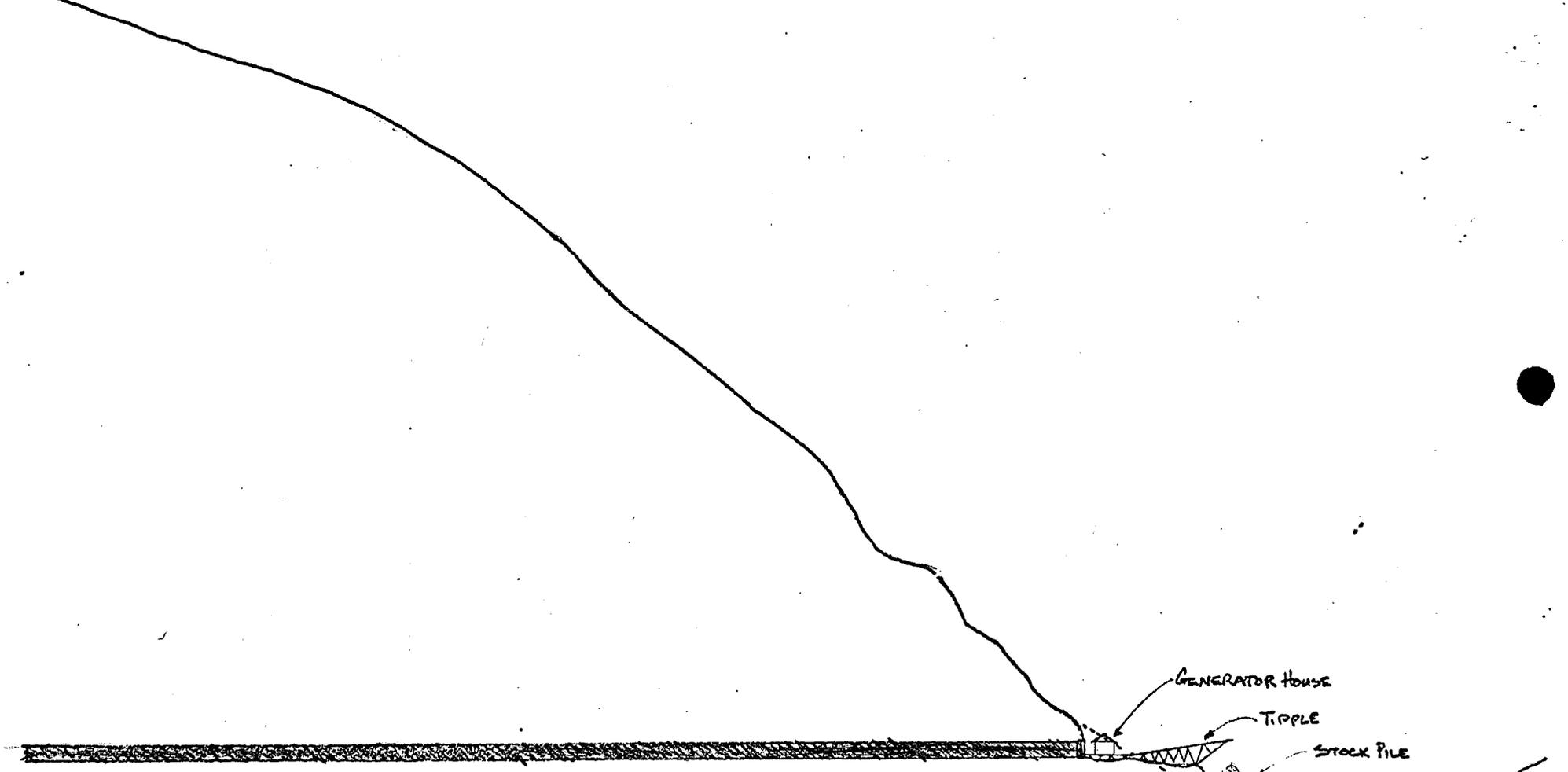
Note: The information for figure A.1 thru A.5 was obtained from Monograph Series No. 3, 1972, Central Utah Coal Fields. The hole description in A.6-thru A.10 was obtained from the Wasatch Plateau Coal Field, Utah Drilling Project U.G.M.S. 1976.



SEC A
ALONG NORTH BOUNDARY
OF FEDERAL LEASE K-082996

SCALE VERT $\frac{1}{2}$ HOR. 1" = 200'

