CASTLE GATE

COAL MINE

MINING & RECLAMATION PLAN

PERMIT NO.
ACT 007/004

VOLUME 5

CHAPTER 4

LAND USE, LAND STAUTS, AND POST-MINING LAND USE

CASTLE GATE MINE
AMAX COAL COMPANY
Carbon County, Utah

INCORPORATED
EFFECTIVE:
JUL 26 1995
UTAH DIVISION OIL, GAS AND MINING

Prepared by

EARTHFAX ENGINEERING, INC.
Midvale, Utah

June 1995

CHAPTER 4

LAND USE, LAND STATUS, AND POST-MINING LAND USE

TABLE OF CONTENTS

Section	Page
4.0 INTRODUCTION	4-1
4.1 PRESENT LAND USE STATUS	4-1
4.2 LAND USE	4-2
4.3 SOCIO-ECONOMIC CONSIDERATIONS	4-2
4.4 HISTORICAL AND CULTURAL RESOURCES	4-3

LIST OF EXHIBITS

EXHIBIT 4-1 SURFACE OWNERSHIP	MS
EXHIBIT 4-2 COAL PROPERTY MAP	MS
EXHIBIT 4-3 KNOWN AREA OIL AND GAS LEASES	MS

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CHAPTER 4

LAND USE, LAND STATUS, AND POST-MINING LAND USE

4.0 INTRODUCTION

The land use within the mine land area has been historically restricted to low intensity uses because of inherent environmental restrictions, including: slope, soil texture and water. (See Historical and Cultural Resources, Chapter 5). Present and future land use will also be restricted by these factors and will thus likely consist of low intensity grazing (1 animal unit/8 acres/month) wildlife habitat, primitive recreational uses, mining and possible limited timber production in mid-evaluation areas. No farming activities exist within or near the mining area. See Soil Conservation Service (S.C.S.) prime farmland statement in Chapter 8, and Alluvial Valley Floor information in Chapter 7.

4.1 PRESENT LAND USE STATUS

Surface Status - Exhibit 4-1 depicts the present surface ownership, surface managing authorities; present utility corridors and rights-of-way. A listing of surface property owners adjacent to the mine plan area is presented in Table 2-2.

Coal Ownership - Exhibit 4-2 depicts coal ownership on and adjacent to Castle Gate Mine's controlled properties.

Oil and Gas - Exhibit 4-3 shows the known oil and gas ownership or leases. No wells currently exist on the property. Installation of wells prior to coal extraction would sterilize large blocks of coal. It is felt that coal is the primary resource being developed. Any proposed drilling within the coal reserve would be vigorously contested. There are, at present, several leases for oil and gas reserves within the mine plan area, although none are currently active.

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4.2 LAND USE

Regional land use within and adjacent to the mine plan area is governed principally by topography. Within the mine plan area and to the north, east, and west of its boundary, land use is restricted to non-intensive, nondeveloped uses; i.e., grazing, recreation, watershed, wildlife habitats, and in localized areas, small surface developments to support the underground coal mining activities. See Exhibits 3-22, 7-2, 9-1, 10-1, 12-4-1 and 12-4-2 which depict the aerial extent of the various uses. The surface developments within the mine plan area are discussed in detail in the appropriate subsections of Chapter 3. The impact of the operation on land use potential within the mine plan area will be negligible. Further, within the areas of surface disturbance, control and protective measures have been initiated to minimize the micro impact of the site operations. These measures are discussed in Chapters, 3, 6, 8, 9, 10, and 11.

Upon completion of surface operations at a site, the affected areas will be reclaimed pursuant to the site specific reclamation plans presented in Chapter 9. As indicated therein, these plans have been developed to return the affected areas to a condition which is compatible, in terms of use, to the surrounding undisturbed areas.

Castle Gate have no intention of requesting regulatory authority approval for re-designation of the present land use which is grazing and wildlife habitat.

4.3 SOCIO-ECONOMIC CONSIDERATIONS

In recognition of the pending expansion mining activity in Southeastern Utah, local governmental agencies and planning commissions have begun the necessary development work to assure that the associated population increases will be accommodated with a minimum of impact, either to the population itself or to the surrounding environment.

Areas of concern in this effort have included housing, roads, water supply sewage and solid waste disposal and other human need requirements.

The new short term plans for Castle Gate do not include major increase in the labor force and, hence, should not cause an immediate impact on the local socio-economic environment.

Castle Gate has and will continue to work with the local governmental agencies as its long range planning develops to assure maximum coordination of effort and minimal socio-economic disturbance.

Castle Gate accepts this responsibility freely, realizing that a satisfied and stable work force/community association is imperative in the achievement of its production objectives and fulfillment of its civic responsibilities.

4.4 HISTORICAL AND CULTURAL RESOURCES

See Chapter 5.

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CHAPTER 5
HISTORICAL AND CULTURAL RESOURCES

CASTLE GATE MINE
AMAX COAL COMPANY
Carbon County, Utah

Prepared by

EARTHFAX ENGINEERING, INC.
Midvale, Utah

April 1995

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CHAPTER 5

HISTORICAL AND CULTURAL RESOURCES

TABLE OF CONTENTS

Section		Page
5.0	INTRODUCTION	5-1
5.1	CULTURAL AND HISTORICAL RESOURCES	5-1
5.2	HISTORIC MINING ACTIVITIES	5-2

LIST OF APPENDICES

APPENDIX 5-A	WALKER REPORT
APPENDIX 5-B	HARPER/SISSON
APPENDIX 5-C	ARCHAEOLOGICAL RESEARCH CORP. REPORT (6/15/79)
APPENDIX 5-D	ARCHAEOLOGICAL RESEARCH CORP. REPORT (10/22/79)
APPENDIX 5-E	SARGENT REPORT
APPENDIX 5-F	UTAH ARCHAEOLOGICAL RESEARCH CORP. - CRANDALL CANYON REPORT

LIST OF EXHIBITS

EXHIBIT 5-1 SITES AND AREAS SURVEYED FOR HISTORICAL, CULTURAL, AND ARCHAEOLOGICAL RESOURCES . . . . . MS

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CHAPTER 5
HISTORICAL AND CULTURAL RESOURCES

5.0 INTRODUCTION

The affected surface areas of the present operations within the Mine Plan Area comprise less than one percent of the total area and are primarily the result of storage areas and access to the workings through portals. There are no known cultural or historical resources listed or eligible for listing on the National Register of Historic Places. There are also no known archaeological sites within or adjacent to the Mine Plan Area.

5.1 CULTURAL AND HISTORICAL RESOURCES

Site specific cultural, historic and archaeological surveys have been conducted routinely since 1975 on surface areas affected by test hole drilling for access road construction. These surveys are disbursed over the existing and proposed underground works. Some 69 pad areas and access roads have been analyzed. Nothing has been observed to indicate the presence of a cultural, historic or archaeological resources. The roughness of the terrain and the general lack of subsistence resources has and continues to limit any development of the uplands over the mining area.

Some of the larger canyons contain remnants of former towns, i.e.; Mutual, Standardville, Rains, Royal, Storrhs, however our current mining operations have not impacted these areas nor do we have future plans to do so. Some building remains in Crandall Canyon were analyzed in 1980 - 81 and found to be ineligible for listing to the National Register.

The State Historical Preservation Society has been provided with a map of all the proposed facilities and requested to provide background data if any exists.

The reports of the various Consultants are included as appendices to this Chapter.

Further studies will be conducted, as requested, for any future mine facilities prior to surface disturbance.

5.2 HISTORIC MINING ACTIVITIES

Previous mining has been quite extensive within the Mine Plan Area and all mines are classified as underground mining method with ordinary development systems and primarily room and pillar systems for extraction of minerals other than coal mined.

Commencing on our western boundary and progressing eastward to our eastern boundary, the following mining was accomplished by various mining companies, each operation joining the previous listed.

The key to the list is as follows:

1. Type of mining method,
2. Coal seams mined
3. Extent of mining
4. Approximate dates of past mining
5. Land use preceding mining

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MUTUAL COAL COMPANY

1. Underground mining method
2. Castle Gate A and Subseam 2
3. a. Subseam 2, extensive mining
   b. A Seam, moderate
4. 1918 - 1946
5. Primarily grazing

UTAH-CARBON COAL COMPANY

1. Underground mining method
2. Castle Gate A and Subseam 1 and 2
3. a. Castle Gate A, extensive
   b. Subseam 1, limited amount
   c. Subseam 2, extensive
4. 1917 - 1948
5. Grazing

SPRING CANYON COAL COMPANY

1. Underground mining method
2. Castle Gate A, B, D, and Subseam 1, 2, and 3
3. a. Castle Gate A, extensive
   b. Castle Gate B, extensive
   c. Castle Gate C, small amount
   d. Castle Gate D, extensive
   e. Subseam 1, extensive
   f. Subseam 2, extensive
   g. Subseam 3, extensive
4. 1918 - 1972
5. Grazing

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CARBON FUEL

1. Underground mining method
2. Castle Gate B and Subseam 3
3. a. Subseam 3, extensive
   b. B Seam, extensive
4. 1932 - 1971
5. Grazing

UTAH FUEL

1. Underground mining method
2. Castle Gate A, B, C, D, and F seams
3. a. A Seam, extensive
   b. B Seam, moderate
   c. C Seam, extensive
   d. D Seam, extensive
   e. F Seam, moderate
4. 1878 - 1972
5. Grazing

INDEPENDENT COAL AND COKE

1. Underground mining method
2. Castle Gate A and D seams
3. a. A Seam, moderate
   b. D Seam, extensive
4. 1907 - 1972
5. Grazing

APPENDIX 5-A

WALKER REPORT

ARCHAEOLOGICAL SURVEY REPORT ON FOURTEEN PROPOSED DRILL SITES NEAR FORD RIDGE, UTAH

J. Terry Walker

Brigham Young University

Provo, Utah

Submitted to:

Braztah Corporation

Helper, Utah

At the request of Mr. Roy Full of Salt Lake City and on July 16 and 22, 1975, the author surveyed fourteen proposed coal-lease drill sites for the Braztah Corporation of Helper, Utah. The drill sites were located on Ford Ridge and in Rains Canyon, Ciochettor Canyon, and Burnt Tree Fork of Spring Canyon near Helper, Utah.

The survey consisted of investigating the area within a 100 to 150 feet radius of the center of each area to be disturbed by the drilling operations. Eight of the drill sites (1, 4, 6, 7, 8, 9, 11, and 13) required surveying an access road to the site as well.

In surveying these access roads though, an important problem arose. Most of the roads had not been surveyed nor identified (flagged) on the ground. Because the archaeologist did not have an exact route to follow, the survey was less efficient than it could have been. In the future, it will better serve all parties if the exact routes of access roads and the exact location of the drill sites are marked on the ground.

In conclusion, no archaeological sites were found near any of the proposed drill sites. Therefore, archaeological clearance for the drilling project is granted. Also, enclosed with this report is an appendix containing a site survey report on each drill site surveyed.

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number _____ Project Site Number MC-1-75 BYU Site Number _____

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 SW Sec. 33

Geographic Area: Ford Ridge

Drainage: Price River Elevation: 8300

Map Reference: Castle Gate Quad. Aerial Photo #: _____

Culture(s) Represented: _____

Type of Site: NONE Components: _____

Architecture: _____

No. of Rooms: _____ Condition: _____

Construction: _____ Depth: _____

Topography: Ridge top Soil Type: _____

Site Area: _____ Slope: _____

Exposure: _____ Access: None, to build road

Special Features: _____

Salvage Recommendations: _____

Artifacts (None collected _____ None observed _____)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags: _____

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-2-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 SW Sec. 33

Geographic Area: Ford Ridge, Crandall Canyon

Drainage: Price River Elevation: 8600

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Ridge top Soil Type:

Site Area: Slope:

Exposure: Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-3-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 NW Sec. 32

Geographic Area: Ford Ridge, Crandall Canyon

Drainage: Price River Elevation: 8650

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Near Ridge Top Soil Type:

Site Area: Slope:

Exposure: North Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-4-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 NW Sec. 32

Geographic Area: Ford Ridge, Crandall Canyon

Drainage: Price River Elevation: 8700

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Soil bench on slope Soil Type:

Site Area: Slope:

Exposure: North Access: None, road to be built

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-5-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 SW Sec. 32

Geographic Area: Ford Ridge, Sowbelly Gulch

Drainage: Spring Canyon, Price R. Elevation: 8400

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Slope Soil Type:

Site Area: Slope:

Exposure: East Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-6-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 SW Sec. 30

Geographic Area: Ford Ridge, Crandall Canyon

Drainage: Price River Elevation: 8750

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Soil bench on slope Soil Type:

Site Area: Slope:

Exposure: North Access: None, road to be built

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number: _____ Project Site Number: MC-7-75 BYU Site Number: _____

State: Utah County: Carbon Near Town: Helper

Location: T 12 S. R 9 E. 1/4 SW Sec. 31

Geographic Area: Ford Ridge, Rains Canyon

Drainage: Spring Canyon, Price R. Elevation: 8750

Map Reference: Castle Gate Quad. Aerial Photo #: _____

Culture(s) Represented: _____

Type of Site: NONE Components: _____

Architecture: _____

No. of Rooms: _____ Condition: _____

Construction: _____ Depth: _____

Topography: Ridge top Soil Type: _____

Site Area: _____ Slope: _____

Exposure: _____ Access: Existing road

Special Features: _____

Salvage Recommendations: _____

Artifacts (None collected _____ None observed _____)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags: _____

Remarks:

Recorder: J. Terry Walker Date: July 16, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-8-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 NW Sec. 31

Geographic Area: Rains Canyon

Drainage: Spring Canyon, Price R. Elevation: 8000

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Narrow Canyon Bottom Soil Type:

Site Area: Slope:

Exposure: Access: None, road to be built

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-9-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 9 E. 1/4 NE Sec. 36

Geographic Area: Rains Canyon

Drainage: Spring Canyon, Price R. Elevation: 8200

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Narrow canyon bottom Soil Type:

Site Area: Slope:

Exposure: Access: None, road to be built

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-10-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 8 E. 1/4 NE Sec. 35

Geographic Area: Cicochetto Canyon

Drainage: Spring Canyon Price R. Elevation: 8050

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Canyon bottom Soil Type:

Site Area: Slope:

Exposure: Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-11-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 8 E. 1/4 NW Sec. 35

Geographic Area: Burnt Tree Fork

Drainage: Spring Canyon, Price R. Elevation: 8050

Map Reference: Scofield Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Narrow canyon bottom Soil Type:

Site Area: Slope:

Exposure: Access: None, road to be built

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-12-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 8 E. 1/4 SW Sec. 35

Geographic Area: Burnt Tree Fork

Drainage: Spring Canyon, Price R. Elevation: 8050

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Canyon bottom Soil Type:

Site Area: Slope:

Exposure: Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-14-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 8 E. 1/4 NW/SW Sec. 36

Geographic Area: Ciochetto Canyon

Drainage: Spring Canyon, Price R. Elevation: 8000

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Canyon bottom Soil Type:

Site Area: Slope:

Exposure: Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

SITE SURVEY SUMMARY
Museum of Archaeology and Ethnology
Brigham Young University

Braztah Corp. Drill Sites Survey
PROJECT

Utah Survey Site Number	Project Site Number	BYU Site Number
	MC-14-75	

State: Utah County Carbon Near Town Helper

Location: T 12 S. R 8 E. 1/4 NW/SW Sec. 36

Geographic Area: Ciochetto Canyon

Drainage: Spring Canyon, Price R. Elevation: 8000

Map Reference: Castle Gate Quad. Aerial Photo #:

Culture(s) Represented:

Type of Site: NONE Components:

Architecture:

No. of Rooms: Condition:

Construction: Depth:

Topography: Canyon bottom Soil Type:

Site Area: Slope:

Exposure: Access: Existing road

Special Features:

Salvage Recommendations:

Artifacts (None collected None observed)

Ceramics:

Lithic:

Other:

Not collected:

Number of artifact bags:

Remarks:

Recorder: J. Terry Walker Date: July 22, 1975

Department of Anthropology and Archaeology

Brigham Young University

June 10, 1977

Mr. Ken Ball
American Electric Power Service Corp.
P.O. Box 629
Helper, UT 84526

Dear Ken:

Enclosed is a copy of the report for the 41 drill sites we examined along with the invoice. Copies have been sent to those individuals indicated below.

Sincerely,

Dale L. Berge

Dale L. Berge
Archaeologist

Distribution: USGS Sale Lake City
BLM Moab District Manager
BLM Price River Area Manager
BLM Utah State Office

cn
enclosure

130 MSRB, Brigham Young University, Provo, Utah 84602 (801) 374-1211, Extension 3058

Department of Anthropology and Archaeology

Brigham Young University

June 10, 1977

Mr. Leon Bergreen
Bureau of Land Management
Price, UT 84501

Dear Mr. Bergreen:

I have inspected 41 drill sites, as indicated on the accompanying map, and access roads to the locations for cultural resources for American Electric Power Services Corporation. No archaeological sites were found at any of the indicated drill hole sites or on any of the access roads. This lack of cultural evidence is probably due to the high elevation, steep canyon walls, or lack of subsistence resources and water.

State records indicate that no other archaeological sites have been discovered in the immediate area of this survey. Mr. Terry Walker, formerly of this department, conducted an archaeological survey at other drill hole sites for the same company with negative results.

It is recommended that a cultural resource evaluation clearance be granted to American Electric Power Services Corporation for the purpose of drilling.

Sincerely,

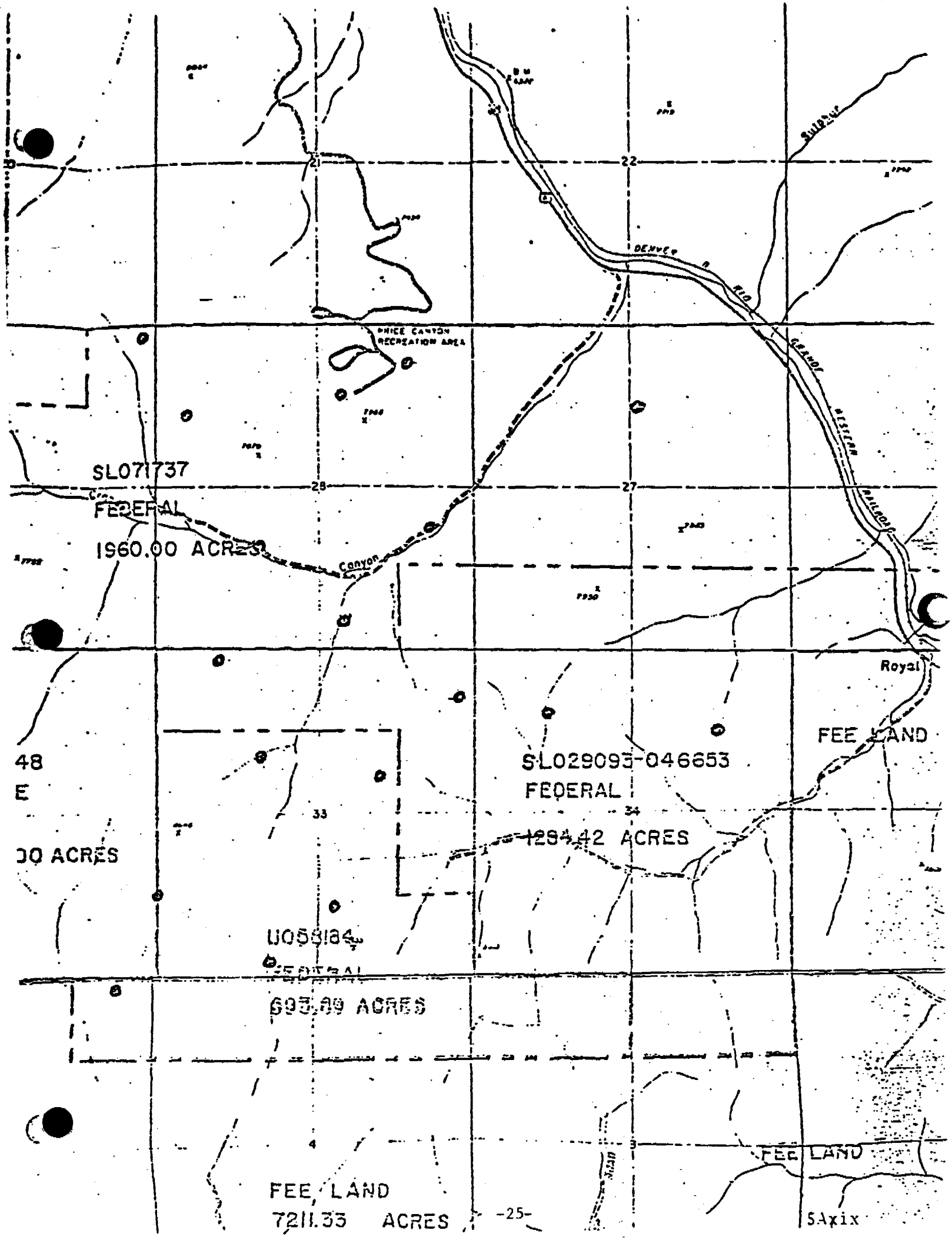
Dale L. Berge

Dale L. Berge
Archaeologist

DLB/cn
cc: ✓American Electric Power Services Corporation
Bureau of Land Management Moab District Office
Bureau of Land Management Utah State Office

5Axviii

130 MSRB, Brigham Young University, Provo, Utah 84602 (801) 374-1211, Extension 3058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FEDERAL
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Canyon
Royal
FEE LAND
SL029093-046653
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FEE LAND
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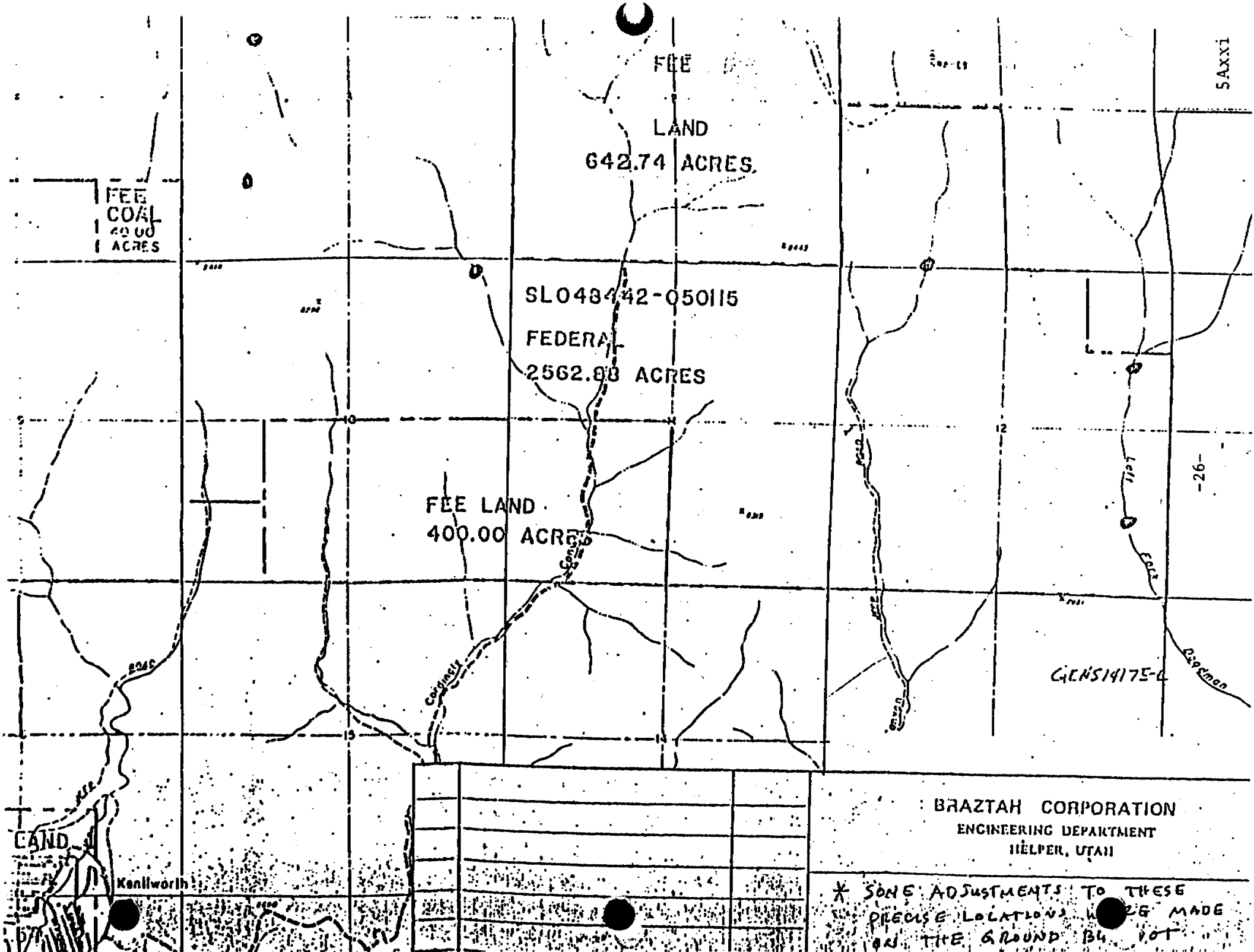
FEE LAND
5Axix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COAL
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FEDERAL
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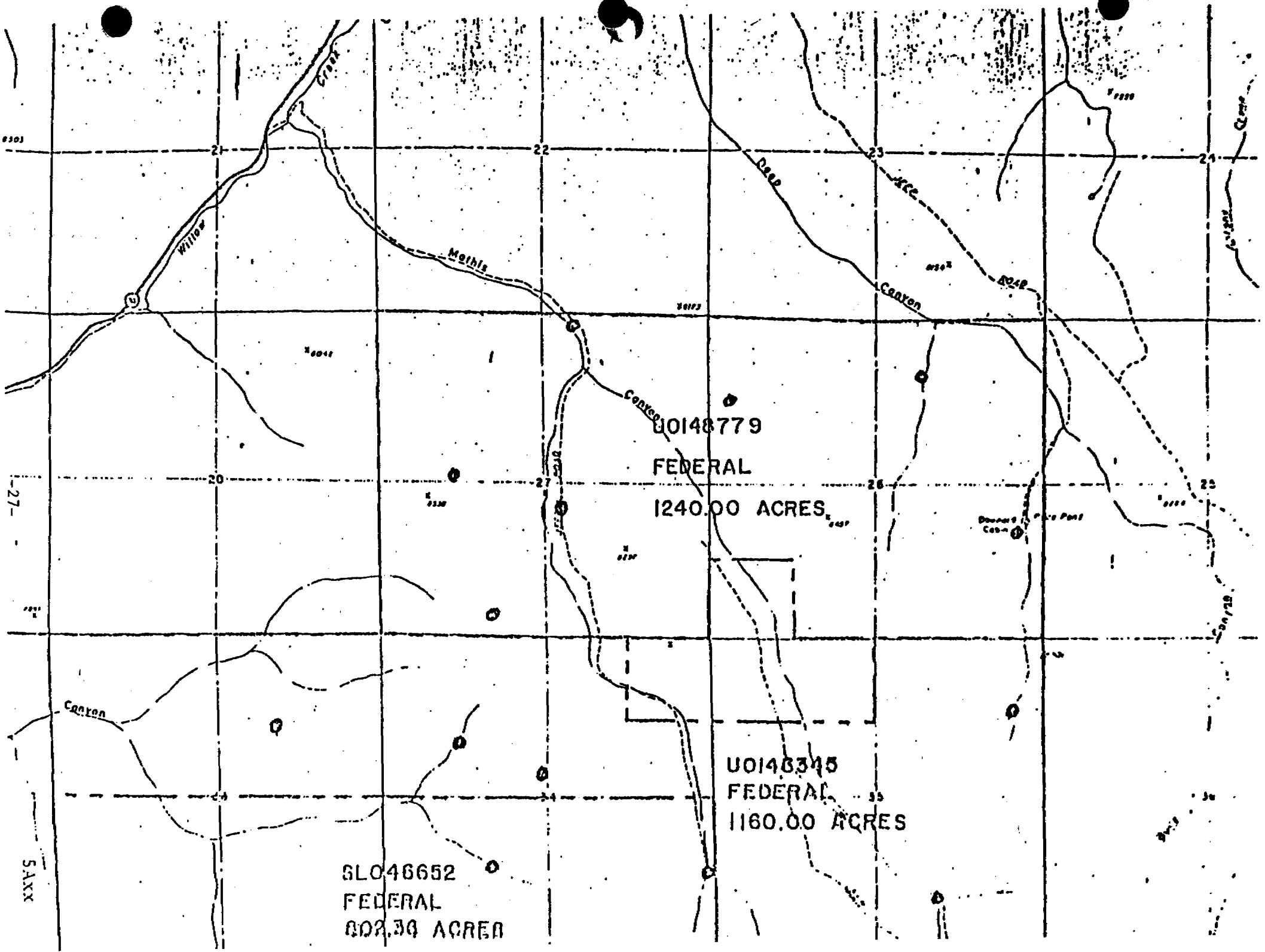
FEE LAND
400.00 ACRES
Cottonwood
Cottonwood
Kenilworth
GEN514175-4
BRAZTAH CORPORATION
ENGINEERING DEPARTMENT
HELPER, UTAH
* SOME ADJUSTMENTS TO THESE
PRECISE LOCATIONS
ON THE GROUND BY
5Axxi
-26-


Willow
Creek
Mathis
Canyon
Deep
Canyon
Canyon
U0148779
FEDERAL
1240.00 ACRES
U0146345
FEDERAL
1160.00 ACRES
SL046652
FEDERAL
802.36 ACRES
21
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23
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APPENDIX 5-B

HARPER/SISSON REPORT

AN ARCHEOLOGICAL AND HISTORICAL SURVEY OF TWELVE DRILL SITES AND ACCESS ROADS IN THE PRICE CANYON REGION OF CARBON COUNTY, UTAH

PREPARED FOR
AMERICAN ELECTRIC POWER SERVICE CORP.

By
Blake Harper
under the direction of
Edward B. Sisson
Department of Anthropology
University of Utah

Antiquities Permit Number 77-UT-081
BLM Mini Permit Number M-10

June 1978

INTRODUCTION

This report is submitted in partial fullfillment of an agreement between the University of Utah, Department of Anthropology, and the American Electric Power Service Corporation for the survey of the historical and prehistorical cultural resources of twelve drill sites and associated access roads in the Price Canyon region of Carbon County,

The survey was conducted by Blake Harper of the University of Utah during the second week in June, 1978. This report consists of a brief discussion of the physiography and setting of the drill sites in the Price Canyon area, an explanation of the survey procedures and techniques, and conclusions resulting from the survey.

ENVIRONMENTAL SETTING

The surveyed drill sites and access roads are located on land administered by the Bureau of Land Management, Moab District Office. In the survey area Cretaceous (Black Hawk Group, Castlegate Sandstone, Price River Formation, and Star Point Sandstone), Cretaceous and Tertiary Undifferentiated (North Horn Formation), and Paleocene and Eocene (Flagstaff Limestone) formations are exposed by numerous deep and narrow valleys (Stokes and Madsen 1961). All surveyed drill sites and access roads are on the slopes of steep ridges at elevations between 1,915 and 2,645 meters (6,300 to 8,700 feet).

Vegetation in the survey areas consists of the Ponderosa Pine zone. Common species include Ponderosa Pine (Pinus ponderosa), Utah

Juniper (Juniperus osteosperma), Quaking aspen (Populus tremuloides), Big sagebrush (Artemisia tridentata), and mountain mahogany (Cercocarpus montanus). Some species of the Chenopodiaceae and Compositae were also observed in the survey area.

PREVIOUS INVESTIGATIONS

A search of records and files at the Antiquities Section, Utah Division of State History, showed no previously recorded archeological or historical sites which will be directly impacted by the proposed work. There are no sites in the immediate vicinity listed on the National Register of Historic Places or on the State Register.

There have been no recent excavations in Carbon County. Areas which have seen extensive archeological investigation include the Range Creek Canyon and Mine Mile Canyon areas on the eastern and southern boundaries of the county. Many archeological surveys have been conducted in recent years and 267 Smithsonian trinomial site numbers have been assigned in Carbon County (Harper, et al., 1978:0). Only a few recorded sites are found in the general area of the present survey. A petroglyph site, 42Cb29, is located just west of Martin at the mouth of Hardscrabble Canyon. A historic site, 42Cb107, is located 4 km south of Standardville in Wildcat Canyon. Four small lithic scatters are located 8 km southwest of Standardville.

SURVEY PROCEDURES

Access to the twelve drill sites and access roads was possible by two wheel drive pickup except for MC 1-78 where the road was washed

out. None of the sites or access roads were specifically marked by flagging at the time of the survey, although an isolated piece of flagging was occasionally encountered. Locations of the survey areas were marked on USGS 7 1/2' topographic maps. As most of the proposed drill sites and access roads are in washes or are close to existing drill sites, the areas surveyed are believed to correspond closely to the proposed work areas.

For each drill site a minimum area of 50 by 50 meters was intensively surveyed by walking parallel transects spaced approximately 8 meters apart. Access roads were examined by walking two parallel transects approximately 10 m apart. In most cases the lines were more of a zigzag than a straight line because of rugged terrain and heavy vegetation. Care was taken, however, to insure that the area was intensively covered.

DRILL SITE DESCRIPTIONS

See figures "a" to "d" for the locations of drill pads and access roads.

Drill Site MC 1-78. Location: SE1/4 NE1/4 NE1/4 Section 4, T13S, R10E.

Drill Site MC 1-78 is located on alluvium at the junction of two unnamed washes approximately 3.5 km up Dry Canyon. An access road approximately 750 meters in length was also surveyed to the northwest. The proposed access road and drill site are reached by following a dirt road leading up Dry Canyon from State Highway 33. At the time of the

survey, this road was washed out by Willow Creek and the survey area was reached on foot. Both washes were dry at the time of the survey.

No cultural resources were located.

Drill Site MC 3-78. Location: NE1/4 NE1/4 SW1/4 Section 26, T12S, R9E.

Drill Site MC 3-78 is located 0.5 km north of the Castle Gate on the southeast side of a shallow wash which runs between two steep ridges. An access road was surveyed leading from U.S. Highway 6 and 50 to the site, a distance of approximately 400 meters. As this route must cross the Price River, access is easier by means of an existing dirt road which runs parallel to the railroad tracks on the northeast side of the river and highway. An abandoned masonary building is located just east of the proposed access road.

No cultural resources were located.

Drill Site MC 4-78. Location: SW1/4 NW1/4 SW1/4 Section 30, T12S, R9E.

Drill Site MC 4-78 is located on the north side of a jeep trail atop Ford Ridge approximately 3 km east of the radio towers on Beaver Peak. Approximately 250 meters north of the radio towers the jeep trail joins a dirt road which connects with Highway 6 and 50 a kilometer northwest of a picnic ground 15 km southeast of Soldier Summit. A second jeep trail forks to the north just west of the proposed site. An old corral is located on the west side of this jeep trail.

No cultural resources were located.

Drill Site MC 5-78. Location: NE1/4 SE1/4 NW1/4 Section 30, T12S, R9E.

Drill Site MC 5-78 is located 1 km northeast of MC 4-78. The access is the same as far as the junction of the two jeep trails. MC 5-78 is located 1 km from that junction on the northern jeep trail. A 150 meter access road leading east from the jeep trail to the drill site was also surveyed.

No cultural resources were located.

Drill Site MC 6-78. Location: NW1/4 SW1/4 SW1/4 SEction 31, T12S, R9E.

Drill site MC 6-78 is located on a steep ridge south of Ford Ridge and east of Rains Canyon. Access to the location is by the same dirt road and jeep trail as MC 4-78. Approximately 1.5 km past MC 4-78 there is a jeep trail leading south for 1 km and ending at drill site MC-106. The proposed access road from this point southwest to the drill site was also surveyed. This access road is approximately 350 meters in length.

No cultural resources were located.

Drill Site MC 7-78. Location: SW1/4 SW1/4 NE1/4 Section 31, T12S R9E.

Drill Site MC 7-78 is located on the side of the jeep trail which leads to MC-106 and MC 4-78. The jeep trail drops sharply following the side of the ridge, leveling off for a short distance approximately 350 meters north of MC-106. Drill site MC 7-78 is located in this level area.

No cultural resources.

Drill site MC 8-78. Location: SW1/4 SW1/4 NE1/4 Section 31, T12S, R9E.

Drill Site MC 8-78 is located near the top of Robinson Gulch. Access to the site is by means of a dirt road through Spring Canyon from Helper. A jeep trail following Robinson Gulch ends at Drill site MC-41. The proposed access road from that site leads to MC 8-78 approximately 400 meters northwest. This access road, following a steep arroyo which drains Ford Ridge from the north, was also surveyed.

No cultural resources were located.

Drill Site MC 9-78. Location: SE1/4 SW1/4 SE1/4 Section 31, T12S, R9E.

Drill Site MC 9-78 is located on the east slope of a steep ridge west of Robinson Gulch. Access is the same as for MC 6-78 to existing drill site MC-106. An access road from that site looping to the southeast was also surveyed. This proposed route is approximately 500 meters in length.

No cultural resources were located.

Drill Site MC 10-78. Location: NE1/4 NE1/4 NW1/4 Section 5, T13S, R9E.

Drill Site MC 11-78 is located on the east side of the highest peak between the upper ends of Robinson Gulch and Sowbelly Gulch. Access is by means of the main jeep trail atop Ford Ridge. Approximately 5 km east of the radio towers and 300 meters east of the jeep trail leading to MC 6-78, MC 7-78, MC 9-78, and MC 10-78, a jeep trail proceeds south from Ford Ridge to MC-114. Where this trail makes a sharp cutback, a 200 meter access road is proposed leading south to MC 11-78. Both the drill site and the access road were surveyed.

No cultural resources were located.

Drill Site MC 12-78. Location: NE1/4 SE1/4 NE1/4 Section 29, T12S, R9E.

Drill Site MC 12-78 is located 3.5 km from Highway 6 and 50 up Crandall Canyon. A dirt road runs through the canyon and a proposed access leaves the road at a meadow or shallow pond area. The access road follows a shallow wash for 400 meters looping to the north. Both the drill site and the access road were surveyed.

No cultural resources were located.

Drill Site MC 13-78. Location: NW1/4 NW1/4 NE1/4 Section 26, T12S, R9E.

Drill Site MC 13-78 is located 1 km east of Highway 6 and 50 on the side of a steep ridge 1 km north of The Castle Gate. Access to the

site was via an unnamed paved road through Emma Park which leaves Highway 6 and 50 near Kyune. A dirt road leaves the paved road at Matt's Summit and proceeds south to the edge of a high plain overlooking Price Canyon. An access road is proposed looping 2.75 km southwest from this trail to the drill site. The access road follows the edge of the high plain for 1.5 km and then drops sharply along the side of a steep ridge. Highway 6 and 50 is visible to the south at many places along this ridge. Both the access road and the drill site were surveyed.

No cultural resources were located.

SURVEY RESULTS

No archeological or historical sites were found during the survey. The intensive survey and records search indicates that no cultural resources (historic or prehistoric) are endangered by the proposed drilling activities and access roads. However, if buried archeological features are encountered during drill site activities, all work should halt immediately and an archeologist informed.

REFERENCES CITED

Harper, Blake, et al.

1978 An Archeological Reconnaissance of Proposed Green River Reservoir, Green River Generating Plant, Green River to Emery Pipeline, Green River to Huntington Transmission Line, Green River to Wellington Pipeline via Highway 6, Green River to Wellington Pipeline via Buckhorn Flat, Wellington Generating Plant, Wellington to Huntington Transmission Line, Emery to Huntington Transmission Line, Muddy Creek Reservoir, Muddy Creek to Emery Pipeline. Ms. of file, University of Utah Archeology Laboratory. Salt Lake City.

Stokes, William Lee and James H. Madsen, Jr.

1961 Geologic Map of Utah, Northeastern Quarter. Map authorized and financed by Utah State Land Board.

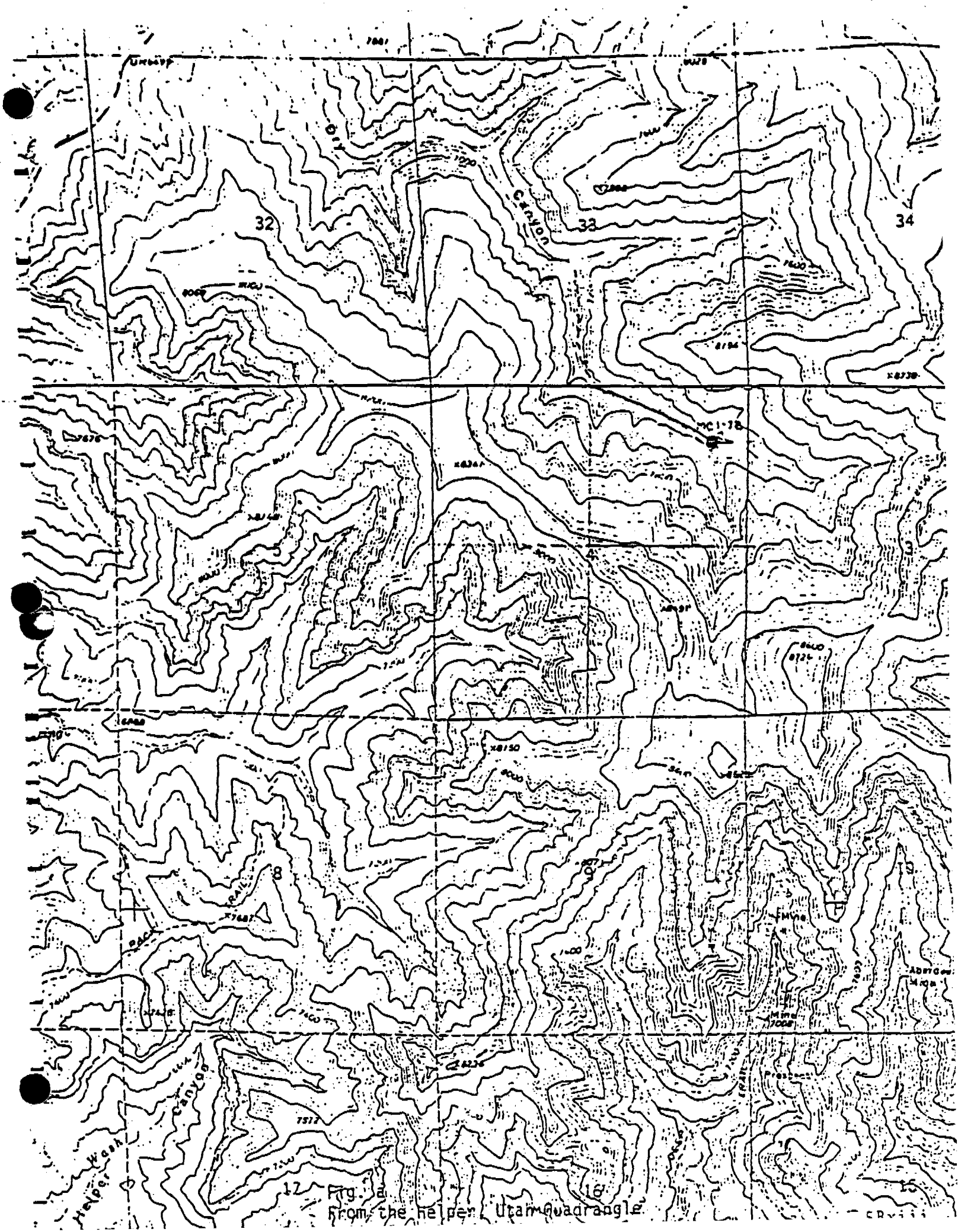

Fig. 2
From the Helper, Utah Quadrangle

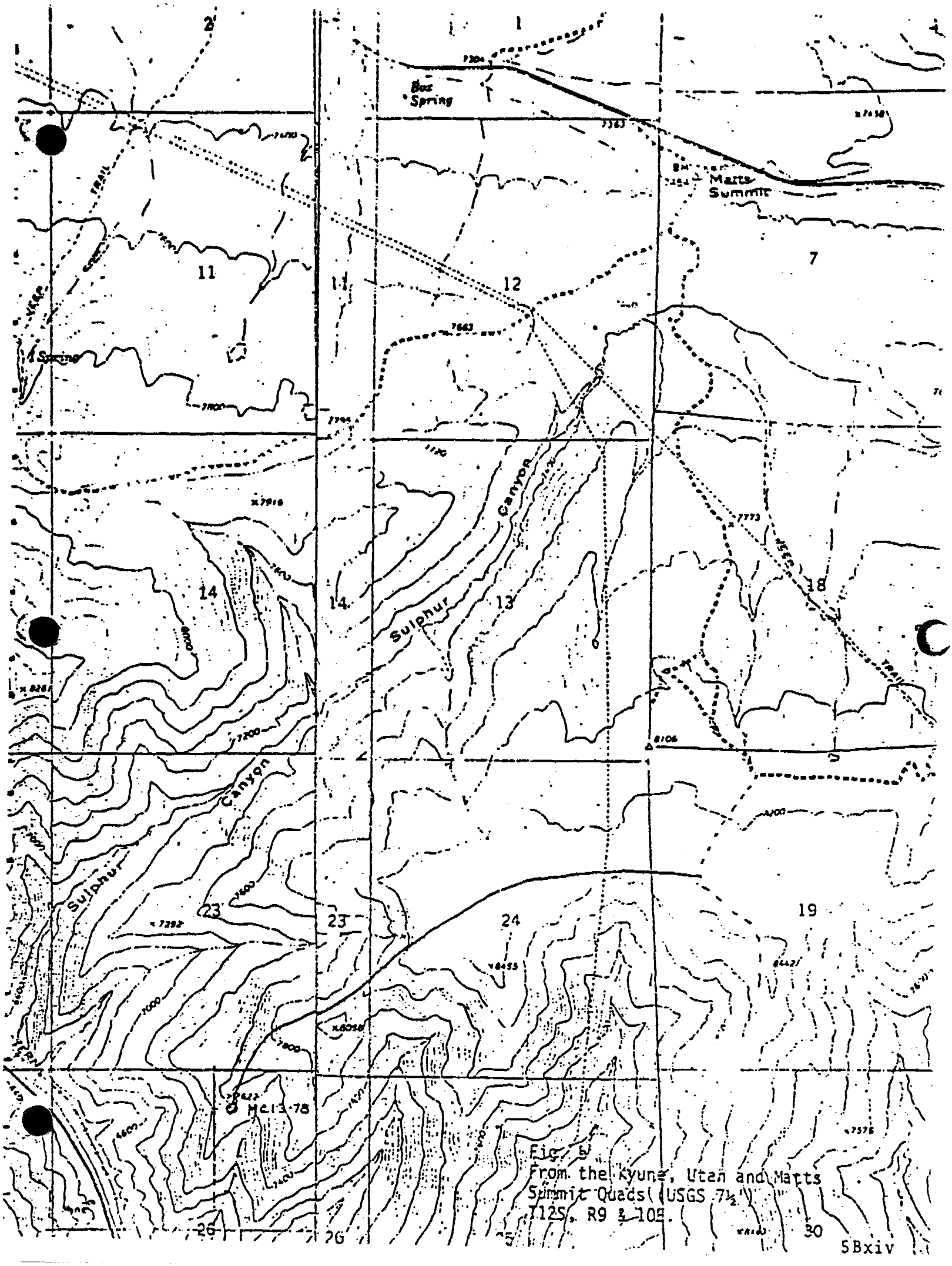

Fig. 6
From the Kyune, Utah and Matts Summit Quads (USGS 7½')
T12S, R9 & 10E.