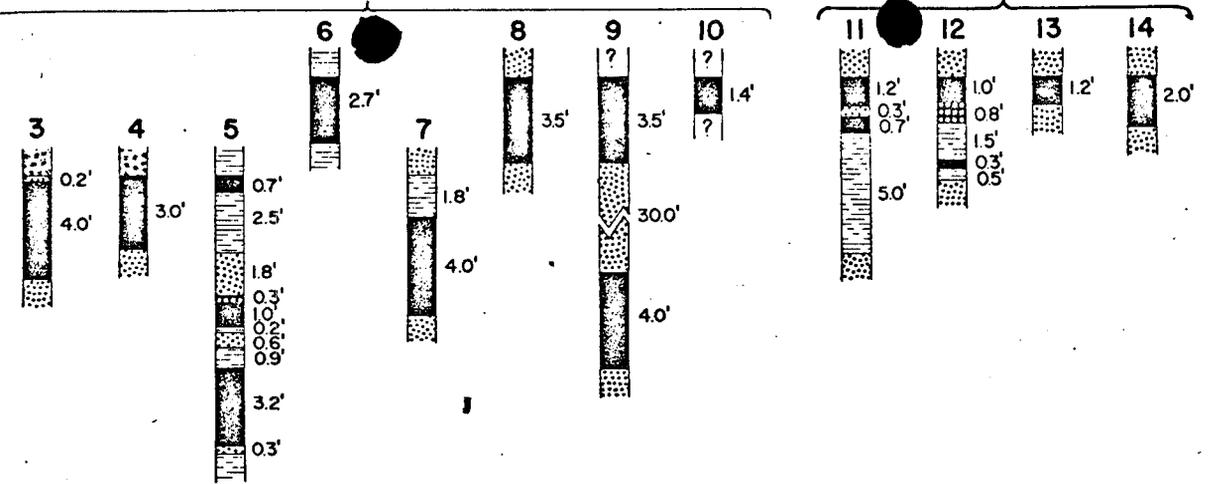
FIG A.2



SECTION B
AT TIPPLE ON FEE LAND
SCALE 3' VERT & HOR. 1" = 100'

FIG A.3

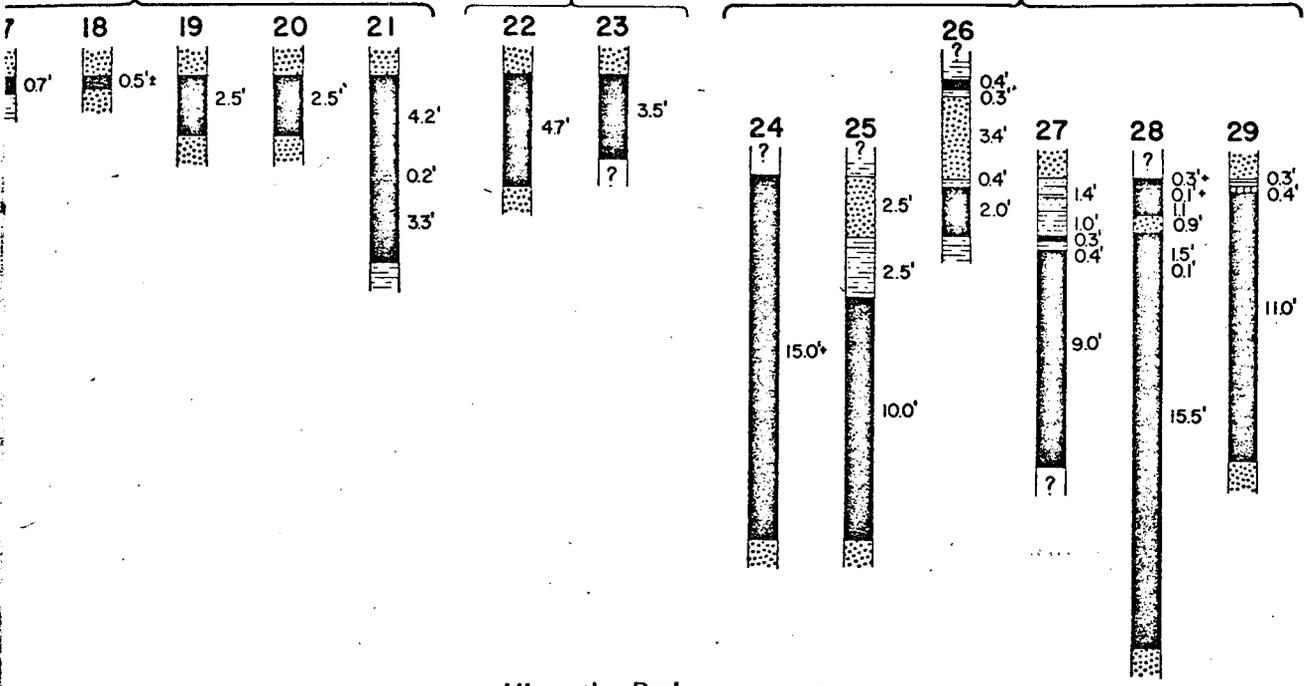
GENERATOR HOUSE
TIUPLE
STOCK PILE
ROAD
COTTONWOOD CREEK
ORIGINAL CONTOUR
FINAL CONTOUR AFTER RECLAMATION WILL ALSO FOLLOW THIS LINE