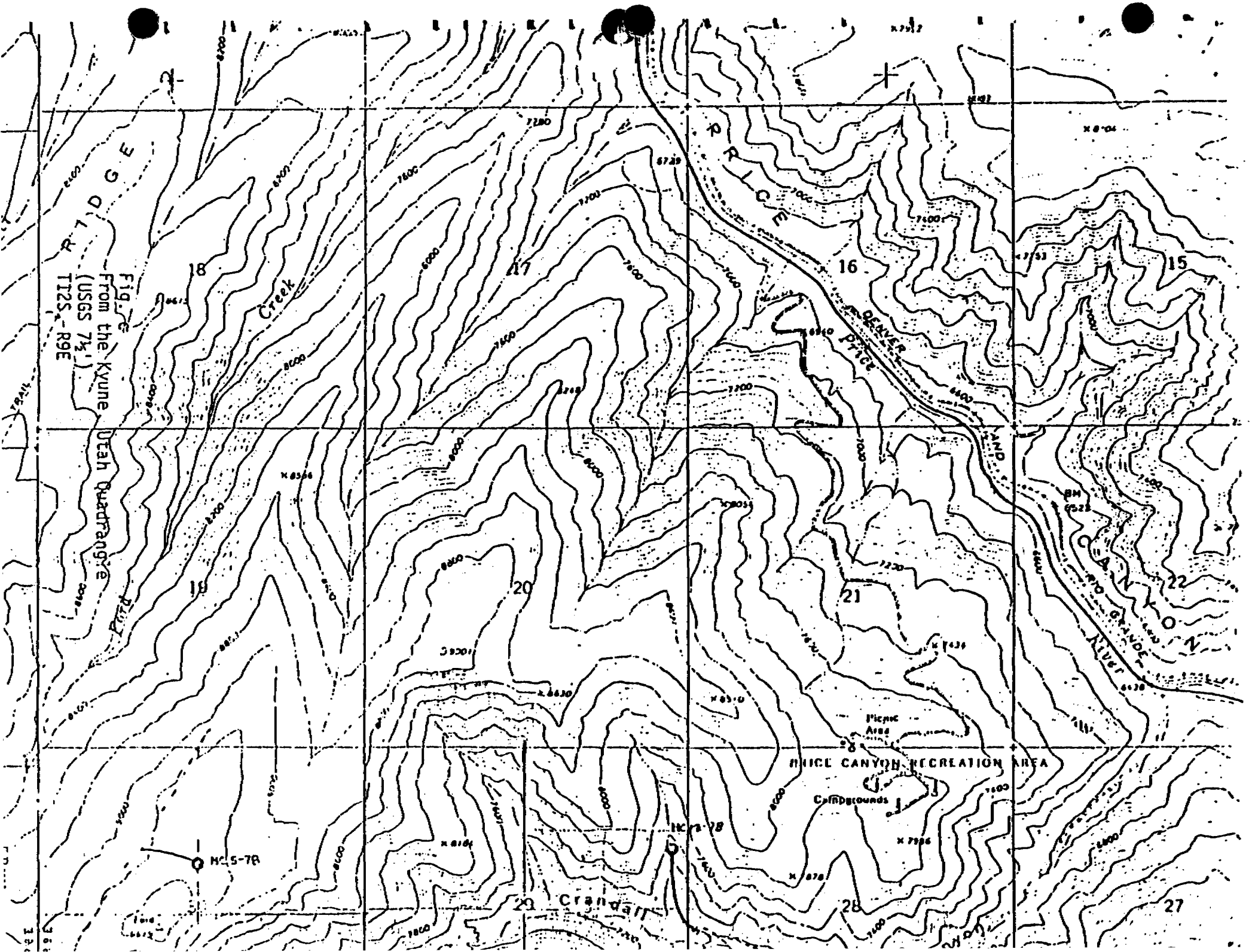
Fig. 2
From the Kyune
(USGS 7½')
T12S-R9E
Utah Quadrangle
RIDGE
Creek
PRICE
DENVER
Price
RIO GRANDE
RIVER
CANYON
Picnic Area
PRICE CANYON RECREATION AREA
Campgrounds
HC-5-7B
HC-5-7A
Crandall
18
17
16
15
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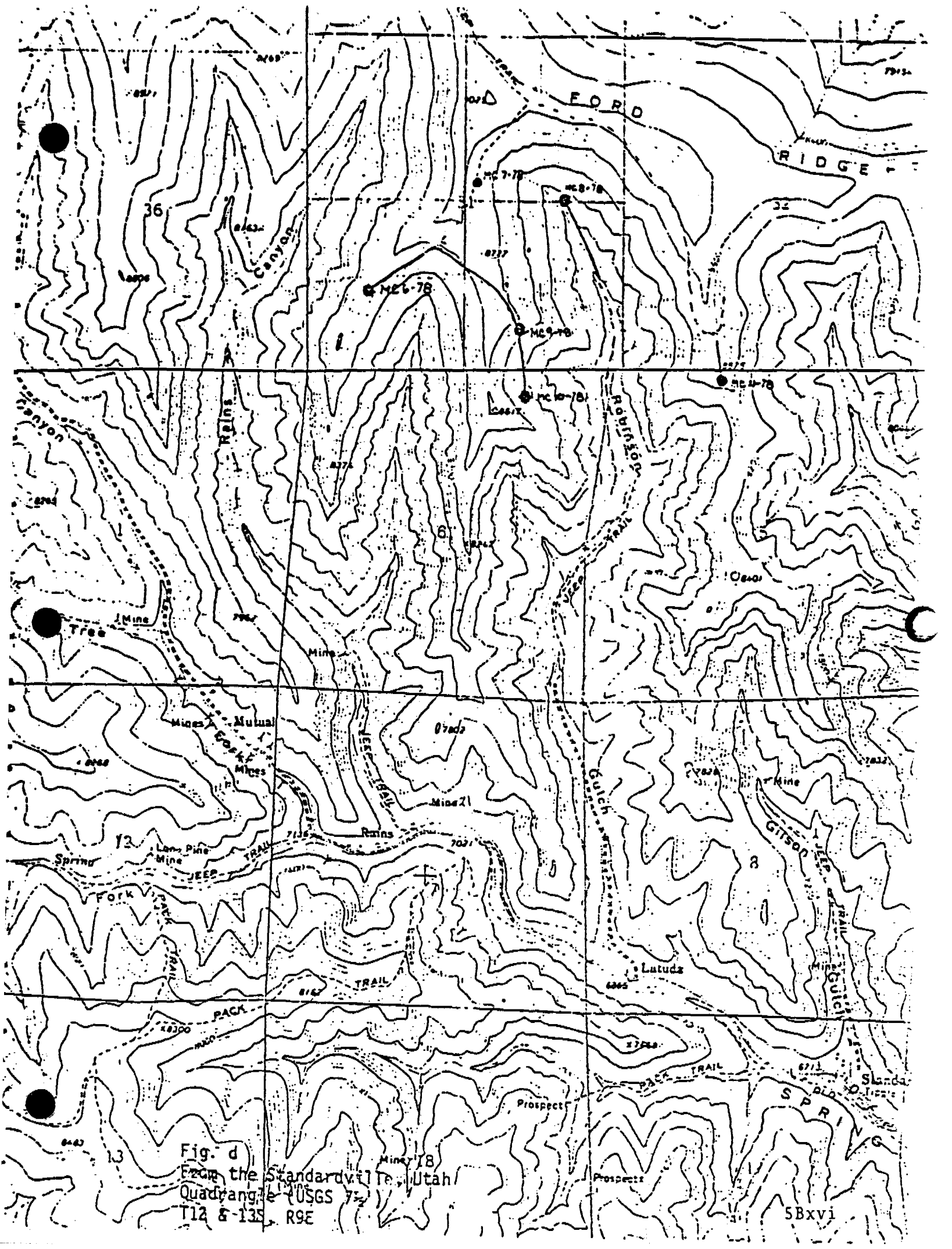


Fig. d
From the Standardville, Utah
Quadrangle (USGS 7½)
T12 & 13S, R9E

APPENDIX 5-C

ARCHAEOLOGICAL RESEARCH CORP. REPORT

ARCHEOLOGICAL - ENVIRONMENTAL RESEARCH CORPORATION

P.O. Box 17544 – Salt Lake City, Utah 84117
Tel.: (801) 486-0261

June 15, 1979

Subject: Archeological Survey North of Helper, Carbon County, Utah

Project: American Electric Power Service Corporation Water Well Drilling Project

Project No.: AEP-79-2

BLM Permit: 79-Ut-061 (M-12)

To: Mr. Don A. Stephens, American Electric Power Service Corporation, P.O. Box 629, Helper, Utah 84526

Mr. Leon Berggren, Price River Area Manager, P.O. Box AB, Price, Utah 84501

Mr. Gene Day, District Manager, Bureau of Land Management, P.O. Box 970, Moab, Utah 84532

Info.: Mr. Richard Fike, BLM Archeologist, Bureau of Land Management, University Club Bldg., 136 East South Temple, Salt Lake City, Utah 84111

RECEIVED

JUN 22 1979

AEP
SERVICE CORPORATION
HELPER, UTAH

General:

On Wednesday, June 13, a cultural resource inventory was conducted by AERC staff archeologist Wayne Howell at American Electric Power Service Corporation's reserve well located overlooking Sowbelly Gulch, and a water well located in Crandall Canyon. The inventory included examination of the reserve well location which is situated in the NE¼, NE¼, NW¼ of Section 5, Township 13 South, Range 9 East, and its accompanying access road, and the water well location which is situated in the SE¼, NW¼, SE¼ of Section 28, Township 12 South, Range 9 East, and its accompanying access road.

The drill locations were examined by walking parallel 10 meter wide transects over the entire area. The access roads were examined by walking 15 meter wide zig-zag transects their entire length.

Results and Recommendations:

No cultural remains of any prehistoric or historic period were observed. Therefore, AERC recommends cultural clearance for the project provided American Electric Power Service Corporation adheres to the following stipulations:

1. All vehicular traffic, personnel movement, and construction be confined to the locations examined and to access roads leading into these locations.

2. All personnel refrain from collecting individual artifacts or from disturbing any cultural resources in the area.

3. A qualified archeologist be consulted should cultural remains from subsurface deposits be exposed during construction work or if the need arises to relocate or otherwise alter the construction area.

Wayne Howell (for F. R. Hauck)
Wayne Howell, Archeologist

F. R. Hauck
F. R. Hauck, Ph.d., President

Attachment 3

U.S.
Department of the Interior
Bureau of Land Management
Utah State Office

Summary Report of
Inspection for Cultural Resources

BLM Report ID No. | | | |-| | | | | | | (1–10)

Report Acceptable Yes __ No __

Mitigation Acceptable Yes __ No __
Comments: _____

1. Cultural Report or Project PRICE RIVER CANYON LOCALITY (11–40)

2. Development Company American Electric Power Service Corporation

3. BLM Mini Permit No. M-12 (41–45)

4. BLM Antiquities Permit No. 79-Ut-061 (46–55)

5. Report Date 6 15 79 (56–62) (Month Day Year)

6. Field Work Dates June 13, 1979

7. Responsible Institution AERC (63–77)

Fill in spaces 81, 85, 93, 97 only if:
Y = Vernal Meridian
H = Half Township

8. Fieldwork Location:
TWN 12S (78–81) Range 9E (82–85) Section(s) 28 (86, 87) 32 (88, 89)
TWN 13S (90–93) Range 9E (94–97) Section(s) 6 (98, 99) (100, 101)

9. Resource Area PR (102, 103) Other: _____ County

BO = Bonneville, WA = Wasatch, HR = House Range, WS = Warm Springs,
SE = Sevier River, HM = Henry Mtns., BR = Beaver River, DX = Dixie,
KA = Kanab, ES = Escalante, SJ = San Juan, GR = Grand, PR = Price River,
SR = San Rafael, DM = Diamond Mountain, BC = Book Cliffs.

10. Description of Examination Procedures:
The drill locations were examined by walking parallel 10 meter wide transects over the entire area. The access roads were examined by walking 15 meter wide zig-zag transects their entire length.

11. Linear Miles Surveyed 5 (104–112)
and/or
Definable Acres Surveyed 2 (113–121)
and/or
*Legally Undefinable Acres Surveyed (122–130)
(*A parcel hard to cadastrally locate i.e., center of section)

12. Inventory Type I (131)
R = Reconnaisance
I = Intensive
S = Statistical Sample

13. Description of Findings (attach appendices, if appropriate)
No cultural remains of any historic or prehistoric period were observed.

14. Number Sites Found: | | | | | (132–136)
No sites = 0

15. Collection: | | Y = Yes, N = No (138)

16. Actual/Potential National Register Properties Affected:
None

17. Conclusion/Recommendations: AERC recommends that a cultural resourse clearance be awarded the American Electric Power Service for development of the locatic noted above providing their adherence to the following stipulations: 1. all vehicular traffic, personnel movement, and construction be confined to the locations examined and to access roads leading into these locations; 2. all personnel refrain from collecting individual artifacts or from disturbing any cultural resources in the area; and 3. a qualified archeologist be consulte*

18. Signature of person in direct charge of field work: [signature]

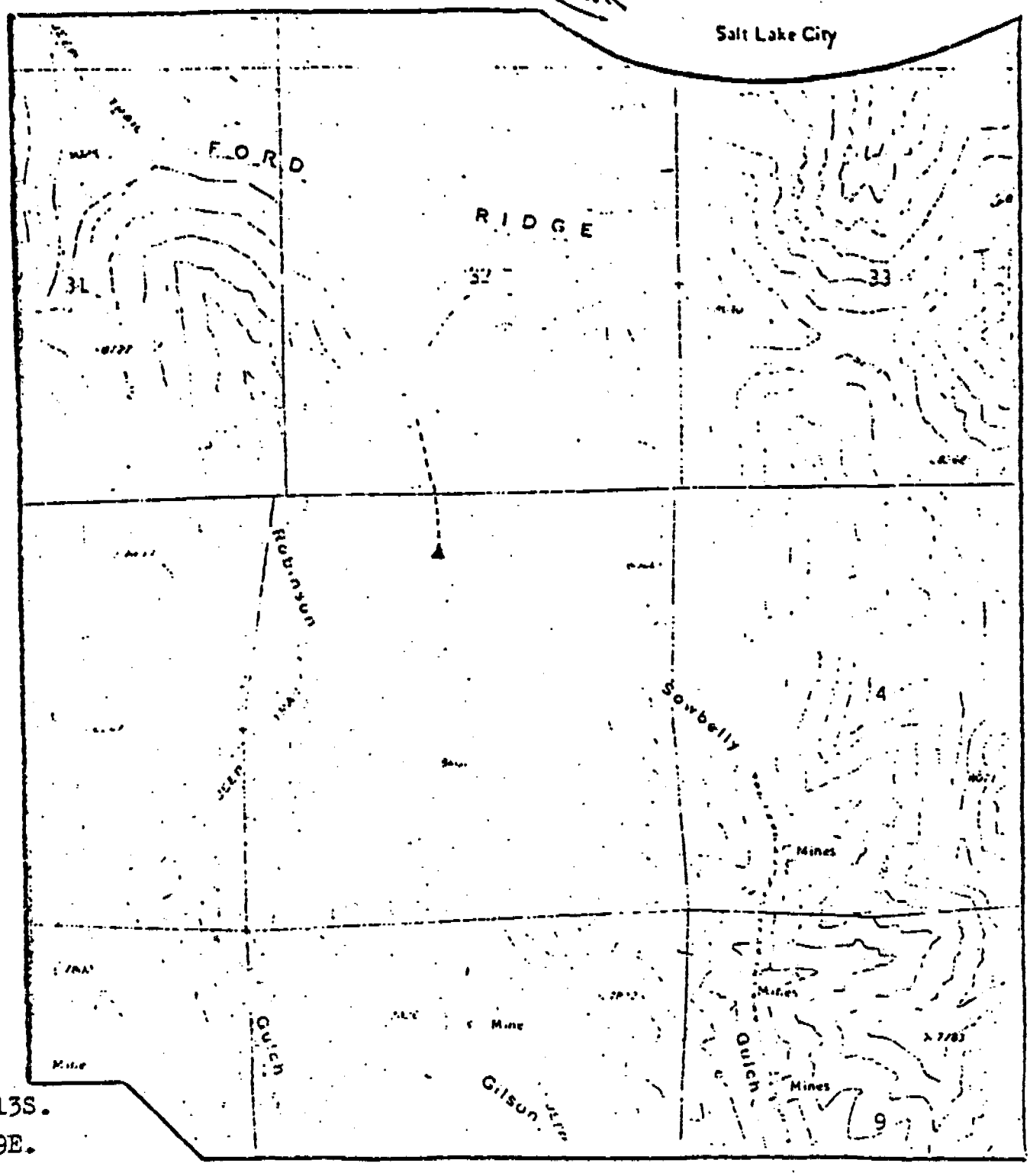
19. Signature and Title of Institutional Officer Responsible [signature]
President

UT 8100-3 (4/79)

*should cultural remains from subsurface deposits be exposed during construction work or if the need arises to relocate or otherwise alter the construction area.

ARCHEOLOGICAL-ENVIRONMENTAL RESEARCH CORPORATION

Salt Lake City



T. 13S.

R. 9E.

Meridian: Salt Lake

Quad: Kyune, Utah 7.5'

Project: AEP-79-2

Series: Eastern Utah

Date: 6-15-79

WATER WELL LOCATIONS IN CARBON COUNTY, UTAH

-43-

Legend:

Drill Location ▲

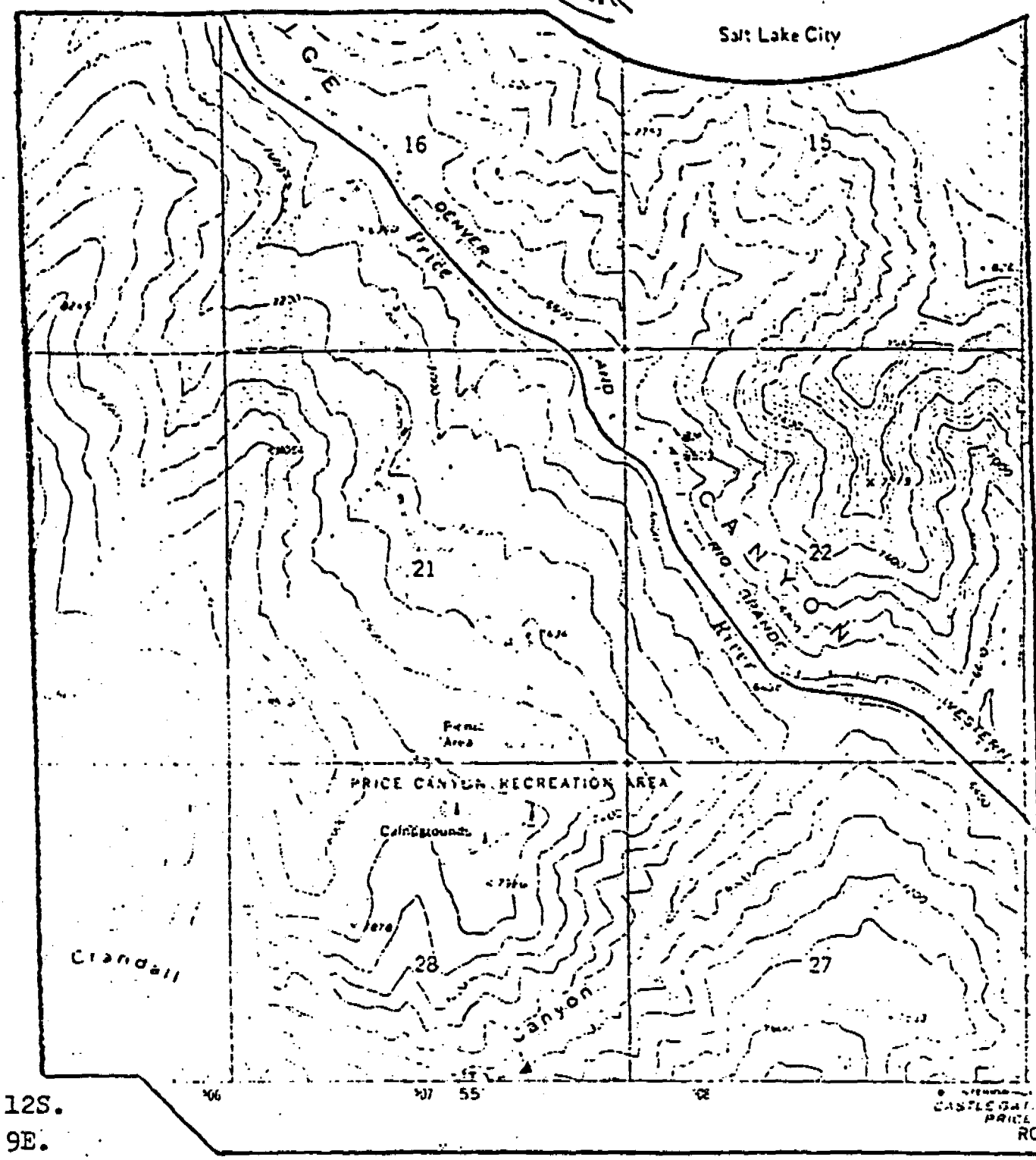
Access Road

.5 0 .5 M

N

ARCHEOLOGICAL-ENVIRONMENTAL RESEARCH CORPORATION

Salt Lake City



T. 12S.

R. 9E.

Meridian: Salt Lake

Quad: Kyune, Utah 7.5'

Project: AEP-79-2

Series: Eastern Utah

Date: 6-15-79

WATER WELL LOCATIONS IN CARBON COUNTY, UTAH

-44-

Legend:

Drill Location ▲

Access Road

.5 0 .5 M

.5 0 .5 1Km

N

5Cv

ARCHEOLOGICAL - ENVIRONMENTAL RESEARCH CORPORATION

P.O. Box 17544 — Salt Lake City, Utah 84117
Tel.: (801)

Subject: Non-intensive Cultural Resource Evaluations in the Ford Ridge Locality of Carbon County, Utah

Project: American Electric Power Company/Braztah Sites and Access Roads for #3 and #5

Project No.: AEP-79-1

Permit: 79-Ut-061 (m-12)

To: Mr. Donald Stephens, Project Geologist, American Electric Power Company, P.O. Box 629, Helper, Utah 84526

Mr. Gene Day, District Manager, BLM, P.O. Box 970, Moab, Utah 84532

Mr. Leon Berggren, Price Area Manager, BLM, P.O. Box AB, Price, Utah 84501

Info: Mr. Richard Fike, BLM Archeologist, BLM, University Club Bldg., 136 East South Temple, Salt Lake City, Utah 84111

5Cvi

U.S.
Department of the Interior
Bureau of Land Management
Utah State Office

Summary Report of
Inspection for Cultural Resources

For BLM Use Only

Attachment 5

BLM Report ID No. ___-___ (1–10)

Report Acceptable Yes __ No __

Mitigation Acceptable Yes __ No __

Comments: _____

1. Cultural Report or Project: Partial Locations - Fordd Ridge (11–40)

2. Development Company: American Electric Power Company (AEP-79-1)

3. BLM Mini Permit No. 12 (41–45)

4. BLM Antiquities Permit No. 79-Ut-061 (46–51)

5. Report Date: 4 (Month) 27 (Day) 1979 (Year) (56–62)

6. Field Work Dates: 4-24-79

7. Responsible Institution: AERC (63–77)

Fill in spaces 81, 85, 93, 97 only if:
V = Vernal Meridian
H = Half Township

8. Fieldwork Location:
TWN 12S (78–81) Range 9E (82–85) Section(s) ___ (86–87) ___ (88–89)
TWN 13S (90–93) Range 9E (94–97) Section(s) ___ (98–99) ___ (100–101)

9. Resource Area: PR (102–103) Other: Carbon County

BO = Bonneville, WA = Wasatch, HR = House Range, WS = Warm Springs,
SE = Sevier River, HM = Henry Mtns., BR = Beaver River, DX = Dixie,
KA = Kanab, ES = Escalante, SJ = San Juan, GR = Grand, PR = Price River,
SR = San Rafael, DM = Diamond Mountain, BC = Book Cliffs.

10. Description of Examination Procedures: The archeologist conducted a non-intensive examination of the localities for the Braztah #3 and #5 layouts including access roads, service areas and well locations. Most of the proposed locations have been previously impacted. The locatio are all on steep talus slopes at an elevation between 6600 and 7300 feet. Very marginal potential for cultural resources.

11. Linear Miles Surveyed ___ (104–112)
and/or
Definable Acres Surveyed ___ (113–121)
and/or
*Legally Undefinable Acres Surveyed 3 (122–130)
(*A parcel hard to cadastrally locate i.e., center of section)

12. Inventory Type: R (131)
R = Reconnaisance
I = Intensive
S = Statistical Sample

13. Description of Findings (attach appendices, if appropriate)
No prehistoric or historic cultural resources of any type were observed on Federal lands.

14. Number Sites Found: 0 (132–133)
No sites = 0

15. Collection: N (138) Y = Yes, N = No

16. Actual/Potential National Register Properties Affected:

No National Register status properties will be affected by the project.

17. Conclusion/Recommendations: AERC recommends cultural resource clearance and a determination of "no effect" be provided contingent to the developer's adherence to the following stipulations: 1. all vehicular traffic personn movement and construction be confined to the location examined and to evaluated access roads; 2. all personnel refrain from collecting individ

18. Signature of person in direct charge of field work: F. R. Hauck

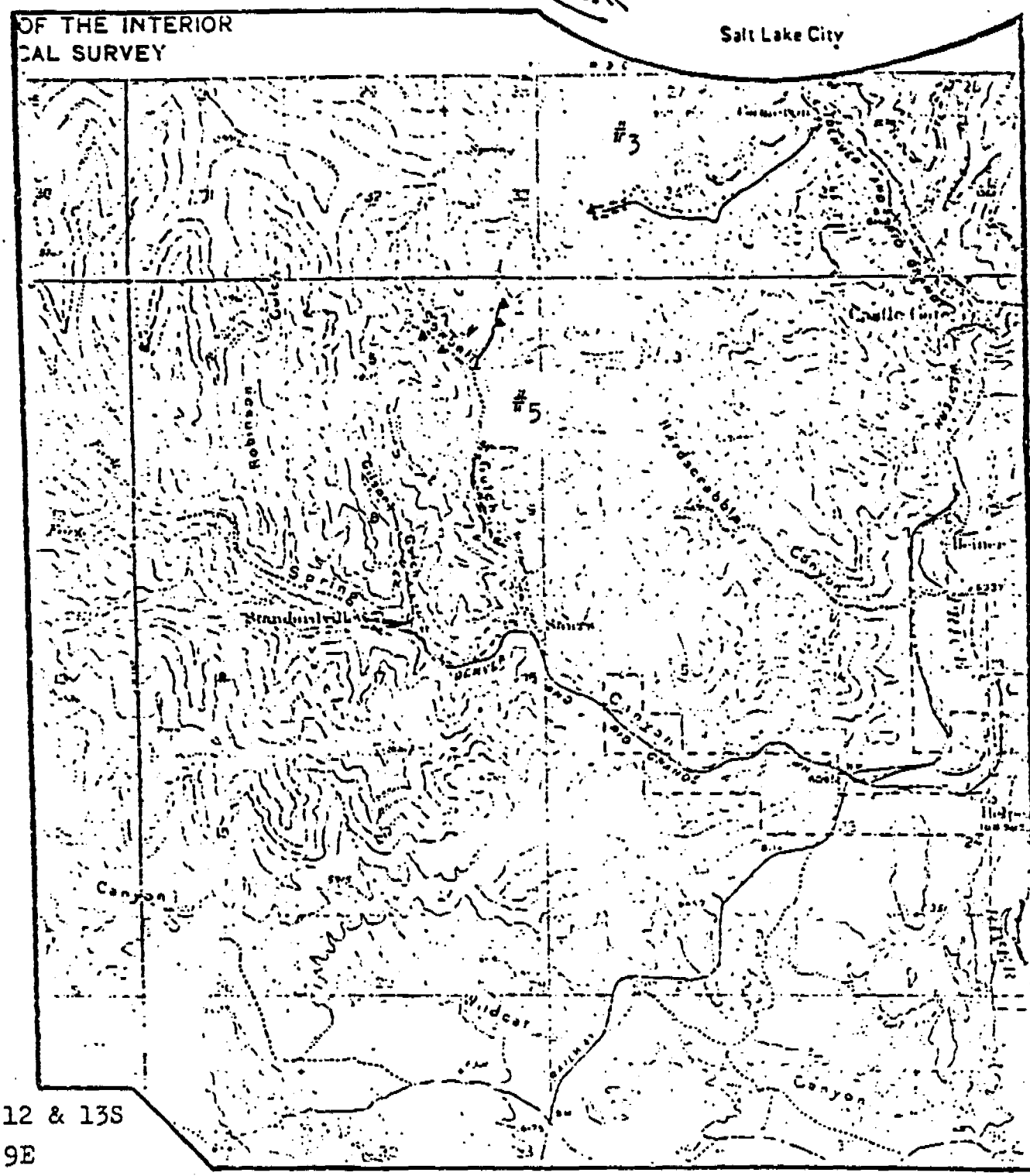
19. Signature and Title of Institutional Officer Responsible F. R. Hauck F. R. Hauck
President

UT 8100-3 (3/79) 5Cvii

*artifacts or from disturbing any cultural resources

ARCHEOLOGICAL-ENVIRONMENTAL
RESEARCH CORPORATION

Salt Lake City



T. 12 & 13S

R. 9E

Meridian: Salt Lake B&M

Quad: Castle Gate, Utah
15 Minute USGS

Project: AEP-79-1

Series: Central Utah

Date: 4-27-79

BRAZTAH #3 and #5
LOCATIONS

Legend:

Drill location

Access road

Service area

0 .5 1

.5 0 .5 1 Km

APPENDIX 5-D

ARCHAEOLOGICAL RESEARCH CORP. REPORT

ARCHEOLOGICAL - ENVIRONMENTAL RESEARCH CORPORATION

588 West 800 South Bountiful, Utah 84010
Tel: (801) 292-7061 or 292-9668

October 22, 1979

Subject: An Archeological Reconnaissance of Proposed Well Locations and Access Roads in the Matt's Summit Locality of Carbon County, Utah

Project: American Electric Power Service Corporation - 1979 Drilling Program

Project No.: AEP-79-3

Dept. of Interior Permit No.: 79-Ut-061

To: Mr. Don A. Stephens, Resident Geologist, American Electric Power Service Corporation, P.O. Box 629, Helper, Utah 84526

Mr. Gene Day, BLM District Manager, Bureau of Land Management, Moab Office, P.O. Box 970, Moab, Utah 84532

Mr. Leon Berggren, BLM Area Manager, Bureau of Land Management, Price Resource Area, P.O. Box AB, Price, Utah 84501

Info: Mr. Richard Fike, BLM Archeologist, Bureau of Land Management, University Club Bldg., 136 East South Temple, Salt Lake City, Utah 84111

Dr. David Madsen, State Archeologist, Antiquities Section, 307 West 200 South, Suite 1000, Salt Lake City, Utah 84101

3Di

U.S.
Department of the Interior
Bureau of Land Management
Utah State Office

Summary Report of
Inspection for Cultural Resources

For BLM Use Only

BLM Report ID No. ____-____ Attachment

Report Acceptable Yes __ No __

Mitigation Acceptable Yes __ No __
Comments: _____

1. Cultural Report or Project: Eight Drill Sites and Access Roads

2. Development Company: American Electric Power

3. BLM Mini Permit No. ____ (41–45)

4. BLM Antiquities Permit No. 79-UT-061 (46–51)

5. Report Date: 10 (Month, 56–58) 19 79 (Day, 59–62; Year)

6. Field Work Dates: 10/10-12/79

7. Responsible Institution: AERC (63–77)

Fill in spaces 81, 85, 93, 97 only if: V = Vernal Meridian, N = Half Township

8. Fieldwork Location: TWN 12S (78–81) Range 10E (82–85) Section(s) 28 (86, 87) 29 (88, 89) and 30.
TWN 12S (90–93) Range 9E (94–97) Section(s) 25 (98, 99) 26 (100, 101)

9. Resource Area: PR (102, 103) Other: Carbon County

BO = Bonneville, WA = Wasatch, HR = House Range, WS = Warm Springs,
SE = Sevier River, MM = Henry Mtns., BR = Beaver River, DX = Dixie,
KA = Kanab, ES = Escalante, SJ = San Juan, GR = Grand, PR = Price River,
SR = San Rafael, DM = Diamond Mountain, BC = Book Cliffs.

10. Description of Examination Procedures: An archeologist walked parallel and zig zag transects 12 to 15 meters apart inspecting drill sites up to 150 foot radius from centers marked with red and blue flagging. A 15 meter corridor for access roads was inspected and marked along the center line with orange or red flagging. Drill site No. 6 (see map) was not flagged because of the difficulty in pinpointing the locality. However, the entire bottom of the

11. Linear Miles Surveyed: 3.6 (104–112)
and/or
Definable Acres Surveyed: ____ (113–121)
and/or
*Legally Undefinable Acres Surveyed: ____ (122–130)
(*A parcel hard to cadastrally locate i.e., center of section)

12. Inventory Type: I (131) (see reverse)
R = Reconnaisance
I = Intensive
S = Statistical Sample

13. Description of Findings (attach appendices, if appropriate)
One historic stone structure was inspected, photographed, sketched, and recorded on an Antiquities Site Inventory form for reporting to concerned agencies. The site was recorded as AERC 350N/1.

14. Number Sites Found: 1 (132)
No sites = 0

15. Collection: N (133) Y = Yes, N = No

16. Actual/Potential National Register Properties Affected:

No National Register Properties will be affected by this project.

17. Conclusion/Recommendations:

AERC recommends that a cultural resource clearance be granted to based on adherence to the following stipulations:
(see reverse)

18. Signature of person in direct charge of field work: V. Garth Norman

19. Signature and Title of Institutional Officer Responsible: F. R. Hauck
F. R. Hauck, Ph.D.
President

1. All vehicular traffic, personnel movement, and construction to be confined to the locations examined and to access roads leading into these locations.

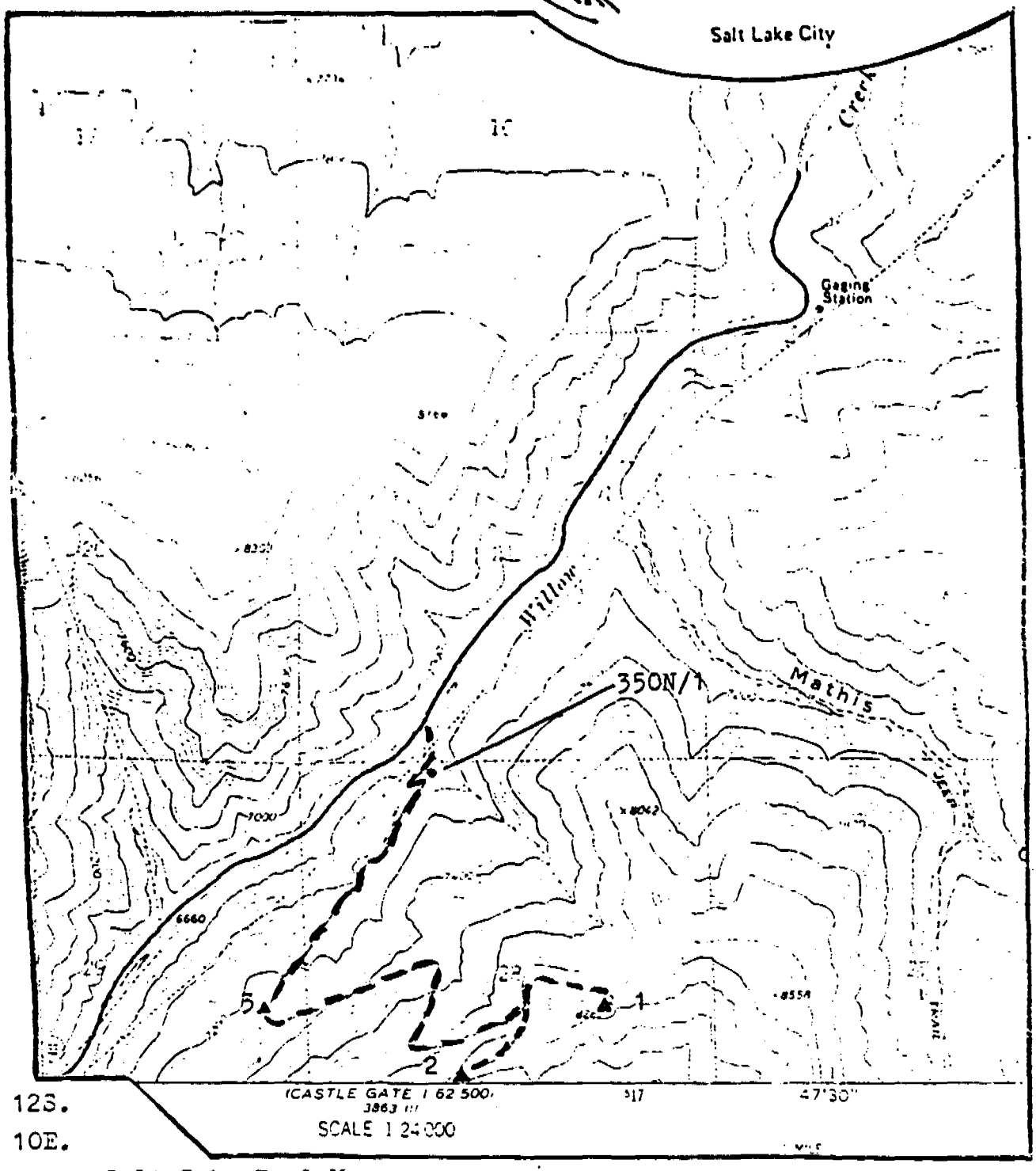
2. All personnel refrain from collecting individual artifacts or from disturbing any cultural resources in the area.

3. A qualified archeologist be consulted should cultural remains from subsurface deposits be exposed during construction work or if the need arises to relocate or otherwise alter the construction area.

#10 continued--canyon was examined beyond the site locality to the proximity of the drainage and ridge on the slopes to the north of the drill site locality.

5Diii

ARCHEOLOGICAL-ENVIRONMENTAL RESEARCH CORPORATION



T. 12S.

R. 10E.

Meridian: Salt Lake B. & M.

Quad: Matt's Summit Quad, Utah 7.5 Minute USGS

Project: AEP-79-3

Series: Central Utah

Date: 10/22/79

ACCESS ROAD AND WELL LOCATIONS IN THE WILLOW CREEK LOCALITY, CARBON COUNTY, UTAH

Legend:

Existing Road

Access Road

Drill Location

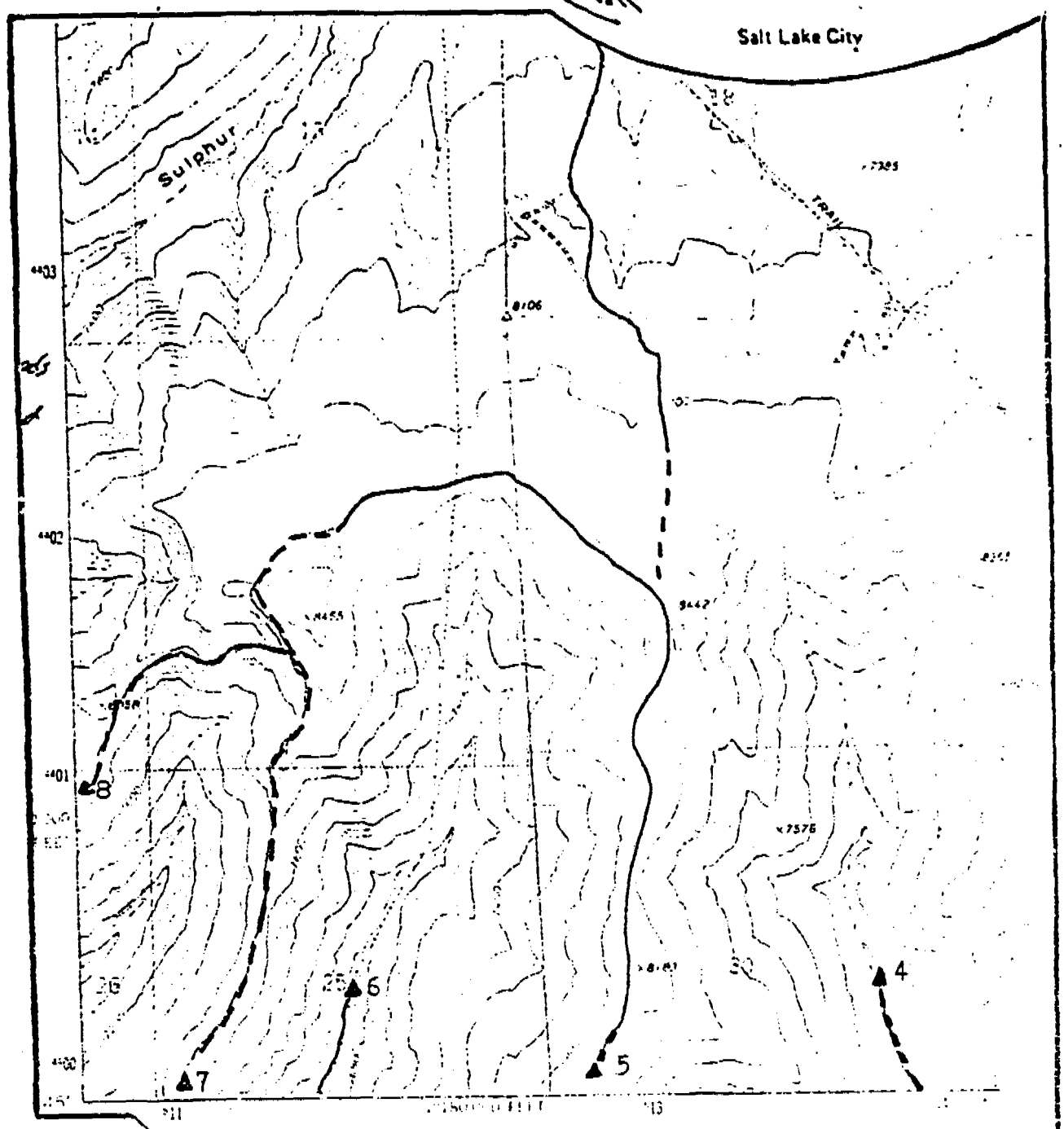
Archeological Site

0 .5 1 mi

.5 0 .5 1 Km

Scale

ARCHEOLOGICAL-ENVIRONMENTAL
RESEARCH CORPORATION



T. 12S.
R. 9 & 10E.

dited, and published by the Geological Survey
S and USC&GS

Meridian: Salt Lake B. & M.

Quad:
Matt's Summit, Utah
7.5 Minute
USGS

Project: AEP-79-3
Series: Central Utah
Date: 10/22/79

ACCESS ROAD AND WELL LOCATIONS IN THE MATT'S SUMMIT LOCALITY OF CARBON COUNTY, UTAH

Legend:
Existing Road
Access Road
Drill Location

0 .5 1 mi
.5 0 .5 1 Km
Scale

APPENDIX 5-E

SARGENT REPORT

M E M O R A N D U M

TO: LaMar Lindsay
Assistant State Archeologist

DATE: July 3, 1980

FROM: Kay Sargent
Staff Archeologist

RE: Crandall Canyon Survey, Price River Coal Co.

I spent Monday, June 30, and Tuesday, July 1, surveying the bottom of Crandall Canyon and a transect from the upper part of that canyon into upper Hardscrabble Canyon, per the request of Don Stephens, geologist for the Price River Coal Co. (see attached maps). The survey in Crandall Canyon was for the access road and mining facilities; the transect into Hardscrabble Canyon was for a power line, to affect a ca. 50-60 foot corridor. As part of the power line crosses federal lands, I checked with Craig Benson (BLM-Price Office) prior to the survey. It turns out that only a small part of the access road is on federal land (SE 1/4, NW /1/4, NW 1/4, Sec. 27, T12S, R9E) and less than a mile of the power line will cross federal land (Craig Benson personal communication).

There is presently an access road into Crandall Canyon. I first examined the southeast side of the drainage and then the northwest. I proceeded on a zig-zagging and weaving course to cover the area. Special care was taken to examine any rockshelters or knolls in or very near the survey area. Flagged and staked points were followed in surveying the power line route, starting from the north. The terrain was extremely rugged and steep. Much of the power line route was under heavy forest cover (pinyon-juniper, longer needled pine, wild flowers such as columbine, lupine, Indian paint brush, etc., and sagebrush). Approximately half a mile of the northern end (dashed on map) was not thoroughly checked due to the ruggedness of the terrain. Most of this is on the side of a very steep, rocky ridge and is private land. The rest of the route was very difficult, but more than an adequate width was examined as I often had to go out of the way to find access along the route.

A literature search had been conducted and the State and National Register of Historics consulted (Division of State History files) prior to the survey. There are no known archeological sites immediately near the survey area. There are several petroglyph sites (C6149-160) in Gordon Canyon to the south, in Township 14 South, Range 9 East. A recent survey of a couple of ranges to the east by our office (Hawkins & Seward, 1980) located several historic sites but no prehistoric ones.