Blind Canyon Bed

Cottonwood Bed

Hiawatha Bed



Hiawatha Bed

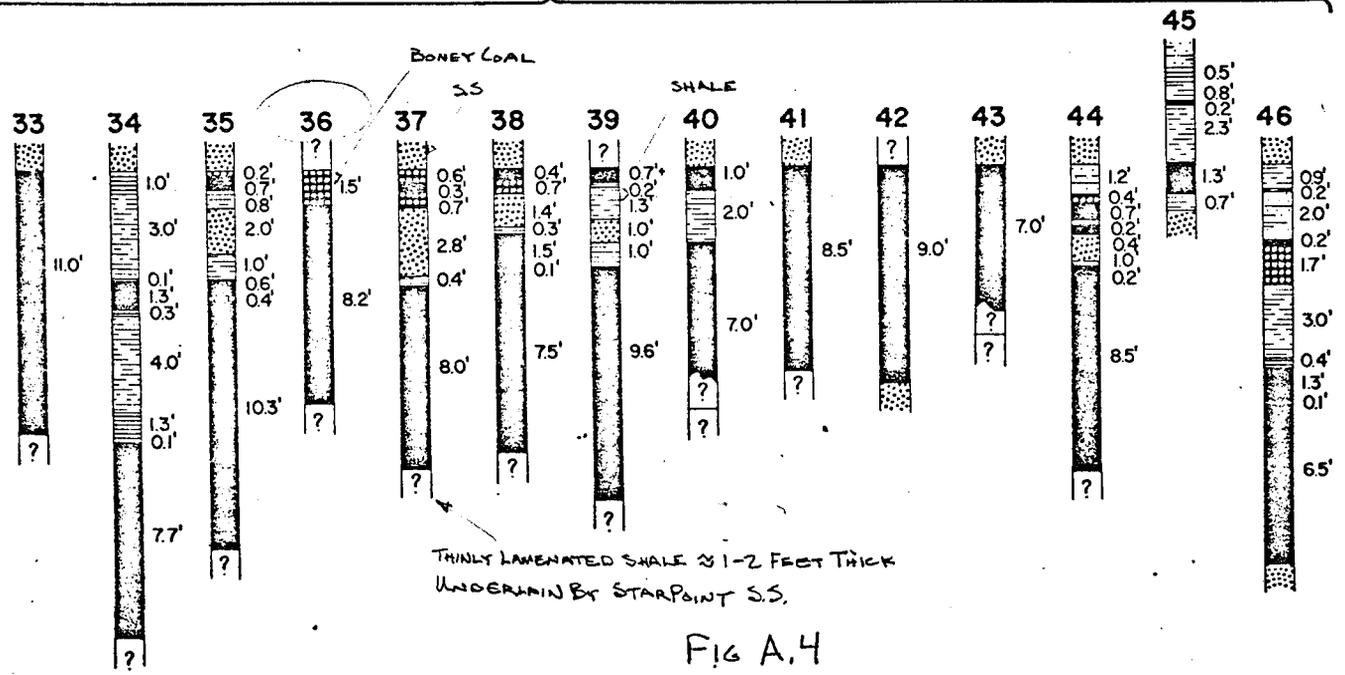
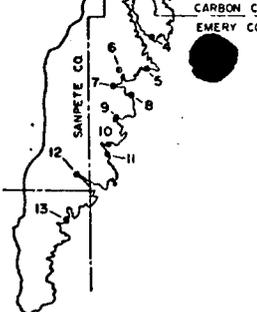