5Ei

No archeological sites per se were present in the area surveyed. One rockshelter near the mouth of Crandall contains much bone. Some of it appeared recent, some weathered and old. There was also some charred and fragmented bone. No artifacts were found in association. No prehistoric remains were found elsewhere on the survey in contrast to abundant historic remains. No Smithsonian site number was assigned. It is on the opposite side of the drainage from the access road and should not be affected.

Several historic structures were located in the canyon. These were for the most part "crude" - most of the stones were unshaped, loosely laid without mortar (the exception is the one lowest in the canyon). All were unusual in incorporating large boulders. According to Gene Haub and Frank Pero, these were all built by an old sheepherder who had lived in Crandall Canyon. The northernmost structures were a cluster of contiguous "rooms" built against the northern cliff wall. Several courses of stones were loosely stacked. This appears to have been a "junk" area as there was quite a bit of debris such as corrugated metal sheets, metal barrels, etc. There is the remnant of a fence to the west. One strange construction was the partial body of an old car upon, and around which, stones were piled. Supposedly a fire was built in this by the old sheepherder to provide heating in the winter for young lambs. The dimensions of this area is approximately 200 meters east-west by 75 meters north-south.

A couple of hundred meters down the canyon, across the stream bed, there is another, better constructed building. This is built onto the canyon wall on the south and onto a large boulder on the east. Two sawed logs form the lintel for each of the two windows and the doorway in the west wall.

Half-way down the canyon, and adjacent to the road on the northwest side, is a better constructed building. The southeast wall is a large boulder. The other stones appear shaped and are mortared. Nailed wood planks form the frames for the windows and door. A long, low retaining wall is formed by several courses of rock.

None of the structures identified have roofs. No early glass (purple) or soldered cans were found, so the time of occupation is unknown. The two building sites further up the canyon are within the area where the mining facilities are to be built.

Since the time of construction is unknown, it is unclear whether these structures qualify for the 50 years age minimum for historic sites. Upon discussion with Phil Notarianni (Historian, Utah State Historical Society) who has done much research in Carbon County, these may be significant in documenting sheep herding in the area which was not common. He had scheduled to go to Price next week (July 9th) and is willing to stop in Crandall Canyon to examine them. If they are of interest, they can be studied and photographed, yet need not interrupt construction plans. No Smithsonian site numbers were assigned to the buildings.

I recommend clearance for the project, with the allowance that the historic buildings can be studied if it is warranted in Phil Notarianni's opinion, after his visit on July 9.

Approximately two field days, including travel time, and one office day were spent on this project. Price River Coal Company should be billed accordingly.

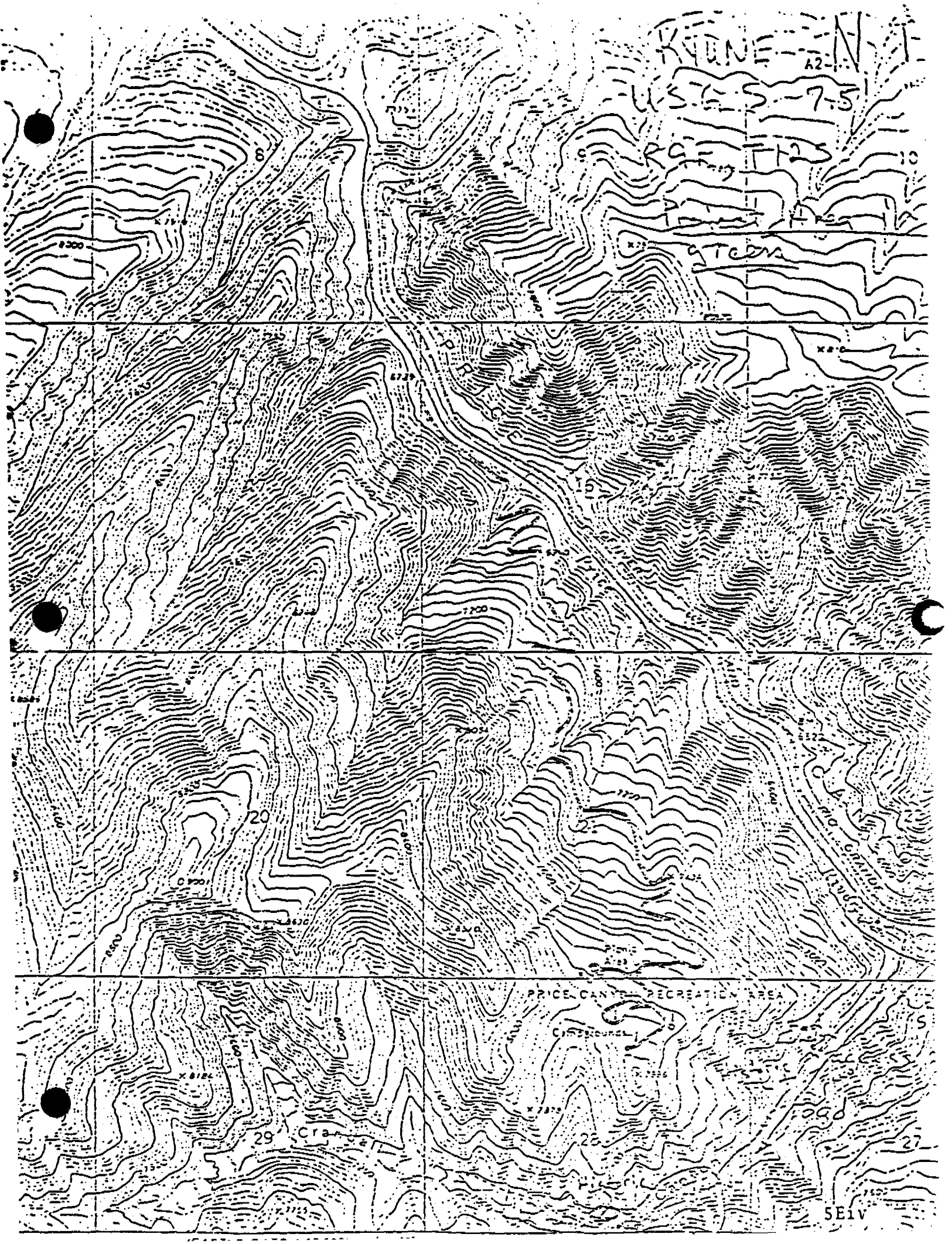
Sincerely,

Kay Sargent

Kay Sargent
Archeologist

KS:dh

cc: Craig Benson,
BLM Archeologist, Price Office
Phil Notariani,
Historian, Utah State Historical Society
Bruce Hawkins,
Historic Archeologist, State Antiquities Section


KYUNE
A2
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PRICE CANYON RECREATION AREA
CAMPGROUND
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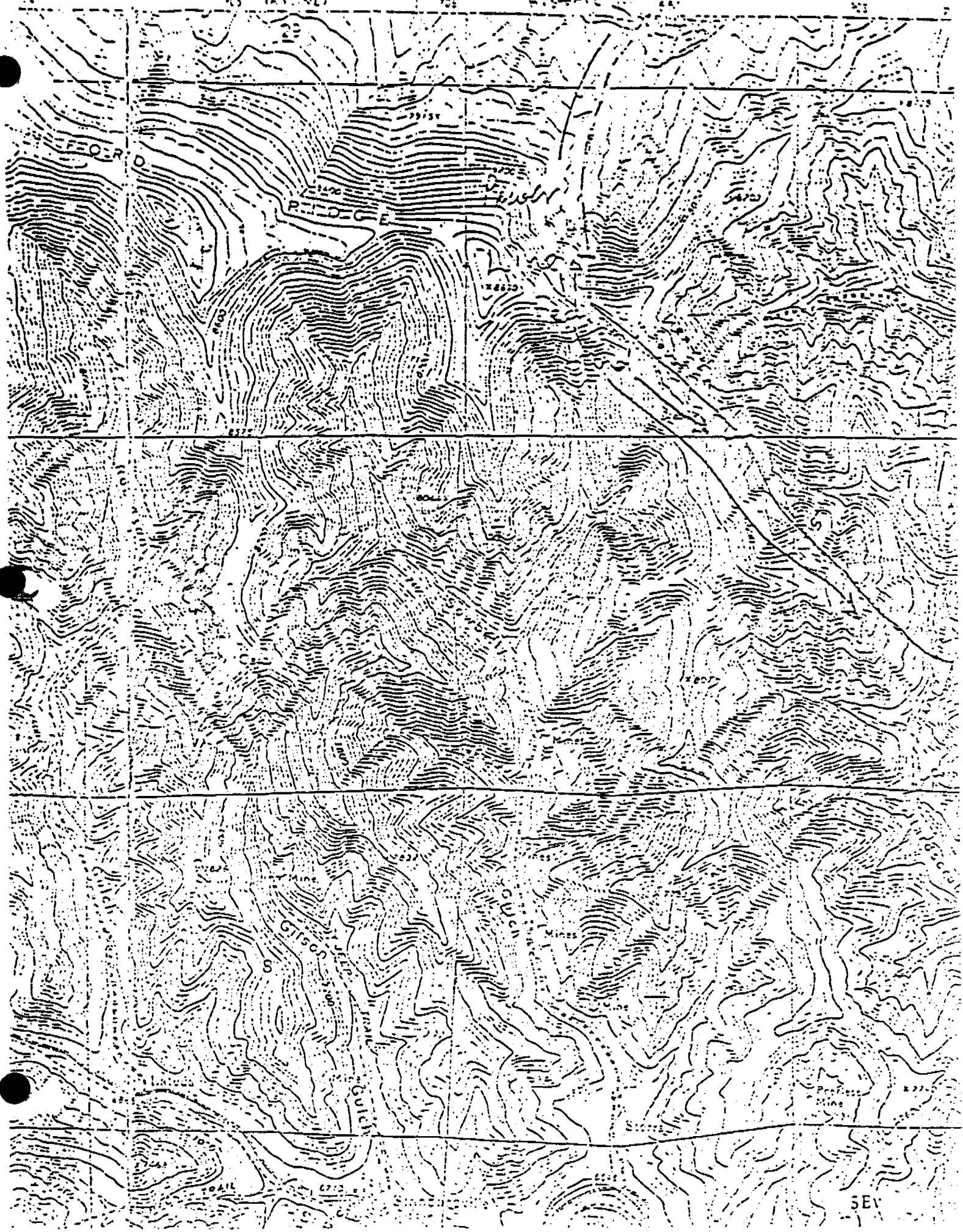
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SEC

U.S.
Department of the Interior
Bureau of Land Management
Utah State Office

Summary Report of
Inspection for Cultural Resources

For BLM Use Only A2-6.

BLM Report ID No. | | | |-| | | | | | | (1–10)

Report Acceptable Yes __ No __

Mitigation Acceptable Yes __ No __
Comments: _____

Cultural Report or Project CIRIANDALL CANYON (11–40)

Development Company Price River Coal Company

BLM Mini Permit No. | | | | | (41–45) 4. BLM Antiquities Permit No. | | | |-| | | | | | (46–55) pending formal notic

Report Date | | |7| 3 |1|9|8|0| (56–62) 6. Field Work Dates 6/31/80 - 7/1/80
Month Day Year

Responsible Institution |S|T|A|T|E |H|I|S|T|O|R|Y| | (63–77)

Fill in spaces 31,85,73,37 only if:
Y = Vernal Meridian
H = Half Township

Fieldwork Location: TWN |T|1|2|S| (78–81) Range |R|0|9|E| (82–85) Section(s) |2|2| |2|7| (86,87 / 88,89), 28, 33
TWN |T|1|3|S| (90–93) Range |R|0|9|E| (94–97) Section(s) |0|3| |0|4| (98,99 / 100,101)

Resource Area |P|R| (102,103) Other: _____ Carbon County

BO = Bonneville, WA = Wasatch, HR = House Range, WS = Warm Springs,
SE = Sevier River, HM = Henry Mtns., BR = Beaver River, DX = Dixie,
KA = Kanab, EE = Escalante, SJ = San Juan, GR = Grand, PR = Price River,
SR = San Rafael, DM = Diamond Mountain, BC = Book Cliffs.

Description of Examination Procedures: Single person zig-zagging to cover area. For power line, 50 - 60 ft. corridor; canyon bottom on both sides of access; for larger areas, zig-zagged until all covered.

Linear Miles Surveyed and/or (104–112) |3|
Definable Acres Surveyed and/or (113–121)
Legally Undefinable Acres Surveyed (122–130) |C|2|1|1|6|0|
(*A parcel hard to cadastrally locate i.e., center of section)

12. Inventory Type |I| (131)
R = Reconnaissance
I = Intensive
S = Statistical Sample

Description of Findings (attach appendices, if appropriate)
No prehistoric sites found. One shelter with bone, some burned, but no artifacts. Several historic buildings, all of unknown age. No Smithsonian numbers assigned.

14. Number Sites Found: | | | | |0| (132–135)
No sites = 0
15. Collection: |N| (136) Y = Yes, N = No

Actual/Potential National Register Properties Affected:
None.

Conclusion/Recommendations:
Recommend clearance.

Signature of person in direct charge of field work: _____

Signature and Title of Institutional Officer Responsible _____ 6E

APPENDIX 5-F

UTAH ARCHAEOLOGICAL RESEARCH CORP.

CRANDALL CANYON REPORT

UTAH ARCHAELOGICAL RESEARCH CORPORATION • 87 E. CENTER, SUITE 103 • SPANISH FORK, UTAH 84660 • (801) 798-7061
FIELD OFFICE: P.O. BOX 1147 • MONTICELLO, UTAH 84535

January 5, 1981

Mr. K. B. Hutchinson
Price River Coal Company
PO Box 629
Helper, Utah 84526

Dear Mr. Hutchinson;

Enclosed you will find our report on the three archaeological sites in Crandall Canyon. As you will see by the report, we have recommended that all three sites be cleared for construction. We have also recommended that no further mitigation be required and that the sites not be nominated to the National Register of Historic Places.

We have forwarded copies of the report to Mr. Jim Dykman and Mr. William Killam. If both Mr. Dykman and Mr. Killam agree with our recommendations, then construction can proceed through the sites.

Please let me know if I can assist your company any further with the clearance of these sites or on any future archaeological problem. We have enjoyed working with your company and wish you the best in the future.

Sincerely,

Diana Christensen

Enclosures

5Fi

UTAH ARCHAELOGICAL RESEARCH CORPORATION • 87 E. CENTER, SUITE 103 • SPANISH FORK, UTAH 84660 • (801) 798-706
FIELD OFFICE: P.O. BOX 1147 • MONTICELLO, UTAH 84535

SUBJECT: Documentation & Recommendation for Determination of Eligibility to the National Register of Three Archaeological Sites in Crandall Canyon, Carbon County, Utah

AUTHOR: Diana Christensen
with appendices by Alan Overstreet, Glynneth Bockholt, Margaret Williams & Clayton Cook

DATE December 1980

PREPARED FOR:

Mr. K. B. Hutchinson
Price River Coal Company
P.O. Box 629
Helper, Utah 84526

Mr. Jim Dykman
Utah State Historical Society
307 West 200 South Suite 1000
Salt Lake City, Utah 84101

Mr. William Killam
Office of Surface Mining
Brooks Towers 1020 Fifteenth Street
Denver, Colorado 80202

5Fii

PREFACE

Utah Archaeological Research Corporation became involved with the three archaeological sites in Crandall Canyon at the request of Mr. K.B. Hutchinson of Price River Coal Company. Originally we were contracted to determine the placement of fences to protect the archaeological sites from adverse effects during construction activities. It was soon evident that the placement of fences around the sites would not be adequate to protect them from construction activities planned for 1981. It was, therefore determined that further investigation into these three sites was necessary in order to ascertain if any of the three were eligible for nomination to the National Register of Historic places. This is the subject of this report.

Analysis of the artifacts recovered from the sites (predominately from surface collections) was completed by Alan Overstreet, Glynneth Bockholt, and Margaret Williams, graduate students at Brigham Young University in Historic Archaeology. All three have had previous experience on historic sites (Goshen, Utah & Chesterfield, Idaho) and the analysis of artifacts from them. Clayton Cook analyzed the bones collected form the sites. He is an archaeologist from UTARC and has done numerous faunal studies in Utah and Mesoamerican including his master's thesis which was a detailed faunal analysis of five sites in Utah County. Photographs for the study were taken and developed by Marian Jacklin, staff archaeologist with UTARC. Maps were executed and drawn by Diana Christensen and Wayne Howell, both of UTARC. The historic record search and documentation was done in Price, Helper and

Salt Lake City, Utah by Diana Christensen and Glynneth Bockhole. Mrs. Bockholt had previously completed a similar search for Goshen, Utah. Further research of historic literature available for the area and time periods was done by Wayne Howell and Diana Christensen. Technical assistance throughout the project was provided by Sandra Cook.

Field work was conducted by Diana Christensen, who was assisted by Alan Overstreet, Clay Cook, Wayne Howell, Marian Jacklin and Denise Evans.

This documentation could not have been accomplished without the assistance of all those listed above. Thanks is given to them and also to the individuals in Salt Lake and Helper, Utah who provided assistance with the oral history of the area; Mr. Fred Voll, Mrs. Edna Romano, Mr. Frank E. Pero, Mrs. Mary Angotti, Mrs. LaRae Pressetto, Mrs. Barabara Liadakis, Mr. Frank Pero and Mrs. Helen Papanikolos.

D.C.
Spanish Fork, Utah
December, 1980

ccd.chapter5/1

Documentation and Recommendation for Determination of Eligibility to the National Register of Three Archaeological sites in Crandall Canyon, Carbon County, Utah

TABLE OF CONTENTS

PAGE NO.

Chapter I.....

Introduction.....

UTARC's Involvement with the Project.....

Historic Preservation and It's role in the Crandall Canyon Sites.....

Chapter II.....

Geography and Climate.....

History.....

Chapter III.....

Archaeological sites in Crandall Canyon.....

42CB215.....

Archaeological Investigations.....

Summary.....

National Register Consideration for 42CB215.....

Recomendations.....

42CB2156.....

Archaeological Investigations.....

Summary.....

National Register Considerations for 42CB216.....

ccd.chapter5/1

Recommendations.....

42CB217.....

Component 1.....

Component 2.....

Component 3.....

Component 4.....

Component 5.....

Component 6.....

Component 7.....

Archaeological Investigations.....

Summary.....

National Register Considerations.....

Recommendations.....

Chapter IV CONCLUSION.....

BIBLIOGRAPHY.....

APPENDICES.....

APPENDICES

PAGE NO.

I. Glass Artifacts by Alan Overstreet.....

II. Metal Artifacts by Alan Overstreet and Margaret Williams.....

III. Ceramic Artifacts by Glynneth Bockholt.....

IV. Miscellaneous Artifacts by Alan Overstreet.....

V. Bone Artifacts by Clay Cook and Diana Christensen.....

VI. A Revision of an Archaeological Survey in Crandall Canyon, Carbon Conty, Utah by Lamar W. Lindsay.....

VII. Memo to Lamar Lindsay from Kay Sargent.....

VIII. Memo to Lamar Lindsay from Phil Notarianni Copy of Death Certificate of Gust. Emanuel Baboulakes.....

LIST OF FIGURES

PAGE NO.

1. Map of Area.....
2. Map of 42CB215.....
3. Sketch of facade at 42CB215.....
4. Photo of Structure at 42CB215.....
5. Photo of Structure at 42CB215 and closeup of chisel marks on stone.....
6. Photo of details inside structure at 42CB215.....
7. Photo of Test Trench 1 at 42CB215.....
8. Photo of Test Trenches 2 and 3 at 42CB215.....
9. Map of 42CB216.....
10. Sketch of facade at 42CB216.....
11. Photo of 42CB216 structure and bridge remnants.....
12. Photo of bridge remnants and retaining wall at 42CB216.....
13. Map of 42CB217.....
14. Sketch map of 42CB216 and 42CB217.....
15. Sketch of facade at 42CB217.....
16. Photo of 42CB217.....
17. Photo of Component 4, 42CB217.....
18. Photo of stove in Component 2 and outhouse in Component 6 of 42CB217.....
19. Photo of cement water cistern in Component 3 of 42CB217.....

20. Photo of Test Trenches 3 and 4 at 42CB217.....

21. Photo of ceramic artifacts from 42CB217.....

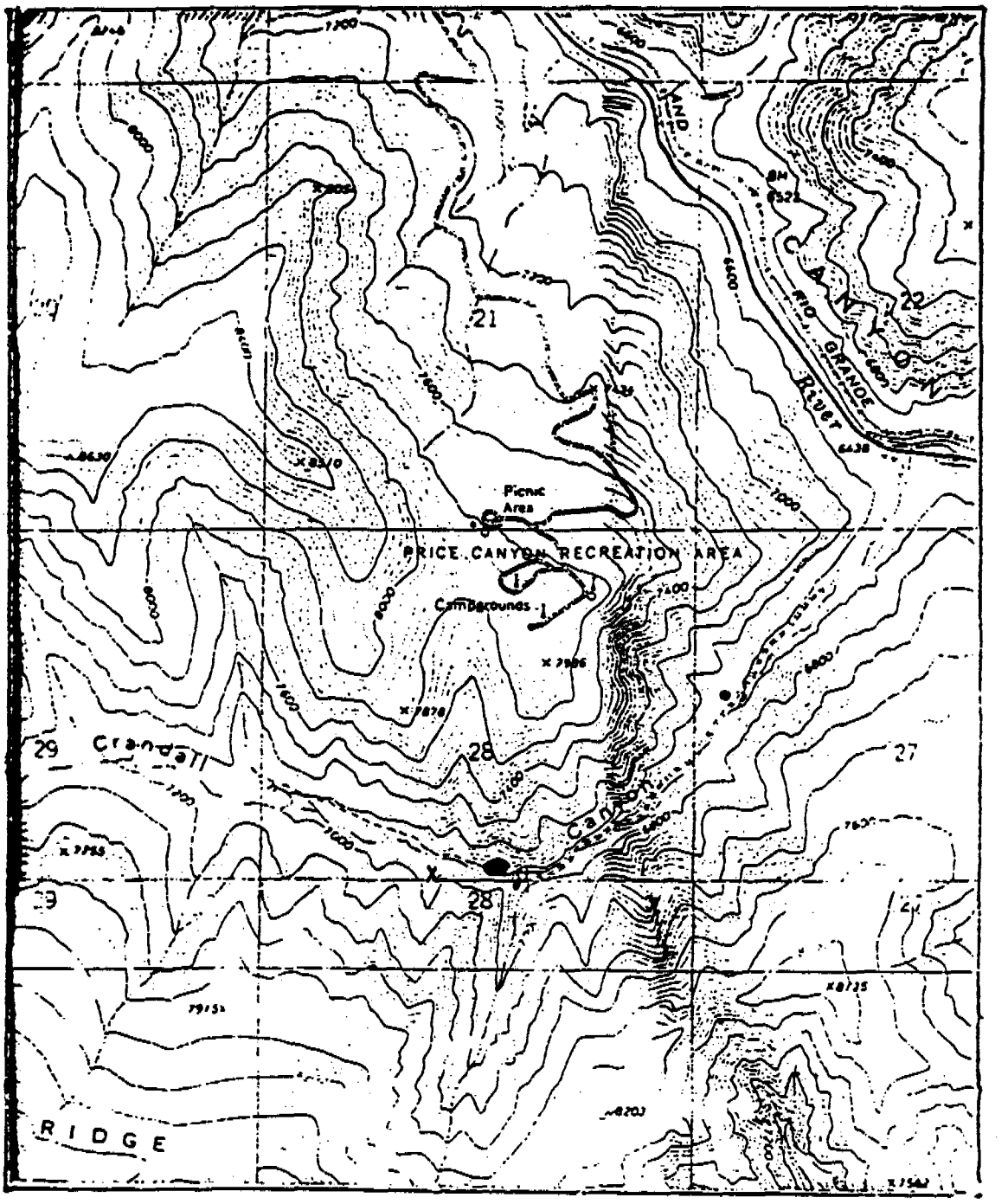
22. Photo of whole amber bottle from Component 3 of 42CB217.....

Documentation and Recommendation for Determination
of Eligibility to the National Register of Three
Archaeological Sites in Crandall Canyon,
Carbon Conty, Utah

Introduction

On November 19-21, 1980, Archaeological documentation, test excavation, mapping and collecting was done on 42CB215, 216, 217, historic sites in Crandall Canyon, Carbon County, Utah by Utah Archaeological Research Corporation. The work was done at the request of the Office of Surface Mining upon recommendation from the State Historic Preservation Officer for Price River Coal Company (PRCC) of Helper, Utah. Construction activities could endanger 42CB215 and 217 and future mining activities could endanger 42CB216. 42CB215 is in a narrow part of Crandall Canyon where the access road for the coal mine will be constructed. 42CB217 is in a wider portion of Crandall Canyon and will be used by PRCC for the shop and other structures associated with the coal mine. 42CB216 is near the area of the coal mine itself but is in no immediate danger of destruction. While the archaeologists were conducting investigations on 42CB215 and 217, they were asked to include 42CB216 at the same time "just in case it came too near mine operations".

The three archaeological sites were encountered during an archaeological reconnaissance conducted on June 30 and



0 ½ 1 mile

SCALE 1:24000

N

PROJECT: PRCC-80-1

TOWNSHIP: 12 S

COUNTY: Carbon

RANGE: 9 E

QUADRANGLE: Standardville 7.5 (1972)
Kyune 7.5 (1969)

LEGEND: ● Archaeological Site
✗ Reservoir

5Fx

July 1, 1980 by Kay Sargent of the Division of State History. Sargent also encountered a rock shelter near the mouth of Crandall Canyon, but as no artifacts were found associated with it, it was not designated as a site at that time. Sargent questioned the significance of the historic sites and was unsure as to their age and, hence, designation as historic sites. In her report she recommended clearance for the coal company pending the opinion of Phil Notariannie, Historian with the Utah State Historical Society. Notarianni visited the sites on July 9, 1980, and stated that the sites were of historical importance as they appeared to be related to the sheep industry of the area. "That industry, with it's involvement of various ethnic groups, was of importance economically as it allowed Carbon County a diversity lacking in other Utah mining areas" (Notarianni, 1980). Notarianni recommends preservation of the sites for further archeological documentation, if preservation is impossible.

Lamar Lindsay, Assistant State Archaeologist, consolidated Notarianni's and Sargent's memorandums into a report on October 20, 1980. In this report Lindsay recommends avoidance of the archaeological sites and also states that if avoidance is impossible, them "they should be the subject of additional research" (Lindsay 1980:4).

UTARC's Involvement with the Project

On November 7, 1980 UTARC received a phone call from K.B. Hutchinson of the Price River Coal Company to send an archaeological to direct in the placement of fences around 42CB215 and 217, in order that construction could proceed as soon as possible on the access road up Crandall Canyon to the coal mine. Wayne Howell, UTARC staff archaeologist, met Gene Haub, Price River Coal Company employee, in the canyon on November 10. Howell learned at that time that the

sites (42CB215 and 217) could not be completely avoided by construction activities planned for 1981 and recommended that further investigation into the status of the sites be done. Copies of the original survey report (Sargent 1980), subsequent historical recommendations (Notarianni, 1980) and report on the sites (Lindsay, 1980) were obtained, after which Lamar Lindsay, Assistant State Archaeologist, and Jim Dykman, State Historic Preservation Officer, were contacted verbally concerning the project. It was agreed by all parties that further documentation of the sites including detailed mapping, measuring and photographing and limited archaeological test excavations, be conducted. A research proposal for this documentation and description of 42CB215 and 217 was drafted and submitted to Lamar Lindsay and Jim Dykman on November 13, 1980, and subsequently approved by both.

On November 19-21, 1980, fieldwork was conducted in Crandall Canyon with the permission of Price River Coal Company. At this time plane table/alidade maps were made of the structures and associated features of 42CB215, 216 and 217, random surface collections of representation artifacts were collected from the sites photographs were taken in black and white and color of all significant features and structures of the sites, building facades were drawn, diagrammed and measured and test trenches were placed in 42CB215 and 217.

Following the fieldwork laboratory analysis of all artifacts collected at the sites from surface and test trenches were analyzed by Glynneth Bockholt, Alan Overstreet, and Margaret Williams, Brigham Young University graduate students in Historic Archaeology. Historic investigation of the records of the sites was conducted at the County Courthouse in Price (property and tax records), Utah Division of Vital Statistics (birth and death records) in Salt Lake City, Deseret

News and Tribune obituary indexes in Salt Lake City, Brigham Young University Library (pertinent historic books and articles) and in person and verbally with various individuals in Price, Helper, Bountiful, and Salt Lake City, Utah (oral histories).

It was discovered, in connection with the historical investigations of the sites in Crandall Canyon, that oral histories should be utilized to a limited extent in the documentation of historic sites. Frequently, the informants contradicted each other and, when compared to the written documents, were in error. We were told by one informant that "Crandall Canyon Gus," the major occupant of the sites in Crandall Canyon, died on the site of 42CB217 approximately 18-20 years ago and was subsequently discovered there. Death records for "Crandall Canyon Gus" indicate he, in fact, died in the Veterans Hospital in Salt Lake City following a one day stay in 1967, thirteen years ago rather than the estimated 20. This is not to say that the informants purposely misled the historian, but rather that oral histories are limited in their documenting value due to individual biases, prejudices, knowlege and relative reflective capacities. One problem encountered during the historic research was that no living relatives could be found. Crandall Canyon Gus never married and, presumably, had no offspring. Irene Kounalakis, who inherited the property after the death of Gus, could not be located.

This report is a summary description of the three historical sites (42CB215, 216, 217) located in Crandall Canyon, including the archaeological information obtained from the test trenches and the recommendations regarding them in reference to possible National Register nominations as Historic Place of significant value to the United States, Utah or Carbon County.

Historic preservation and it's role in the Crandall Canyon sites

In order to understand historic preservation and its role in American life and business, we must first look at its legal base. Growing governmental concern during the past 100 years or so has led to numerous acts, laws and regulations concerning historic properties and their protection. This has resulted today in a "confusing but nonetheless compelling legal base" (King, Hickman and Berg 1977:45).

The National Historic Preservation Act of 1966 declares that "(a) the spirit and direction of the nation are founded upon and reflected in its historic past; (b) that the historical and cultural foundations of the Nation should be preserved as a living part of the community life and development in order to give a sense of orientation to the American people. . ." It was this act which gave the Secretary of the Interior the power to maintain a national register of "significant historic properties". It also formed the Interior/advisory Council/State triad that forms the structural core of historic preservation.

Previous congressional acts, the Antiquities Act of 1906 and the Historic Sites Act of 1935, provided a legal base for the protection of historic and prehistoric sites and antiquities. Executive Order 11593 implemented the 1966 National Preservation Act by directing federal agencies to identify and nominate historic properties to the National Register and by requiring that care be exercised to avoid unnecessarily damaging properties that might be eligible for the National Register (King, Hickman and Berg 1977:47).

This is the point at which the three historic sites in Crandall Canyon come into play. As historic sites, their significance is being explored in order to determine if they do qualify for the National Register of Historic Places.

Although all three sites are located on private land, Price River Coal Company and its activities are under the jurisdiction of a federal office, the Office of Surface Mining, and as such, are legally liable for the destruction of potentially "significant historical properties".

This report will examine each site individually regarding state, local or national significance for the archaeological, historical, ethnographical and architectural aspects of the sites in question. This individual evaluation is located following the physical and archaeological descriptions of each site in Chapter 3 of this report.

The purpose of Historic Preservation is to enhance our perception of nation, state and local history, to educate the American people regarding their heritage and to preserve those historic sites exemplifying American history and cultural heritage. "It is not the purpose of Historic Preservation to stop construction projects. Its purpose is to maximize preservation in the modern world, not to keep the modern world from existing" (King, Hickman and Berg 1977:175).

Obviously, everything does have the potential of historic value but at the same time "not everything should be preserved or afforded special treatment" (King, Hickman and Berg 1977:7).

Decisions must be made at the local, state and national level in regards to what constitutes a significant historical property which should be included in the National Register of Historic Places. Criteria for listing on the National Register area:

> "The quality of significance in American history, architecture, archaeology and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and; (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) That are associated with the lives of persons significant in our past; or
(c) That embody the distinctive characteristics of type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinquishable entity whose components may lack individual distinction; or
(d) That have yielded, or may be likely to yield, information important in prehistory or history (36CFR 60.6).

Definitions of some terms used in this report:

Historic property: any place where people have created something that can contribute-through its study or through its continued availability for individual or group experience to our "consultable record" of human existence (King, Hickman and Berg 1977:5).

Significant data: data that can be used to answer research questions, including questions of present importance to scholars and questions that may be posed in the future (36CFS Part 66).

Archaeological significance: a site or area is archaeologically significant if it has the capacity to yield useful information regarding the archaeology of the region or area or site.

CHAPTER II

CRANDALL CANYON

Geography and Climate

Crandall Canyon is located in Central Utah, northwestern Carbon County, approximately 8 miles northwest of the town of Helper. The canyon is directly south of the Price River Recreation Area and is approximately 3 miles up canyon from the former town of Castle Gate.

The stream in the canyon is a tributary to the Price River, which in turn empties into the Green and Colorado Rivers further south (Stokes 1956:6). This area, known as the Wasatch Plateau, is characterized by steep hillsides of flat lying shale and sandstone which are dissected by numerous streams flowing predominately east or west.

The area is generally typified as being semi-arid with the winter snowfall on the mountains contributing much of the moisture for the valleys below. The summit of the Wasatch Plateau was glaciated during Pleistocene times (Stokes 1956:6). Numerous coal fields have been and are continuing to be exploited in the area, including the Emery, Wasatch Plateau and Book Cliffs coal fields.

The elevation of this canyon extends from approximately 6440′ at the mouth to nearly 8800′ near the plateau. The canyon itself begins in a east-west direction but flows northeastward to meet the Price River approximately two miles up canyon.

Extremely steep hillsides and a narrow canyon floor effectively restricted extensive human occupation of the canyon itself.

Flora in the canyon is predominantly pinyon-juniper, with areas of sagebrush

in open flat canyon bottoms and hillslopes, pockets of Douglas Fir, Quaking Aspen, and Yellow Pine in the canyon and Narrow Leafed Cottonwood along the canyon bottom.

History

The area around Crandall Canyon has evidence of prehistoric occupation by various native American groups, such as Archaic, Fremont and Numic peoples, but so far no direct evidence has been found for their occupation in Crandall Canyon. The earliest human group for which archaeological evidence does exist in Crandall Canyon is that of the Historic anglo.

American trappers traversed the areas as early as 1827 (Stokes 1956:8). A trail through the area established by William Wolfskill from New Mexico to California in 1829-30 was used almost annually until the war with Mexico (1846). On September 27, 1877, Mormons from Mt. Pleasant were encouraged to settle the area of Castle Valley (McElprang 1949:17). Shortly afterwards coal in various areas around Price was discovered and exploitation began. A branch line of the Denver and Rio Grande Railroad was completed from Springville to Castle Gate in 1883 in order to haul the coal, which up to this time had been Hauled by wagon over the mountains.

Immigrant laborers began arriving in the area to work the mines. At first, English speaking immigrants were employed in the mines, but because of a strike in the 1890's the first Italians were brought in. In 1903 the Italians and South Slavs struck and Greeks were brought in as strikebreakers. In 1922, when the Greeks struck, Mexicans were brought in. Each coal miners strike acted to increase the cosmopolitan atmosphere of the area. This combination of many cultures set Carbon County apart from the rest of Utah and it remains so today (Papanikolas 1975).

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The immigrants were natural laborers to fill the mines with. Many of them were single young men who had just arrived from their native country (some had been recruited in the home land for labor gangs). They were, on the whole, poor, illiterate individuals who had heard of the wealth to be made in America and they flocked to this "land of Promise" in the late 1800's and early 1900's. At first these laborers filled the ranks of railroad gangs but they gradually drifted to the mines of the west where their untrained, illiterate status was not detrimental for making a good wage. Gradually, the immigrants saved their wages, sent for friends, family, brides from the motherland, bought houses in the community, became engaged in other pursuits, such as farming, storekeeping, ranching, herding, and were more or less integrated into the community. This transition was not as easy at it appears and today in the small, predominately "Mormon" communities of Utah, there is still a strong barrier between the "Gentile" and "Mormon", "old-timer" and "intruder", "settler" and "newcomer" even though the families have lived in the same communities for 2 or 3 generations.

An unusual immigrant group that did not easily assimilate itself into American culture was the Greeks. The first Greek to arrive in Carbon County was John Diamante ("Uncle John") who arrived in 1903 (Papanikolas 1975:116). Shortly after this, numerous Greeks arrived to work the mines. Many were sent by labor leaders, such as Leonidas G. Skliris of Salt Lake City, in order to break the strikes. These men were foreigners who were used to the Padrone tyranny of Europe in which a Padrone "cares" for his men and in return the men pay a fee to the Padrone. Others came directly from Greece with tags on their coats to direct them to a fellow villager already established in the U.S.A. In one way or another the Greeks came to Carbon County and other parts of the western United States.

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For the most part these men had come to America in order to earn money that was badly needed at home by the members of the family who had remained behind. The immigrants came to the U.S. to earn money after which they planned to return to Greece, as had many other Greeks throughout the centuries. Greece always considered these immigrants citizens, no matter how long they resided outside the country.

The original Mormon settlers of the area tolerated but never really accepted these strangers in their midst. Their foreign religion, their swarthy complexions and dark coloring, their exuberance for life and extreme emotionalism all served to segregate the Greeks from the mormons, just as other foreign groups were also segregated.

After World War I numerous anti-immigrant campaigns started, then the 1922 strike by the Greeks, Italians and Slavs paralyzed the coal industry. In 1924 the Ku Klux Klan became active in Carbon County in order to roust out anti-Americans.

Unlike the other immigrant groups, the Greeks maintained their nationalism and unity as a distinct entity in Utah. Wives were sent from the Motherland, many termed picture brides but many also sisters and relatives of other immigrants already here. Many began leaving as soon as they were established, some to Salt Lake City, some further west, some remaining in Carbon County. Many bought sheep, goats, others opened markets, cigar stores, restaurants, hotels and a few became farmers (Papanikolas 1971).

Several Greek institutions served to keep the Greeks united in America. The first of these was the Greek Coffeehouse, where the Greeks from the mine congregated to keep alive greek language, traditions and comradeships. The

second of these was the establishment of the Greek Orthodox Church in Salt Lake City and then Price. The third was the the establishment of "immigrant lodges". These immigrant lodges were frequently located in the mountains where the Greeks would gather for picnics (lambs roasting in spits), dances and socialization (Papanikolas 1970:186-188). This was done primarily during the summer months. Many times a wedding or baptism marked the occasion after which lambs were roasted and goatherders from the mountain draws brought fresh goat cheese (Papanikolas 1970:148). These "immigrant lodges" were only one aspect of a complex institution that adhered the Greeks in the community to each other.

Some of the Greek miners, having never married lived as solitary goatherders and sheepherders (an occupation familiar to them from Greece) in mountain draws. These solitary "sheep ranches" in the isolated canyons are described as having "a few motley ewes grazing among the sagebrush while whiskey stills worked at full speed in nearby shacks" (Papanikolas 1975:121).

The Greeks living in Utah communities contributed to the early history of Utah and substantially added to the cosmopolitan atmosphere of Carbon County.

Today Crandall Canyon is still the site of extensive coal mining activities.

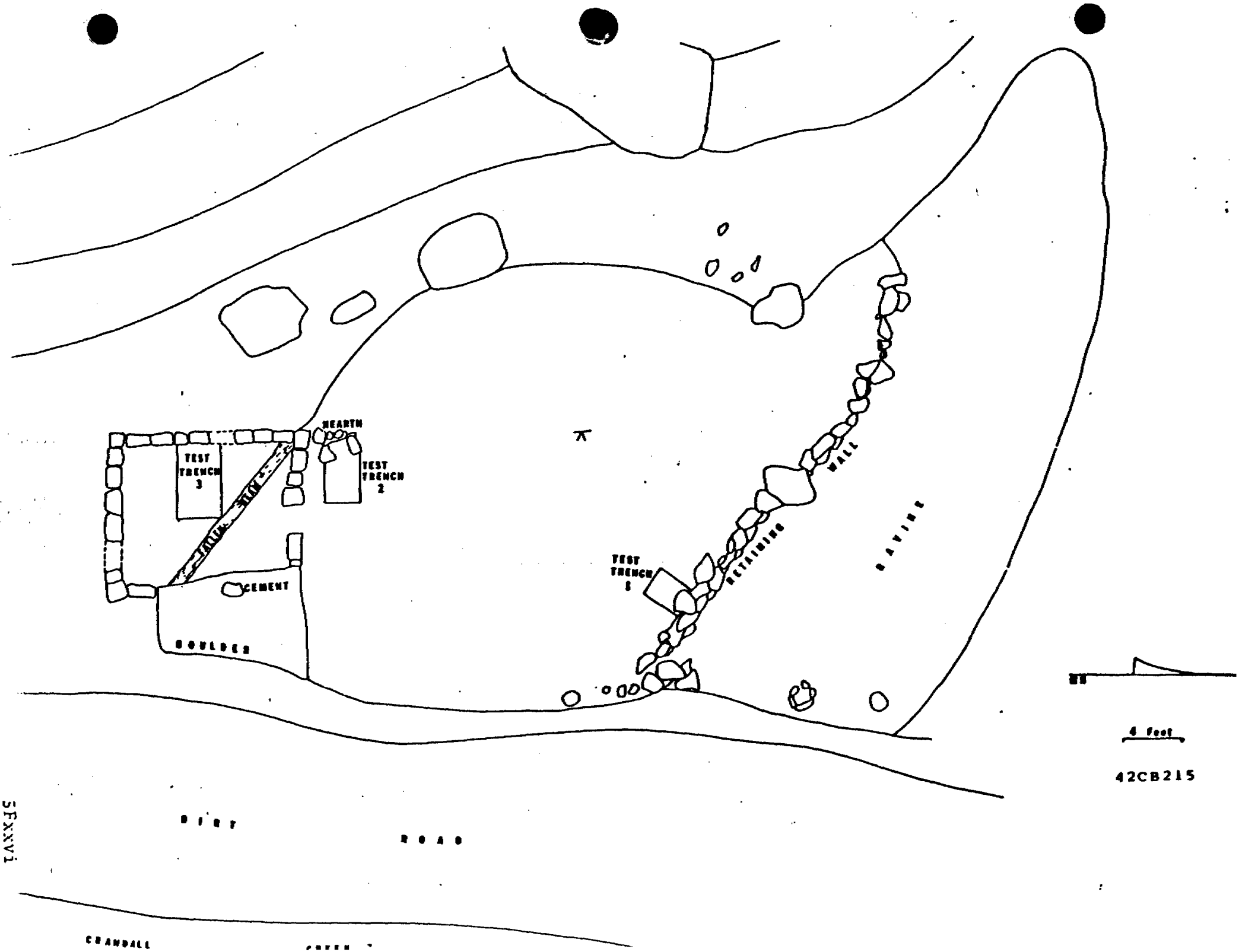
CHAPTER III

ARCHAEOLOGICAL SITES IN CRANDALL CANYON

42CB215

This historic site consists of one well-dressed sandstone structure, a retaining wall and terrace immediately north of the structure and two fire pits, one immediately north of the structure (the other appears to be relatively recent and is adjacent to the dirt road).

The structure is comprised of various sizes of sandstone blocks from the immediate vicinity. The larger blocks are well shaped with squared corners, some of which have chisel marks. The blocks are well placed in order to construct strong, straight, thick walls (1 foot). There are three of these stone walls with a large sandstone boulder comprising the eastern wall of the structure against which the other walls abut. Remnants of mud mortar between the rocks and smaller unshaped sandstone rocks chinked the walls tightly against the weather. A large fallen wooden beam lies diagonnally inside the one room structure and numerous large metal sheet remnants litter the site, inside and outside the structure. One of these is an old metal sign with the letters RIC still discernible. The remainder of the pieces of sheet metal are of various sizes and types, both corrugated and uncorrugated, which give the impression that they were gathered from various souces. Pieces of cement were found inside the structure and on top of the large boulder and opposite (west) stone wall. This would have held the large wooden


HEARTH
TEST TRENCH 3
TEST TRENCH 2
FALLEN WALL
CEMENT
BOULDER
TEST TRENCH 1
RETAINING WALL
RAVINE
4 Feet
42CB215
DIRT ROAD
CRANDALL

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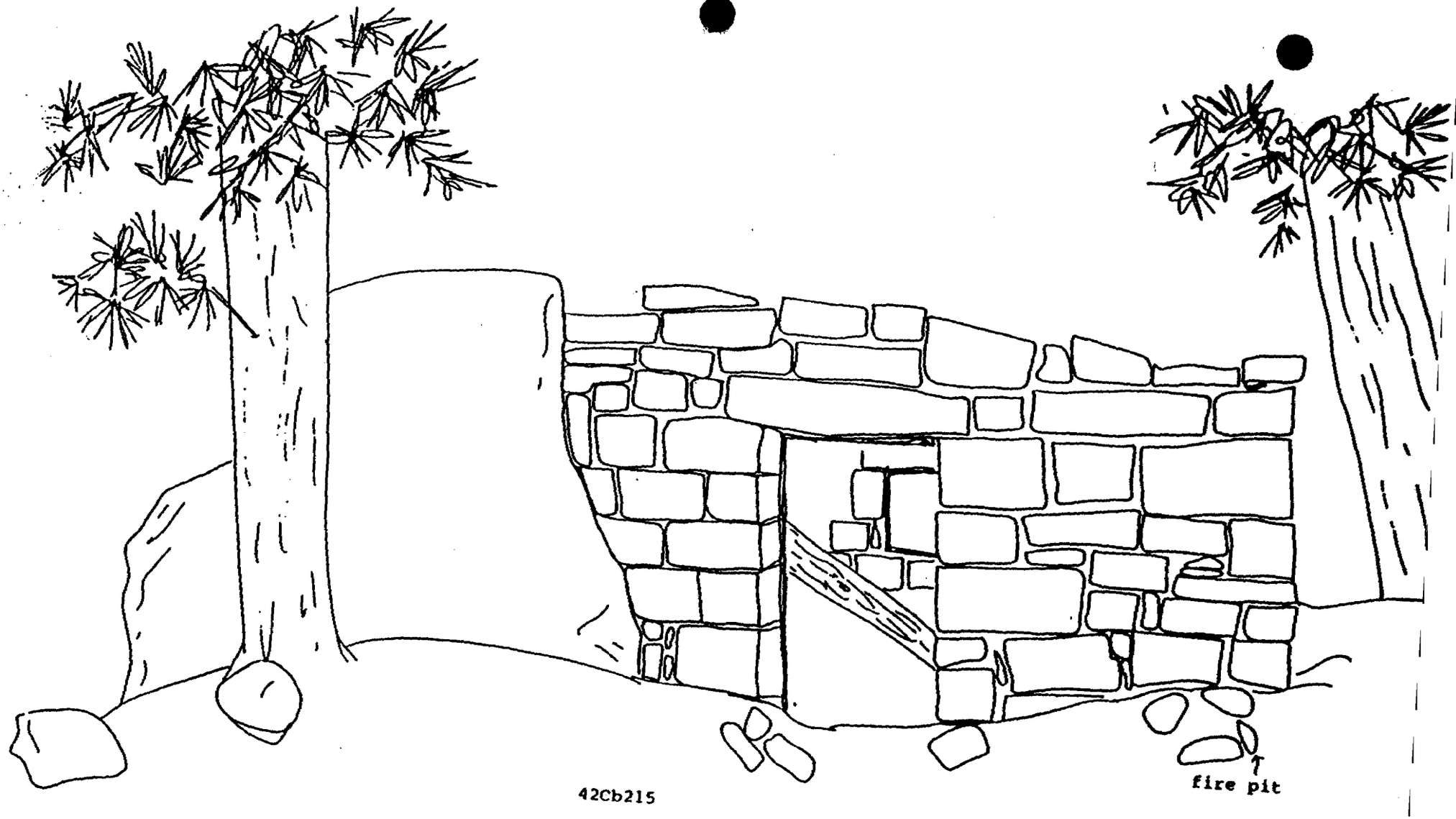


42Cb215

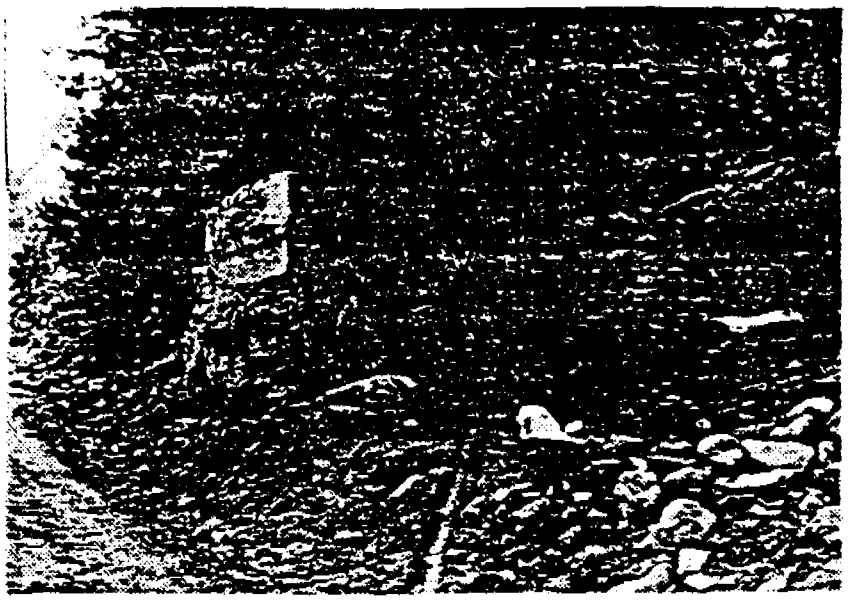
Building Height: right wall: 5' 11"
left wall: 8'
Length: 19'2"
Width: ground level: 12'6"
top level: 14'4"

Door: 70"x 39"
Wall thickness: 17"-19"
Back window: 25"x 30"
Inside dimension: 17'x 10'

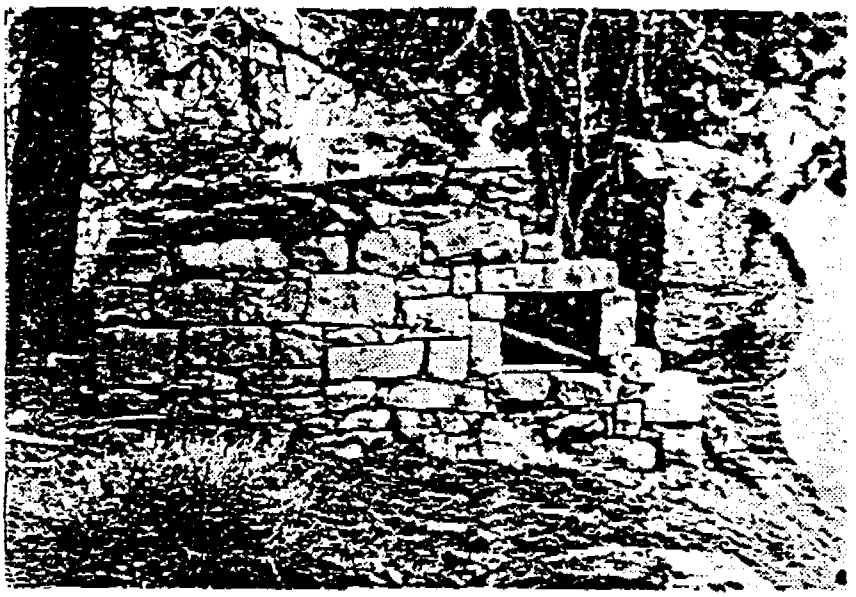
beam in place upon which was placed the sheet metal in order to form the roof. There are two windows (west and south walls), and one door (north wall) in the structure, all of which are framed in even (saw cut) pieces of wood. No remnants of window glass nor a door was found on the site. The hinges on the door indicate that it swung inward. A wall niche was observed in the west wall a few inches south of the window. There were remnants of mud mortar inside it on the stone walls which indicate that something (wooden or metal) with smooth sides once occupied the niche. This could have been an icebox or storage box of some kind.

No indications of a stove or fireplace were found inside the structure; no chimneys, no fire-blackened or heat-reddened stones, no charcoal. The cooking, if it was done here, must have taken place in firepits outside the structure, one of which is conveniently located just outside the door and adjacent to the north wall.

The dirt road up Crandall Canyon today passes within two feet of the structure and Crandall Creek is on the opposite side of the road. The canyon at this point is fairly steep and narrow, the only level points being occupied by the structure, terrace and road. The hill slopes up steeply from the structure and is strewn with large sandstone boulders.



42Cb215 looking south, front of structure



42Cb215 looking northeast, back of structure

The terrace in front of the structure is an enigma. It was purposely constructed with the stone retaining wall containing fill dirt approximately 1-2 feet deep. Either the soil was placed behind the wall to create a flat, terraced area in front of the structure, or more likely, the wall acted as a protection against erosion. A small ravine is directly in front (north) of the retaining wall, but this is not the main side canyon down which runoff from the walls of the canyon comes. That is located 20 feet further north.

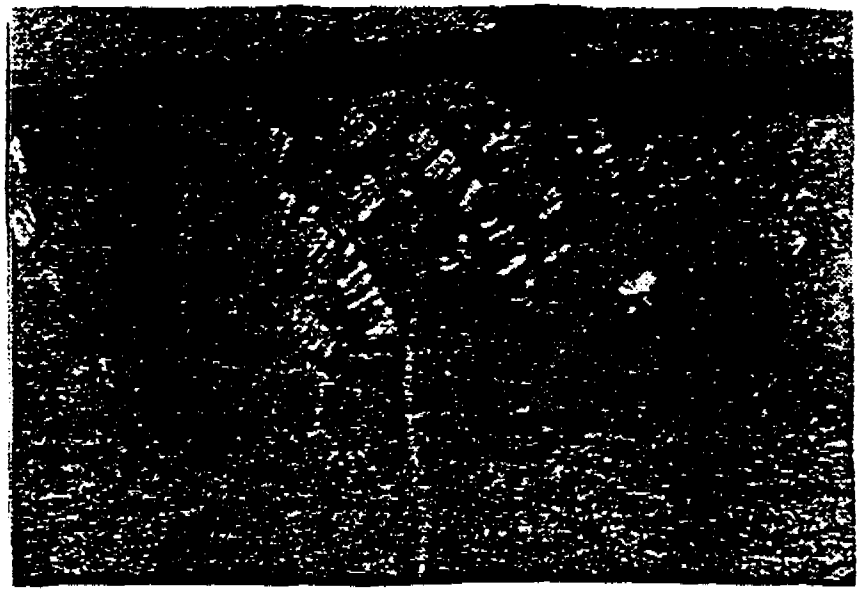
All in all, the structure is fairly well made, one story, one room structure which incorporates a large, naturally placed boulder as one of its walls.

Archaeological Investigations

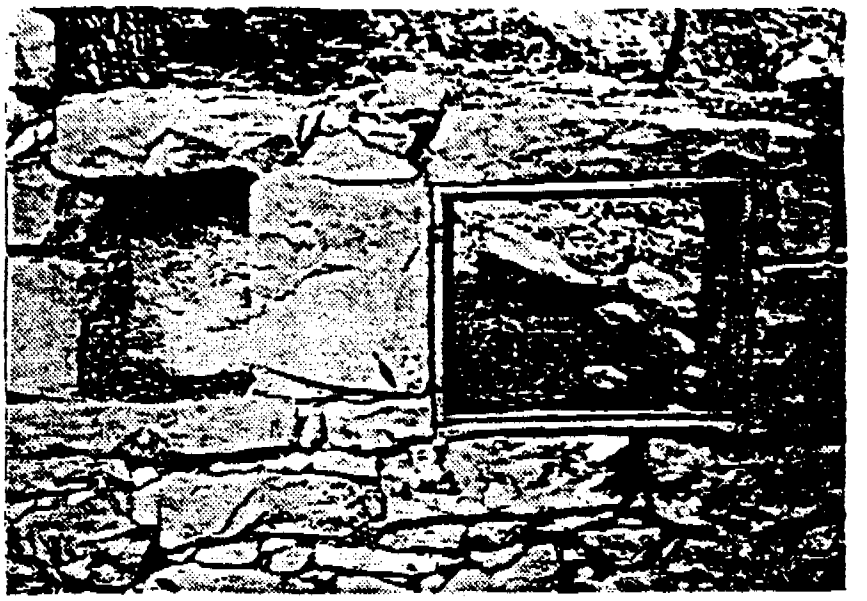
Three trenches were placed into the fill of this site. The first was a 3′ by 3′ square immediately inside the retaining wall. This revealed no stratification, once the top level of pine needles was removed. It was dug to a depth of approximately 1′ except for a small 1′ by 1′ corner which was extended to approximately 2′. The strata remained uniform throughout and contained no cultural materials. The soil was a dark loam with small sandstone pebbles evenly interspersed throughout it.

Trench 2 was 2′ by 4′ and was located 2 feet north of the north wall of the structure and encompassed the outside fire pit. Depth of this trench varied from approximately 1′ around and inside the fire pit to 3" in the eastern end

-20b215 looking west, note scrap metal littering area

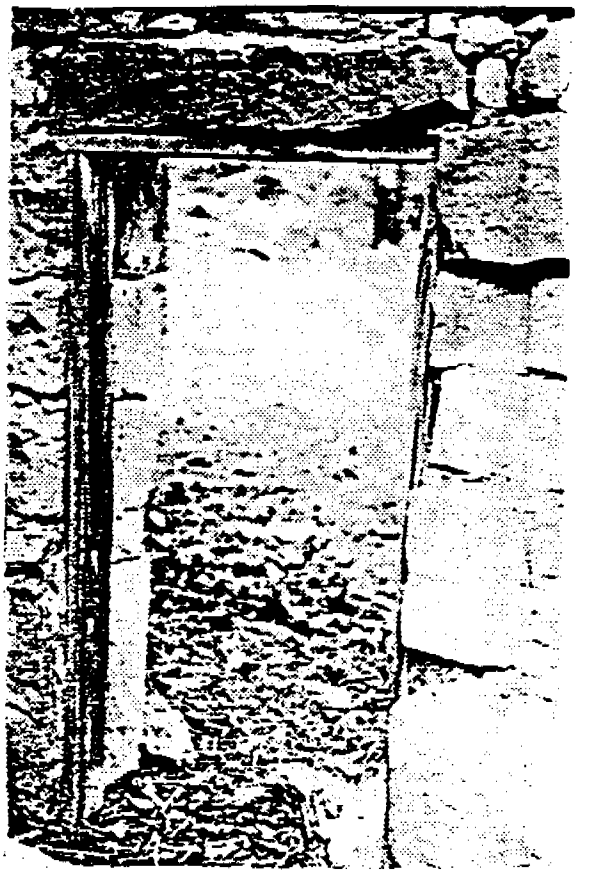


-20b215, close up of chisel marks on some of the building stones



42Cb215 inside structure,

details of window frame and "ice box?" in western wall



42Cb215 front door frame from inside structure

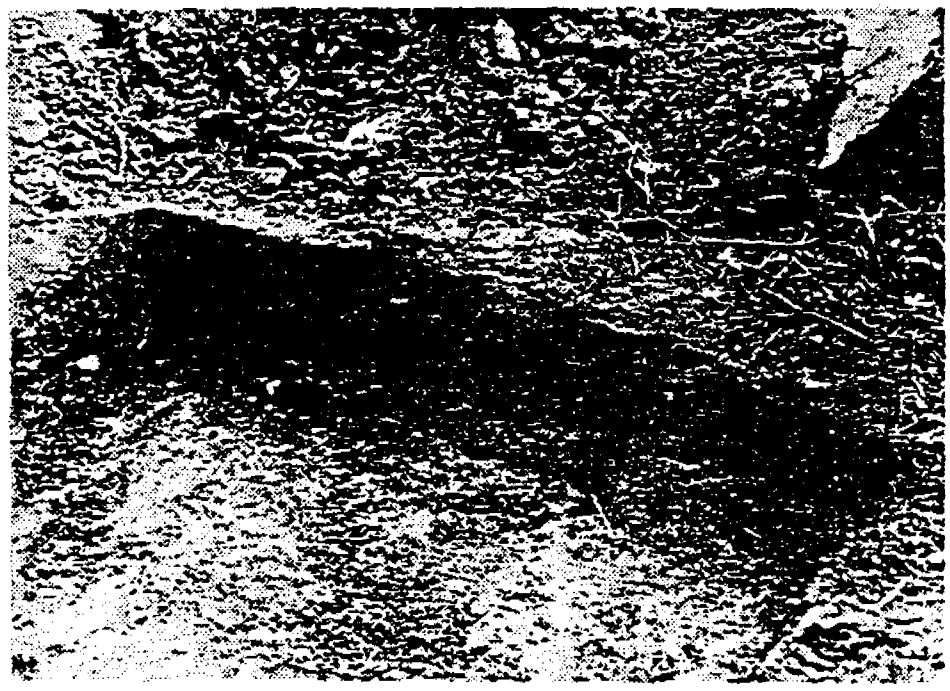
of the trench, due to the natural slope of the hill in this location. The only cultural materials found in the trench were flattened, heavily rusted tin can fragments which were located inside the firepit below rocks which had slumped in and directly above the heaviest concentration of charcoal. This was probably the level of last utilization of the fire pit. The fire pit itself was originally four-sided, one of the rocks having fallen down inside which gave the impression of three-sidedness. The firepit was small (1' by 14") and deep (11").

The fill in the remainder of the trench was dark and loamy but depth of the fill depended upon the slope of the hill. Near the door the depth was only 2-3' deep while near the firepit it reached 12" in depth. The fill appears to be natural decayed material from the trees near the house, and deposition has probably occurred since the structure was utilized as all artifacts were found immediately below this loamy fill and above the sterile ground surface.

The third and last trench on the site was placed inside the structure itself, four feet north of the southern wall. The trench was 3' by 5' and was excavated to a depth of 10". In order to excavate the trench, several sandstone blacks and large sheets of metal had to be removed. Then, a thick layer of pine needles (approximately 4") was raked off and excavation began. The soil inside the structure was soft compared to the much harder soil of the other two trenches.

42Cb215 test trench 1 near retaining wall

42Cb215 test trench 2 with fire hearth outside structure



42Cb215 test trench 3 inside structure, cast side exhibiting depth of fill

Depth of the fill was relatively shallow beneath the pine needle layer and was a dark humus layer until sterile clay was hit. The dark fill averaged 2-3" deep. The trench was placed against the west wall and indicated that the sandstone blocks rested on soil, no foundation was laid prior to construction. Artifacts located in this trench were sparse and were scattered from the surface until sterile soil was hit.

Summary

The function of this structure appears to be that of a seasonal cabin that was occupied only during the warm months. No heating or cooking system inside the structure and the general lack of artifacts in and around it indicate light, seasonal occupation.

This was probably a summer cabin or functioned as one for a limited time period.

The artifacts recovered indicate that occupation of the site ranged from the 1920-30's, occupied a shorttime, and then was the scene of hunter and picnickers' camps to the present day.

National Register Considerations for 42CB215

In order for a site to qualify for the National Register, it must have either national, state or local significance in one or all of the following areas: history, ethnography, archaeology, architecture. We can ask these questions regarding this or any other site in relation to its consideration as a site listed on the National Register of Historic places:

1. Will the preservation or relocation of this structure aid in the understanding and promotion of history, ethnography, archaeology and architecture of the area, state or nation?

2. Will significant information be gained from further mitigation of these sites prior to their destruction? (Significant meaning that it can be used to answer specific research questions about this site that has not or could not be obtained from any other site).

We must first keep in mind that technically any historic site is unique and all can be argued as being historic properties, or a "place where people have created somthing that can contribute to our 'consultable record' of human existence" (King, Hickman and Berg 1977:5).

> "Any resonably imaginative soul can come up with a research topic applicable to almost any historic property; the problem is deciding on a triviality line, below which a research question is not worth consideration". (King, Hickman and Berg 1977:100)

The ultimate questions in deciding the significance of any site is arrived at following the consideration of many factors, some of which have already been delineated. A few more factors regarding the significance of 42CB215.

Archaeologically - from test trenches placed in the site, it appears that the depth of occupational fill is shallow and contains relatively few artifacts. Further trenching or excavation of the site would not justifiably increase our knowledge of this site.

Historically - the historical occupation of the site appears to have been connected with seasonal habitation by Greek immigrants to Carbon county. Historically, this phenomenon is interesting, but this site does not appear to be a particularly good example of that phenomenon. This site is not "connected with an event of national,

state or local importance" nor is it directly "associated with events that have made a significant contribution to the broad patterns of our history" (National Register criteria).

Architecturally - the site does not exhibit "distinctive characteristics of a type of method of construction" and it is not "the work of a master" nor does it "possess high artistic values" (National Register criteria).

Ethnographically - the site apparently represents a portion of the activities of the Greeks in Utah and Carbon County but the site itself is not a unique representation of that cultural entity.

42CB215 will be destroyed by the coal company. If it is found to qualify for the National Register, then several alternative mitigative procedures need to be analyzed. The site could be completely or paritally excavated, it could be relocated following excavation or relocated with no excavation considered necessary. The bottom line is, is 42CB215 justifiably worth the time and expense that further mitigation would entail? Will if yield a return in information gained or history enhanced that the outlay would cost?

Recommendations

42CB215 should be cleared for construction activities to proceed through it with no further mitigation required of Price River Coal Company. 42CB215 should not be nominated to the National Register of Historic Places.

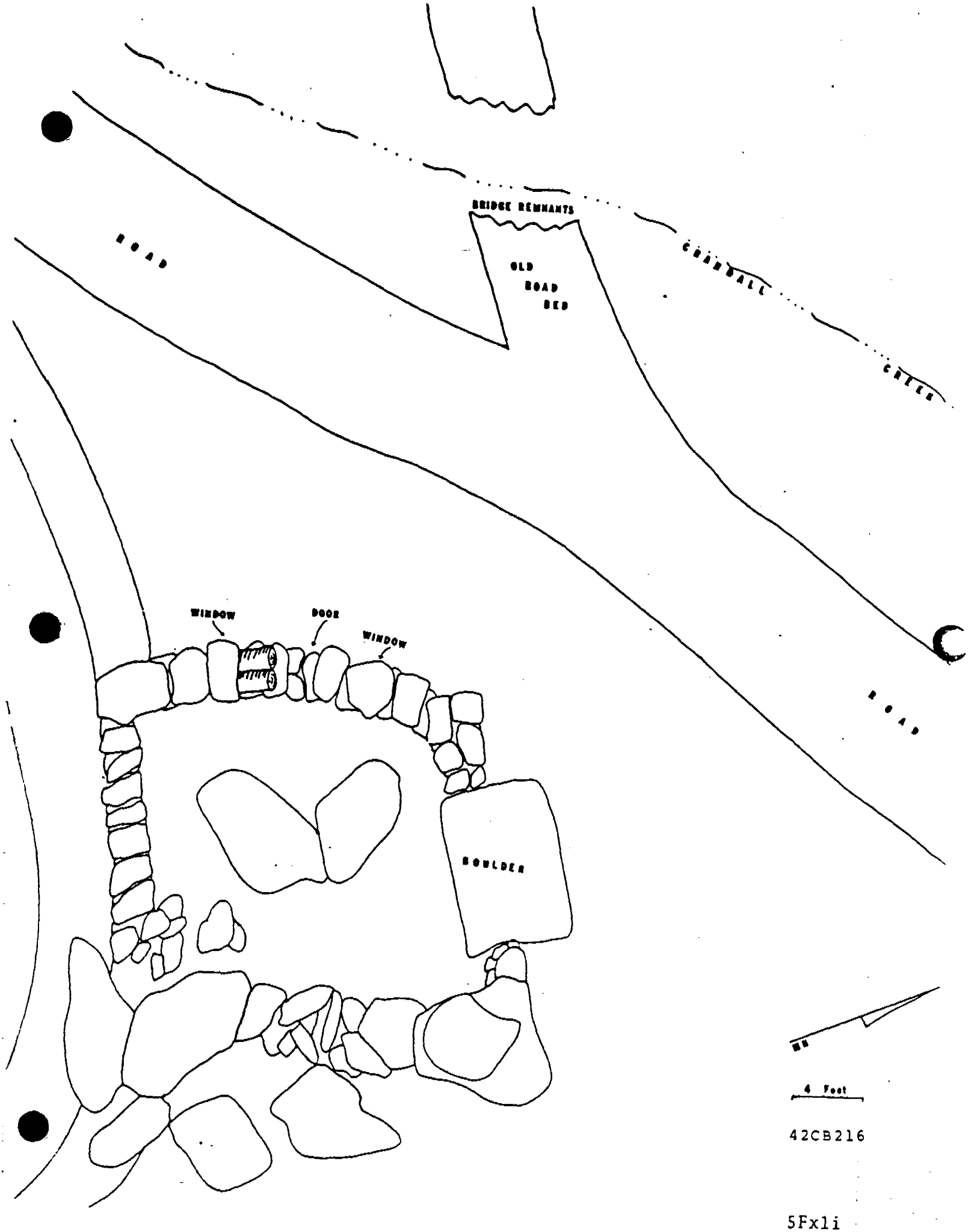
42CB216

42CB216 is located approximately 7/10 or a mile southwest of 42CB215 at the confluence of a tributary canyon from the south. It is a small, one room stone structure built against the steep hillslope of Crandall Canyon. At this point in Crandall Canyon, the canyon is still relatively narrow. It begins to open up at this point and the large open space occupied by 42CB217 is north of 42CB216 approximately 300 feet.

The structure at 42CB216 is similar to the structure at 42CB215 in that it is comprised of native stone and utilizes several large boulders and the steep hillslope as walls and parts of walls. But it differs from 42CB215 in that the stones used in the construction are not as well shaped and none exhibit chisel marks on their surface. No evidence of mortar nor of roof remains at this site, there is no cement nor fragments of sheet metal strewn about as in both 42CB215 and 217.

The site is comprised of this stone structure and the bridge remnants over the creek directly in front of the structure.

Several large boulders and stones comprise the inside of the structure. Some may have fallen in from the steep hillside following construction. Part of the west wall which is against the hillside has slumped into the structure. The fill of the structure is almost negligible, it is difficult to see any soil around rocks of all sizes which fill the room.



42CB216

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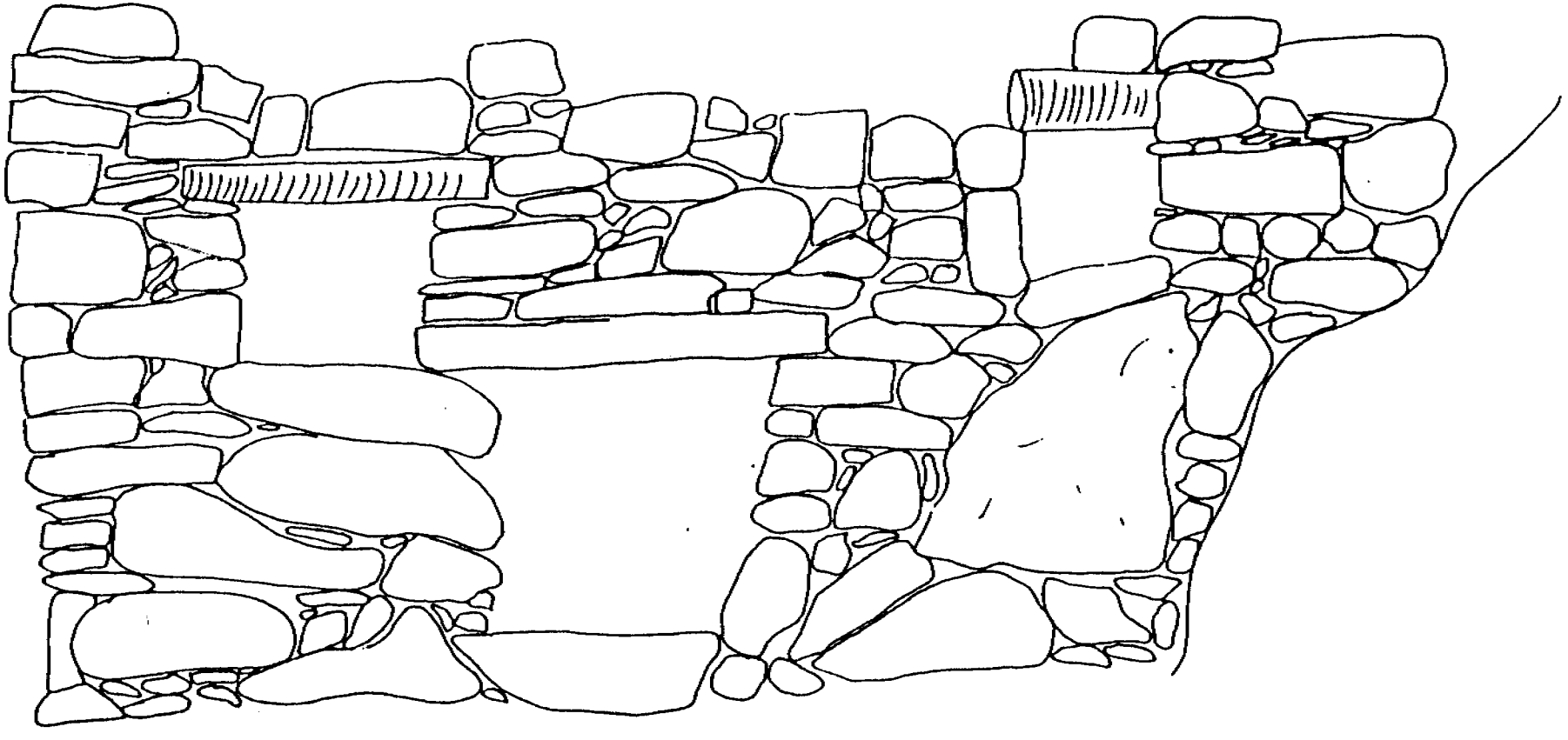


42Cb216

Building Height: 11'

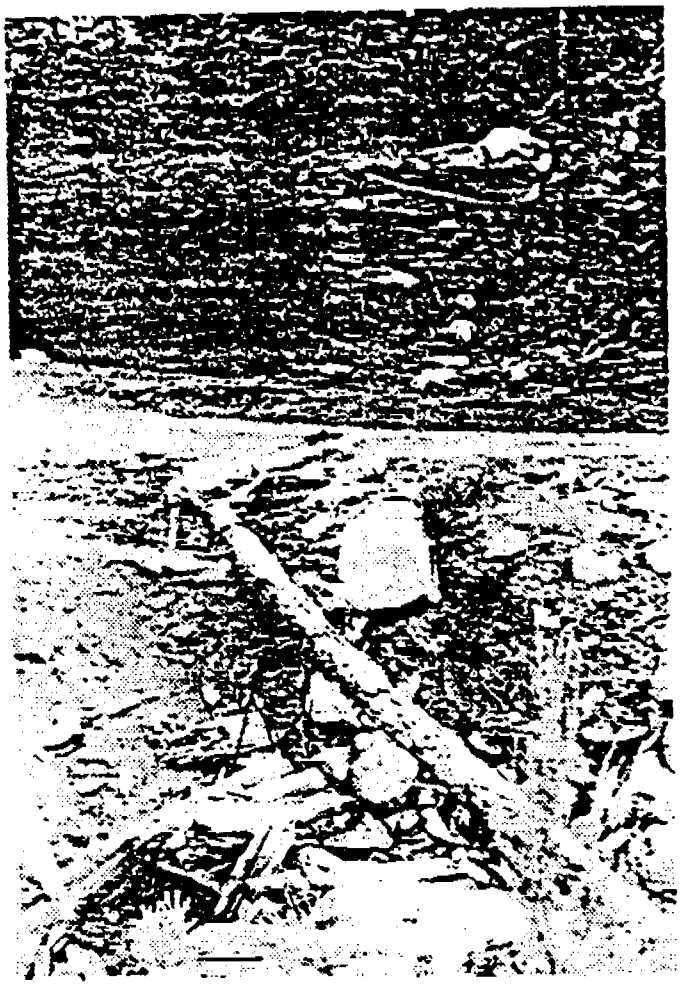
Width: 20'4"

Length: 23'

Inside Dimension: 17'x19'

Door: 4'4"x3'4"

Windows: 2'6"x2'



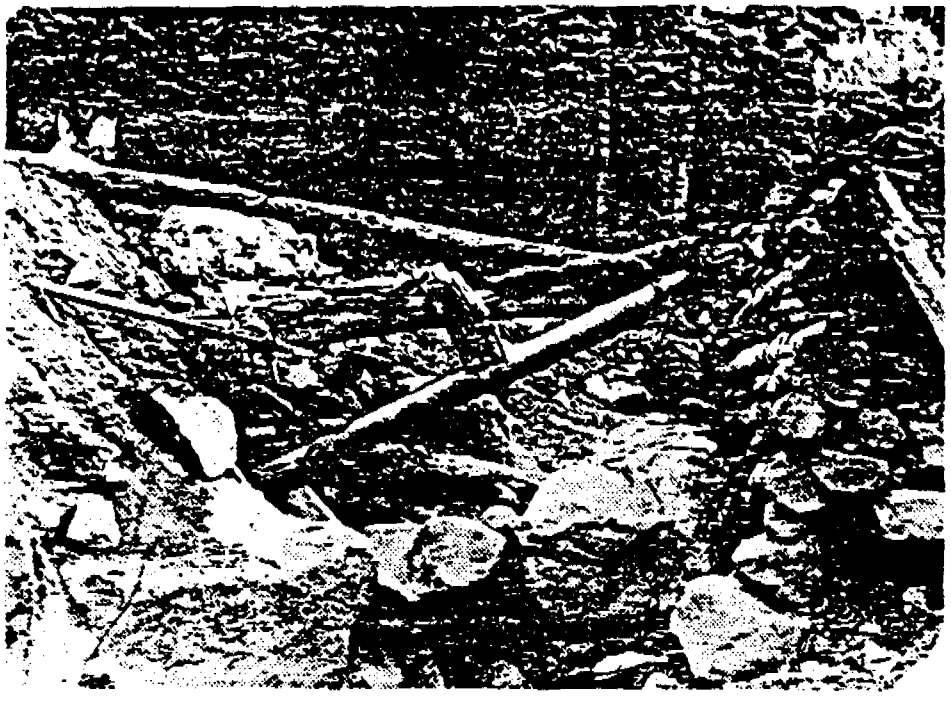
42Cb216 looking southeast, remnants of bridge across Crandall Creek

in foreground, present dirt road in center

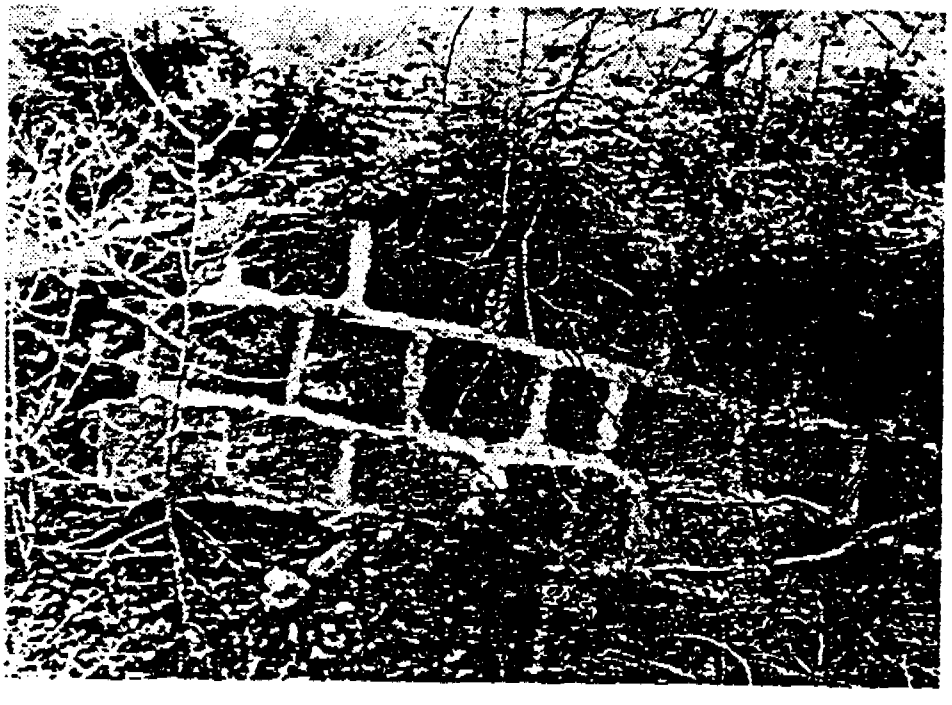
Close-up of 42Cb216,

historic structure incorporating large boulders in the walls

5Fxliii



Bridge remnants near 42Cb216, looking south



Shaped stone and cement retaining wall on old road bed near bridge remnants

There are two windows and a door on the north side. Two short logs are used as lintels above each window. There are no wooden frames in the windows and door, as was observed at 42CB215. No interior features were observed. No fireblackening or heat-reddened stones indicating fires inside the structure were observed, either.
Most of the east wall is comprised of a large natural boulder which is approximately 3 feet high. This could have been the only wall on this side as no evidence of wall above the rock was found. This could have been a large window overlooking the road up Crandall Canyon and the canyon itself.

A wooden bridge and old road bed are located in front of the stone structure. The bridge crossed the creek as two separate, narrow wooden trellises. An elevated road bed on the northwest side of the bridge was faced with cut stone and cement on the northeast side to halt erosion of the road bed itself. The cut stone wall is similar to others observed down canyon and along the highway near the Price River. This may have been constructed by county road crews.

Archaeological Investigations

There were no trenches placed in 42CB216 due to the evident lack of fill inside and outside the structure. Very few artifacts littered the surface but these were all collected as part of the surface collection. Surface collections of the other two sites were not total, but random selections of diagnostic or unusual artifacts. Some of the artifacts from 42CB216 appeared to have come from 42CB217, car seat springs are identical to some found at 42CB217.

Summary

The one room stone structure at 42CB216 resembles the structure at 42CB215 except that no evidence of roofing remains. This appears to have had a similar function, that of a seasonally occupied structure for a limited time period (possible summer cabin). No evidence of fires or stoves appear inside the structure. This structure lies in the shade of the hillside and trees at all time, and so is very cold. It would have been an uncomfortable dwelling in all but the summer months. One of the reasons for a much more extensive occupation at 42CB217 may have been due to the fact that the sun reaches and warms the site area year round.

National Register Considerations for 42CB216

Does 42CB216 have significance on a national, state, or local level for history, archaeology, ethnography, or architecture?

This small, one room structure is not unique architecurally, nor is it connected to an historic event or famous person. Archaeologically it does not appear to have the capacity to reveal significant information regarding the occupation of the structure. It could be connected to the seasonal occupation of Greek immigrants from the area, it could have been a summer cabin occupied by the Greeks.

Ultimately however, does the site, or will the site in the future, have the capacity to yield significant information that cannot be obtained from other sources?

Recommendations

It is recommended that 42CB216 (the structure, associated road bed

and bridge) be cleared for construction and mine activities by the Price River Coal Company. 42CB216 does not exhibit qualities which make it a good candidate for nomination to the National Register of Historic Places and therefore, should not be nominated.

42CB217

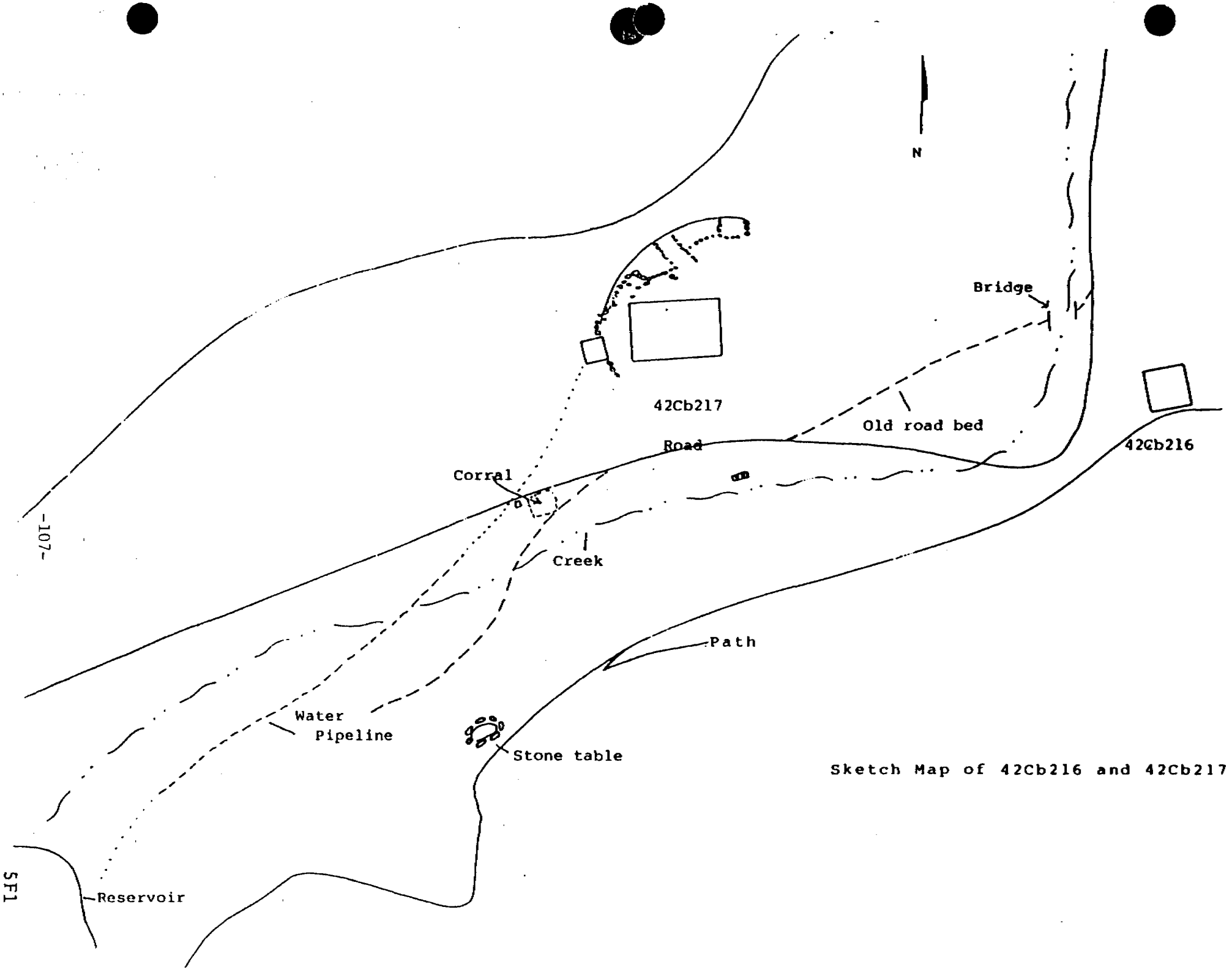
This is an extensive, sprawling site of many activity areas with many associated artifacts littering the entire site area. It appears to have been left in a state similar to when it was occupied, allowing for a few years deterioration and the removal of artifacts by curious by-passers over the years. On the surface was found the remains of bottles, ceramics, clothing, stoves, car parts, bed springs, chair parts, barrels, wash tubs, bones, plastic pieces, cement fragments, charred wooden posts, etc. In fact, nearly all artifact types which would be necessary to occupy the site were found.

The main part of the site (designated as Components 1, 2, and 3) exhibited the remains of a least 5 rooms, a large cement floor (20x35 feet), a midden area with numerous saw-cut and uncut animal bones, cement cistern for water, and connected water basin and many associated artifacts.

Component 4 was also a heavily occupied area but no rooms were evident in this component. Several walls, fences and "incubating units" (stoves to keep young animals warm) suggest this may have been a large area for goats and sheep.

Another corral with associated debris is across the road from Component 4 and was designated as Component 5. Component 6 was

comprised of another midden area (this one predominately of metal parts), an outhouse (2 seater) and a possible barbecue area.



Sketch Map of 42Cb216 and 42Cb217

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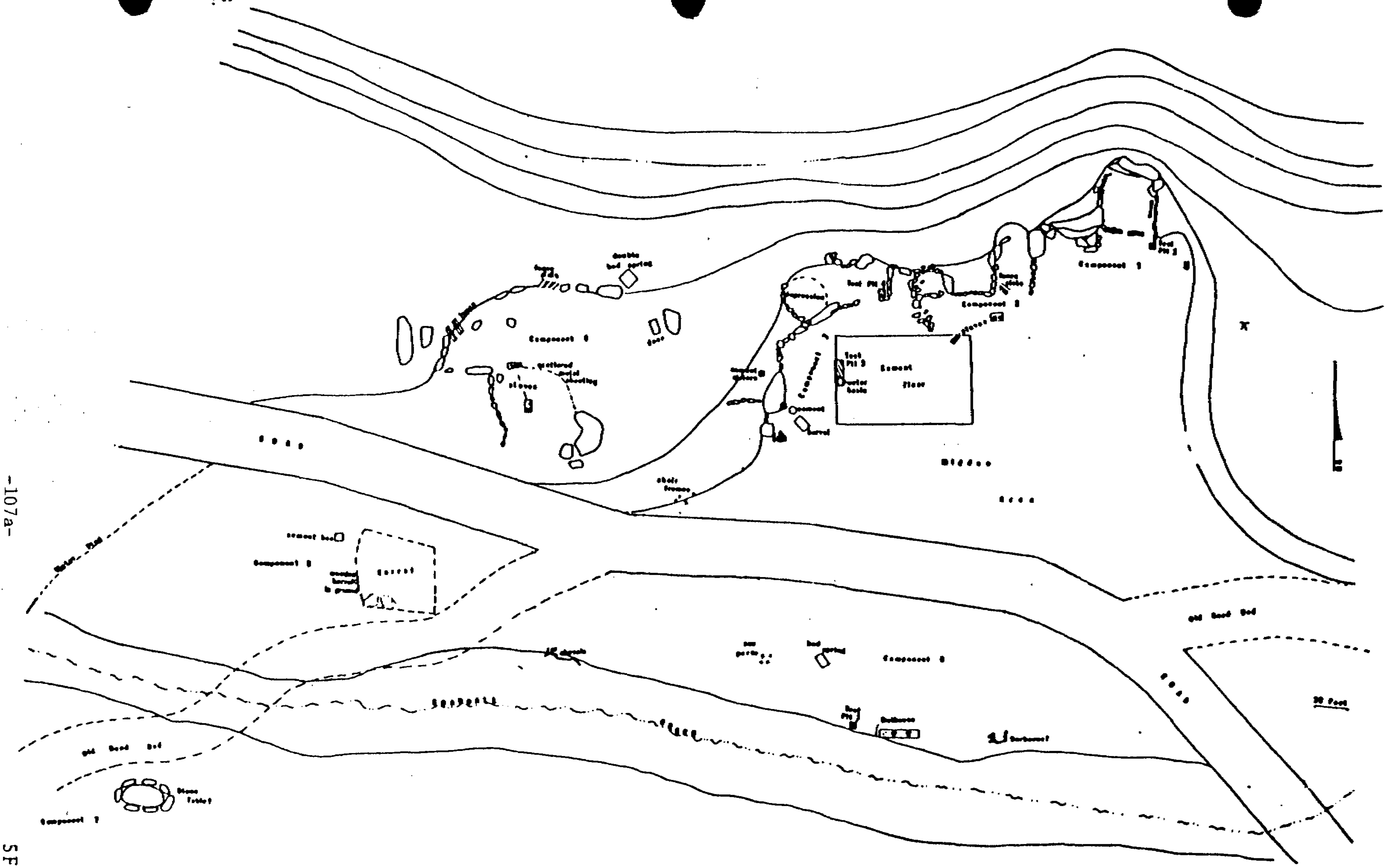

42CB217

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Across the creek is an unusual large flat stonesetting on three smaller stones with smaller stones around it, a reservoir and water pipe extending from the reservoir to the water cistern of component 3. This is Component 7.

Also on site are the remnants of an old road bed which partially follows the existing dirt road up Crandall Canyon which bisects the site.