FIG A.4



CARBON CO
EMERY CO

⑥

COTTONWOOD CANYON SECTION

T.17S., R.6E., SW 1/4 NE 1/4 Sec. 25

④

BEAR CANYON SECTION

T.17E., NE 1/4 SW 1/4 Sec. 24

⑤

GRIMES WASH SECTION

T.17S., R.7E., SW 1/4 SW 1/4 Sec. 26

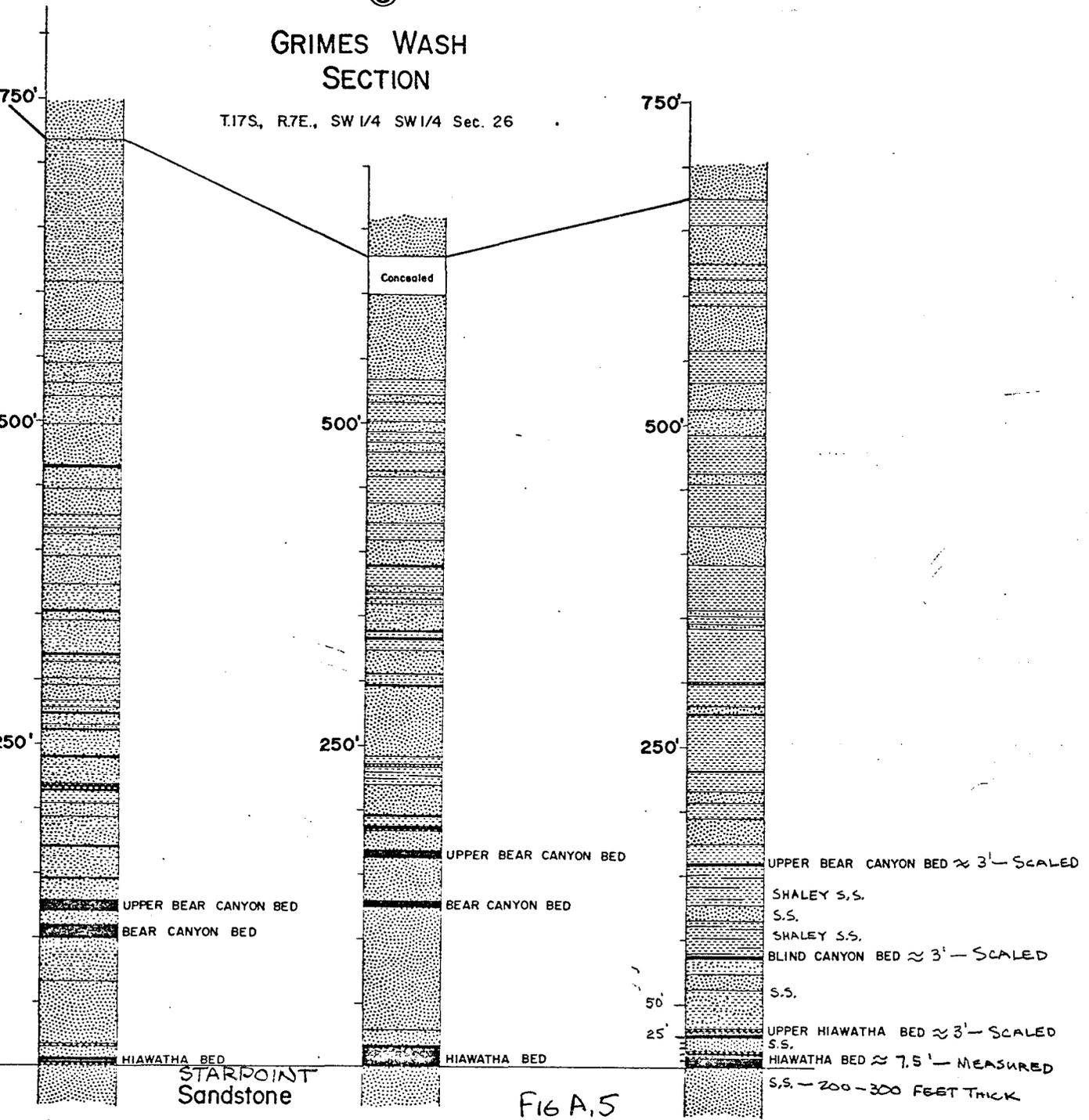


FIG A.5

Project Wasatch Plateau Location 24-17S-6E Sheet 1 of 5
 Drilling 8-5-75 Completed 8-9-75 Total Depth of Hole 369.6'
 Core Recovery (%) 100% Feet 210.8' Ground Elev. 7470'
 Hole Logged by H. Doelling, F. Davis, Driller Boyles Bros.
L. Green, J. Call (U.G.M.S. #4)