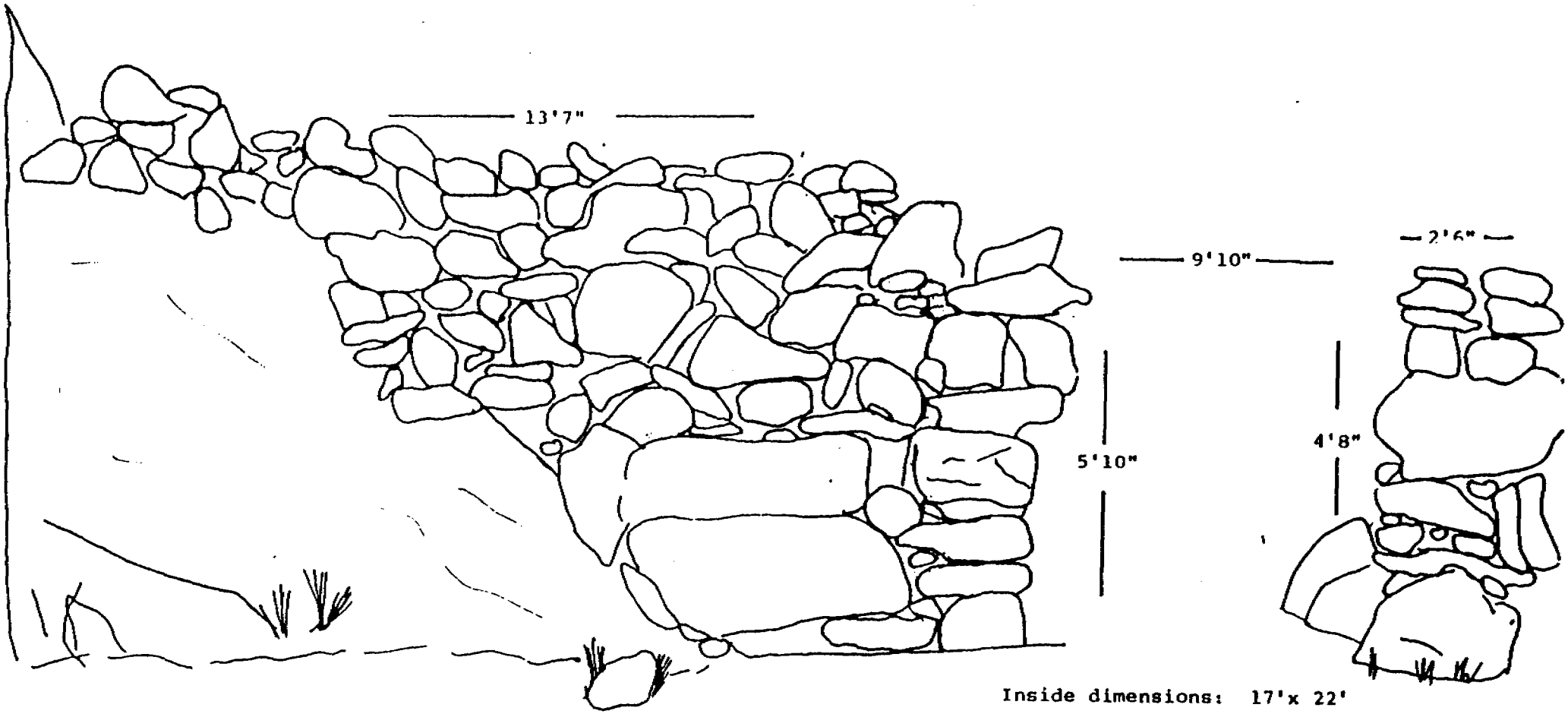
42CB217 is in an area of Crandall Canyon which widens and also where the creek angles to the west. 42CB216 is east of the site approximately 300 feet. 42CB215 is downstream from 42CB216 approximately 7/10 of a mile. All three Historic sites in Crandall Canyon are within one mile of each other.

Component 1. This component has the best constructed room of the site. The room has three stone walls with a back wall made of several large, natural rocks and the hillslope. The walls are irregular sandstones placed without mortar to a height of approximately 5 feet. The room itself is approximately 16 feet by 12 feet and has a window and door in front (south). No evidence of a roof remains, although numerous sheets if metal litter the site elsewhere. Part of a metal bed frame leans against the east wall inside the structure. The inside sandstone rocks exhibit fire-reddening, especially in the southwest corner. None of the sandstone blocks appear to have been shaped prior to their use but were more or less placed in a haphazard manner to form walls. A possible fireplace of irregular sandstone blocks lies in front of the room but it does not exhibit fire blackening. A long

wooden pole (part of a tree) with wire connected to it and dangling to one side is on the cliff immediately above this room. This may have served as an antennae of some sort, possibly for a radio. Another partially burned tree with wire connected to it is in a room of Component 3.

Component 2. This component also has a room but it is different from the room in Component 1. This room is constructed of two sandstone walls with the dirt hill comprising the back wall and an open front which was never walled. The back hillslope was partially excavated in order to create the room. The rock walls are of irregularly sized, unshaped sandstone rocks (no chisel marks were observed on any of these rocks as was seen as 42CB215). The rocks are from the immediate vicinity. A short (3 foot) Fence of narrow saw-cut wooden slats and wire lies at the front of the room. Several large sheets of metal which may have been part of the roof lie on the floor of the room. The sandstone walls all exhibit fire-reddening. A large propane stove lies on its side in front of the room and a hood to a similar stove lies in the room itself.

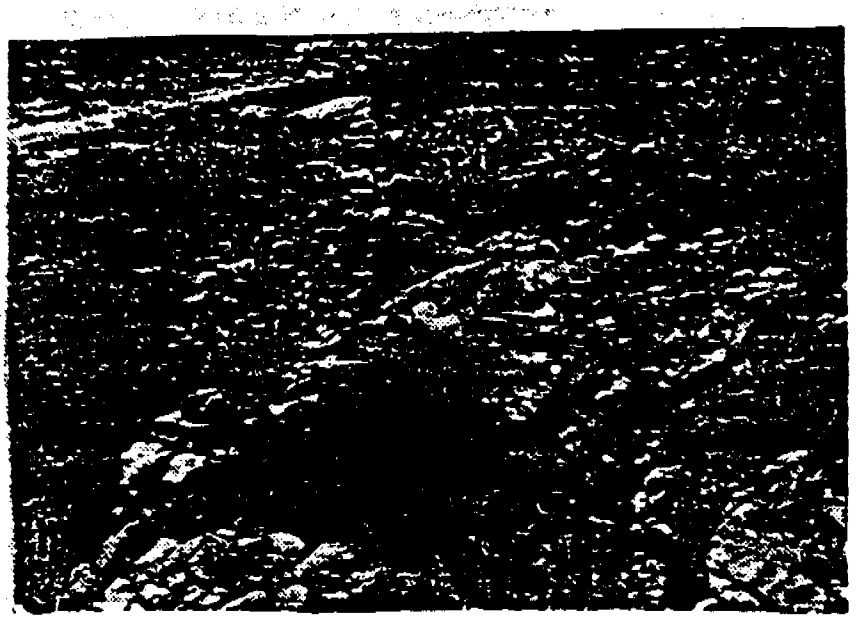
This room appears to have been for animals. It may have been a warming area for the young goats or sheep or just a room to hold the animals in.



Inside dimensions: 17'x 22'

42Cb217

Component #2



42Cb217 looking southwest

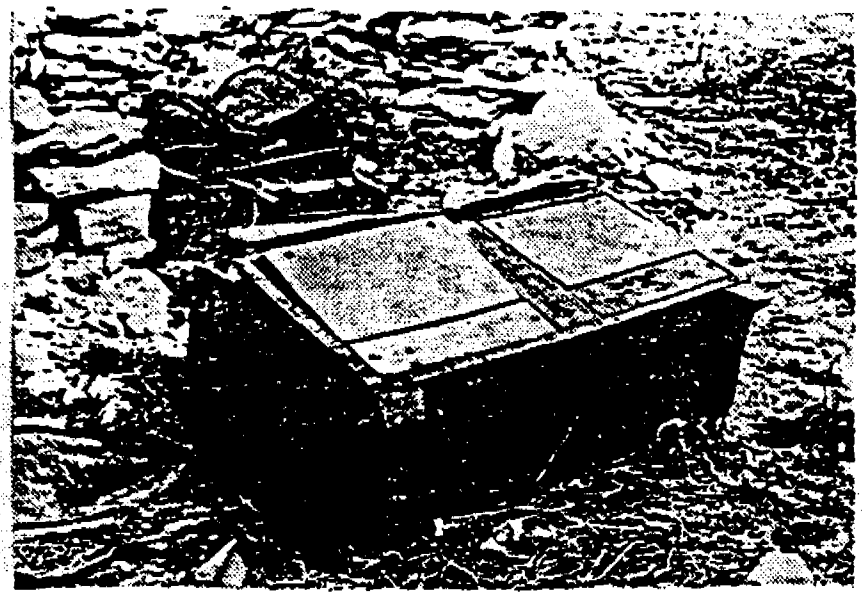
View of Component 1, 42Cb217, looking north

From the first room a sandstone wall fronts the hillside creating a high retaining wall or the impression of another room behind it. In back of this wall (on the hillside) were several cans and fragments of bottles.

Another possible room is on the east side of Component 2. This is a small deep room completely filled with fallen sandstones. No artifacts were observed in the room itself and the sandstones of this room exhibited no fire-reddening.

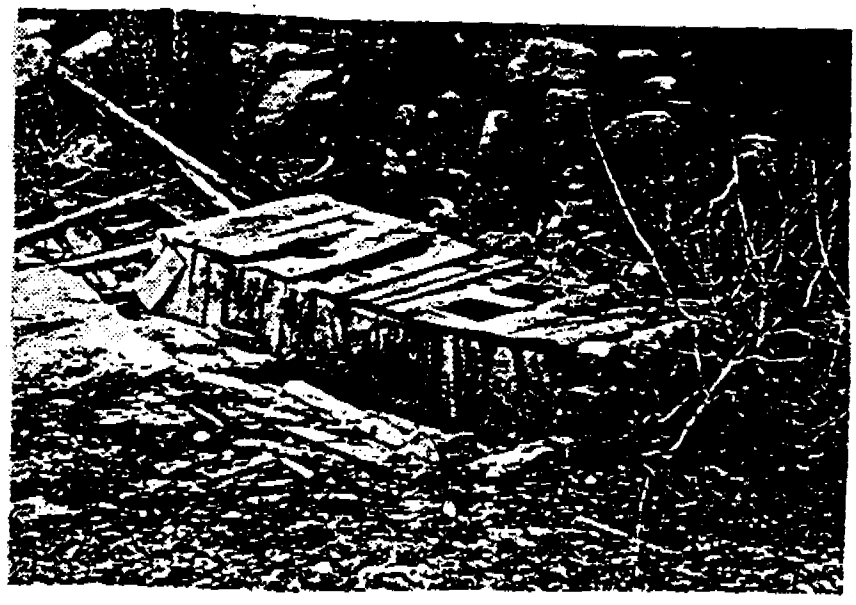
Component 3. Component 3 was a large litter-strewn area with several walls and a "corral" type area in front of the walls which was covered with metal sheets of various shapes an sizes. Remnants of a large cement floor flush with the ground were visible here. On the eastern end of the cement floor was an added water basin of rocks and cement with a lead pipe leading out of it. A large cement cistern (for retaining water) was observed east of the cement floor. This was behind a large rock and was elevated above the cement floor approximately 5'. It had a small (15" by 15") square opening which had originally been capped but is now open and completely filled with rubble, including very recent debitage (Pringles potato chip, cans, etc.).

One room is against the hill and is comprised of two stone walls with the third (back) wall being the hillside. On the eastern end of this room is an excavated pit (6' deep) against a large natural stone.



Propane stove in Component 2, 42Cb217,

fencing materials and other stove part in background



Outhouse near Crandall Creek, 42Cb217

The stone was unnaturally darkened (not fire blackened) possibly from animals kept in the depression. The remainder of the room contained numerous artifacts on the surface. It was in this room that most clothing on the site was found (a shirt remnant, a coat, overalls, tied quilt, shirt fragment, curtain fragment). Also in the room was a large galvanized steel wash tub, a 55-gallon drum and a shovel blade. Some of the stones comprising the walls had been heat-reddened, especially on the outer walls facing the large cement floor. The room was partially filled with rocks and part of the slumped hillslope.

A room with two partial walls remaining was located at the end of the arc of rooms. These walls and the large sandstone rocks used as walls are all highly heat-reddened. A large 55 gallon drum was lying on its side near this room, It had a cement casing on one end and an identical cement casing was found inside the room. Miscellaneous artifacts littered both the outside and inside of the room; springs, car parts, tubing, large sheet metal pieces, ceramic water pipe, wire, pieces of a stoneware mug.

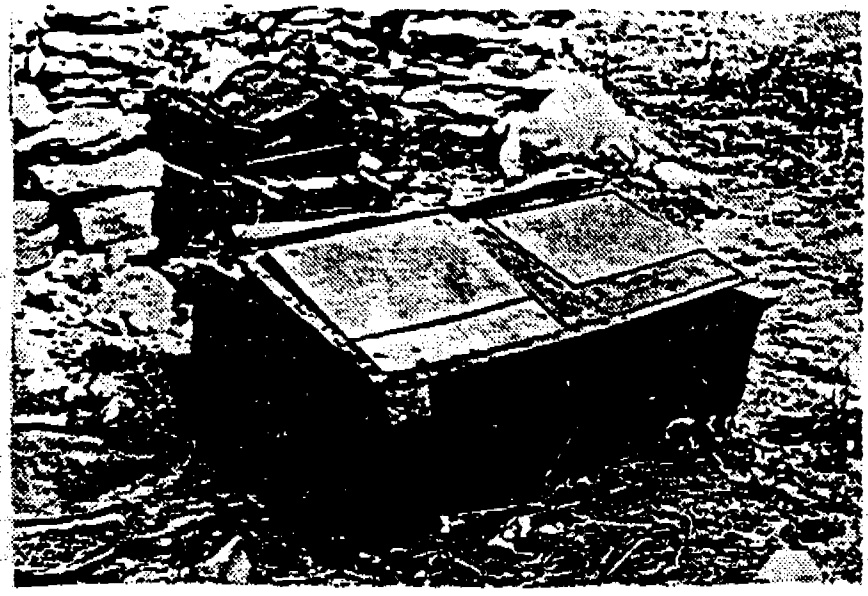
The large cement floor (20' by 35') in the center of the open area surrounded by rooms and crude stone walls was in poor shape. The southern end of the floor was in relatively good condition with definable edges and smooth appearance, but more than half of the cement floor was badly crumbeled. In fact, in order to determine the northern edge of the floor, it was necessary to observe changes in soil color. No post holes or other features or depressions were observed on this cement floor even though large parts of it were swept clean. A water

basin was added to the western edge of the cement floor. This was a circular basin of stones that had been cemented in and covered with a cement basin approximately 4" deep. A 1/2" iron pipe came up through the cement basin and at one time stood approximately two feet upright (it had been bent down parallel to the ground).

Component 4. This component had several fences, both upright and lying down, rock wall alignments, two stoves (one of which was incorporated into a rock construction with a car top for a hood), and scattered artifacts including numerous pieces of sheet metal, broken ceramics of various kinds, a double bed spring, a wooden door four metal chair frames and miscellaneous wire and metal fragement.

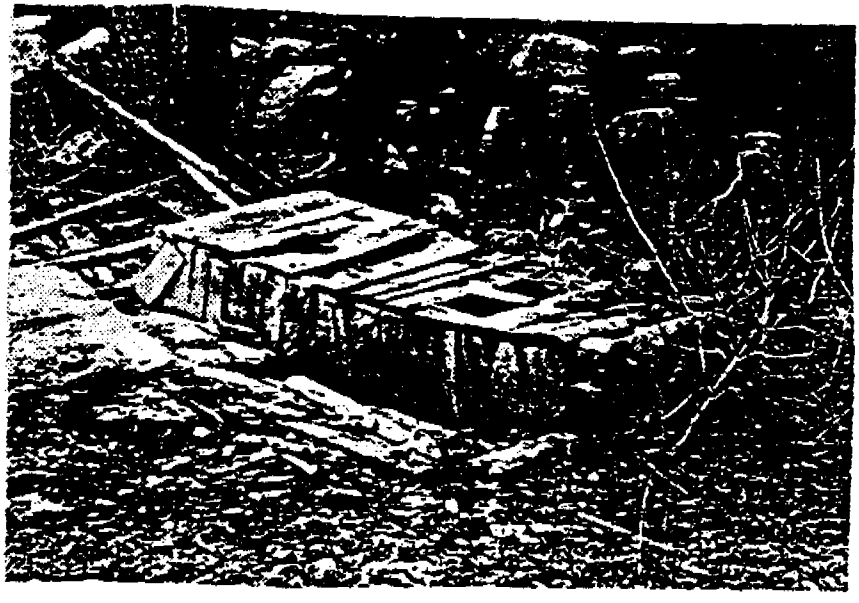
Two corral areas were discernable; one encircling a stove with a rock wall and most of the metal sheeting, and one north of that with fencing (some still in place) and rocks creating an enclosure.

One of the stoves was a white propane Monarch lying on its side and the other was a wood-burning stove that had been incorporated into a stone heating unit with the top of a car as its hood. All the stones around this unit were deeply reddened from heat.



Propane stove in Component 2, 42Cb217,

fencing materials and other stove part in background



Outhouse near Crandall Creek, 42Cb217

5Flix

Cement water cistern and breather hole

near Component 3, 42Cb217

5F1x

Component 5. South of Component 4 and across the existing dirt road were the remnants of a fence corral, a wooden barrel in the ground and a cement box. Remnants of the old road bed lie to the south of this corral. The fence around the corral was of thin wooden slats and wire similar to fencing found in other areas of the site. The cement box was approximately 2' by 3' and originally had a cover on it.

Component 6. This component is comprised of the outhouse, midden area an small stone enclosure (barbecue?) near Crandall Creek. The outhouse was a two-seater made of differing sizes of saw-cut lumber. This was still in good condition but the lumber wall around the facility had fallen down. This wall was originally 6'3" high and was apparently unroofed. The small stone enclosure east of the outhouse was 5 feet in diameter and appeared to have been a fireplace (barbecue?). The stones indicated heat-reddening on the inside.

A single bed spring, several car parts, seat springs and a car chassis (approximately 1920's model) litter the component. Numerous car parts were found scattered throughout the site and also at 42CB217, but all could easily be from one car.

Component 7. This component is comprised of an unusual stone slab (resting on three smaller stones) with smaller stones encircling it, a path going up the hillside, old road bed, water pipe system, and reservoir. The reservoir is an earthern structure in the creek bed and has an extensive water system leading to the center of the site. Most of the route of the water pipe is covered with earth and in some spots large sandstone rocks. At the crossing of the creek the pipe connects

to a rubber hose and then back to another pipe after the creek has been crossed. There were no scattered artifacts littering this component.

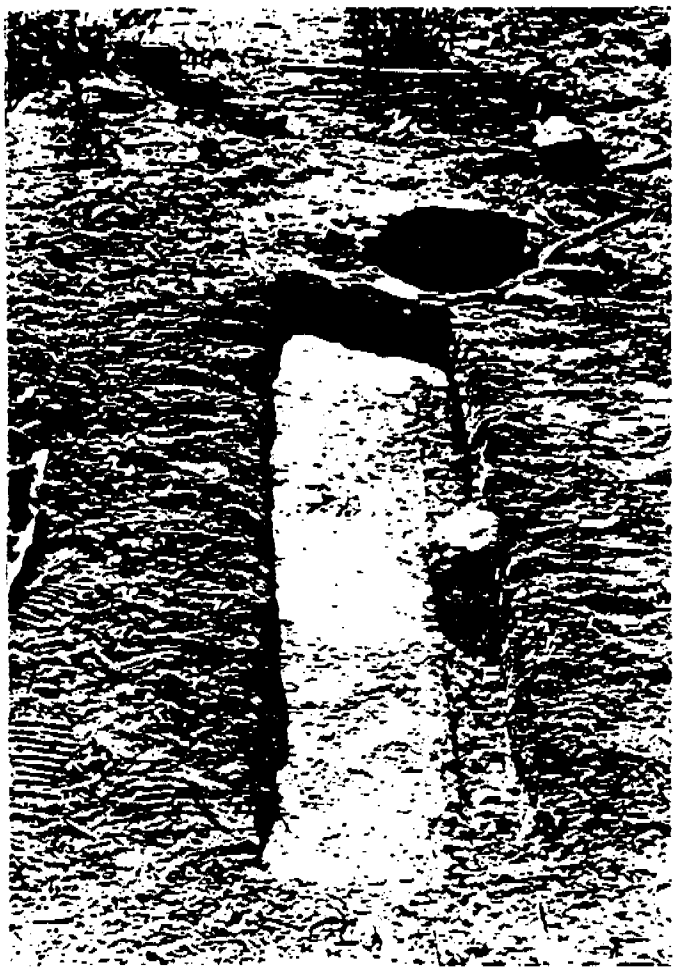
Archaeological Investigations

Test Pit 1. The first test pit was placed in a depression near the creek (west of outhouse) that was thought to be a former location of the outhouse. The pit was 3′ by 3′ and encountered no artifacts or cultural materials. The soil was sandy with gravel and was similar in color to the surrounding soil. It was in an area that had been disturbed but apparently not for the deposition of cultural materials.

Test Pit 2. The second test pit was placed in front of the room in Component 1. This pit was also 3′ by 3′ and was only excavated to a depth of 3" as sterile soil was hit. The soil was dark and contained artifacts to a depth of 1 1/2" when it became much lighter in color and contained no artifacts.

Test Pit 3. This test pit was placed in the southeast corner of the room north of the cement floor, was 2′ by 2′ and was dug to a depth of 8". Three whole bottles (canning) were found lying on each other with their lids intact.

Bottles "in situ" in test trench 3, 42Cb217



Test trench 4, 42Cb217,

revealing edge of large cement floor and water basin

5Flxiii

Fragments of other bottles were also found in the test pit. The whole bottles were empty except for one which contained fragements of cloth. The soil in the test pit was dark and uniform in color and texture.

Test Pit 4. The fourth and final test pit was placed near the cement water basin and large cement floor of Component 3. This test pit was 6' by 3' and went to a depth of 6" until the cement floor was encountered. The trench revealed that the cement water basin had been added to the cement floor as a later addition. The fill of the trench was extremely dark, compact soil with artifacts interspersed throughout. It appeared to be a uniform material, with no sand or gravel mixed in and could have been the result of animals (goats and sheep) living on the area.

Summary

42CB217 is a large debris strewn site (600' by 300') with several components and an extensive areal occupation. The rooms are crude, make-shift affairs composed of stacked unmortared, unshaped sandstones that were roofed with scrapes of sheet metal. The large amount and diversity of artifacts present on the surface indicates an occupation that covered several decades. Artifacts found on the site date its occupation predominately to the 1920's and 30's with sporadic artifacts to the present day.

Historic data on the site indicates that it was originally owned by the Peerless Coal Company. Sometime prior to 1929 (probably the early 1920's) a large lodgetype structure was constructed on-site complete with water system. This structure was a large log structure

of which there remains only a cement foundation and water system and remnants (reservoir, water pipe, cement box, cement basin and cement cistern) today. This was constructed by the Greeks of Helper and Castle gate and could have been one of the "immigrant lodges" referred to in the historic literature. These are described as places where the Greeks congregated on weekends, sometimes after a wedding or bapitsm, and held dances, parties and social activities.

One Greek man is singled out as the "caretaker" of the site by many who were interviewed, but this may have been due to his later occupation of the site and not to activities in the 1920's and 30's. Gust. Emanuel Baboulakis homesteaded the area around the site (T12S 49E Section 28, SW1/4 and NW1/4 of the SE1/4) on August 19, 1939. On May 11, 1940, the land near that of Gus Baboulakis and also down canyon (T12S R9E Section 28 NE1/4, SE1/4 and SW1/4; Section W1/2 of NW1/4 and W1/2 of SW1/4 and S1/2 of NE1/4) was homesteaded by Michael Polichronake (Polikronake). Baboulakis owned the land on which sites 42CB216 and 217 stood and Polichronake owned the land under 42CB215. Gust. Baboulakis' land was occupied by him until his death on June 3, 1967, in the VA Hospital in Salt Lake City, Utah, of pulmonary emphysema after a 1 day stay in the hospital. Baboulakis was more commonly known as Gust. Zacithenakis (Zacithinakis, Zakinthinakis, Zacenthenakis, Zacethenakis). It was under this name that he recorded the land patent in Crandall Canyon. Gus' life in Crandall Canyon is described by people of the area as that of a semi-hermit type who raised goats and sheep in the canyon. He was also famous for his

"Crandall Canyon Spring Water", a euphemism for his own brand of moonshine, which was delivered to customers by a boy. Crandall Canyon Gus, the name he was known by, would entertain friends at the site, at which time a jug was passed and reminiscences began. The girls of the area were never allowed up canyon alone (except for the mouth of the canyon where picnics were often held) because of the "atmosphere" of the place. Gus typifies the lone Greek goatherder in the moutain draws of the area who had a few sheep but maintained a solitary existence while manufacturing his "Crandall Canyon Springwater". Gus never married and was one of the few Greeks in Utah who served in World War I. After his death, Irene Kounalakis inherited and then sold the land to Dick and Annalee Jones of Orangeville, Utah. The land now belongs to the Franklin Real Estate Company.

Following Gus' death in 1967 (at age 74) no one occupied the canyon. From then until the present the canyon had been visited by intermittent picnickers, hunters, campers and sightseers from neighboring communities.

National Register Consideraions

42CB217 is an interesting site in that it was extensively occupied by a unique individual for at least 30 years. However, does this qualify it for nomination to the National Register of Historic Places? Does the site have national, state or local significance?

Archaeology - In archaeological aspects, the site does not exhibit cultural depth that would justify further investigation. Most of the fill in the trenches was shallow.

History - The historical ramifications of the site and its use are interesting. The fact that this may be the site of a Greek "immigrant lodge" could make it unique enough to qualify as an historical nomination to the National Register. But the remnants of the lodge today would make this a poor nomination. The log superstructure is completely gone and all that remains is the cement floor it rested on. The later occupation of the site by Crandall Canyon Gus completely altered the site appearance. The historical aspect of Gus' occupation does not justify the sites nomination to the National Register. He was not connected with the sheep industry, as implied by Notarianni (1980), except in a very marginal way. The impact of this individual upon society was minimal, at his own preference. This could qualify as a study of the individualism of a Greek immigrant to the area, but is of minimal value to general historical or ethnographical studies of the area or state.

Ethnography - The site is one in which a distinct cultural entity in Carbon County, the Greeks, occasionally had parties, picnics and at which one Greek lived most of his life in this country. Although the site is culturally interesting, the Greeks and their effect on this state and Carbon County could be better studied at other sites in the area.

Architecture - The architecture at 42CB217 is a helter skelter affair that is definitely unique but not of great artistic value. For the most part, construction was that of a single man making additional throughout his 30 years occupation of the site. If the lodge had

remained to this day, it would possibly have qualified as a Historic Place on the National Register.

Alternatives for the mitigation of 42CB217 need to be discussed. The site, if found to qualify for the National Register, could be preserved in its entirety for future study or as a historic place of merit. It could also be further excavated completely or partially (trenches). The site could also be moved to another locale in order to preserve its uniqueness. The further excavation or exploration of 42CB217 would not justifiably increase our knowledge of this site, its occupation or function. The movement of the site would also be moot as all that remains standing is a ramshackle affair of walls, fences and sheet metal. Had the lodge remained at lest fairly intact, then there would have been the possibility that it could have been preserved or moved. But it is too late to consider this alternative now.

Recommendations

42CB217 should be cleared for construction by the Price River Coal Company to proceed in this location. No further mitigative procedures are recommended. The site is not recommended for nomination to the National Register of Historic Places.

CHAPTER IV

CONCLUSION

The three historical sites in Crandall Canyon, Carbon County, Utah (42CB215, 216, 217) were more fully documented with plane table/alidade maps, black and white and color photographs and sketches by Utah Archaeological Research Corporation in November and December of 1980. Surface collections of artifacts from the sites were analyzed and archaeological test excavations were placed in two of the sites (42CB215 and 217). Further historic documentation on the sites in Crandall Canyon was done utilizing death, property and tax records, and oral and written histories.

The results indicated that the three historic sites are part of seasonal occupation of Greek immigrants in the form of two cabins and a lodge. The major occupation and visible construction at 42CB217 is attributed to an isolated greek individual (Gust. E. Baboulakis) for the duration of approximately 30 years.

On the basis of this investigation it is recommended that further mitigation at 42CB215, 216 or 217 would not justifiably increase the information on these sites and should not be required. It is also recommended that none of these sites be nominated to the National Register of Historic Places as they apparently do not meet the criteria for nomination as an historic property of national, state, or local significance on the basis of archaeological, historical, ethnographical or architectural values.

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APPENDICES

Introduction to Artifact Analysis

The purpose of the artifact analysis is to attempt to identify and, if possible, date enough of the artifacts to give a general use period for the three main historical sites which are located in Crandall Canyon, Carbon County, Utah. The artifacts, which we were able to obtain dates for, place the time periods of use of the sites 42CB215, 42CB216, and 42CB217 from the late 1920's through the 1970's. The main period of occupation appears to be between the 1930's and 1940's. Although many artifacts have been dated in these appendices, there were many more which could not be identified and some which couldn't be dated in the time allotted. Further dating of some artifacts could be done with more time, such as ceramics, but many of the types found have not yet any source material to draw on for history, etc. Other artifacts, especially metal types, requires some trade catalog reprints or patent searches which is quite time consuming, although enough information has been gathered which would enable further research to be done later, if deemed necessary.

The total number of artifacts recovered from the Crandall Canyon Salvage Project is 229 (see Table 1). The dating of the artifacts does not purport to give the actual date of the construction of the structures, only the seeming periods of use. Many of the artifacts came from surface collection, although test trenches were made in the near frozen ground which yielded some of the artifacts.

The artifacts of most use in quickly dating periods of use are

usually the ceramics and bottles which are found. This observation remained fairly true for this site. Although bottles were probably predominant in the dating of this site, some metal objects, such as license plates, also helped.

The following descriptions provide the basis for dating time ranges or periods of usage of the various structures.

One would also need to realize that these artifacts do not represent all the specimens that could have been collected but only a sampling as this was a salvage project. Artifacts were randomly selected from the sites during the surface collections in order to represent the greatest extent of time periods of use for the site and variety of artifact types. All the artifacts encountered in the test trenches were retrieved and are analyzed in these appendices.

TABLE 1
ARTIFACT SUMMARY

Glass		Items
Flat		7
Molded		34
Unidentifiable		5
	Total	46

Metals		Items
Wire		23
Flat		12
Cast		4
Molded		36
	Total	75

Ceramics		Sherds
Earthenware (soft paste)		
Red with stone temper (waterpipe)		5
Earthenware (hard paste)		
Brown		17
Gray		4
Porcelain (soft paste)		
Annular Ware		15
Porcelain (hard paste)		
Black Transfer		3
Green Transfer		2
Alkaline (clear)glazed		3
Annular Ware		9
	Total	58

Miscellaneous		Items
Rubber		5
Leather		1
Plastic		3
Miscellaneous		4
	Total	13

Bone		Bones
Sheep (Ovis aires)		12
Cow (Bovine)		8
Deer (Odocoileus hemionus)		7
Marmot (Marmota)		1
Wood Rate (Neotoma)		1
Unidentified		2
	Total	31

Total of all collected artifacts: 229

Definitions:

Molded — Any item which is given a recognizable shape or design, can be embossed or crimped also. This category does not include die cast items.

Unidentifiable — Any item which is unrecognizable. It can be melted, smashed, etc. You may only be able to recognize the material, if that.

Miscellaneous — Any item which doesn't fall into the already established categories. Some of the materials could be mixed materials or unrecognizable materials.

GLASS ARTIFACTS
by Alan Overstreet

42CB215 Surface

One clear glass base only, with a textured pattern and an embossed number "26". The diameter is 3-5/8" and this would probably also be post 1940 (Berge 1980:80).

42CB215 Surface

One metal Crown cap still attached to an amber Crown finish (post 1892—see Berge 1980:43, 56, 58).

42CB215 Surface

Two clear molded glass sherds, post 1940 (Berge 1980:80). They resemble NEHI soda of the 1950's and 60's type of bottle neck designing.

42CB216 Surface

One light green, almost clear, finish and neck with handle only for a large bottle—probably a gallon size. The handle is squared and at the base of the screw thread-type finish, is a metal ring which is probably the ring left after a roll on type cap closure was unscrewed (Berge 1980:43). The finish diameter is about 1-3/8", post 1924.

42CB216 Surface

Five miscellaneous glass sherds, mostly clear with slight tinges of green or aqua near the edges. There are two Crown top finishes, one clear and one aqua. Uniformity in manufacturing suggests possibly post ca. 1930/1939 (Berge 1980:81). 2sk 2 42CB217 Surface Component #1

Two light green, 5/16" thick, ground, edged, high quality plate glass sherds.

42CB217 Surface Component #1

One glass sherd, clear on one side, silvered on the obverse, mirror.

42CB217 Surface Component #1

One clear bottle base or bowl bottom, post 1940 (Berge 1980:80).

42CB217 Surface Component #2

One clear glass but slightly yellowish tinged gallon bottle fragment finish, neck with handle and part of shoulder only. What little embossing which is available reads part of an E or F space and GA with most of the right half of the A gone; I believe this simply says ONE GALLON. The slight yellowish tint may suggest use of selenium as the clearing agent, therefore suggesting a time period of ca. 1916-1930 (Munsey 1970:555).

42CB217 Surface Component #2

One clear glass sherd, thickness 3/16", post 1940 (Berge 1980:80). I can't identify the purpose of this sherd except to say it is embossed with a bundle of wheat and a few other undetermined parts of designing.

42CB217 Surface Component #2

One clear glass, post 1940, bottle base only. Uniform thickness, 1/4" in center (Berge 1980:80). It is embossed on the bottom with a 10" and a "505".

42CB217 Surface Component #3

One whole amber bottle 11-3/16" in diameter. It has a Crown cap finish, an embossed ring around the base of the neck and the mold seams are irregular. It was made in a cup mold and has the Owens bottle machine scar on the base. Embossing on the very bottom reads 24 I 3. The little letter in the diamond may be a sideways "H" but I prefer to think it is an "I" (eye) which would make it Owens Illinois definitely after 1929 (Toulouse 1972:397).

42CB217 Surface Component #3

One screw thread, 1/4" thick, milk glass, small jar finish. There is a little rust on the threading of the finish suggesting a metal cap at one time. The sherd is partly melted by heat. If this can be considered a continuous or quick-thread finish then it is post 1919/1924 (Berge 1980:57).

42CB217 Surface Component #3

One amber body sherd and part of the shoulder, 3/16" thick. Probably a beverage bottle.

42CB217 Surface Component #3

One light green 5/16" thick, flat, high quality, plate glass sherd.

42CB217 Surface Component #3

One unidentifiable, light green lump of melted glass.

42CB217 Surface Component #3

One unidentifiable, clear lump of melted glass.

42CB217 Surface Component #3

One unidentifiable, clear lump of melted glass.

42CB217 Surface Component #3

One clear 1/4" thick flat glass sherd, post 1940 (Berge 1980:80).

42CB217 Surface Component #3

Three clear miscellaneous glass sherds, post 1940 (Berge (1980:80).

42CB217 Surface Component #3

One clear molded glass sherd, post 1940 (Berge 1980:80).

42CB217 Surface Component #3

One amber bottle based only—partial sherd which is embossed and reads A which may be the Hazel-Atlas Glass co. 1920-1964 (Toulouse 1972:239).

42CB217 Surface Component #4

One slightly melted approximately 5/16" thick greenish tinged plate glass sherd. The back side of this sherd is coated with a greyish black substance. This was probably a mirror.

42CB217 Surface Component #4

One lump of unidentifiable very melted, slightly greenish, glass.

42CB217 Surface Component #4

One unidentifiable melted aqua glass sherd.

42CB217 Surface Midden Area

One clear 3/32" slightly curved glass sherd.

42CB217 Surface Midden Area

One slightly green 3/16" thick, edges unground, flat glass. Perhaps window glass sherd.

42CB217 Test Pit #2

One amber bottle base of uniform manufacture, 1/8" thickness, embossing on the bottom which is undecipherable. Probably post 1930/1939 (Berge 1980:81).

42CB217 Test Pit #2

One amber lower bottle body sherd, 1/16" thick.

42CB217 Test Pit #2

One clear glass fragment, slightly curved, post 1940 (Berge 1980:80).

42CB217 Test Trench #3

One light purplish colored embossed glass sherd. I couldn't identify what this was but purple coloring suggests manganese use as a glass clearing agent ca. 1880-1915/1925 (Munsey 1970:55 and Berge 1980:77).

42CB217 Test Trench #3

Five clear glass sherds, some may be from a lamp chimney or bottles. One is definitely a grown finish and another is an embossed

body sherd which appears to read, fragmentary form, "SELF SEAL; TRADEMARK." This information once again would suggest post 1940 (Berg 1980:80).

42CB217 Test Trench #3

One clear glass bottle, post 1940 (Berge 1980:80). This bottle is 5" high and 2-7/8" in diameter and has a snap cap (or patent lip) finish as a Giles ca. 1902/03 (Berge 1980:49, 53).

42CB217 Test Trench #3

One clear glass, post 1940, bottle (Berge 1980:80). Embossing on the base reads "Table products, Inc., Los Angeles." It also has other marks, stands for Glass Container Corp., since 1945 (Toulouse 1972:220). The bottle finish is a screw cap type threaded finish and the bottle is 6-7/16" high.

42CB217 Test Trench #3

One clear glass, post 1940, bottle (Berge 1980:80). This screw cap finish bottle is 5-1/4" high and 3-1/16" diameter and is embossed on the base as the previously mentioned bottle in one respect; it also has the trademark for the Glass Container Corp. and therefore is post 1945 (Toulouse 1972:220).

METAL ARTIFACTS

by Alan Overstreet and Margaret Williams

Three license places were collected, all from the 42CB217 surface collection. The numbers and dates are as follows (all from Utah):

(1) 3 A 56905, year 1953
(2) 66828, year 1955
(3) CH 91-86, year 1958

Only one Mason type canning jar lid from test trench 3 of 42CB217. This is a two piece threaded tin lid having evidence of a rubber seal. It is approximately 1/16" in metal thickness and has a 2-3/4" diameter. The patent date of the Kerr self sealing lid is August 31, 1915 (Toulouse 1969:120).

From 42CB217, the surface collection of the midden area, there are two shot gun shells with the red plastic body and a brass metal base. The diameter of each is 7/8" with the height 2-11/16". The base reads "Sears," "12-GA," "Ted Williams."

From 42CB217, surface collection of the midden area, one tin can (rusty). The top and bottom are crimped, height is 3" and the diameter is 2-3/8". This crimping method for cans is common after 1900 (Berge 1980:261).

42CB215 Surface

One rusty Crown cap for a bottled beverage. Crown caps were invented first in 1892 and are still in use today for sodas, etc. (Berg 1980:43, 56, 58).

42CB215 Surface

One aluminum bottle or can cap. It is so flattened that it is hard to tell if it is threaded or not.

42CB215 Surface

Two pieces of tin sheeting, one having a rippled finish and plain edges and one having a crimped over edge and a corrugated crease in the body of the sheet. These items could have been used as roofing material.

42CB215 Surface

An unusually formed piece of metal holding two square broken off lengths of wood. Actually I believe this item to be one of the cross pieces of something like an early wooden and canvas folding army cot.

42CB215 Surface

One piece of wire, taken from what may have been a fence. The wire is rusty and is approximately 1/16" gauge.

42CB215 Surface

One piece of wire, rusty, approximately 1/8" gauge.

42CB215 Surface

One more shotgun shell, metal base only. This one is Remington 12 gauge "Express."

42CB215 Surface

One each round, flat, rusted metal disc. This could be a can

bottom? It is 2-13/16" diameter, approximately 1/64" thick and has embossed on it EST794, AE 260.

42CB216 Surface

One A&W Root Beer can. This is a pull tab, aluminum can with a computer read pricing bar code printed on the lower side. It also reads that is was canned under the authority of A&W Beverages, New York by 7-Up Bottling Co. of Salt Lake City, Utah. A&W Root Beer was not put into cans until some time in the mid to late 1970's.

42CB216 Surface

One 6" high rectangular rusted metal can having a screw on cap type mouth located at one end and off to one end of the top end. The construction is crimped together and the can looks like the type that solvents, etc., are usually stored in.

42CB216 Surface

Two each tangled, tempered, rusted, metal springs about the right size for upholstery—perhaps of car seats? These are not the type of springs that are close in the middle. The gauge is about 1/16".

42CB217 Surface Component #1

One each table knife of rusted metal. It is of one piece of metal having no welds so it is probably drop forged or stamped. The first universal use of stainless steel, especially for flatware, was in 1930's but was first patented in 1916 (Berge 1980:265).

42CB217 Surface Component #1

One badly rusted metal can 3-7/8" high and 3" in diameter. It has crimped ends and a side seam. The contents were probably liquid judging from the manner in which the can was opened leaving two small triangular openings near the edge of the end. The size of the can and the look of it lead one to believe it may have been an evaporated milk can.

42CB217 Surface Component #1

One strip of metal. One end is free of rust indicating a recent break, both ends are jagged. The piece is 1-5/16" wide and 6-3/4" in length. The piece has a shallow curve with one end curled over towards the outside of the curve creating a 1/8" diameter tube. This was probably used for an edge rather than containing anything.

42CB217 Surface Component #1

A piece of rusty wire approximately 1/16" diameter.

42CB217 Surface Component #2

This is a 5" diameter rusty crimped edge metal lid, reminiscent of a coffee can lid. There is attached to the top, off center, the metal piece which at one time probably was attached to a key which was used for opening the metal can near one end. This type of can appears after 1917 (Berge 1980:261).

42BC217 Surface Component #2

Lettering on this object identified it as a fuel filter of somekind. There is only one hole in one end which suggests maybe a type used in a fuel tank instead of an in-line type. The hole in the one end has a rubber edging. The body of the filter has scores of small holes all around it. This item is 2" in diameter and 3-3/8" long.

42CB217 Surface Component #2

This is a hexagonal metal threaded nut of heavy metal. It is 3/4" high and 1" in diameter from point to point. This is of a size similar to those used on cars.

42CB217 Surface Component #2

This item is a short length of pipe probably steel. There is lettering which reads ANG but there may have been more to read if a longer piece had been found. The pipe looks as if it had been cut nearly through with a hacksaw and then broken off before the cut was completed.

42CB217 Surface Component #2

One metal threaded male plug having a rubber washer attached. The side which would be used to tighten with some tool is inset to a depth of 716" and has an outside diameter of 1-1/16". There is writing in the inset which reads "Tri-Sure," "Chicago USA," "Pats.," "1901196," "1982144," 1982145,""AF". The threaded end, flatside, has an isosceles triangle and a diameter.

42CB217 Surface Component #2

Appears to be of brass or copper metal, possibly a small valve of some type. Small holes suggest it may have been used for gas. Both sides have been broken off but there remains a few threads around one of the two holes. There are some impressed symbols on each side. One looks like a shield with an S inside and the other resembles bull horns.

42CB217 Surface Component #3

One piece of rusted wire approximately 7-1/16" in diameter.

42CB217 Surface Component #3

One rusty metal saw blade broken off. In appears to have been a key hole saw. There are also two holes having each a screw or rivet (no threads showing) with 7/16" diameter heads.

42CB217 Surface Component #3

On single edge axe head having one flattened hammer-like rectangular surface. This rusty item has the lettering SCC Co. impressed into the metal in small letters near the flattened head. The opposite side has what appears to be the letters JM hammered into the metal with large dots probably with hammer and punch. It is 1-7/16" thick, 3" wide and the blade is 5-7/8" long.

42CB217 Surface Component #3

Two varied short lengths of rusted metal closely spaced and interlocking coiled tubes, almost like flexible metal tubing or pipe. Approximately 1/2" in diameter, there seems to be the remains of something inside—perhaps wiring?

42CB217 Surface Component #3

One metal battery casing, appears to be a D cell flashlight type battery. Although the brand is obscured by rust, it appears to read as NOVEL; Longlife.

42CB217 Surface Component #3

Two wrinkled (melted?) very light, non-corroded or rusted, metal fragments. These pieces have undefined shapes and are probably aluminum.

42CB217 Surface Component #3

One shiny semicircular, mostly flat, metal piece having one bent over straight edge with a metal rod through it (like a hinge) and one semicircular edge with a hinging lip and evidence of a rubber gasket. Probably stainless steel, this piece looks like half the top of a restaurant sugar bowl.

42CB217 Surface Component #3

One rusted bent once over flat piece of metal which has metal wire stitched into one edge.

42CB217 Surface Component #3

One very corroded flat piece of metal. Judging from the corrosion, possibly copper.

42CB217 Surface Component #3

One heavy, partially melted piece of shiny metal. May be stainless steel (Berge 1980:265). The shape is odd like a rectangle with a semi-

circle attached to one end—one corner and a hole drilled in the other corner.

42CB217 Surface Component #3

Two pieces of what first appears to be a form of rusty barbed wire but upon closer examination might also be cut up field fencing with the coils holding short cut off pieces of intermediate spacing wire. If it is field fencing, the squares would be about 4 1/2" square as that is the approximate distance between the small coils (see Fountain n.d.:122).

42CB217 Surface Component #4

One rusted steel doorknob. Totally free of decoration except for a band of metal around the waist. There is a hole through the shank and the knob is 2 1/4" in diameter (Eastwood 1976:94).

42CB217 Surface Component #5

One twin outlet electrical box which utilized the non-grounded type of receptacle.

42CB217 Surface Component #5

One 8" long 3/8" diameter round (steel) common nail shaped spike.

42CB217 Surface Component #5

Five fragments of rusted metal wire screening material, 1/16" mesh, such as might have been used for windows.

42CB217 Surface Component #6

One metal (steel?) door hasp for use with a padlock. This item is hinged, one section has three holes drilled in it and is 2" long and the longer 4 1/4" section has a slight bend with an elongated hole near the bend close to the end. The width is uniform and 1 1/2" and the thickness is 3/23".

42CB217 Surface Component #6

One cast iron door, enameled on one side, possibly from a stove. This item is rectangular and the corners are slightly rounded and the dimensions are 2-3/8" by 6 1/2". One side is rusted with two protrusions and the other side is enameled. The protrusions appear as if they were meant to hinge or latch-up. The metal is approximately 7/32" thick.

42CB217 Surface Midden Area

One piece of metal (rusty), 3 1/4" long, 2 1/2" wide, and 1/16" thick. This piece of metal is mostly flat having one broken edge and three factory type edges, one of which has what appears to be two tongues of metal that are both slightly curved in the same direction, as if they were to hook into two slots. There is also one neat hole in the near center equi-distant from each finished edge (minus the tongues.)

42CB217 Surface

One each enameled rectangular metal tray 16" by 11 1/2" with 1/16" thick metal. The edges are bent out and downward slightly. Most of the enamel was white in color and the bent edges had a blue stripe all the way around.

42CB217 Surface

Six pieces of metal of some kind, brittle, shaped like screening of some kind but heavier and with rectangular squares. There are five brown (or rusted) pieces and one nearly complete gray one. They appear to be electrical.

42CB217 Surface

One table knife blade only, the handle is missing but a short tang is there for attaching one. The handle probably was wood, bone, or plastic. This piece is also rusted but very small beads of some shiny metal element are seen in a few spots; possibly the result of an intense heat melting a plating material, possibly silver.

42CB217 Surface

One rusty Crown cap for a beverage bottle. Invented and used from 1892 till present (Berge 1980:43, 56, 58).

42CB217 Surface

One rusted flat metal fragment 8 1/4" long and crimped over 2/3 of its length; unidentifiable.

42CB217 Test Pit #1

One rusted metal nearly flexible spring 5 1/2" long and 3/4" in diameter. Each end has a sort of hook which is reminiscent of a screen door spring.

42CB217 Test Pit #2

Eight wire nails. Five are rusted beyond recognization, the other three are rounded with a four-sided chisel point. Two of the 16 penny nails have a series of 5 notches on the shank just under the flat (common) heads. The sizes of the nails are as follows (d stands for penny—a term used for size in hardware):

3 each 16d
1 each 9d
3 each 8d
1 each 10d

Automatic wire nail makers were used in 1855 in France and are still in use today (Berge 1980:256).

42CB217 Test Trench #3

Approximately one half of a rusty mason style canning jar lid liner. This is part of a two piece jar lid of tin of the type developed after 1915 (Toulouse 1969:120).

CERAMIC ARTIFACTS

by Glynneth Bockholt

Observation of the ceramics from 42CB217 yielded three types: hard paste earthenware, soft paste porcelain and hard paste porcelain. The following is a count of these types.

Earthenware (soft paste)	
Redware with stone temper (water pipe)	5 sherds
Earthenware (hard paste)	
Brownware	17 sherds
Grayware	4 sherds
Porcelain (soft paste)	
Annularware	15 sherds
Porcelain (hard paste)	
Black Transfer	3 sherds
Green Transfer	2 sherds
Alkaline (clear) glazed	3 sherds
Annularware	9 sherds
Total	58 sherds

The earthenware has been determined hard paste because of its qualities, as explained in Berge (1980:188); "the earthenware that has hard paste is that which is only slightly absorbent though not readily so. The paste is more vitreous than soft paste, but is also opaque. It may not require a glaze for limited domestic use. Hard paste vessels

are wellfired and very hard." Included in this category are the brownware, consisting of a jug and one molded sherd, and the grayware, consisting of various rim, body and base sherds, usually with a cobalt glaze.

Brownware is described as "vessels which have a dark brown glaze, usually on both exterior and interior walls. The body pastes range from a reddish to a cream color" (Berge 1980:188). Both the jug and the molded sherd have pastes of a cream or buff color. The jug, which measures 10 1/2" long with a diameter of 6", has a dark brown glaze on the interior only, with the exception of the neck and handle. It's hallmark is a transfer printed maple leaf with the company's name, Western Stoneware Co. included. The base indicates this piece of brownware crockery was produced on a potters wheel. The other sherd of this type has a light brown glaze and is decorated in rectangular scales. It obviously is the product of a mold rather than a wheel. According to Ramsay (1939:20 in Berge 1980:188) those vessels within the brownware type that have a cream-colored body are "almost always ornamental pieces that were pressed into molds while still in a plastic state."

The grayware sherds have essentially the same characteristics: a cream colored paste and a cobalt glaze. In its beginning stages of manufacture, grayware was mostly confined to heavy, plain utilitarian vessels (Berge 1980:189). But when decorated, the designs were usually done in cobalt blue "since it will not oxidize at the high temperature required for firing stone vessels" (Ibid.). One sherd is decorated with

a blue flower motif and appears to be cork stamped rather than handpainted or transfer printed. The surface of cork stamped ware is "not hand painted, and yet, judging by detail and sharpness of lines, it is not transfer-printed. It appears to be stamped on the vessel prior to glazing, since the design is under the glaze" (Berge 1980:208).

The soft paste porcelain presents an interesting case, as, according to Ramsay (1939), soft paste or the frit type of porcelain was never made in America, at least prior to 1900. (Berge points out that archaeological evidence may change his (Ramsay's) information). Perhaps these sherds, all annularware or banded, are not exactly soft paste but are merely softer than the other hard paste sherds. "It is hard to clearly distinguish what is actually hard paste and what is soft paste at the point where the two approach each other in composition and/or physical attributes" (Berge 1980:211). Or perhaps, softpaste was made after 1900, which, if correct, would date these sherds past 1900. As the surfaces are "waxy"—looking and can be scratched, the latter suggestion may seem more plausible.

Hard paste porcelain is "fine-grained, compace non-absorbent, has a conchoidal fracture, and is close to steel in hardness" (Ramsay 1939:115 in Berge 1980:210). It makes up the largest number of sherds from this site, and, as little hard paste porcelain was produced before 1900 (Berge 1980:175), the abundance of it may be an indicator for a post 1900 date for the ceramics.

In regards to the type of glaze used, the alkaline or clear glaze seems to be present on all sherds. The alkaline or leadless glaze was

invented for porcelain in 1820 and for red earthenware in 1822 as a replacement for lead glazes, which were detrimental to the health of potters (Theus 1974). But, according to Ramsay (in Berge 1980:171) these leadless glazes were primarily used after 1860.

Unfortunately, the hallmarks are currently unable to be dated. Most sources have included ceramic hallmarks through the 1800's. It is supposed that these marks are of a later date probably in the 1900's, as the general character of the sherds and other artifacts would also support a recent date.

EARTHENWARE

42CB217 Component 3 Surface

One body sherd; hard, cream colored paste. Brown glaze with clear alkaline glaze over it. Embossed mold with rectangular scales design. Probably brownware.

42CB217 Component 3 Surface

Two sherds (one rim, one body-base); hard paste, cream colored paste. Light blue cobalt glaze: grayware. Some possibility could be lead glazed.

42CB217 Component 3 Surface

Jug (13 sherds reconstructed with 3 others). Dark brown glaze interior, also neck and handle. 10 1/4 inches high, 6 inches diameter. Hard with cream colored paste. Hallmark: maple leaf with company name: Western Stoneware Co. done in blue transfer printed. Brownware crockery. One sherd. Hard and cream colored paste. Cobalt glaze. Grayware.

42CB217 Component 3 Surface

One sherd. Hard and cream colored paste. Blue flower motif; cork stamped ware. Grayware.

SOFT PASTE PORCELAIN

42CB217 Component 3 Surface

Matching set of green, maroon red and green banded (annularware). 2 rim sherds from shallow saucer; 5 sherds and 2 base sherds from an oblong platter. 1 handle-base sherd and 1 rim sherd of a cup and 1 rim-base and 1 base sherd of cup's saucer. On the base of the cup is part of a mark. . . . EPCO USA CHINA. The cup is also fire bleached; a thin green band runs the diameter--middle handle of the cup and a thicker green band around the top rim.

The matching saucer has a thin green band running the center base and a thicker band running the outside rim. The other saucer and oblong platter are thin banded in alternating colors green, maroon red, and green on the outside rim.

42CB217 Component 3 Surface

1 sherd--rim, probably of cup--with 1 maroon red band (annularware) around outside top rim. 1 sherd--rim of saucer, same type as above. (May be part of a set).

42CB217 Component 3 Surface

3 rim sherds, 2 reconstructed. 2 base sherds—mark (printed). 1 body sherd. All have clear alkaline glaze. Observation on the inside base indicates this piece was made on a potters wheel. Appears to have

been small jar or cork of some sort. Unusual gray-blue ring around outside diameter of the base and gray-blue dots scattered on the remaining sherds. On sherd same type but different shape (profile of rim is different). Probably another jar or crock.

HARD PASTE PORCELAIN

42CB217 Component 3 Surface

Nine sherds reconstructed deep saucer. Six inch diameter. One maroon red band (inside). Annularware. Mark: Iroquois—Syracuse, New York. Printed.

42CB217 Component 3 Surface

Two rim sherds of a plate and one body sherd of a cup. 1 Black transfer printed with clear alkaline glaze.

42CB217 Component 3 Surface

One base sherd—part of mark. . .INFELTER inside oval garter; 1 body sherd, 1 rim sherd. Clear alkaline glaze with matte finish. Probably large crock or jar.

42CB217 Component 4 Surface

Two sherds reconstructed—plate. Green transfer patter (flowers) around rim with clear alkaline glaze.

CERAMIC WATERPIPE

Red earthenware with small stone temper.

42CB217 Component 5 Surface 1 piece

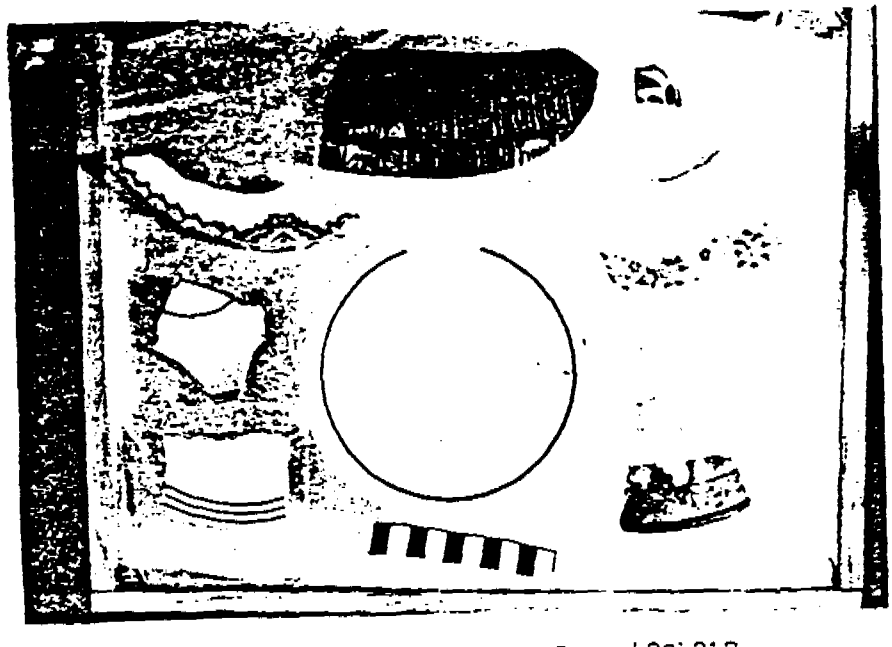
42CB217 Component 3 Surface 1 piece

42CB217 Component 2 Surface 2 pieces

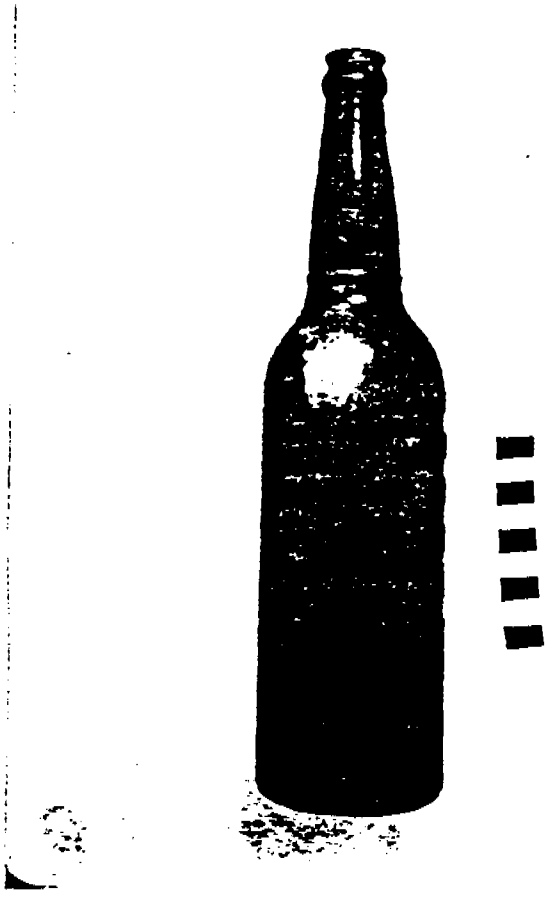
42CB217 Surface Midden 1 piece

4 1/2 inch diameter; pipe 1/2 inch thick. Presence in all locations leads us to conclude pipe ran throughout site.

Brownware jug from surface of Component 3, 42Cb217



Various ceramic artifacts from 42Cb217



Whole amber bottle from surface of Component 3, 42Cb217

Miscellaneous Artifacts

by Alan Overstreet

42CB215 Surface

One clear plastic snap on lid from a Pringle's Original Style Potato Chips cannister. From personal experience I can say that this item could not date before the late 1960's/early 1970's and they are still being manufactured in the United States.

42CB216

One stitched leather piece. It appears to be bedding such as might be found in use on some types of upholstery edging. It appears to be leather and is approximately 16" long.

42CB217 Surface Component #2

One windshield wiper blade, metal backed—rubber insert. It is fairly small at only 8" long. May be for a small car.

42CB217 Surface Component #3

One black rubber 1/2" diameter reinforced gas hose. There appears to be the remnant of a metal hose clamp near on end and the word "GAS" is printed in white every 3/4".

42CB217 Surface Component #3

One fired electrical wire. One end has a prong type connection which is used under a hold down screw electrical contact. The wire has 12 strands of wire twisted together and coated with rubber. The whole thing looks as if it has been subjected to intense heat.

42CB217 Surface Component #3

One piece of brittle hard substance which appears to have been a square or rectangle, judging by the neatly cut factory edges. The other edges are torn or broken. The substance is 3/16" thick and may be some sort of asbestos or linoleum floor tile. This piece appears as if it may have been in a fire, by the coloring.

42CB217 Surface Component #3

One cloth, rubber impregnated or layered, rubber hose of somekind. This item is flayed open, is black inside and red or orange outside. This could be an early type of radiator hose for a car.

42CB217 Surface Component #4

One whitish two-hole button, it will scratch and, therefore, I believe it is plastic. It would, therefore, also have to be somewhat after the time of initial Bakelite production, post 1909 (Encyclopedia Brittanica 1977:VII;933).

42CB217 Surface Component #5

One orange (amber?) pressed molded (corrugated one side) round plastic piece. This item is probably the plastic cover for some kind of automobile warning light? Lettering on the smooth side reads "Grote 902....." Part of the 2 is missing and there may have been more.

42CB217 Surface Midden Area

One cloth reinforced rubber impregnated round ring. This may have been some kind of washer or gasket.

42CB217 Surface Midden Area

One 2" long by 7/8" diameter reinforced rubber pressure hose.

42CB217 Test Pit #2

This flat piece appears like it might be Bakelite. All edges are rough with no factory edge available. This item is black, lightweight, brittle, and 1/8" thick, use unknown.

Bakelite (phenol-formaldehyde resin) was first manufactured by regular production methods in 1909 as devised by L.H. Baekland in the United States

42CB217 Test Trench #3

One thick curved rubber piece. This was probably, once, a solid rubber tire such as could be found on a tricycle or wagon. Although smooth on the flat outside part of the semicircular fragment the inside of the curve is rough, uneven, and appears to have been torn away from something; possibly a metal wheel rim.

BONE ARTIFACTS

by Clay Cook & Diana Christensen

The bones recovered from the three archaeological sites in Crandall Canyon (42CB215, 216, 217) represented 5 separate species of animals (37 bones in all). These bones were randomly selected from each of the sites in order to give a representative collection of the fauna being exploited and used on the sites.

12 sheep (Ovis aries)
8 Cow (Bovine)
7 Deer (Odocoileus heminous)
1 Marmote (Marmota)
1 Wood Rat (Neotoma)
2 Unidentified
37 bones total

At 42CB215 three deer bones were collected. These represent no more than one individual and could easily be remnants of activities conducted onsite that are not associated with the principal occupation or construction of the structure, such as animal or hunting activities.

42CB216 yielded 2 saw cut cow bones (Bovine) (1 individual) and 1 saw cut sheep (Ovis aries) bone (1 individual). The cow bones represent 2 shoulder roasts and the sheep bone represents a rib roast. These could be associated with the occupation of the structure or later activities but it is impossible to determine as the bones were collected from the surface.

Bones were much more numerous from 42CB217, as were all other artifact categories.

The surface collection and test trenches of the site yielded the following bones:

Provenience	Quantity	Animal	Species	Individuals Represented	Meat Cuts (Where applicable)
Comp. 1	1	Sheep	Ovis aries	1	
Comp. 2	1	Deer	Odocoileus	1	
Comp. 2	1	Wood Rat	Neotoma	1	
Comp. 3	5	Sheep	Ovis arives	1	
Comp. 3	3	Cow	Bovine	1	2 shoulder roasts 1 rump roast
Comp. 5	1	Cow	Bovine	1	1 shoulder roast
Midden area	1	Marmot	Marmota	1	
Midden area	7	Deer	Odocileus	2	
Midden area	3	Sheep	Ovis aries	1	
Midden area	2	Cow	Bovine	1	1 rib roast (portion) 1 shoulder roast (portion)
Test trench 2	2	Sheep	Ovis aries	1	1 saw cut (cut unknown)
Test trench 2	2	Deer	Odocoileus	1	
	1	Unidentified	_		
Test trench 3	1	Unidentified	_		

Analysis of the bones from 42CB217 indicates several factors in fauna use at the site. These are:

1. All use of cow (Bovine) on site is in the form of butchered cuts, these are primarily shoulder roasts. This would also imply that these meat cuts are obtained elsewhere and purposely selected. This is reinforced as no other Bovine bones are found on site.

2. Most of the sheep bones present were not butchered. Only one (portion of a rib roast) was saw cut. This could indicate that the sheep was being utilized in a minor capacity as a foodstuff or that the sheep being eaten were "home grown". This last assumption is further strengthened by archaeological and historical evidence on the site.

A REVISION

OF

AN ARCHEOLOGICAL SURVEY IN CRANDALL CANYON, CARBON COUNTY, UTAH.

By

LAMAR W. LINDSAY

Antiquities Section

Division of State History

October 20, 1980

Chapter V/2

INTRODUCTION

This report is a revision of a brief Memorandum by Kay Sargent (July 3, 1980). The report explains an archeological survey conducted in Crandall Canyon, Carbon County, for the Price River Coal Compnay. The survey was conducted on June 30, and July 1, 1980. The survey involved walking transects in two principle areas which are apparently ear-marked for mining, associated access roads, and a power line route. The survey areas are located in roughly the southern quarter of Section 22, T. 12 S., R. 9 E., (about 80 acres) and the southern half of Section 28, T. 12 S., R. 9 E. (about 160 acres) (U.S.G.S. Kyune and Standardville 7.5 Minute Quadranges). About one mile of access road links the two areas. Only a very small portion (about 200 meters) of the roadway is on federal land. This is in the SE 1/4 of the NW 1/4 of the NW 1/4 of Section 27. Additionally, the access road continues southward from the area in the southern half of Section 28 through the north half of Section 33 and southeastward through the south half of Section 33, (T. 12 S., R. 9 E.), continuing southeastward through the northeast quarter of the northeast quarter of Section 4, into the west half of Section 3 (T. 13 S., R.9 E.). This latter segment of roadway is about 2-1/2 miles in length. Roughly 3/4ths of a mile of the latter segment (southern 1/2 of Section 33) is on federal land. A power line runs roughly parallel to and on the west of the southern segment. In sum, two fairly sizeable areas are ear-marked for mining. One area northernmost in the development is immediately adjacent to US Highways

50 and 6 on the Price River. The second area to be mined in Crandall Canyon is about 3/4 of a mile south of the Price Canyon Recreation Area Campground. A roadway and power line extends the development south and southeast to Hardscrabble Canyon. Except for the two very limited portions of the roadways, all development is apparently on private land (see attached maps).

METHODOLOGY

A staff archeologist of the Antiquities Section conducted the infield examination. With the identification of several historic sites, a historian with the Utah State Historical Society conducted a follow-up inspection to evaluate the sites. The initial two-day inspection involved walking the landscape. The entire area was inspected including the course of the proposed power line which was well staked. About a-half-a-mile of the access road and power line route was not surveyed due to the extremely steep and rugged terrain. Obviously, archeological sites could not occur in this area. This involved the transect from the southernmost mining area, the southern 1/8 of Section 28, and the approximate northern 1/2 of Section 33. According to the archeologist, much of the power line route was under heavy forest cover which included pinyon/juniper, apparently western yellow pine, sagebrush, and a variety of forbs. We are assured that more than an adequate width was examined over the course of the roadway and power line routes. Our methodology also included a search for the Division of State History's files for prior archeological sites

documentation. No sites have been previously recorded in the survey area.

SURVEY RESULTS

No prehistoric sites were identified in the survey area. A rockshelter near the mouth of Crandall Canyon in the NE 1/4 of the NE 1/4 of the NW 1/4 of Section 27, T. 12 S., R. 9 E., appeared promising, but no artifacts were identified on the surface. The shelter apparently contained burned and fragmented bone. The bone appeared to be both recent and of some age. Some historic debris is also present in the general area. It is difficult to determine whether or not the rockshelter warrants an archeological site designation without testing. Without prehistoric artifacts on the surface, it cannot now be designated an archeological site. It is apparently removed from the impact of mining and road development. The site is on private land.

Three historic sites (42CB215-217) are variously located, one along the access road between the two areas to be mined, and two in the area ear-marked for impact in Section 28 (see attached historic site inventories).

Site 42CB215 is in the NW 1/4 of the SW 1/4 of the NW 1/4 of Section 27, T. 12 S., R. 9 E. The site is on private land. It consists of a single, small masonary structure and associated historic debris.

Site 42CB216 is at the north central perimeter of the southern area to be mined. This perimeter is on the north side of Crandall

Canyon. It is in the SW 1/4 of the NW 1/4 of the SE 1/4 of Section 28, T. 12 S., R. 9 E. The site is on private land. Similarly, site 42CB216 consists of a single, masonary room and associated historic debris.

Site 42CB217 was also identified in the southern area to be mined. It is on the south side of Crandall Canyon in the SW 1/4 of the NW 1/4 of the SE 1/4 of Section 28. It is on private land. The site consists of scattered rubble and stone wall remnants possibly indicating four or more rooms. Abundant historic debris is associated with the rubble.

The preservation historian for the Utah State Historical Society suggests that historic sites were in use during the 1920's and 30's (see attached Memorandum). The sites may be associated with the sheep industry in the area.

IMPACTS AND RECOMMENDATIONS

The existing documentation from both Price River Coal Company and the survey suggests that the three historic sites will be directly impacted by development. It may be that site 42CB215 can be avoided with limited relocation of the access road. The remaining two sites are directly within the southernmost area to be mined. The staff historian indicates that the historic sites are particularly important in the context of recognizing and documenting economic diversity in a well-known Utah mining area. This diversity is apparently absent in similar areas elsewhere in the state. We recommend that Price River Coal Company be strongly encouraged to preserve the sites. If

avoidance cannot be accomplished, then they should be the subject of additional research. This could be in the form of providing more explicit documentation, including mapping. A more ambitious study involving subsurface archeology, at least on a limited sampling basis, perhaps might be productive. However, avoidance of the site is preferred.

Antiquity Section

Archeological Survey

Site No. 42Cb215 County Carbon State Utah

Site name

1. Map reference U.S.G.S. Kyune 7.5 Minute Quadrangle

2. Location Northwest side of Crandall Canyon, a southwest tributary of Price Canyon

NW¼, SW¼, NW¼ Sec. 27 T. 12S R. 9E

3. UTM Grid: Zone Easting Northing

4. Type of site Structure

5. Cultural affiliation (list basis of designation) Historic, age unknown

6. Owner and address Price River Coal Co.

7. Informants

8. Previous designations and published reference for site

9. Site description and condition Historic masonry room (mortared). In disrepair. Large fallen log inside (see sketch).

10. Cultural features, area of occupation, depth and character of fill Low, loose-laid stone wall (N-S) on east. (ca. 7m long; 5-6m high). Small masonry structure ca 3m to west. Large boulder forms south side; other walls are wet-laid masonry and built onto boulder. Planks nailed together on inside of doorway (E. wall) and windows (W and N walls). Ca. 3m north-south x 4.5m east-west.

11. Environmental setting (vegetation, water, topography, etc.) Low knoll on gentle south facing slope of canyon bottom. Scrub oak, pinyon-juniper, prickly pear, low grasses; cottonwoods along stream ca 6m to south.

12. Elevation 6600 feet

13. Material collected and deposition None

14. Material observed rusted metal, modern cans

15. Material reported and owner/address N/A

16. Recommendations for further work Avoid if possible

17. National Register potential questionable significance

18. Photo Nos. KS-80-10-5 & 6

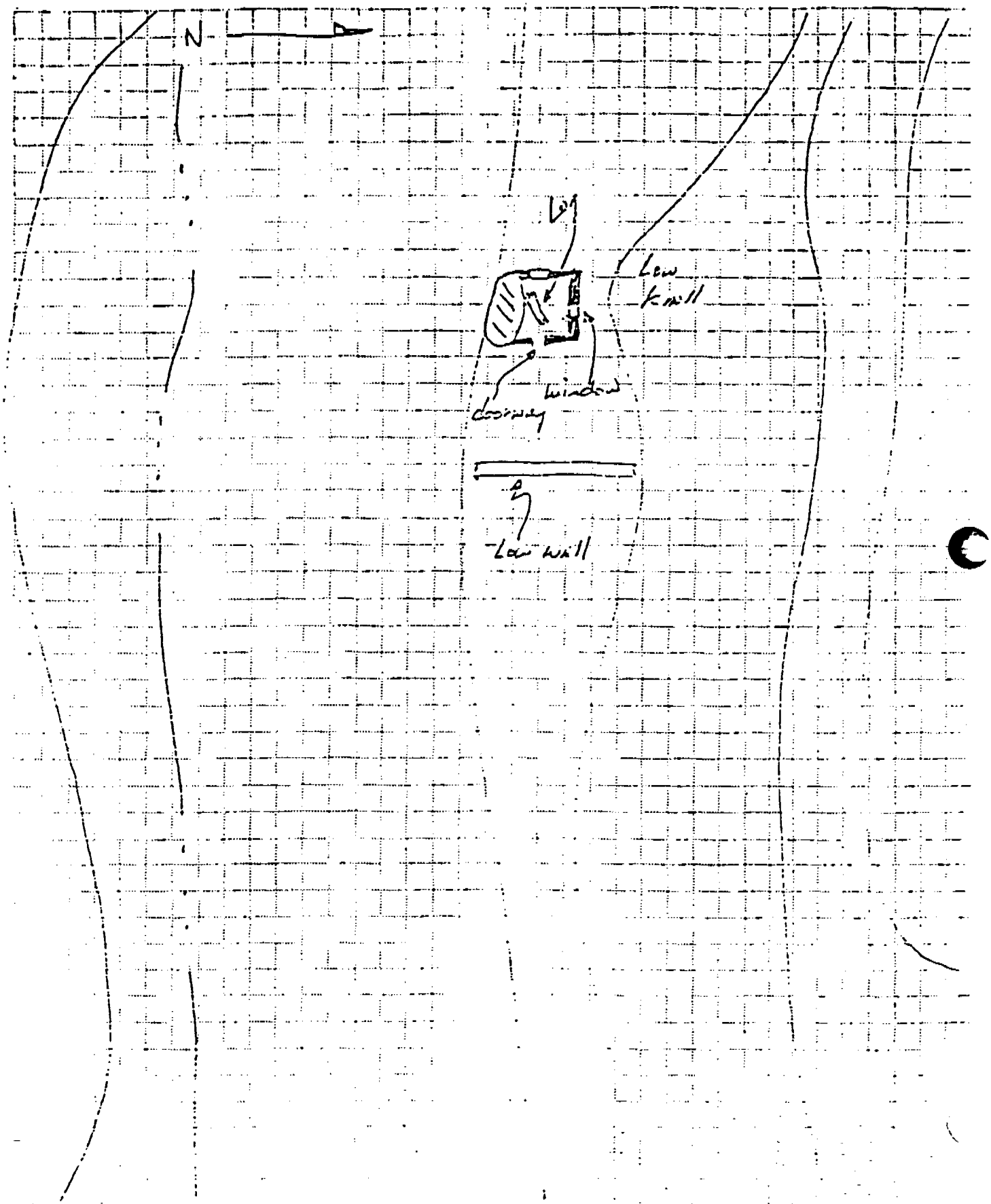
Sketch of map made by survey party Sketch map

5Fcxvi

CONTINUATION FORM

Antiquities Section *Division of State History*

Feature No. Site sketch map SITE 42Cb215 DATE 6/30/80



Antiquity Section

Site Survey Sheet
Archeological Survey

Site No. 42Cb216 County Carbon State Utah

Site name

1. Map reference U.S.G.S. Kyune 7.5 Minute Quadrangle

2. Location South side Crandall Canyon at confluence with south tributary. Crandall Canyon is a SW tributary to Price Canyon just before road crosses street; west of small side canyon to south. SW¼, NW¼, SE¼ Sec. 28 T. 12S R. 9E

3. UTM Grid: Zone Easting Northing

4. Type of site Masonry structure

5. Cultural affiliation (list basis of designation) Probably historic (the logs in it have extremely even flat ends as if sawed).

6. Owner and address Price River Coal Co.

7. Informants

8. Previous designations and published reference for site

9. Site description and condition Small dry masonry structure, against south canyon wall, incorporating boulders ca 4m square; 2 windows and door (small) on west side. Two sawn logs form lentil for each. Canyon bottom, south of road (which is south of street here)

10. Cultural features, area of occupation, depth and character of fill Pinyon-juniper, sagebrush, Indian paintbrush. Canyon bottom-may be part of 42Cb217 which is ca 200m to west and across street. Depth unknown, there is some fill inside.

11. Environmental setting (vegetation, water, topography, etc.) Canyon bottom. Pinyon-juniper, sagebrush, Indian paintbrush.

12. Elevation 6900 feet

13. Material collected and deposition None

14. Material observed Broken modern glass

15. Material reported and owner/address N/A

16. Recommendations for further work Avoid if possible

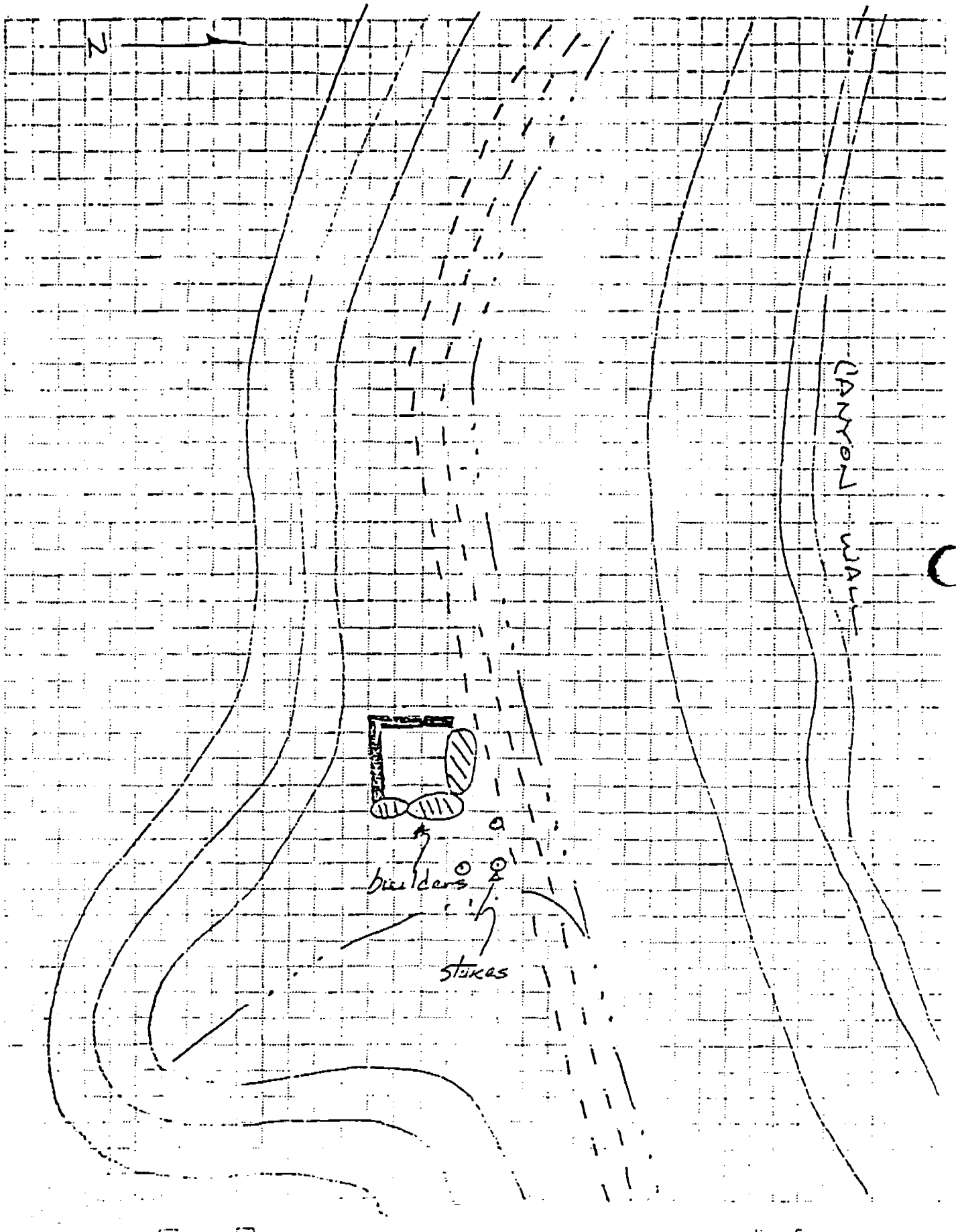
17. National Register potential Questionable significance

18. Photo Nos. KS-80-10 3 & 4

CONTINUATION FORM

Antiquities Section *Division of State History*

Feature No. Site sketch map SITE 42Cb216 DATE 6/30/80



Antiquity Section

Archeological Survey

Site No. 42Cb217 County Carbon State Utah

Site name

1. Map reference U.S.G.S. Kyune 7.5 Minute Quadrangle

2. Location north side of Crandall Canyon, a SW tributary of Price Canyon. On canyon bottom north of road and stream.

SW¼, NW¼, SE¼ Sec. 28 T. 12S R. 9E

3. UTM Grid: Zone Easting Northing

4. Type of site Structural

5. Cultural affiliation (list basis of designation) Historic

6. Owner and address Private, Price River Coal Co.

7. Informants

8. Previous designations and published reference for site

9. Site description and condition Scattered rubble, stacked stone walls, corruga metal, metal barrels, remnants of fence on west.

10. Cultural features, area of occupation, depth and character of fill Area of occupation ca 200 m E-W x 75 m N-S. Loose stone walls on North side. See sketch, photos. Appears to have been 4 or more rooms.

11. Environmental setting (vegetation, water, topography, etc.) Canyon bottom; intermittent stream on south, to south of road. Lush, unidentified weeds, pinyon-juniper, cottonwoods on south facing slope.

12. Elevation 6900 feet

13. Material collected and deposition None

14. Material observed Historic debris, no soldered cans or purple glass seen.

15. Material reported and owner/address N/A

16. Recommendations for further work Avoid

17. National Register potential Questionable significance

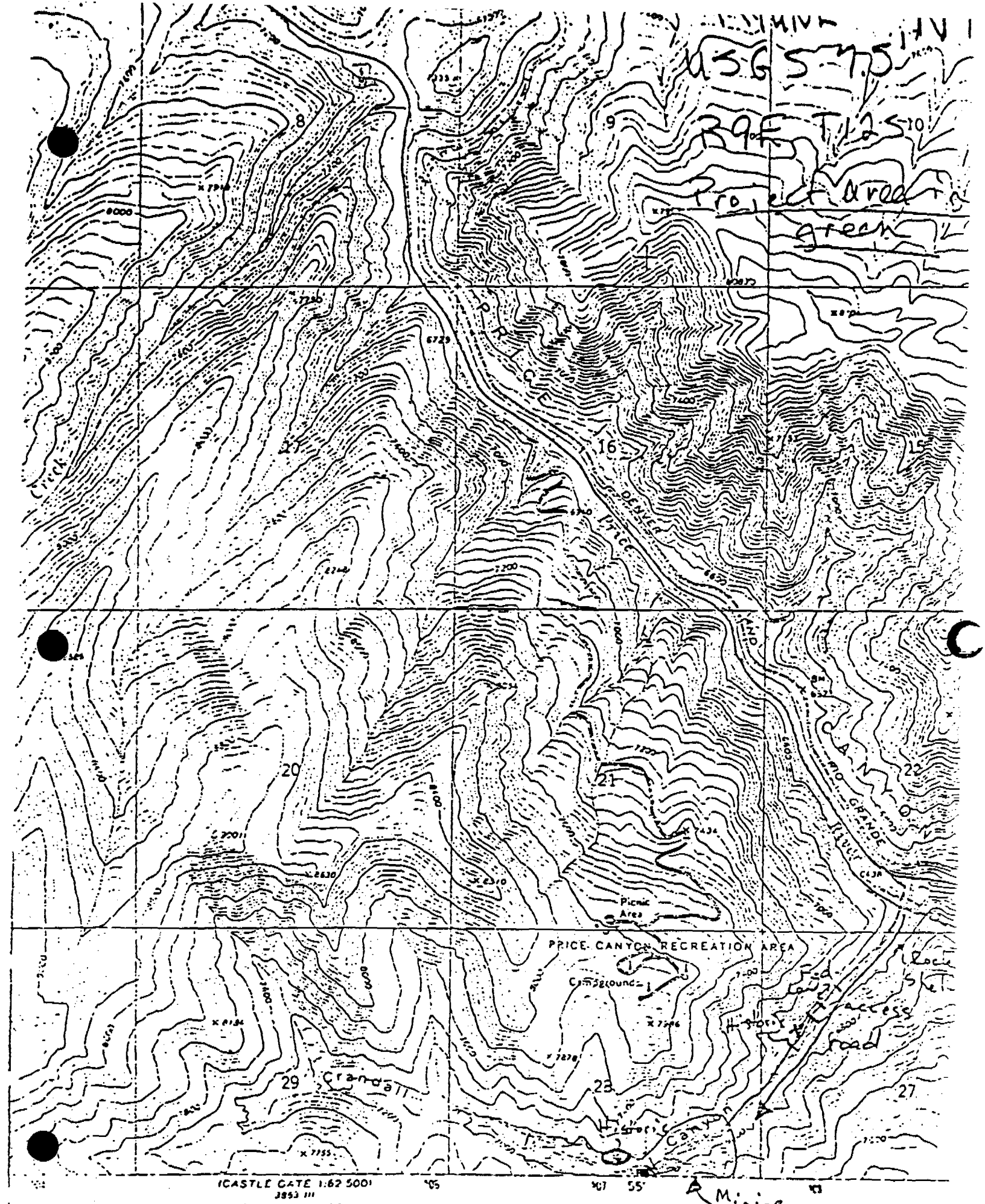
18. Photo Nos. KS-80-10-1 & 2

19. Type of map made by survey party Sketch map

Map Comment

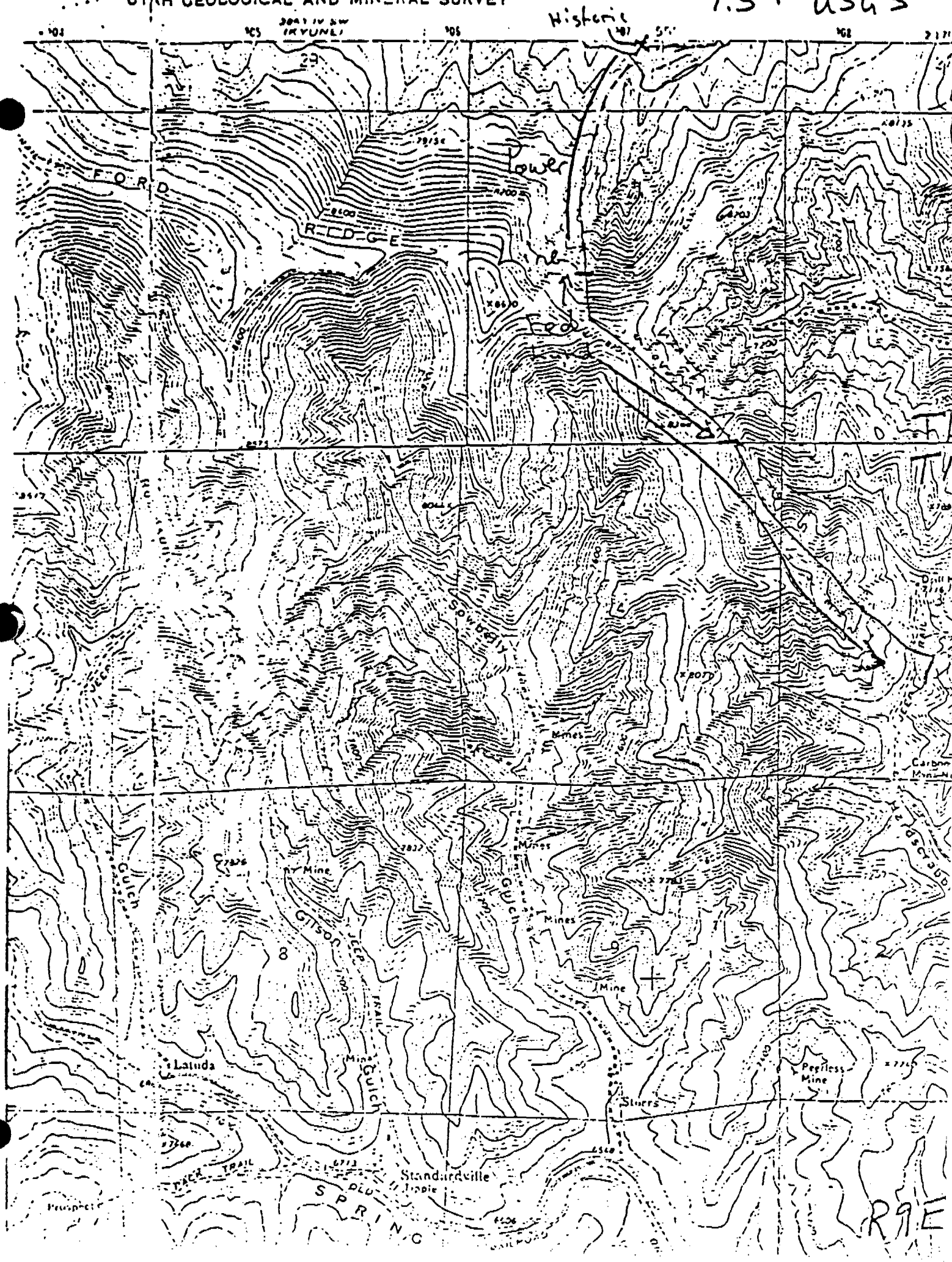
Date 6/30/80

5Fcxx


USGS 7.5
R9E T12S
Project area is green
PRICE
DENVER
RIO GRANDE
Picnic Area
PRICE CANYON RECREATION AREA
Campground
Crandall
Canyon
Road
Mine Facilities
CASTLE GATE 1:62 500
SCALE 1:24 000

STATE OF UTAH
UTAH GEOLOGICAL AND MINERAL SURVEY

7.51 USGS



MEMO

TO: La Mar W. Lindsay
Assistant State Archeologist

DATE: Sept. 30, 1980

FROM: Phil Notarianni
Preservation Historian,
Utah State Historical Society

SUBJECT: Crandall Canyon Sites.

On July 9, 1980, I visited the Crandall Canyon area at the request of Kay Sargent, staff archeologist. In her survey she identified three areas containing historic structures (sites A, B, and C of her report). I photographed those sites both in black/white and in color (slides). Kay had thoroughly mapped the sites. Between sites A and B I noticed a small, crude, wooden bridge that apparently crossed the streambed. In my opinion sites A, B, and C are of historical importance.

These sites have been identified as related to the sheep industry in the area. That industry, with its involvement of various ethnic groups, was of importance economically as it allowed Carbon County a diversity lacking in other Utah mining areas. Bruce Hawkins, historic archeologist, examined glass dinnerware samples gathered by me and placed them as in use during the 1920s and 1930s. These dates are probably the years of activity at these sites.

From Kay's report all sites are on private land. I would strongly recommend that the owners be encouraged, where possible, to preserve the sites (perhaps by moving them). Site C appears out of the immediate construction area, and perhaps the access road could be built further away from the structure. Once these sites are gone, the historical record of their existence also disappears. We have photos, but I would suggest that the land owners might acquire the services of Bruce Hawkins to examine the sites as an historic archeologist to retrieve all information possible prior to demolition. This would at least leave the historical record more complete and lead to a better understanding of sheep raising in the area.

Phil Notarianni

Phil Notarianni
Preservation Archeologist, USHS

PN:ap

5Fcxxiv

M E M O R A N D U M

TO: LaMar Lindsay
Assistant State Archeologist

DATE: July 3, 1980

FROM: Kay Sargent
Staff Archeologist

RE: Crandall Canyon Survey, Price River Coal Co.

I spent Monday, June 30, and Tuesday, July 1, surveying the bottom of Crandall Canyon and a transect from the upper part of that canyon into upper Hardscrabble Canyon, per the request of Don Stephens, geologist for the Price River Coal Co. (see attached maps). The survey in Crandall Canyon was for the access road and mining facilities; the transect into Hardscrabble Canyon was for a power line, to affect a ca. 50-60 foot corridor. As part of the power line crosses federal lands, I checked with Craig Benson (BLM-Price Office) prior to the survey. It turns out that only a small part of the access road is on federal land (SE 1/4, NW /1/4, NW 1/4, Sec. 27, T12S, R9E) and less than a mile of the power line will cross federal land (Craig Benson personal communication).