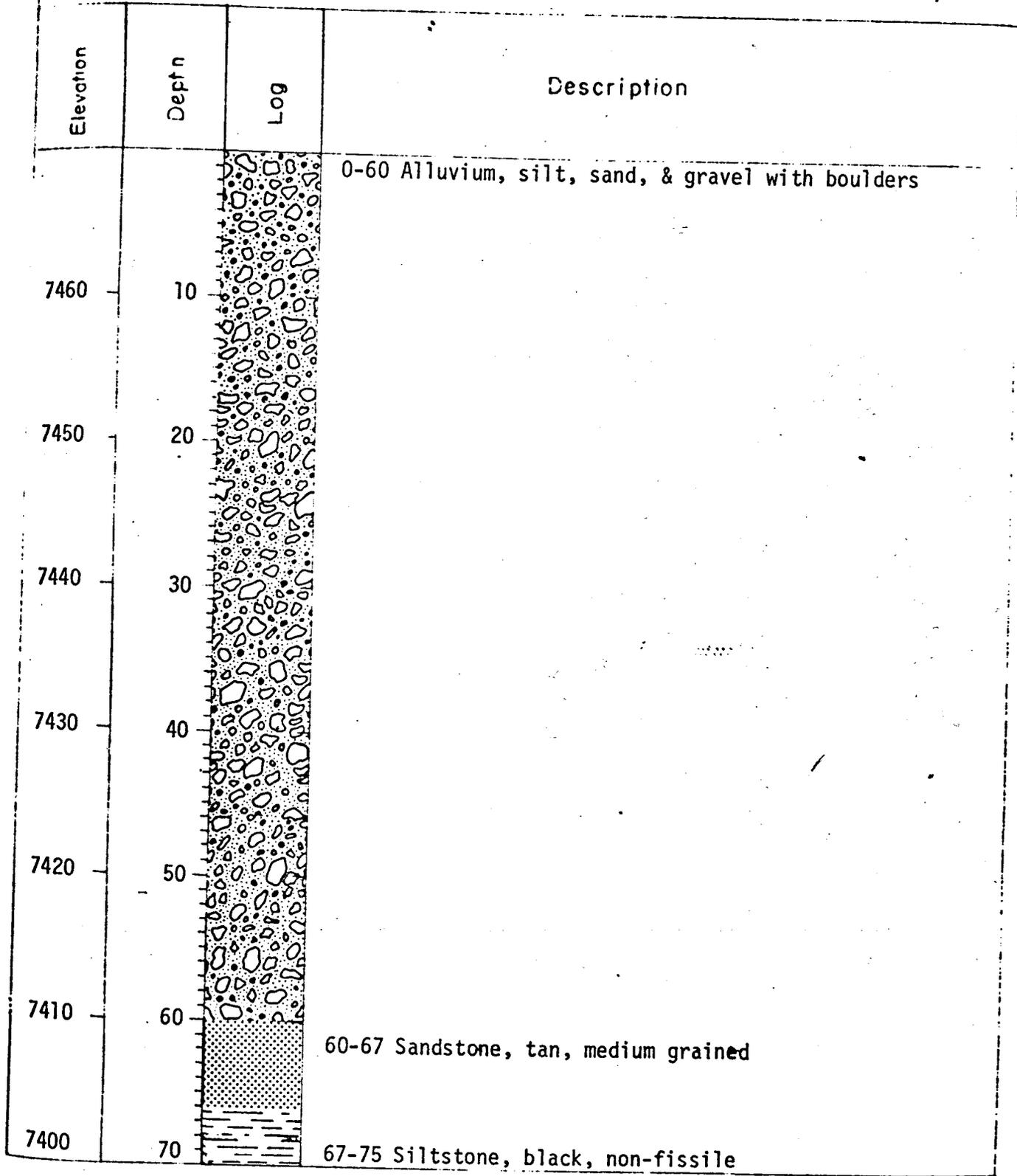


Fig A.6

Description
 Site Roans Canyon (U.G.M.S. #4)

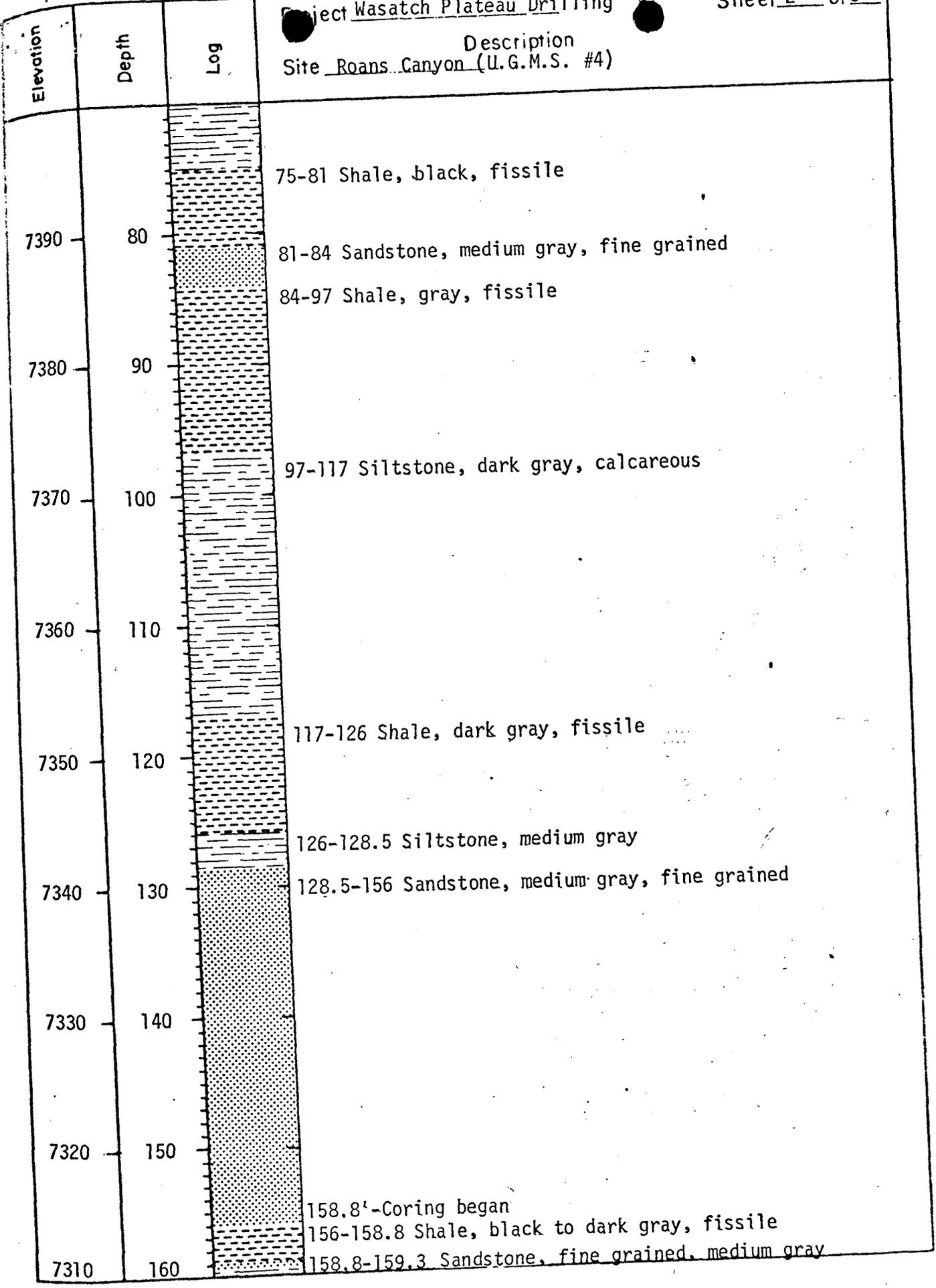


Fig. A.7

Description
Site Roans Canyon (U.G.M.S. #4)