There is presently an access road into Crandall Canyon. I first examined the southeast side of the drainage and then the northwest. I proceeded on a zig-zagging and weaving course to cover the area. Special care was taken to examine any rockshelters or knolls in or very near the survey area. Flagged and staked points were followed in surveying the power line route, starting from the north. The terrain was extremely rugged and steep. Much of the power line route was under heavy forest cover (pinyon-juniper, longer needled pine, wild flowers such as columbine, lupine, Indian paint brush, etc., and sagebrush). Approximately half a mile of the northern end (dashed on map) was not thoroughly checked due to the ruggedness of the terrain. Most of this is on the side of a very steep, rocky ridge and is private land. The rest of the route was very difficult, but more than an adequate width was examined as I often had to go out of the way to find access along the route.

A literature search had been conducted and the State and National Register of Historics consulted (Division of State History files) prior to the survey. There are no known archeological sites immediately near the survey area. There are several petroglyph sites (C6149-160) in Gordon Canyon to the south, in Township 14 South, Range 9 East. A recent survey of a couple of ranges to the east by our office (Hawkins & Seward, 1980) located several historic sites but no prehistoric ones.

No archeological sites per se were present in the area surveyed. One rockshelter near the mouth of Crandall contains much bone. Some of it appeared recent, some weathered and old. There was also some charred and fragmented bone. No artifacts were found in association. No prehistoric remains were found elsewhere on the survey in contrast to abundant historic remains. No Smithsonian site number was assigned. It is on the opposite side of the drainage from the access road and should not be affected.

Several historic structures were located in the canyon. These were for the most part "crude" - most of the stones were unshaped, loosely laid without mortar (the exception is the one lowest in the canyon). All were unusual in incorporating large boulders. According to Gene Haub and Frank Pero, these were all built by an old sheepherder who had lived in Crandall Canyon. The northernmost structures were a cluster of contiguous "rooms" built against the northern cliff wall. Several courses of stones were loosely stacked. This appears to have been a "junk" area as there was quite a bit of debris such as corrugated metal sheets, metal barrels, etc. There is the remnant of a fence to the west. One strange construction was the partial body of an old car upon, and around which, stones were piled. Supposedly a fire was built in this by the old sheepherder to provide heating in the winter for young lambs. The dimensions of this area is approximately 200 meters east-west by 75 meters north-south.

A couple of hundred meters down the canyon, across the stream bed, there is another, better constructed building. This is built onto the canyon wall on the south and onto a large boulder on the east. Two sawed logs form the lintel for each of the two windows and the doorway in the west wall.

Half-way down the canyon, and adjacent to the road on the northwest side, is a better constructed building. The southeast wall is a large boulder. The other stones appear shaped and are mortared. Nailed wood planks form the frames for the windows and door. A long, low retaining wall is formed by several courses of rock.

None of the structures identified have roofs. No early glass (purple) or soldered cans were found, so the time of occupation is unknown. The two building sites further up the canyon are within the area where the mining facilities are to be built.

Since the time of construction is unknown, it is unclear whether these structures qualify for the 50 years age minimum for historic sites. Upon discussion with Phil Notarianni (Historian, Utah State Historical Society) who has done much research in Carbon County, these may be significant in documenting sheep herding in the area which was not common. He had scheduled to go to Price next week (July 9th) and is willing to stop in Crandall Canyon to examine them. If they are of interest, they can be studied and photographed, yet need not interrupt construction plans. No Smithsonian site numbers were assigned to the buildings.

I recommend clearance for the project, with the allowance that the historic buildings can be studied if it is warranted in Phil Notarianni's opinion, after his visit on July 9.

Approximately two field days, including travel time, and one office day were spent on this project. Price River Coal Company should be billed accordingly.

Sincerely,

Kay Sargent

Kay Sargent
Archeologist

KS:dh

cc: Craig Benson,
BLM Archeologist, Price Office
Phil Notariani,
Historian, Utah State Historical Society
Bruce Hawkins,
Historic Archeologist, State Antiquities Section

DEPARTMENT OF HEALTH

STATE OF UTAH — DEPARTMENT OF HEALTH

REGISTRAR'S NO. 1292 **CERTIFICATE OF DEATH** STATE FILE NO. 67 18 2944

This is a legal Record and will be permanently Filed

Write Plainly

Typewriter Indelible Ink

All items to be complete and accurate

Physician Must sign Personally

original certificate to Local Registrar immediately

Suicides should Cause of Death plain terms

Funeral Director's No. 217

Registrar's No. 285

2R-5/62

1. PLACE OF DEATH a. COUNTY: SALT LAKE	2. USUAL RESIDENCE (Where deceased lived. If institution: Residence before admission) a. STATE: UTAH b. COUNTY: SALT LAKE
b. CITY, TOWN, OR LOCATION: SALT LAKE CITY, UTAH; c. LENGTH OF STAY IN (b): 1 DAY	c. CITY, TOWN, OR LOCATION: SALT LAKE CITY,
d. NAME OF HOSPITAL OR INSTITUTION (If not in hospital, give street address): VETERANS HOSPITAL	d. STREET ADDRESS: 468 - 6TH AVENUE
e. IS PLACE OF DEATH INSIDE CITY LIMITS? YES [X] NO [ ]	e. IS RESIDENCE INSIDE CITY LIMITS? YES [X] NO [ ]; f. IS RESIDENCE ON A FARM? YES [ ] NO [X]
3. NAME OF DECEASED (Type or print): First GUST; (AKA Middle ZAKINTHINKIS) EMANUEL; Last BABOULAKIS	4. DATE OF DEATH (Month, Day, Year): JUNE 3, 1967
5. SEX: MALE; 6. COLOR OR RACE: WHITE; 7. MARRIED [ ] NEVER MARRIED [X] WIDOWED [ ] DIVORCED [ ]; 8. DATE OF BIRTH: 6-4-92; 9. AGE (In years last birthday): 74; If under 1 year: Months, Days; If under 24 hrs.: Hours, Min.	
10a. USUAL OCCUPATION (Give kind of work done during most of working life, even if retired): MINER & FARMER; 10b. KIND OF BUSINESS OR INDUSTRY: MINING & FARMING; 11. BIRTHPLACE (State or foreign country): EMPRESNECO, GREECE; 12. CITIZEN OF WHAT COUNTRY? USA	
13. FATHER'S NAME: Manuel Baboulakis; 14. MOTHER'S MAIDEN NAME: Irene Maredakis; NAME OF SPOUSE: None	
15. WAS DECEASED EVER IN U.S. ARMED FORCES? (Yes, no, or unknown): YES; If yes, give war or dates of service: WORLD WAR I; 16. SOCIAL SECURITY NO.: 529 14 95 03; 17. INFORMANT: HOSP RCDS, VAH, SLC, UTAH	

MEDICAL CERTIFICATION

18. CAUSE OF DEATH (Enter only one cause per line for (a), (b), and (c).)

PART I. DEATH WAS CAUSED BY:

IMMEDIATE CAUSE (a): ~~Right heart failure~~ — INTERVAL BETWEEN ONSET AND DEATH: weeks

Conditions, if any, which gave rise to above cause (a), stating the underlying cause last.

DUE TO (b): Multiple Pulmonary Emboli

DUE TO (c):

PART II. OTHER SIGNIFICANT CONDITIONS CONTRIBUTING TO DEATH BUT NOT RELATED TO THE TERMINAL DISEASE CONDITION GIVEN IN PART I(a): Pulmonary emphysema with right heart failure

19. WAS AUTOPSY PERFORMED? YES [X] NO [ ]

20a. ACCIDENT [ ] SUICIDE [ ] HOMICIDE [ ]; 20b. DESCRIBE HOW INJURY OCCURRED (Enter nature of injury in Part I or Part II of Item 18.)

20c. TIME OF INJURY: Hour a.m. p.m.; Month, Day, Year

20d. INJURY OCCURRED WHILE AT WORK [ ] NOT WHILE AT WORK [ ]; 20e. PLACE OF INJURY (e.g., in or about home, farm, factory, street, office bldg., etc.); 20f. CITY, TOWN, OR LOCATION; COUNTY; STATE

21. I attended the deceased from 6-2-63 to X 6-3-67. Death occurred at 4:00 A.M. on the date stated above; and to the best of my knowledge, from the causes stated.

22a. SIGNATURE (Degree or title): M. M. Mitchell M.D. M.M.MITCHELL,M.D.,Acting Chief,Med.Serv.; 22b. ADDRESS: VAH, SLC, UTAH; 22c. DATE SIGNED: 6/5/67

23a. BURIAL, CREMATION, REMOVAL (Specify): BURIAL; 23b. DATE: 6/6/67; 23c. NAME OF CEMETERY OR CREMATORY: MT. OLIVET CEMETERY; 23d. LOCATION (City, town, or county) (State): SALT LAKE CITY, UTAH

24. FUNERAL DIRECTOR'S SIGNATURE AND ADDRESS: DESERET MORTUARY CO., 36 E. 7TH SO.; 25. DATE RECD. BY LOCAL REG.: 6-6-1967; 26. REGISTRAR'S SIGNATURE: [signature] M.D.

SDH-BHS 94 (12-79)

This is to certify that this is a true copy of the certificate on file in this office. This certified copy is issued under authority of Section 26-15-26 of the Utah Code Annotated, 1953 as Amended.

Date Issued: DEC 30 1980

John E. Brockert
John E. Brockert
DIRECTOR OF VITAL STATISTICS

CHAPTER VI

REGIONAL GEOLOGY

REVISED APRIL, 1989

INCORPORATED
EFFECTIVE:
JUL 26 1995
UTAH DIVISION OIL, GAS AND MINING

CHAPTER 6

REGIONAL GEOLOGY

TABLE OF CONTENTS

Section		Page
6.1	REGIONAL GEOLOGY	6-1
6.2	COAL	6-16
6.2-1	Spring Canyon Group (Sub-seams 1, 2 and 3)	6-28
6.2-2	Castle Gate Coal Group (Castle Gate A-E and Kenilworth Seams)	6-28
6.3	PROPERTIES OF OVERBURDEN MATERIALS	6-30

LIST OF TABLES

TABLE 6-1	RAW COAL PROPERTIES	6-18
TABLE 6-2	PHYSICAL PROPERTIES OF FLOOR ROCK	6-18
TABLE 6-3	DRILL HOLE SAMPLES	6-19
TABLE 6-4	INSEAM QUALITIES	6-25
TABLE 6-5	TYPICAL SEAM QUALITIES	6-25
TABLE 6-6	INSEAM QUALITIES	6-26
TABLE 6-7	AVERAGE VALUES OF TABLES	6-26
TABLE 6-8	THEORETICAL VS. ACTUAL VALUE	6-27
TABLE 6-9	CHEMICAL TEST RESULTS, COAL REFUSE, OVERBURDEN, AND ROOF AND FLOOR MATERIAL	6-31

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LIST OF FIGURES

		Page
FIGURE 6-1	GENERALIZED STRATIGRAPHIC SECTION	6-2
FIGURE 6-2	GENERALIZED SECTION OF ROCK FORMATIONS, BOOK CLIFFS COAL FIELD	6-3
FIGURE 6-3	GRAIN SIZE DISTRIBUTION	6-20
FIGURE 6-4	GRAIN SIZE DISTRIBUTION	6-21
FIGURE 6-5	GRAIN SIZE DISTRIBUTION	6-22
FIGURE 6-6	GRAIN SIZE DISTRIBUTION	6-23
FIGURE 6-7	GRAIN SIZE DISTRIBUTION	6-24
FIGURE 6-8	VERTICAL SETTLEMENT OF OVERBURDEN	6-43
FIGURE 6-9	MEASURED VS. PREDICTED TOTAL SUBSIDENCE, YORK CANYON MINE TEST PANEL	6-44
FIGURE 6-10	PILLAR SIZES IN ROOM AND PILLAR WORKING	6-45
FIGURE 6-11	MINING UNDER PRICE CANYON	6-46
FIGURE 6-12	MINING UNDER WILLOW CREEK	6-47

LIST OF APPENDICES

APPENDIX 6-A	REPRESENTATIVE DRILL LOGS - CROSS SECTION A-A' ON EXHIBIT 6-2 AND RELATED TO SUBSIDENCE DISCUSSIONS	6-48
APPENDIX 6-B	EXCERPTS FROM THE "SUBSIDENCE ENGINEERS HANDBOOK', NATIONAL COAL BOARD, 1975	6-164

LIST OF EXHIBITS

EXHIBIT 6.1 MINE PLAN AREA GEOLOGY . . . . . MS

EXHIBIT 6.2 DRILL HOLE & CROSSECTION LOCATIONS - COAL CROP LINE . . . . . MS

EXHIBIT 6.2A CROSS SECTIONS . . . . . MS

LIST OF EXHIBITS (Continued)

EXHIBIT 6.2B CROSS SECTIONS . . . . . MS

EXHIBIT 6.3 D SEAM RESERVES . . . . . MS

EXHIBIT 6.4 COAL SEAM INTERVALS CW-D K-CW . . . . . MS

EXHIBIT 6.7 COAL SEAM INTERVALS A-B B-C . . . . . MS

EXHIBIT 6.8 A SEAM RESERVES . . . . . MS

EXHIBIT 6.9 COAL SEAM INTERVALS SUB 1 - SUB 2 . . . . . MS

EXHIBIT 6.10 COAL SEAM INTERVALS SUB 3 - SUB 4 . . . . . MS

EXHIBIT 6.11 SUB 3 SEAM RESERVES . . . . . MS

EXHIBIT 6.12 COMPARISON OF THREE DRILL LOGS . . . . . MS

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6.1 REGIONAL GEOLOGY

The proposed Mine Plan Area is within the Book Cliffs Coal Field in Central Utah. The coal-bearing rocks of the Book Cliffs Coal Field consist of approximately 1,400 feet of upper Cretaceous buff to dark gray sandstones and siltstones with minor amounts of interbedded shales, mudstones and clays. These rocks comprise the Blackhawk Formation of the Mesa Verde Group. The Mesa Verde Group overlies, and to the east, interfingers with the very thick Cretaceous Mancos Shale. It represents a series of clastic wedges associated with the onset of the Laramide Orogeny to the west. The Laramide uplift resulted in a transition in this area from marine conditions to those of an unstable continental margin with alternating fresh, brackish, and shallow marine sedimentation, including the various coal beds of lagoonal-littoral origin and massive sandstone units, such as the Star Point, Aberdeen and Castle Gate. A geologic map of the Mine Plan Area is shown in Exhibit 6-1. A generalized stratigraphic section of the coal section is shown in Figure 6-1. Figure 6-2 is a generalized section of the rock formations in the Book Cliffs Coal Field.

A detailed description of the formations of the area follows. These descriptions are from Utah Geological and Mineralogical Survey Monograph, Series No. 3, 1972: Central Utah Coal Fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs and Emery, by H. H. Doelling, Pages 254 - 262.

Mancos Shale - The Mancos is a thick (4,300 to 5,050 feet) unit in its exposure below the Book Cliffs of this area. Most of the

Figure 6-1

GENERALIZED STRATIGRAPHIC SECTION

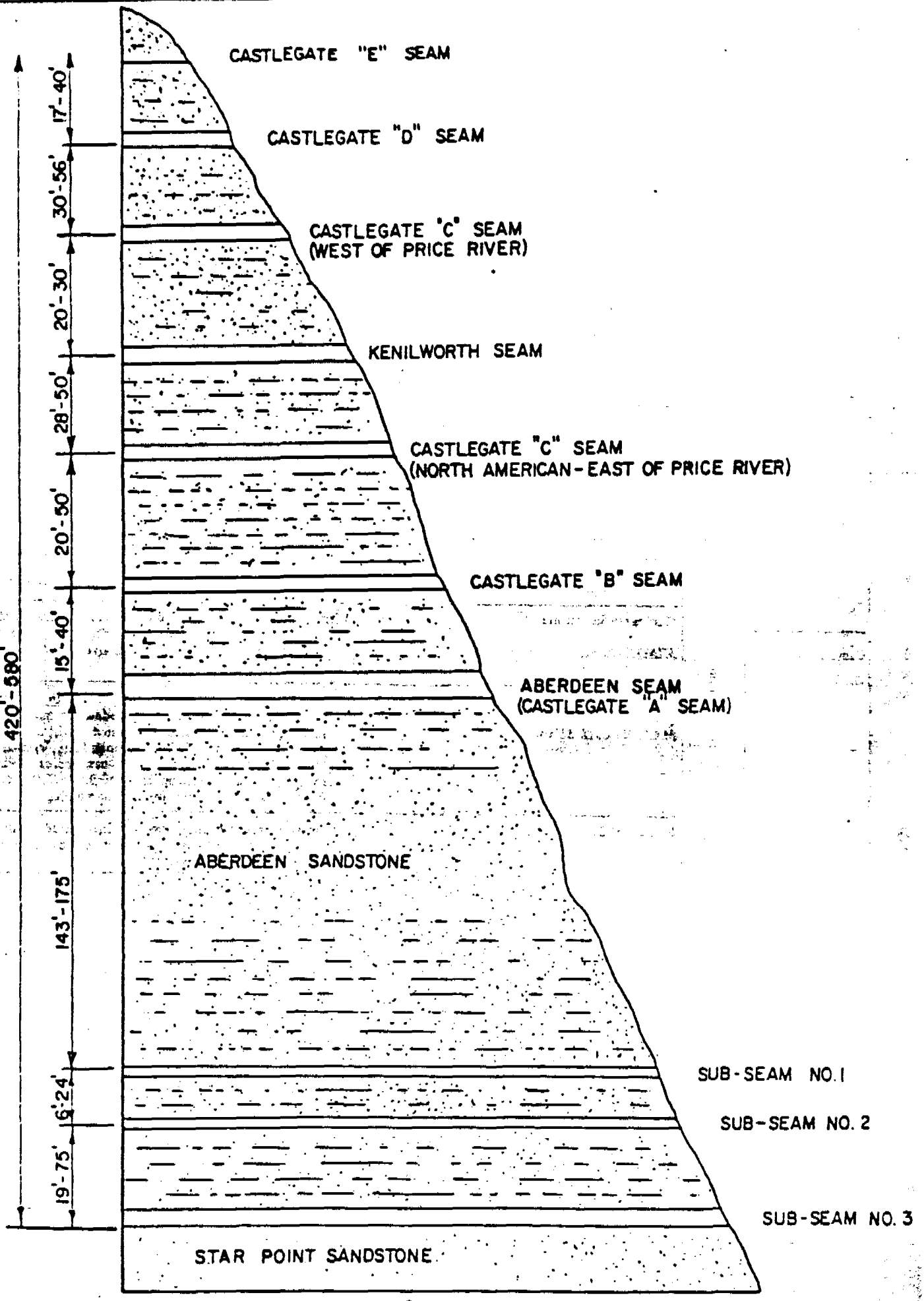

Figure 6-2

System	Series	Stratigraphic unit		Thickness (feet)	Description
TERTIARY	Eocene	Green River Formation		–	Greenish gray and white claystone and shale, also contains fine-grained and thin-bedded sandstone. Shales often dark brown containing carbonaceous matter. Full thickness not exposed.
		Colton Formation	Wasatch Formation	300-2,000	Colton consists of brown to dark red lenticular sandstone, shale and siltstone, thins westwardly and considered a tongue of the Wasatch.
				3,000	Wasatch predominantly sandstone with interbedded red and green shales with basal conglomerate. Found in east part of field and equivalent to Colton and Flagstaff in west.
	Paleocene	Flagstaff Limestone		0- 500	Flagstaff mainly light gray and cream colored limestones, variegated shale, and fine-grained, reddish brown, calcareous sandstone.
		North Horn Formation *MINOR COAL*		350-2,500	Gray to gray green calcareous and silty shale, tan to yellow-gray fine-grained sandstone and minor conglomerate. Unit thickens to west.
CRETACEOUS	Danian				
	Maestrichthian		Tuscher Formation	0- 200	Light gray to cream-white friable massive sandstone and subordinate buff to gray shale that exhibits light greenish cast. Contains minor conglomerate and probably represents lower part of North Horn, only present in east part of field.
		Mesaverde Group	Price River Formation *MINOR COAL*	500-1,500	Yellow-gray to white, medium-grained sandstone and shaley sandstone with gray to olive green shale. Contains carbonaceous shale with minor coal and thickens along east edge of field.
	Campanian		Castlegate Sandstone *MINOR COAL*	100- 500	White to gray, fine- to medium-grained, argillaceous massive resistant sandstone thinning eastwardly with subordinate shale. Carbonaceous east of Horse Canyon but coal is thin and lignitic.
			Blackhawk Formation *MAJOR COAL SEAMS*	600-1,100	Cyclical littoral and lagoonal deposits with six major cycles. Littoral deposits mainly thick-bedded to massive cliff-forming yellow-gray fine- to medium-grained sandstone, individual beds separated by gray shale. Lagoonal facies consist of thin- to thick-bedded yellow-gray sandstones, shaley sandstones, shale and coal. Coal beds form basis of Book Cliffs coal field. Unit thins eastward grading into the Mancos Shale.
			Star Point Sandstone	0- 580	Yellow-gray massive medium- to fine-grained littoral sandstone tongues projecting easterly separated by gray marine shale tongues projecting westerly.
		Masuk Tongue	Mancos Shale	4,300-5,050	Gray marine shale, locally heavily charged with carbonaceous material, slightly calcareous and gypsiferous, nonresistant forming flat desert surfaces and rounded hills and badlands. Separated mainly to the west into tongues by westward projecting littoral sandstone which eventually grade into shale. Sandstones are fine- to medium-grained, yellow-gray to tan and medium-bedded to massive and cliff forming.
	Santonian	Emery Sandstone			
	Coniacian	Gatley Canyon Sandstone			
		Blue Gate Shale			
	Turonian	Ferron Sandstone *MINOR COAL*			
	Cenomanian	Tununk Shale			
		Dakota Sandstone		2- 126	Heterogeneous sandstone, conglomerate and shale, thin resistant cuesta former.

Generalized section of rock formations, Book Cliffs coal field.

Mancos is a shale of varying shades and hues of gray, locally heavily charged with carbonaceous material. The material ranges from a fine clay to siltstone. Rather than being shaley, it is nodular or massive in its fresh surface appearance. It is often calcareous and gypsiferous. The dominantly marine unit is nonresistant and forms flat desert surfaces or low rounded hills. Where protected by an overlying sandstone unit, it forms badland cliffs. Impervious to water infiltration, it supports little vegetation. Water falling on it produces a layer of mud at the surface which dissolves chemical matter from the shale. Later, as the mud dries, it forms white patches of efflorescences of alkali. Flash floods crossing Clark Valley cut into the soft unit creating deep gullies with almost vertical walls that cannot be crossed easily. Nevertheless, farming is carried out in Clark and Castle Valleys in areas where enough unconsolidated material has mixed with the clay soil to change its texture.

Sandstone tongues project into the Mancos Shale at intervals and, in the west part of the field, divide members. These are littoral to lagoonal in nature and some may contain thin coal beds or carbonaceous units. The sandstone beds immediately above the Mancos (Star Point and Blackhawk) are littoral units as well. These littoral sandstone beds thin toward the east and often pinch out. Part of the Mancos thus becomes younger and transgresses time lines from west to east.

The lowermost sandstone tongue of the Mancos is called the Ferron Sandstone. It is the most extensive of the Mancos tongues and

parallels the Book Cliffs in outcrop along the entire length of the field. The Ferron lies 400 to 800 feet above the Dakota contact. The shale member below the Ferron is termed the Tununk Shale. The Ferron is 25 to 30 feet thick in the Farnham area and probably varies from 25 to 150 feet, thickening to the south and west. To the southwest, south of the town of Ferron in Emery County, it is coaliferous and contains the thick beds of the Emery coal field and Henry Mountains coal field. It is basically a yellow-gray calcareous sandstone, interbedded with thin gray shales. Individual sandstone beds are thin to thick bedded and the unit forms a prominent cuesta. The Ferron south of the Book Cliffs outcrops is mostly littoral and devoid of coal. A large acreage of state land coal leases are held southwest of Price behind the Ferron outcrops and, possibly, thick coal may be present in the subsurface there. The Ferron coal is discussed in the Emery coal field report.

The next sandstone tongue is that of the Garley Canyon Member, according to Clark (1928, p. 112):

> It extends in outcrop from the bench north of Price westward to Garley Canyon, and thence southward to sec. 10, T. 15 S., R. 9 E., where it thins out and disappears, merging with the enclosing shale of the Mancos Formation. The sandstone is a lens in the cross section represented by exposures of it, but it probably represents a pennisula of sandy beaches extending out into the Mancos sea from the mainland on the west. Its eastern limit is somewhere under the bench north of Price....The Garley Canyon Sandstone consists uniformly of two beds of massive sandstone separated by a layer of shale.

The massive sandstones are cliff formers, yellow-gray in color and probably thicken westward in the subsurface. The Garley Canyon Member is about 1,800 feet above the Ferron.

The next sandstone member within the Mancos is the Emery, 400 feet above the Garley Canyon. It, too, is limited in its outcrops in the area of the Book Cliffs. It is first recognized in the bench north of Price and gradually thickens westward and southward. It consists of at least three separate sandstone beds near Helper, each separated by 50 feet of shale. The lower bed is 25 feet, the next 15 feet and the upper bed 5 feet thick. The Emery does not crop out in the east part of the field. The first sandstone units of the Mesaverde Group occur about 800 feet above the Emery near Price River Canyon.

Star Point Sandstone - This formation is only present in the west portion of the field and pinches out in the middle of the Soldier Canyon area. The unit consists of three sandstone tongues (in ascending order): the Panther, Storrs and Spring Canyon. The Spring Canyon Tongue is traceable westward from Soldier Canyon and at this east location, consists of impure limestone concretions and thin beds of sandy shale and sandstone. It forms a cliff in the Kenilworth-Spring Canyon area where it attains a thickness of 100 to 125 feet. Individual beds are in 1- to 10-foot thicknesses with the thinner beds near the bottom.

About 150 feet higher is the Storrs Tongue, the middle interval consisting of Mancos-like shale. It disappears a few miles east of Kenilworth and thickens westward. At Storrs in Spring Canyon,

the member is 30 feet thick. Both Spieker (1931) and Clark (1928) placed the Spring Canyon Tongue in the Starr Point Sandstone so that the initial coal unit was also the initial unit of the Blackhawk Formation. Young (1955) notes six cycles in the Blackhawk and that the Spring Canyon starts the first. He, however, notes that the change of the upper boundary is impractical to the west and south in the Wasatch Plateau where the three members unite. Since the tongues extend only 20 to 30 miles eastward, all three tongues are maintained as Star Point units in this report. The Spring Canyon Tongue is 150 feet thick in Spring Canyon, thins eastward and pinches near Soldier Canyon. The shale interval between the Storrs and Spring Canyon varies, but averages about 100 to 125 feet.

Blackhawk Formation - By virtue of the coal it bears, this formation is the most important unit in the coal field. The best analysis of the unit originates with Young (1955, p. 183-186) and many of his findings are reiterated here. In his discussion he includes the Spring Canyon Tongue here carried with the Star Point Sandstone, with the Blackhawk. With this tongue, he includes six prominent littoral marine sandstone tongues with several minor ones projecting eastward into the Mancos Shale. These sandstone tongues, in their eastward extension, grade into shale and, thus, lose their identity. The interval between each tongue consists of lagoonal deposits of sandstone, shale and coal. The top sandstone ledge below the lagoonal deposits is invariably bleached white. The six members from the highest to the lowest include: Desert, Grassy, Sunnyside, Kenilworth, Aberdeen and Spring Canyon members.

These members can be subdivided only where the littoral sandstone tongues are present and each is limited in extent. As a general rule, the lower members are more easily identifiable to the west and the upper members are more easily identifiable to the east.

The lowest member, the Spring Canyon, consists of 60 to 100 feet of coal-bearing shales and sandstones. The coal beds in the member thin out eastward and are replaced by two massive offshore bar sandstones near Helper which mark the east limits of coal-producing swamps in that sequence. The next member, the Aberdeen, consists of 88 feet of sandstone topped by 100 feet of shale, sandstone and coal near Kenilworth. The Aberdeen Sandstone first appears in the west part of the field and may be recognizable in the Gordon Creek area of the Wasatch Plateau field. It extends eastward to Dugout Canyon a few miles east of Soldier Canyon where it grades into the Mancos. The coal beds are replaced by five bar sandstones between Kenilworth and Coal Creek Canyon that are consequently replaced by Mancos-like shale. The Kenilworth Member has a lower sandstone which reaches a maximum of 85 feet thick and disappears eastward near Sunnyside. The coal-bearing beds become important near the west end of the field, thicken and extend eastward only to thin east of Cordingly Canyon. Farther eastward, the beds grade into Mancos-like shale and eventually become a part of that formation. Thin coal is recognized as far east as the Beckwith Plateau. Four mineable beds are known in the Kenilworth Member. The interval of sand, shale and coal reaches a maximum thickness of 160 feet.

The next member, the Sunnyside, has its sandstone bed reaching a maximum of 50 feet at Pace Canyon. It first appears near Kenilworth, extends eastward by splitting into two tongues and finally gives way to the Mancos near Horse Canyon. The lagoonal rocks are relatively thin, 25 feet, which are replaced east of Sunnyside. These beds contain two important coal beds, however. The Grassy Member is 110 feet thick near the Grassy siding of the D&RGW Railroad 6 miles north of Woodside. The lower sandstone, 60 feet thick, first appears at Sunnyside but grades into the Mancos on the east side of the Green River Canyon. Only a few thin coal beds are present in the upper 50 feet. The final member first appears near the Desert siding of D&RGW Railroad 12 miles south of Woodside at the south end of the coal field. The sandstone reaches a maximum of 70 feet and gives way to the Mancos eastward at Saleratus Canyon east of the Green River. The entire Blackhawk finally disappears in that direction. Fifty feet of coal-bearing rocks present at Desert thin rapidly eastward. At Green River, the overlying Castle Gate Sandstone rests directly on the sandstone beds of the Desert Member. The lagoonal beds contain many thin, unmineable lenses of coal. Young's beds are not easily recognizable south of Sunnyside and Fisher's subdivisions are more easily recognized. The Kenilworth is a lower sandstone, followed by a middle shale. The Sunnyside cliff-forming sandstone (middle sandstone) follows with its coal beds near the top. The lagoonal sequence that follows, including thicker sandstone beds, is called the upper shale or Beckwith zone.

In the Castle Gate area, the Blackhawk ranges from 900 to 1,300 feet thick; the upper members are not definable. Better coal beds are assembled in the lower 500 feet because the coals are best developed above thick sandstone members. In the Soldier Canyon and Sunnyside areas, the Blackhawk has thinned to 500 to 1,000 feet of rock and to the south it thins farther. Near the south end of the Beckwith Plateau 170 to 475 feet of Sunnyside, Grassy and Desert members are underlain by 100 to 260 feet of Mancos-like shale, followed by a littoral sandstone tongue 150 to 170 feet thick. This lower tongue (Kenilworth Sandstone) quickly disappears east of Green River.

Each sandstone tongue is usually medium-grained yellow-gray sandstone, bleached white at the top. Most are thick-bedded to massive at the top and gradually become more thin-bedded near the bottom. Near their eastward terminus, they become finer-grained, eventually reverting to siltstone and, finally, into Mancos Shale. The lagoonal sandstones are medium to fine grained, yellow-gray to brown, shaley to thick-bedded. The shales contain varying amounts of carbonaceous matter which determines their color. The coal beds are more fully discussed in the Coal Seams section.

Castle Gate Sandstone - The Castle Gate Sandstone is a mappable, fine to medium grained, argillaceous to slighly calcareous, normally massively bedded unit found disconformably above the Blackhawk in the west part of the field. The sand grains are usually subangular quartz often with abundant coal particles. A lagoonal facies appears near Horse Canyon which extends eastward across the boundaries of the

field. In the lagoonal facies, carbonaceous shale and siltstone are common. Any coal beds present are thin and lignitic. Thus, the unit is fluvial to the west and becomes lagoonal to the east; still farther east near Thompson, it reverts to a littoral sandstone only to grade into the Mancos a short distance east of the Utah-Colorado line.

The thickness of the Castle Gate ranges from 500 feet near Helper to less than 100 feet near Green River. The unit thickens to the north and west. It is an easily recognizable cliff former and marker bed in most places. It takes its name from a gate-like passage in the Price River Canyon formed by a vertical cliff of this sandstone.

Price River Formation - Conformably overlying the Castle Gate is a series of beds made up of sandstone, shale and sandy shale. Some of the individual sandstone beds, as much as 100 feet thick, are much like those of the Castle Gate. The shales are mostly gray in color, but in some areas, become olive green. West of Woodside, the unit is considered fluvial in origin and contains no coal. East of Woodside, coal-bearing rocks begin to appear at stratigraphically higher levels. The thickness of the Price River is 950 to 1,000 feet near the west edge of the coal field, thins to 516 feet near Sunnyside, but then thickens to more than 1,700 feet near Thompson, 25 miles east of the Green River, where it contains important coal seams. The coal beds west of the Green River are too thin to be mined. In the Thompson area, the Price River is subdivided into members: the Buck Tongue of the Mancos, the Sego Sandstone Member, the Neslen Member and the Farrer Member. Some of the members are identifiable in the Beckwith Plateau north of Green River.

Tuscher and North Horn Formations - Dependent on location, the Price River is overlain by the Tuscher or North Horn Formation. Fisher (1936, p. 20) named the Tuscher after a canyon just east of the Green River. The rock involved is a series of nonfossiliferous light gray sandstones separated by thin beds of shale. He noted that the upper and lower contacts were obscure and that no pronounced erosional unconformity was seen at either the top or bottom of the unit. Fisher's description follows:

> The Tuscher Formation is largely quartz sandstone, but contains buff to gray shales that in many places show a very light greenish cast. The sandstone is typically massive, cross-bedded, friable, and light-gray to creamy white and weathers to rounded surfaces. Rare layers are conglomeratic, carrying a few pebbles of quartz and black chert as much as 1 inch in diameter. The presence of conglomerate and the fact that the sandstones closely resemble those of the Wasatch (North Horn-Flagstaff-Colton) favor assignment of these beds to the Tertiary.

Young (1955, p. 192) notes that the Tuscher is a light-colored, conglomeratic sandstone about 200 feet thick resting unconformably on the Price River beds. The disconformity is not recognized west of the Green River. Gross (1961, p. 30) indicates the sandstones of the Tuscher are often conglomeratic and coarser than underlying beds and contain black, gray or brightly colored chert or quartz. The Tuscher occurs in the east part of the Book Cliffs field, first appearing near Horse Canyon.

To the west, the Price River beds are overlain by the North Horn Formation. The North Horn is a series of shale, sandstone, minor conglomerate and freshwater limestone. The shales are mostly gray or gray-green and are usually calcareous and silty. The sands are fine-grained with a tan to yellow-gray color. The limestones increase in the upper part of the unit. A few thin coal beds outcrop in the unit in Price River Canyon. The North Horn represents fluvial and lacustrine environments of deposition and grades imperceptibly down into the Price River and up into the Flagstaff. It has been noted that the basal part of the unit is probably equivalent to the Tuscher. The North Horn is 2,500 feet thick in the northwest corner of the Book Cliffs field and thins to 400 feet at Sunnyside. At Grande Mesa in Colorado, the North Horn is only 200 feet thick (Young, 1955, p. 192).

In the lower part of the North Horn, Upper Cretaceous fossils were located and in the upper part, Tertiary fossils were identified. The unit, therefore, straddles the time line. In the eastern part of the field, the Mesozoic-Cenozoic line probably also lies in the Tuscher-North Horn sequence, but the position is not known. It may be in the Tuscher or in the North Horn part of the sequence.

Flagstaff Limestone - Clark (1928) did not differentiate the Wasatch in his study of the Sunnyside to the Castle Gate part of the field. He grouped the North Horn, Flagstaff and Colton into the Wasatch Formation. The Flagstaff is the product of a lacustrine environment and consists of thin-bedded limestones, shales and sandstones. The shales are varicolored and interbedded with the

microcrystalline limestone. The less abundant sandstones are calcareous, fine- to medium-grained and reddish brown. The Flagstaff thins from west to east, being 500 feet thick in Price River Canyon and 140 feet thick at Sunnyside, disappearing completely farther east. The contacts are gradational and the unit is dated as Paleocene-Eocene.

Colton-Wasatch Formations - The Colton Formation overlies the Flagstaff in the north and west parts of the field and the Wasatch overlies the North Horn in the east and south parts. Gross (1961, p. 35-37) summarized the relationships; excerpts from his dissertation are repeated here:

> The Colton Formation is a fluviatile deposit in the northern part of the Wasatch Plateau. It consists of lenticular sandstone, shale and siltstone. The colors of the various lithologies are predominately brown and dark red with some yellow. The Colton has a maximum thickness of approximately 2,000 feet along the Green River, but thins westward by intertonguing with, and grading into, the Green River Formation....Near the Green River the Wasatch Formation is approxiamtely 3,000 feet thick and is predominately sandstone with interbedded red and green shales and a conglomerate at the base....East of Sunnyside, Utah, the Colton Formation is equivalent to approximately a tongue of the Wasatch Formation which may be both Wasatch and Flagstaff in age....

Spieker (1931) notes that the Colton in the Wasatch Plateau area ranges from 300 to 1,500 feet thick. The Colton thins westward by grading into the overlying Green River Formation. The age of both Wasatch and Colton is probably Eocene.

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The strata strike northwest to west and dip 3 to 6 degrees north into the Uinta Basin. Faulting is relatively minor in the region and absent within the Mine Plan Area boundaries. Folding is present only as very broad, gentle flexures, resulting in dip variations of less than 4 degrees. The resistant rocks of the Mesa Verde Group create the major topographic feature in the area: a bold, southward-facing escarpment which rises 1,500 feet above the flat erosion surface of the Mancos Shale. These cliffs have formed in the arid environment by northward back-wasting of the sandstones. The cliffs traverse the southern boundary of the property, except where stream erosion has carved deep canyons such as the Price River Canyon which bisects the property in a north-south direction. Erosion of the Mesa Verde units has created several canyons and a very rugged topography.

Above the Blackhawk Formation lies the Price River Formation, also of upper Cretaceous age. The basal member, the Castle Gate Sandstone, is a massive, buff, cliff-forming sandstone about 350 feet thick. This unit marks the end of coal-forming conditions in the area. Above the Castle Gate are about 800 feet of noncoal-bearing sandstones, siltstones and shales. The Price River Formation is unconformably overlain by the Eocene Wasatch Formation, consisting of conglomerates, sandstones, shales and impure limestones.

Cross sections and related drill hole logs are shown in Exhibits 6-2, 6-2A and Appendix 6A. The correlation shown between holes is based on the limited marker beds available. The marker beds used include major coal seams themselves and the three dominant sandstone units shown on the sections - namely, the Star Point, the aberdeen and Castle Gate.

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6.2 COAL

The coal occurs within a stratigraphic thickness of about 700 feet in the lower half of the Blackhawk Formation. As many as 34 individual coal seams have been encountered in a sing drill hole. However, the number of significant seams (>14") ranges from 6 to 16 at a given location, with an average of about 13. Of these, 9 seams are considered to be economically minable. Exhibits 6-3, 6-4, 6-7, 6-8, 6-9, 6-10, and 6-11 are isopach maps of the minable seams. Where seams separation is less than 50′, this has been shown with 10′ isopach lines.

Most seams are clean and resinous, although in places they may be dirty and contain shale and bone partings (coal with 40 to 60 percent noncombustible material included). Thickness of individual coal seams ranges from less than an inch to over 20 feet and is highly variable. Many beds are lenticular or split into multiple seams, which complicates the correlation between drill holes. However, a number of coal seams are persistent and have been traced with certainty through the property. The thicker persistent seams are shown in Exhibit 6-2A & 6-2B. the major coal units are subdivided into two groups: the Castle Gate Group (Castle Gate A to E and Kenilworth Seams) and the Spring Canyon Group (Subseams 1, 2, and 3). General properties of the coal are given in Table 6-1. The lowest coal seam of each group rests on a massive sandstone, which is an aid in the distinction and correlation of these seams. All coals crop-out on the Book Cliffs and dip to the north,

attaining depths of over 3,000 feet below the surface in portions of the property.

Samples of typical roof and floor material from the various coal seams have been collected to determine various chemical and physical properties. Physical test data is presented in Figures 6-3 through 6-7 and in Table 6-2. Chemical test results are presented in Table 6-3. The floor materials have been subjected to Atterberg Limit tests to determine the plasticity and behavior of these materials. All of the samples tested indicated a very low clay content, with essentially no plasticity. This is confirmed by the gradation analyses, which indicate that the floor materials are essentially sands.

A description of groups of coal seams deemed to be of major importance follows, listed in ascending stratigraphic order.

Minable coal seams are generally similar from a processing and end product standpoint. Seven holes have been chosen from the western half of the property (Table 6-3), where the current producing mines are located, which ave some information on each of the mine seams. It is obvious that some seams have only 1 sample in the group of holes; this could happen in about any group chosen, but for the purpose of this discussion, is not considered of great importance.

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TABLE 6-1

RAW COAL PROPERTIES

(Proximate Analysis, As Received Basis)

	Spring Canyon Group	Castle Gate Group				
	Subseam 3	A Seam	B Seam	C Seam	D Seam	Kenilworth Seam
% Moisture	1.95	2.59	3.14	2.67	2.70	2.62
% Ash	11.46	7.86	7.25	8.15	8.12	8.99
% Volatile	41.03	41.23	43.15	43.88	46.47	41.55
% Fixed Carbon	45.57	47.91	46.46	47.30	47.76	46.85
BTU	12,615	12,972	12,984	12,720	12,917	12,797
Sulfur	0.50	0.50	0.26	0.32	0.54	0.38

TABLE 6-2

PHYSICAL PROPERTIES OF FLOOR ROCK

Sample No.		% -200 Mesh	Liquid Limit	Plastic Limit	Plasticity Index	Test For Carbonate
F-1	No. 3 Mine Floor	9	Non-Plastic		0	Negative
F-2	No. 5 Mine Floor	58	18	15	3	Negative
F-3	No. 3 Mine Floor	3.5	Non-Plastic		0	Negative
F-4	No. 4 Mine Floor	32	Non-Plastic		0	Negative
F-5	No. 5 Mine Floor	26	Non-Plastic		0	Negative

(1) Samples were exposed in the laboratory to hydrochloric acid to determine the presence of carbonate.