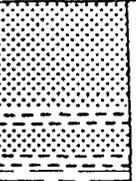
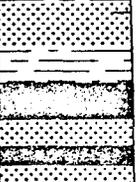
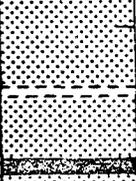
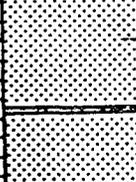
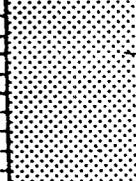
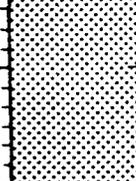
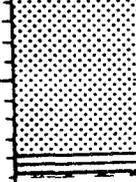
Elevation	Depth	Log	Description						
7300	170		159.3-160.1 Siltstone, sandy, dark gray, coaly streaks						
			160.1-165.4 Sandstone, fine-medium grained, dark gray						
			165.4-166.4 Mudstone, black, argillaceous						
			166.4-167.7 Sandstone, fine grained, very dark gray						
			167.7-168.5 Shale, black, carbonaceous						
			168.5-169.4 Siltstone, very dark gray, sandy						
			169.4-171.4 Sandstone, fine grained						
			171.4-173.6 Siltstone, very dark gray, coaly particles						
			173.6-175.65 Coal, black, shiny, Sample WP-4-1						
			175.65-176.65 Sandstone, fine grained, dark gray						
7290	180		176.65-177.6 Coal, brittle, scattered pyrite, shiny						
			177.6-183.1 Sandstone, fine-medium grained						
			183.1-183.8 Mudstone, dark gray, contorted laminations						
			183.8-186.8 Sandstone, fine grained, medium gray						
			186.8-187.8 Coal, resinous (upper 2"), shiny, black						
			187.8-193.7 Sandstone, fine grained, medium gray						
			193.7-194.2 Shale, carbonaceous, dark brown						
			194.2-223.8 Sandstone, medium gray, fine-medium grained						
			7270	200		223.8-224.9 Shale, dark brown, carbonaceous, argillaceous			
						224.9-226.4 Siltstone, medium gray-brown, sandy			
226.4-233.5 Sandstone, very fine grained, medium gray									
233.5-233.9 Shale, very dark brown, carbonaceous									
233.9-246.8 Sandstone, very fine grained, dark gray to dark brown, carbonaceous									
7250	220					246.8-247.3 Shale, black, carbonaceous, coaly, fissile			
						247.3-247.8 Shale, gray, argillaceous, fissile			
						247.8-257.9 Siltstone, light brown, fossiliferous			
						7240	230		
7230	240								
7220	250								

Fig. A.8

Description

Site Roans Canyon (U.G.M.S. #4)

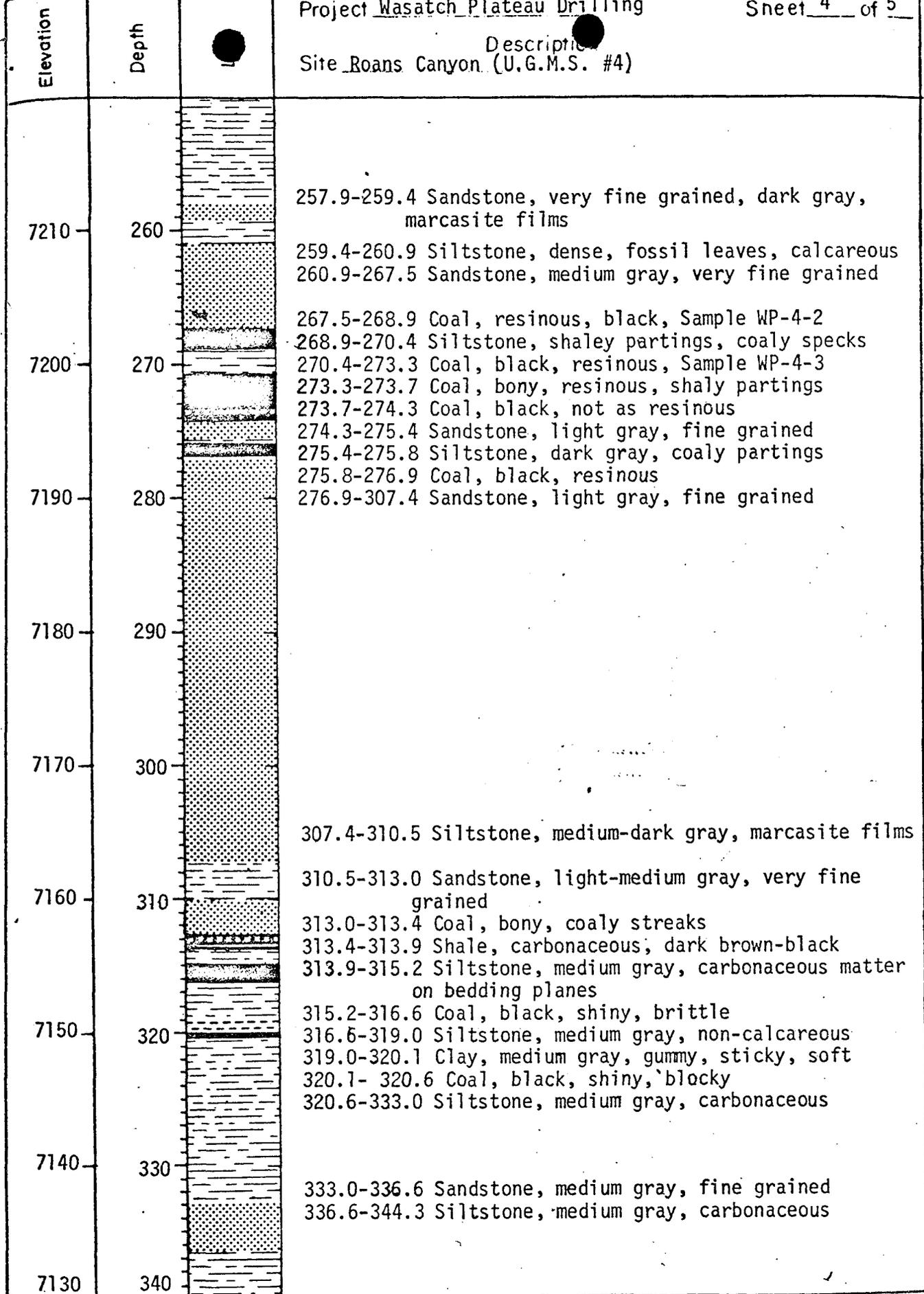
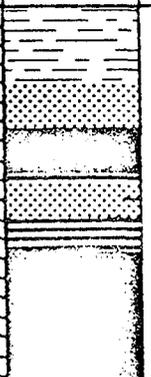
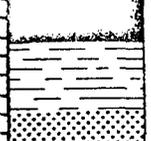
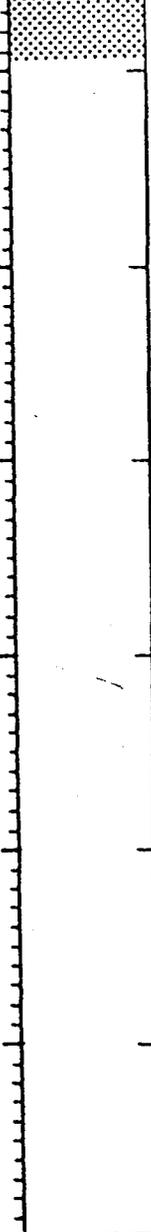


Fig A.9

Elevation	Depth	Log	Description Site Roans Canyon (U.G.M.S. #4)
7120	350		344.3-346.6 Sandstone, medium gray, fine grained 346.6-348.9 Coal, black, shiny, blocky, Sample WP-4-4 348.9-349.3 Shale, dark gray, carbonaceous, fissile 349.3-351.3 Sandstone, medium gray, fine grained 351.3-352.7 Shale, dark gray, carbonaceous, fissile 352.7-361.6 Coal, black, shiny, blocky, Samples WP-4-5, WP-4-6, WP-4-7
7110	360		361.6-365.2 Siltstone, dark gray, carbonaceous 365.2-369.6 Sandstone, medium grained, tan-dark gray
7100	370		369.6 Drilling stopped, 8-9-75 Total Depth-369.6'



United States Department of the Interior

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
8002 Federal Building
Salt Lake City, Utah 84138

April 21, 1977

To: Area Mining Supervisor, CD, Salt Lake City, Utah
Attn: Ralph J. Blumer, Mining Engineer

From: District Chief, WRD, Salt Lake City, Utah

Subject: Trail Mountain Coal Co. (John L. Bell) mine plan--coal lease
U-082996 - Addendum No. 1

The following discussion was prepared by Don Price of this office in response to your request for additional hydrologic data to be submitted with the subject mine plan. The discussion includes information (consistent with presently available hydrologic data) required under items 211.10 (C) (6) (Xiii) and (7) (iii) of the coal mining plan checklist 30 CFR 2111. It is subject to revision on acquisition of new hydrologic data.

Hydrology

Surface water

Coal lease U-082996 is entirely within the drainage basin of Cottonwood Creek, a tributary of the San Rafael River which empties into the Green River about 70 air miles southeast of the lease. Mine portal facilities and the mine access road are adjacent to Cottonwood Creek (Exhibit 1). Cottonwood Creek receives regulated flow (about 2.5 miles downstream from the lease) from Joes Valley Reservoir by way of Straight Canyon, and is used chiefly for irrigation in the Orangeville-Castle Dale area. The stream also supports a local sport fishery and supplies drinking water for livestock and wildlife. In addition, Trail Mountain Coal Co. has appropriated some of the streamflow for use in the proposed mining operation.

Runoff in Cottonwood Creek is measured by U.S. Geological Survey gaging station 09324500 near Orangeville (Exhibit 1). During 55 years of record between 1909 and 1970 runoff past that gaging station has averaged 70,420 acre-feet per year. Minimum recorded flow was 1.2 ft³/sec on April 8, 1966, and maximum recorded flow was 7,220 ft³/sec on August 1, 1964.

Runoff in Cottonwood Creek upstream from its confluence with Straight Canyon is not gaged, but is estimated to average about

1,500 acre-feet per year by correlation with runoff records collected in a similar nearby drainage basin. On July 13, 1976, a flow estimated to be about 0.3 ft³/sec was observed in Cottonwood Creek just upstream from the present mine portal. However, flows exceeding 100 ft³/sec are possible in this same reach of the creek during cloud-burst flooding and high seasonal runoff.

Based on a water yield map compiled by Bagley and others (1964), mean annual runoff from coal lease U-082996 alone is estimated to be about 10 acre-feet. This is 0.7 percent of the estimated average annual runoff in Cottonwood Creek above its confluence with Straight Canyon and only 0.01 percent of the average annual gaged runoff past station 09324500.

Chemical quality of surface water in the coal lease area is good. According to Price and Waddell (1973), the discharge-weighted average concentration of dissolved solids in runoff from the area is less than 250 mg/L (milligrams per liter). Between 1933 and 1977 several hundred water samples were collected from Cottonwood Creek at gaging station 09324500 and analyzed by the U.S. Geological Survey or U.S. Bureau of Reclamation. Dissolved-solids concentrations in those samples generally ranged between 200 and 400 mg/L (U.S. Geol. Survey unpublished data). On July 13, 1976, the flow in Cottonwood Creek just upstream from the mine portal was tested with a field conductivity meter; it had a specific conductance of 500 micromhos per cm which indicates a dissolved-solids concentration of less than 400 mg/L--even during low flow periods.

There are very little data regarding sediment discharges in the coal lease area. A sediment yield map of Utah (U.S. Dept. Agric., 1973) indicates that sediment yields in the Cottonwood Creek drainage are relatively high--ranging from 0.5 to 1.0 acre-feet per square mile per year. Consequently, suspended sediment in Cottonwood Creek is assumed to be relatively high--especially during storm runoff. However, release of nearly sediment-free water from Joes Valley Reservoir helps lower the sediment concentration of the streamflow below Straight Canyon.

Ground Water

Ground water is present in most of the rocks that underlie coal lease U-082996. However, there are no known extensive productive aquifers above or immediately below the coal-bearing beds. Price and Waddell (1973) indicate that the rocks in this general area have low permeability and are capable of yielding only about 1 to 10 gal/min of water to individual wells. The depth to the regional water table (main zone of saturation) is not precisely known; it probably ranges from only a few feet along Cottonwood Creek (which appears to be a gaining stream in the lease area) to more than 1,000

feet beneath the divide between Cottonwood Creek and Straight Canyon. The coal-bearing beds on the lease appear to be above the regional water table. However, they probably contain some local perched aquifers as present mine workings on the lease reportedly have intercepted some water.

Chemical quality of ground water in the lease area is good. According to Price and Waddell (1973) dissolved concentration of the water is generally less than 500 mg/L. The flow of Cottonwood Creek at the mine (which when tested on July 13, 1976 consisted of effluent ground water) had an indicated dissolved-solids concentration of less than 400 mg/L.

There are no known uses of ground water in the lease area except indirectly as baseflow to Cottonwood Creek. Any water produced by mine workings may be used for in-mine operations.

Potential Impacts on Hydrology

The proposed mining operation will have an insignificant impact on the local hydrology and on downstream uses of runoff in Cottonwood Creek. Because the lease contributes only about 0.01 percent of the runoff in Cottonwood Creek above gaging station 09324500, the small changes in runoff (probably less than 1 acre-foot per year) that can be anticipated from construction of new surface facilities, mining, and subsequent land subsidence will be negligible.

There will be a small, but insignificant, increase in fluvial sediment in Cottonwood Creek as a result of new surface construction and increased coal haulage. The impact on downstream uses of the water will be insignificant compared to effects of high sediment discharges that result from cloudburst flooding.

Chemical quality of surface water will be essentially unaffected provided there are no accidental spills of oil or other mining-associated contaminants. If the mine workings produce more ground water than can be consumed in the mine, a discharge permit must be obtained from the Environmental Protection Agency to discharge the water from the mine. In addition, any water released to Cottonwood Creek will have to meet State of Utah Class C water-quality requirements (Exhibit 2) to prevent adverse impacts on downstream uses of the streamflow.

Serious flooding is possible in the lease area during cloud-burst activity. A Log-Pearson Type III analysis (U.S. Water Resources Council, 1976) of peak discharges measured in Cottonwood Creek at gaging station 09324500 indicates there is a 50 percent probability that a discharge equalling or exceeding 1,200 ft³/sec will occur in any given year at that station. A discharge of this magnitude at the

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at Orangeville*

mine would cause serious damage to the culvert and stream crossing. However, the drainage area upstream from the mine is only about 13 percent of the total drainage area upstream from station 09324500. Therefore, there is a much small probability of such a discharge occurring in any one year at the mine.

References Cited

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