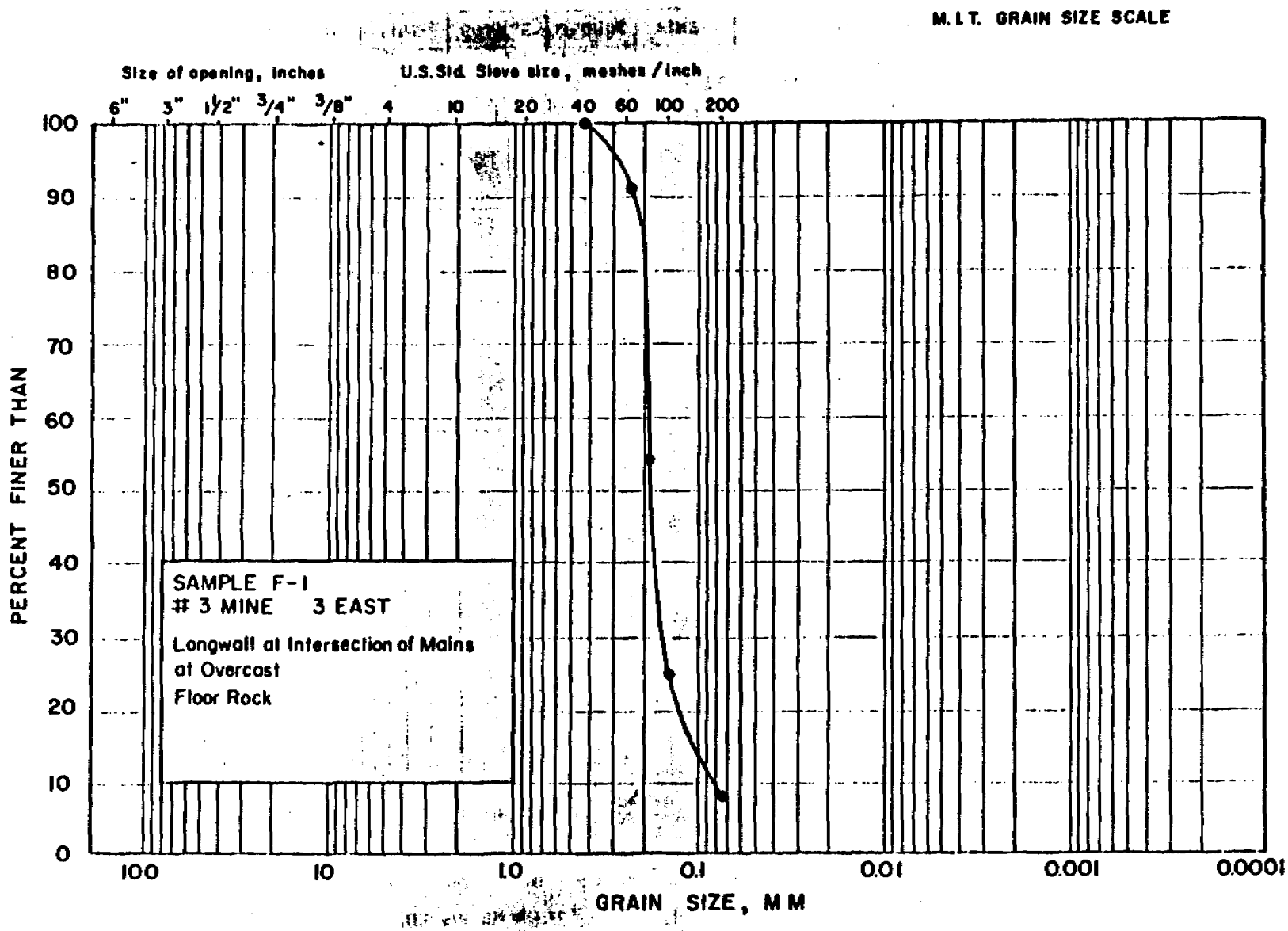
TABLE 6-3

DRILL HOLE SAMPLES (AS RECEIVED)

Drill Hole	Seam	Moisture	Ash	V.M.	F.C.	B.T.U.	Sulphur
MC-9	A	3.04	9.64	42.27	45.05	12,626	.16
MC-9	Sub-2	2.79	7.76	44.53	44.92	13,099	.56
MC-9	Sub-3	3.09	8.00	44.55	44.36	13,148	.39
MC-11	B	3.14	7.25	43.15	46.46	12,984	.26
MC-11	A	2.81	7.94	45.14	44.11	13,007	.34
MC-11	Sub-3	2.93	6.07	42.65	48.35	13,356	.44
MC-41	E	3.09	6.46	43.70	46.75	13,167	.48
MC-41	B	2.71	7.34	42.68	47.27	13,021	.61
MC-41	A	1.84	9.06	43.48	45.62	13,012	.62
MC-41	Sub-2	1.75	8.00	42.21	48.04	13,224	.86
MC-41	Sub-3	2.06	10.04	41.46	46.44	12,984	.81
MC-53	D	2.18	5.56	40.89	51.37	13,254	.41
MC-53	B	1.65	6.47	41.19	50.69	13,546	.36
MC-53	A	1.64	7.59	42.48	48.29	13,387	.43
MC-53	Sub-3	1.47	13.88	38.95	45.70	12,357	.46
MC-3	D	2.06	7.56	43.37	47.01	13,191	.35
MC-3	A	1.77	6.80	43.50	47.93	13,527	.39
MC-3	Sub-3	1.68	7.61	43.02	47.69	13,436	.45
MC-18	D	3.18	5.36	43.03	48.43	13,266	.37
MC-18	K	2.88	5.31	44.17	47.64	13,420	.17
MC-18	C	2.67	6.15	43.88	47.30	13,262	.32
MC-18	B	2.76	4.28	44.59	48.37	13,652	.31
MC-33	D	2.73	6.86	38.81	51.60	12,843	.52
MC-33	B	2.63	6.70	40.67	50.00	13,046	.77
MC-33	A	2.49	6.05	39.50	51.96	13,139	.74
Average		2.44	7.35	42.54	47.65	13,158	.46
Range		1.47	4.28	38.81	44.11	12,357	.16
		3.18	13.88	45.14	51.96	13,652	.86

GRAIN SIZE DISTRIBUTION

Figure 6-3



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Golder Associates

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Golder Associates

Date

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GRAIN SIZE DISTRIBUTION

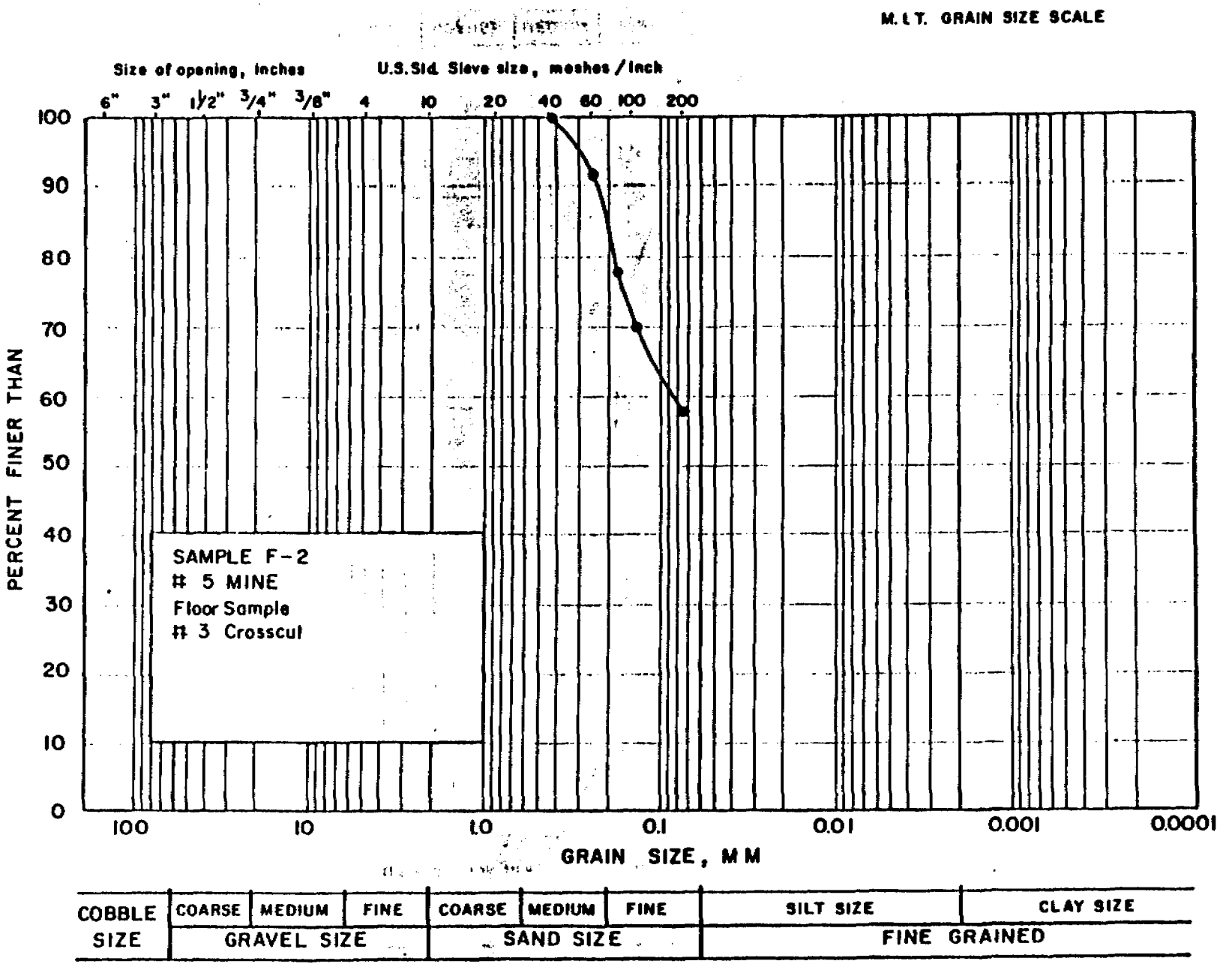
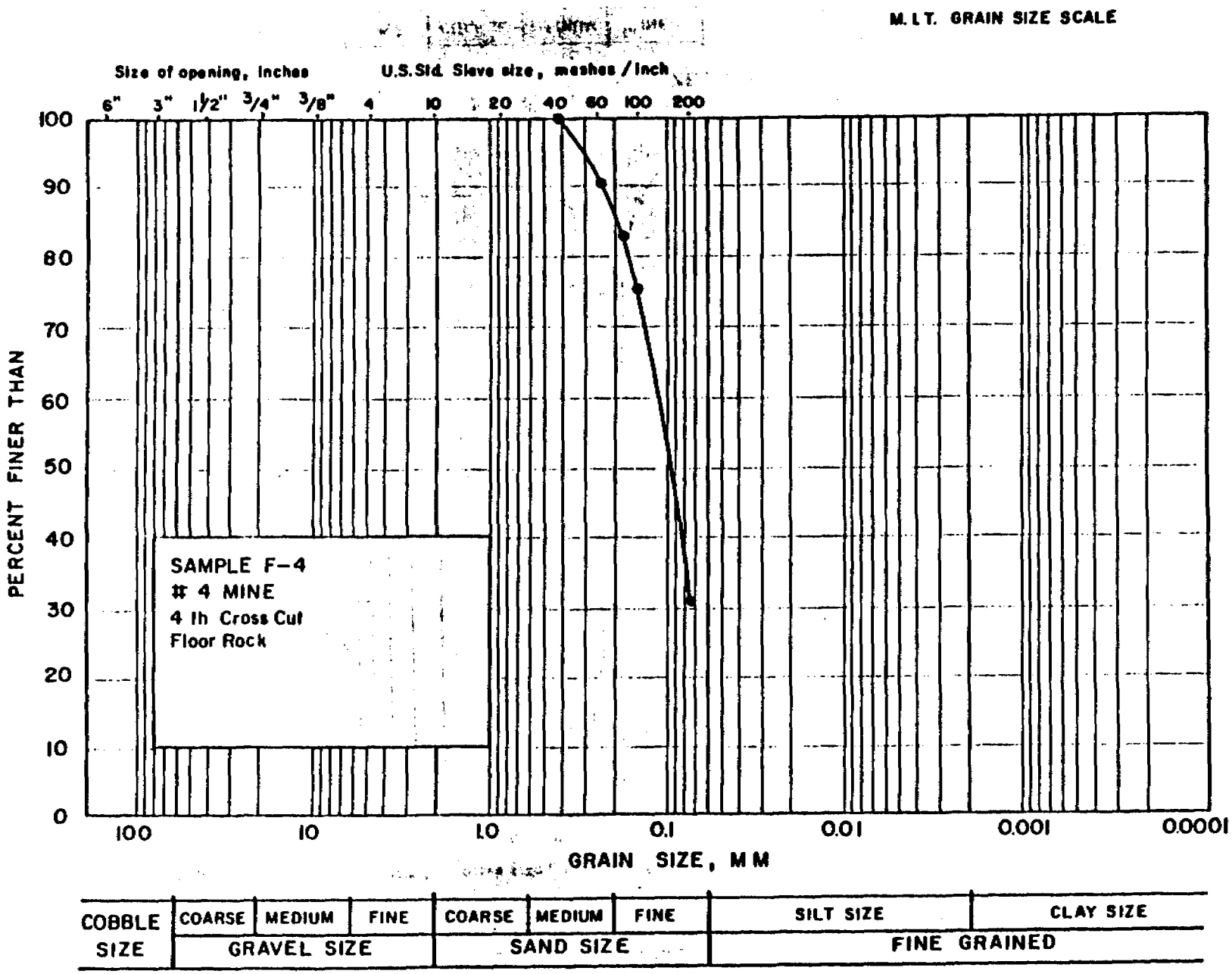


Figure 6-4

GRAIN SIZE DISTRIBUTION

Figure 6-5



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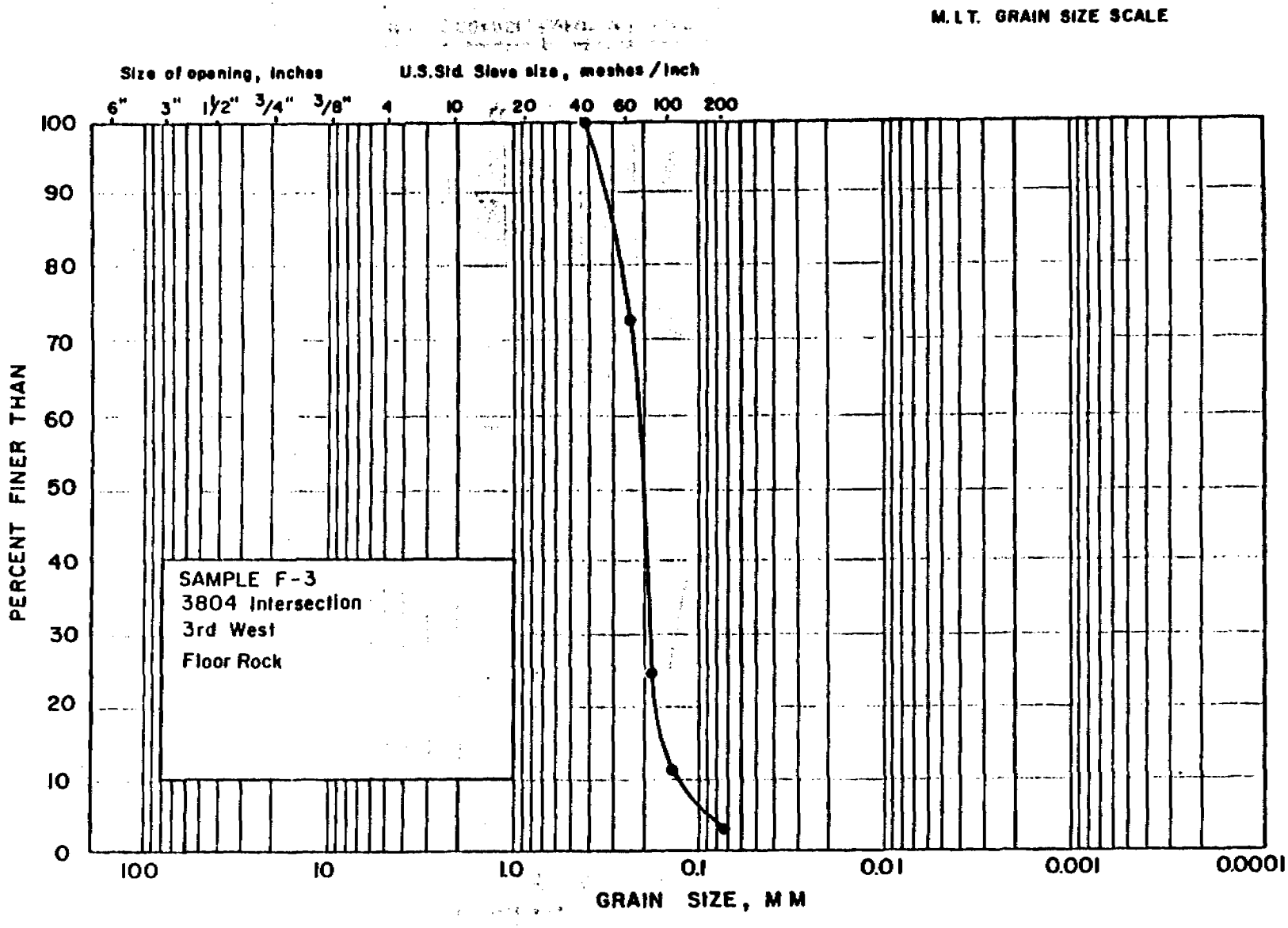

Figure 6-6

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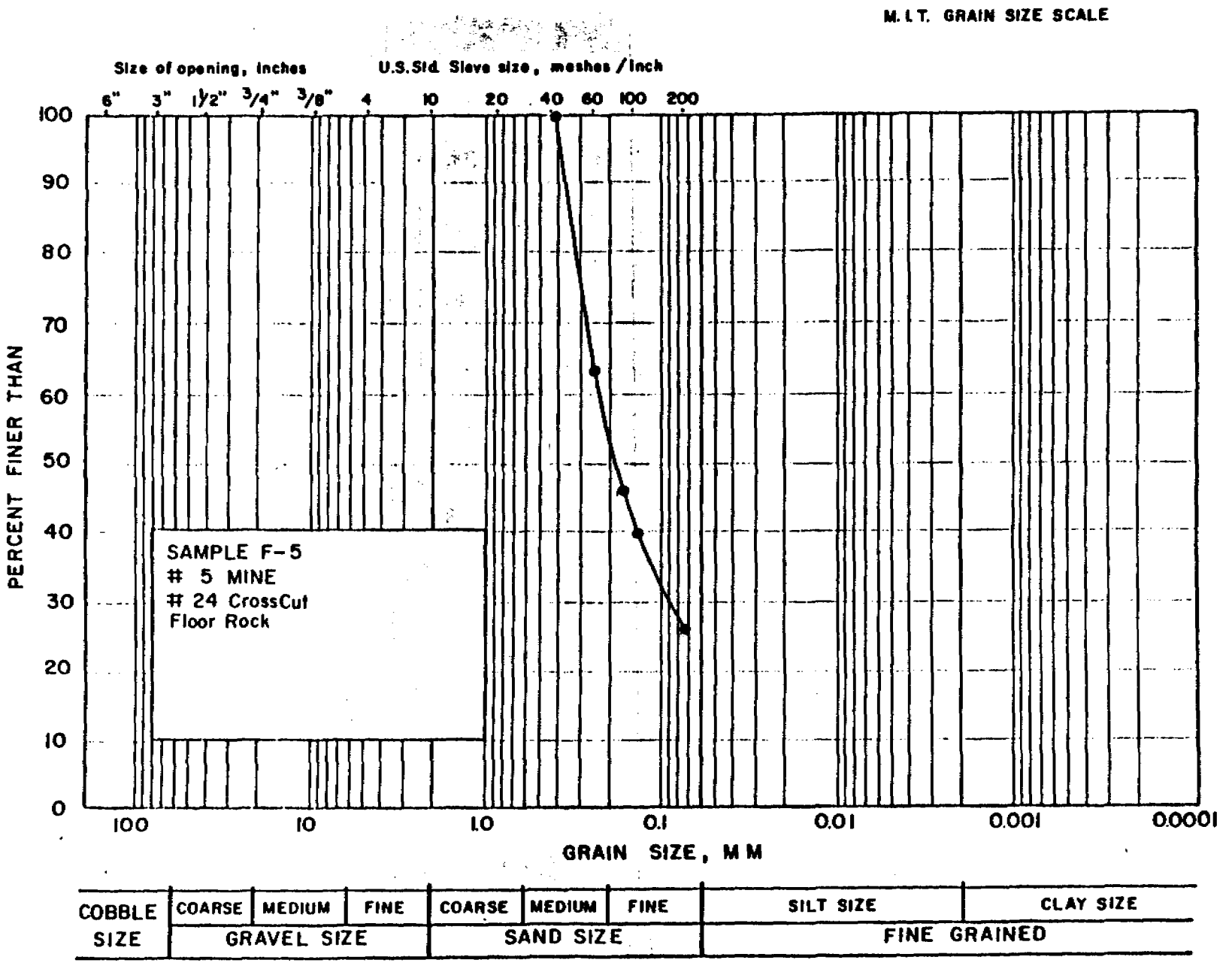

Figure 6-7

TABLE 6-4

IN-SEAM QUALITIES (AS RECEIVED)

Seam	Moisture	Ash	V.M.	F.C.	B.T.U.	Sulphur
A	2.27	7.85	42.73	47.16	13,116	.45
B	2.58	6.41	42.53	48.56	13,250	.46
C	2.67	6.15	43.88	47.30	13,262	.32
D	2.54	5.07	41.53	49.60	13,139	.41
E	3.09	6.46	43.70	46.75	13,167	.48
K	2.88	5.31	44.17	47.64	13,420	.17
S2	2.27	7.88	43.37	46.48	13,161	.71
S3	2.25	9.12	42.13	46.51	13,056	.51
Average	2.57	6.78	43.01	47.50	13,196	.44
Range	2.25	5.07	41.53	46.48	13,056	.17
	3.09	9.12	43.88	49.60	13,420	.71

In a recent 1980 Price River Coal Company Technical Report, prepared for prospective customers, the following statement pertaining to in-seam quality appears: "Examination of the core analyses made from the drill hole cores yield the following typical results, which are believed to be generally representative of in-seam qualities:

TABLE 6-5

Seam	Hole No.	Moisture	Ash	V.M.	F.C.	B.T.U.	Sulphur	MAF B.T.U.
D	MC-16	4.26	5.66	42.32	47.76	13,173	.59	14,508
K	MC-47	1.96	7.59	42.40	48.05	13,085	.50	14,467
A	MC-53	1.64	7.59	42.48	48.29	13,387	.43	14,748
S3	MC-41	2.15	10.35	42.09	45.41	12,739	.45	14,559

There appears to be very little variability in the volatile matter, fixed carbon, B.T.U. and sulfur values between the seams. In addition, the free swelling index (FSI) values have been found to consistently range above 2.0."

The numerical averages of the above numbers are as follows:

Moisture	Ash	V.M.	F.C.	B.T.U.	Sulphur
2.50	7.80	42.32	47.38	13,096	.49

If we extract the D, K, A and Sub 3 seams from Table 6-3, we arrive at the following: (The D, K, A and Sub 3 seams contain ± 73% of the reserves.)

TABLE 6-6

Seam	Moisture	Ash	V.M.	F.C.	B.T.U.	Sulphur
D	2.54	5.07	41.53	49.60	13,139	.41
K	2.88	5.31	44.17	47.64	13,420	.17
A	2.27	7.85	42.73	47.16	13,116	.45
S3	2.25	9.12	42.13	46.51	13,056	.51
Average	2.49	6.84	42.64	47.73	13,183	.38

The averages of Tables 6-4 6-5 and 6-6 are compared in Table 6-7 below:

TABLE 6-7

	Moisture	Ash	V.M.	F.C.	B.T.U.	Sulphur
Table 6-4	2.57	6.78	43.01	47.50	13,196	.44
Table 6-5	2.50	7.80	42.32	47.38	13,096	.49
Table 6-6	2.49	6.84	42.64	47.73	13,183	.38

Even with the apparent "fluke" on sulphur of 0.17 in the K seam, the similarity of the in-seam quality is quite obvious.

The preparation plant was designed and built on the following parameters:

ROM - D and Sub 3 Seams

Moisture	Ash	B.T.U.	Sulphur
6.0	18.2	11,000	0.5

Theoretical plant product, 88% yield at:

Moisture	Ash	B.T.U.	Sulphur
8.0	7.43	12,380	.44

During 1979 and 1980, over 2,000,000 tons were shipped from the preparation plant to generating plants within the system. The theoretical and actual products are compared in Table 8 below:

TABLE 6-8

	Moisture	Ash	B.T.U.	Sulphur
Theoretical	8.0	7.43	12,380	.44
Actual	7.49	8.52	12,313	.49

During the negotiation for the sale of this property (from McCulloch Oil Corporation to American Electric Power Company, Inc.) some 63 core holes were extensively analyzed per contract between the buyer and the seller. At the end of this period, both parties agreed that the coal seams were generally similar, and that such extensive analysis was no longer necessary - this provision was then dropped from the contract. Some 550 million tons of in-place reserves thus changed hands on a mutual agreement that all the coal seams were generally similar.

6.2-1 Spring Canyon Group (Subseams 1, 2 and 3)

The Spring Canyon coal group includes the lowest coals encountered in the Castle Gate quadrangle. The workable coal beds occur in an interval of less than 100 feet between the massive Star Point and Aberdeen Sandstones. This interval decreases to the east and the coal group pinches out just east of Price River. The coal is bright, jet black, and generally free of bone and shale partings.

Subseam No. 3, the lowest seam, is either directly upon the Star Point Sandstone or separated from it by up to a few feet of siltstone and shale. The bed reaches a maximum thickness of about 10 feet and is only 2 feet thick at the western property boundary.

Subseams No. 1 and No. 2 are separated from Subseam No. 3 by an interval of 10 to 40 feet and are thinner as well as more irregular in thickness than Subseam No. 3. Subseam No. 1 is generally of less than mineable thickness over much of the Mine Plan Area.

6.2-2 Castle Gate Coal Group (Castle Gate A-E and Kenilworth Seams)

Separating the Spring Canyon and Castle Gate coal groups is the Aberdeen Sandstone, a 150 to 180 foot white-capped, massive littoral-marine sandstone with variable amounts of interbedded siltstone and shale. This bed is an excellent stratigraphic marker throughout the quadrangle. Immediately above the Aberdeen Sandstone or separated by a few feet of shale-siltstone is the lowest coal of the Castle Gate Group, the Castle Gate A Seam. The Castle Gate A and Kenilworth coal beds are the thickest and of greatest importance. The E Seam is considered to be the least valuable. All seams, but the E, have been mined in the past.

The Castle Gate A coal bed extends across the area, although it is quite thin at places. The coal is massive, brittle, and bright, but also contains dull bands of coal and thin shale and bone partings. Thickness ranges from 3 to 17 feet. In places, the bed splits to two or three sub-beds.

The Castle Gate B Seam is quite lenticular and difficult to identify and correlate. Where definitely established, it has a thickness of 2 to 14 feet, but is usually thin. It commonly contains bone and shale partings.

The Castle Gate C Seam east is positively identified to the east of Price River. The thickness of this seam ranges from 1 to 10 feet. The character varies from bright and brittle to dirty and boney. The Castle Gate C Seam west occurs to the west of the Price River and has been mined in the past.

The Kenilworth Seam is quite thick in places and massive and brittle, but is generally softer than the Castle Gate A Seam. Thin shale and bone partings are common. It is from 3.5 to 23 feet thick east of Price River, where it is easily identified due to the thick sandstone immediately beneath it. West of the Price River, the sandstone unit grades into siltstones and thin sandstones, thus losing its distinctive character. The Kenilworth also becomes thinner and less easy to identify.

The Castle Gate D coal seam is thinner than the A and Kenilworth Seams, but is still quite extensive throughout the property. It is generally quite clean, but may be dirty locally. It is lenticular and 2 to 10 feet thick throughout most of its extent.

The Castle Gate E coal is only identified at a few localities. Although this seam may reach 5 feet in thickness, it is usually quite thin.

6.3 PROPERTIES OF THE OVERBURDEN MATERIALS

Detailed geological and geotechnical coring of the overburden has been carried out on the site. This coring was for two primary reasons:

1. To determine the in situ condition of the overburden materials.
2. To collect specimens for detailed laboratory testing.

Upon completion of the drilling, the drill holes were cased and sealed with perforated PVC tubing so that static water level data and water samples can be collected from the holes.

The logs of these drill holes are presented at the end of this chapter. Generally, the overburden consists of alluvium/colluvium underlain by bedrock. The alluvium/colluvium material is typically loose, brown sandy silt, with cobbles and boulders as a result of weathering of the parent rock materials at higher elevation. Bedrock consists of alternating layers of sandstones and siltstones. The bedrock is strong and massive, with little fracturing.

The hydraulic conductivity (permeability) of the rock, based on packer tests in drill holes, is low, on the order of 10-7 cm/sec. Due to this low permeability, which reflects the massive, fine-grained characteristics of the rock formations and lack of fracturing, the bedrock materials should not be considered as aquifers.

TABLE 6-9

CHEMICAL TEST RESULTS, COAL REFUSE, OVERBURDEN, AND ROOF AND FLOOR MATERIAL

	pH	EC	SAT%	SAR	Na	Ca	Mg	B	ABP
GOB(1)									
GOB Castlegate	8.7	1.70	51.0	13.4	17.83	2.51	1.14	1.9	35
GOB Weigh Station	6.9	2.34	57.2	2.8	8.59	12.21	4.66	3.5	21
GOB Hardscrabble	8.8	1.80	44.2	10.7	18.07	1.91	1.88	1.3	14
Sowbelly Gulch Overburden									
MC205 0-50	7.0	0.82	53.9	2.1	2.68	4.64	2.14	0.7	11
MC205 167-169	7.9	0.82	45.5	4.5	5.11	3.00	1.27	1.3	5
MC205 401-403	9.0	1.90	43.6	11.2	18.97	1.92	2.22	1.1	56
MC205 631-633	9.0	2.75	43.1	11.1	29.33	2.13	7.60	1.0	68
MC205 728-730	8.2	2.42	57.2	10.4	17.79	3.74	1.46	0.7	65
MC205 738-740	9.2	1.90	57.4	13.6	19.41	1.64	2.32	1.0	6
Bear Canyon Overburden									
MC206 0-50	7.4	0.71	52.5	2.9	3.08	4.03	1.58	0.9	14
MC206 124-126	8.3	0.98	61.2	2.6	4.12	5.61	2.52	0.7	67
MC206 376-378	9.2	2.31	48.9	16.1	25.45	4.25	1.58	1.7	37
MC206 628-630	9.2	2.04	55.4	13.3	20.97	2.62	1.55	0.7	33
MC206 850-852	9.1	1.63	59.9	10.7	16.85	1.06	1.51	1.0	54
MC206 988-990	7.8	1.12	58.9	3.3	6.43	5.50	1.84	0.6	69
Crandall Canyon Overburden									
MC207 0-35	7.7	0.71	50.9	2.2	2.98	4.13	1.58	0.8	90
MC207 145-147	7.0	1.97	63.1	1.3	3.86	10.44	4.09	0.5	11
MC207 405-407	9.0	1.49	54.5	9.2	14.59	0.20	2.94	1.2	2
MC207 722-724	9.0	0.92	49.8	8.1	8.16	0.12	2.67	0.9	0
MC207 1036-1038	8.6	1.77	55.0	9.8	14.24	0.70	1.06	0.6	53
MC207 1264-1266	7.9	1.56	63.0	4.5	8.69	5.29	1.85	0.9	55
Mine 3									
Crosscut 14, Floor	5.4	5.09	63.4	4.9	19.89	19.29	8.54	0.6	-1
Crosscut 20, Roof	8.0	2.75	54.9	13.2	28.18	5.87	2.28	1.7	60
E Entry, Floor	8.4	1.32	57.5	8.9	11.80	2.11	0.87	0.6	4
E Entry, Roof	8.7	2.16	49.8	13.9	22.47	3.42	1.63	1.2	50
Mine 5									
1t West Floor	8.1	1.12	51.8	6.1	7.36	2.22	3.17	1.9	6
1st West Roof	8.6	1.49	56.3	9.6	12.67	2.18	2.73	1.6	21
Crosscut 24, Roof	8.7	2.00	61.2	11.2	19.57	0.89	2.63	0.8	30
Crosscut 3, Roof	6.4	4.08	43.1	5.9	23.83	18.55	12.00	0.9	0

pH = Paste pH
EC = Electric Conductivity, MMHOS/CC
Sat% = Water Holding Capacity at Saturation
Ca = Calcium, MEQ/L
Mg = Magnesium, MEQ/L
Na = Sodium MEG/L

SAR = Sodium MEG/L
B = Boran (Soluble), PPM
ABP = Acid/base Potential (Smith Hydrogen Peroxide)
- = Acid
+ = Base T/1,000T

(1)GOB refers to coal refuse material.

Tests performed in July 1979 by Agricultural Consultants, Inc., 240 South First Ave., Brighton, Colorado 80601.

Chemical data on the composition of the overburden materials and mine floor materials is listed in Table 6-9.

Subsidence - General

(1)Surface subsidence over old room and pillar mines has caused considerable concern in some cases. One of the problems was that surface effects did not appear until several years or decades after mining (Brauner, 1973). This long-time delay is caused by the slow deterioration of pillars and other support of the old workings. A second problem is that subsidence over room and pillar workings, if it occurs, results in a complicated pattern.

Significant long-term subsidence over longwalls on the other hand does not occur because the overburden is partially supported by the gob soon after the longwall face has moved through an area. The fact that longwall subsidence is essentially time-independent was observed by other investigators (Dahl et al, 1974).

Longwall mining induces caving (clastic failure) of the immediate and upper roof strata. The caving process propogates upwards to a horizon which is located at a distance equal approximately to 35 to 50 times the mining height over the coal seam as indicated by the data in Figure 6-8. As can be seen, the deformation decreases from a maximum of 1 at the seam roof to near 0 at approximately 67 m (220') above the coal seam. The deformation or deflection above this horizon is essentially continuous, that is little or no bed separation and rotation of the individual rock blocks occurs; the upper strata settle down on the gob without any further increase in volume (porosity).

Based on the limited subsidence data available, draw angles in the U.S. coal mining districts range between 12 degrees and 32 degrees, compared to an estimated 35 degrees in Great Britain.

Subsidence, when uniform, only rarely causes problems to renewable resources such as aquifers, rivers and farmland.

(2) Investigators have determine that the subsidence factor decreases as the amount of sandstone strata in the overburden increases. Typical overburden in this area contains about 35% sandstone (see drill hole logs MC-6-73, MC-48, and MC-53-75 in Appendix 6-A.

(3) Gentry makes the following statements concerning subsidence over a longwall in New Mexico - width of face 168 m (550′), seam height 3 m (10′), overburden average 107 m (350′), which varied from 73 - 134 m (240 - 440′).

(4) "NCB" formulas, graphs and tables were used to predict subsidence. Figure 6-9 provides some interesting information. First, maximum measured subsidence is somewhat less than either of the predicted profile. Also, the measured angles of draw is less (15.7 degrees as compared to 29 degrees) than the predicted. These lower dimensional values often appear to be associated with the presence of thick, strong, sandstone beds in the overburden. Geologic mapping shows that thick sandstone beds overlie the coal seam in this panel.

Surface cracking did occur as a result of mining the panel. It must be emphasized that the surface cracks which developed were not of a magnitude to be hazardous to people or vehicles. At most, the

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esented a hazard which was easily avoidable on surface. It is possible, however, that these cracks could conceivably be troublesome for cattle or wildlife traversing the panel area. Maximum width on all cracks except one, was 0.40 ft. One abnormally wide crack (approximately 0.90 ft. wide) was located behind the point where the face stopped."

Pillar Size

(4)In recommending 120 ft. square pillars in the development entries for longwall panels in the company mines, PD-NCB state: "The reason that this pillar size would suffice for any greater width of longwall panel is that at this depth the strata above a 600 ft. wide panel will have sagged to the extent that the center will be supported by the broken roof rocks upon which the lowest unbroken stratum is resting. Thus a central abutment is achieved to share the strata load with the side abutment pillars." (underlining added for emphasis)

Pressure Arch

(5)Parker Associates Report - Discussing the "pressure arch": "In Utah coal mines the "arch" should be more properly be called a "bridge" because there are many massive sandstones capable of bridging across several hundred feet." (underlining added for emphasis)

(6)Allgaier, in an interim report, states: "Through December 1980, there was no evidence of surface damage from subsidence over the two mined panels. No cracking or down warping of the surface was visible during any of the surveys." - this with a maximum subsidence at the time of 2.7 feet.

resulting cracks represented a hazard which was easily avoidable on surface. It is possible, however, that these cracks could conceivably be troublesome for cattle or wildlife traversing the panel area. Maximum width on all cracks except one, was 0.40 ft. One abnormally wide crack (approximately 0.90 ft. wide) was located behind the point where the face stopped."

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Site Specific Observations

To date, no surface cracks have been observed. Maximum subsidence noted so far is about 2.1 feet. (See past subsidence monitoring data Chapter III.)

It is felt that the cited references coupled with site specific observations adequately support the position that the Castle Gate sandstone will bend rather than break; any small cracks which might appear on the surface would probably be only in the colluvium, and would cause an insignificant amount of damage, as such cracks tend to "heal" themselves soon after the mining face passes them.

Under the conditions which PRCC operates (topography, geology, no known aquifers) and given the fact that the company has agreed not to longwall or second mine within 45 degrees of highways, rivers or railroad tracks, there should be no real concern over subsidence in the area.

As to predicting the actual subsidence, each area is very site specific, with the maximum subsidence depending upon several factors such as amount and composition of overburden, seam height, face width, mining geometry, etc. Such an exercise for land used only for grazing and wildlife, is neither cost effective nor reliable. A method for predicting maximum subsidence under certain conditions, from the National Coal Board (NCB) of Great Britain, is enclosed (Appendix 6-B) for those who wish to "guesstimate" the amount of subsidence to be expected.

Control Points

Subsidence control is run by using points which may be within the angle of draw and/or over previous mining - hereafter called "inside" control points. These inside control points are tied to control points outside the angle of draw, and not over mined areas - called outside control points. Very briefly, the method is: (1) Set up on inside control point and shoot 2 or 3 subsidence points. Compare current readings with the previous readings. If no apparent movement has occured, continue through the subsidence monitoring network, (2) If there is apparent movement, retire to an outside control point, and correct the inside control point before proceeding with the remainder of the survey. The method, when no apparent movement has been noted, saves two days of intensive surveying over very rugged terrain, to re-establish the inside control points.

Past Operations

The Spring Canyon Coal Company located in Sowbelly Canyon, mined in six different seams in that area. The lower seams were the Sub 3, Sub 2, and Sub 1. Located above these seams was the Aberdeen Sandstone. Total interburden between the seams was about 30 feet, that is, 6 feet to 12 feet between seams. Above the Aberdeen the A, B, and D seams were mined. The depth of cover in this area is 1600 feet and the mining operator did not attempt to stack pillars nor mine square, regularly spaced pillars. Observation of pillars in this mine shows that there has been no deterioration of the pillars and roof falls have only occurred at intersections (very little supplemental roof support was used in these mines - wood support, when used, has long since rotted).

The Standard Coal Company did an identical type of operation except the D seam was not recovered. Similar conditions exist as in the Spring Canyon Coal Company mine.

In the Willow Creek area, the C seam has been mined out 12 feet below the Kenilworth seam with 600 feet of cover. Seventy (70) feet below the Kenilworth the B seam has been mined. There is no roof support and the entries are 30 feet wide. No problems due to pillar failure have been apparent. In another area, two seams have been mined out under Willow Creek and the highway with 20 to 900 feet of cover, and no subsidence problems have been noticed in this area (Figure 6-12).

Extensive multiple seam mining has been done in the seams above the No. 3 Mine. In one area, the A seam has been mined; 50 feet above the A seam, the B seam has been mined; 60 feet above the B seam, the C seam has been mined; and 15 feet above the C seam, the D seam has been mined. The only problems which have been noticed are related to the immediate roof control, but these do not appear to be associated with the close proximity of the seams. Second mining was practiced in all four of the upper seams.

In some areas where there is only 20 feet of interburden there has been some interaction between seams when the bottom seam was mined first. The mining method was room and pillar.

Past Evaluations at the Mine Concerning Strata Stability

As the purchase of the mine reserves was based on the amount of recoverable coal, the original negotiations took into consideration

the amount of coal which was not mineable because of subsidence problems and thickness of interburden. Due to the stability of interburden material as evidenced by past mining operations, it was agreed upon that a minimum interburden thickness of 30 feet could be tolerated allowing recovery of the coal seams. Maximum depth of cover was determined to be 3000 feet. Subsidence of the highway in Price Canyon was specifically addressed, and a 45 degree angle of draw was used to define the areas of limited extraction, and preclude any subsidence in these sensitive locations.

During negotiations, the following companies were involved in determining the reserve settlement:

Paul Weir Company - Chicago

John T. Boyd Company - Pittsburgh

Gates Engineering - Denver

In addition, design of the main entries was evaluated by Chas. T. Holland and Jack Parker, both well-known rock mechanics specialists and consultants.

Current Operations

Longwall mining is being conducted in the No. 5 Mine under 2200 feet of cover. Infinitely strong pillars in the gate entries have been designed by the PD-NCB to support the roof as longwall mining progresses. Observation has shown that these pillars are stable after mining has occurred in both panels on either side of the pillars for the duration of time that the pillars were visible. No noticeable effects can be seen in the No. 3 Mine by the gate pillars left in the No. 5 Mine 450 feet above. The two mines are not columnized.

In the No. 5 Mine, 85' x 100' pillars under 2000 feet of cover have shown only minor spalling subsequent to mining out of panels on either side of the pillars. The core of the pillar remains intact.

In the No. 3 Mine, longwall operations in the Sub 3 seam are currently taking place under the old Royal Mine in the D seam. The interburden in these areas is 400 to 450 feet, depth of cover is 800 to 1800 feet. Superposition of the operations has not been possible due to the layout of the old workings, but no problems have been noticed in the longwall operations in the Sub 3 seam due to additional stresses.

Current Evaluations on Strata Stability

A U.S.B.M. project has been conducted in the No. 5 Mine in the D seam. The D seam was developed 160 feet above the B seam; 35 feet below the B seam, the A seam had been mined; 200 feet below the B seam, the Sub 3 seam had been mined. Pressure cells were placed in the pillars and extensometers were installed in the entries. The pillars which were monitored were located over mined-out areas under the D seam or over areas where barrier pillars had been left in the lower seams. As mining occurred in the D seam, the effect of the different rates of extraction in the lower operations could not be measured on the pillars in the D seam. Pillar development in the mine was on 60 x 70 foot centers with 20 foot wide openings leaving 40 x 50 foot pillars.

In a small section of the No. 3 Mine, mining has occurred under up to three of the following seams; the A, B, Cw, and D seams; without the pillars being stacked. There are no stability problems and it is possible to enter these areas except the Cw seam. It appears

that the sandstone disperses the stresses caused by pillar loading, and no "point loading" effect has been noticed.

Geologic and Mining Conditions in the Area to be Mined Under the Price River

Drill log data in the vicinity of the area to be mined under the Price River are included showing the location of coal seams. Drill log data also shows that there is extensive interbedding of sandstones in the interburden and the overburden. The Aberdeen Sandstone exists below the A seam. The Castle Gate sandstone does not occur in this area due to erosion by the Price River.

The plan for mining under the Price River is to determine the appropriate pllar size for the lowest seam to be mined and stack the same size pillar in all other seams. The pillar size will be approximately 70' by 70' in the northeast quarter of Section 35. This pillar size may change once mining enters that area due to geologic and mining conditions encountered. The size of pillar is based upon past mining experience, information in the literature, and from discussions with consultants at the mine.

The enclosed "Pillar Sizes in Room and Pillar Working" will be used as a basis for minimum size of pillars. Actual size will be determined on a site specific basis, giving consideration to geology, location of springs, cliff faces, etc. in the vicinity.

Maximum room or entry width will be 20', per MSHA approved roof control plan.

No second mining will be done within an angle of draw of 45 degrees in critical areas (Price River and Willow Creek corriders).

Good mining practice dictates that entries and pillars should be "stacked" wherever possible.

Mean compressive strength of the various strata, determined by Pittsburg Testing labs during the drilling program, is as follows:

Sandstone	13,800 psi
Shale	9,000 psi
Siltstone	6,500 psi
Coal	2,200 psi

Monitoring sites will be established when and where mining is to take place under rivers and roads (see Chapter III). The map location of monitoring sites is contingent upon the mining taking place as now planned and the concurrence of the surface right of way owners.

R614-301-642

All monuments and surface markers used as subsidence monitoring points will be removed during reclamation in a manner approved by the Division.

R614-301-240, 241, 242, 243.

There will be no mining conducted beneath or adjacent to public buildings or facilities, churches schools and hospitals.

R614-301-525.300

Public Notices will be mailed to all owners and occupants of surface property and structures, notifying them at least 6 months prior to mining.

1. Von Schonfeldt, Hilmar, Wright, Fred D. and Unrug, Konstany F., Subsidence and Its Effect on Longwall Mine Design, paper presented at 1979 Coal Convention of American Mining Congress, St. Louis, Missouri, May 20-23.

2. Peng, Syd S. and Cheng, S.L., "Predicting Surface Subsidence for Damage Prevention", Coal Mining & Processing, May 1981, p. 84.

3. Gentry, Dr. Donald W., "Surface Response to Longwall Mining", The Mines Magazine, March 1977, p. 11.

4. Review of Longwall Face Performance and Ventilation at Braztah No. 3 Mine Utah, PD-NCB Consultants Limited, 1979.

5. Parker, Jack and Associates, Rock Mechanics at the American Electric Power Coal Mines, January 1977.

6. Allgaier, Frederick K., "Surface Subsidence Over Longwall Panels in the Western United States, Monitoring Program and Preliminary Results at the Deer Creek Mine, Utah", United States Department of the Interior, Bureau of Mines, Information Circular 8896.

7. Subsidence Engineers' Handbook, National Coal Board Mining Department, Great Britain, 1975.

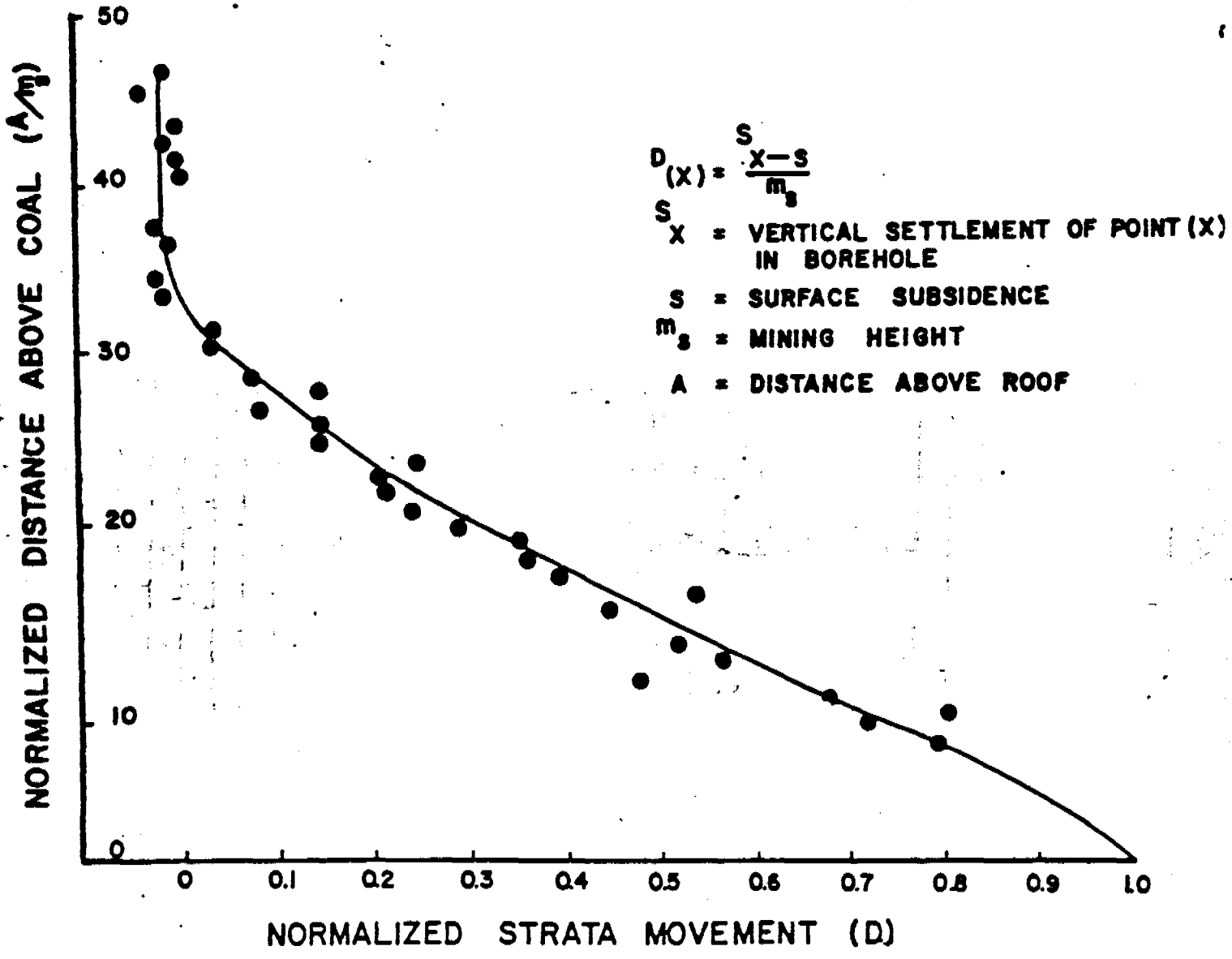


Figure 6-8: VERTICAL SETTLEMENT OF OVERBURDEN

(AFTER H.D. DAHL AND H.A. VON SCHONFELDT, 19

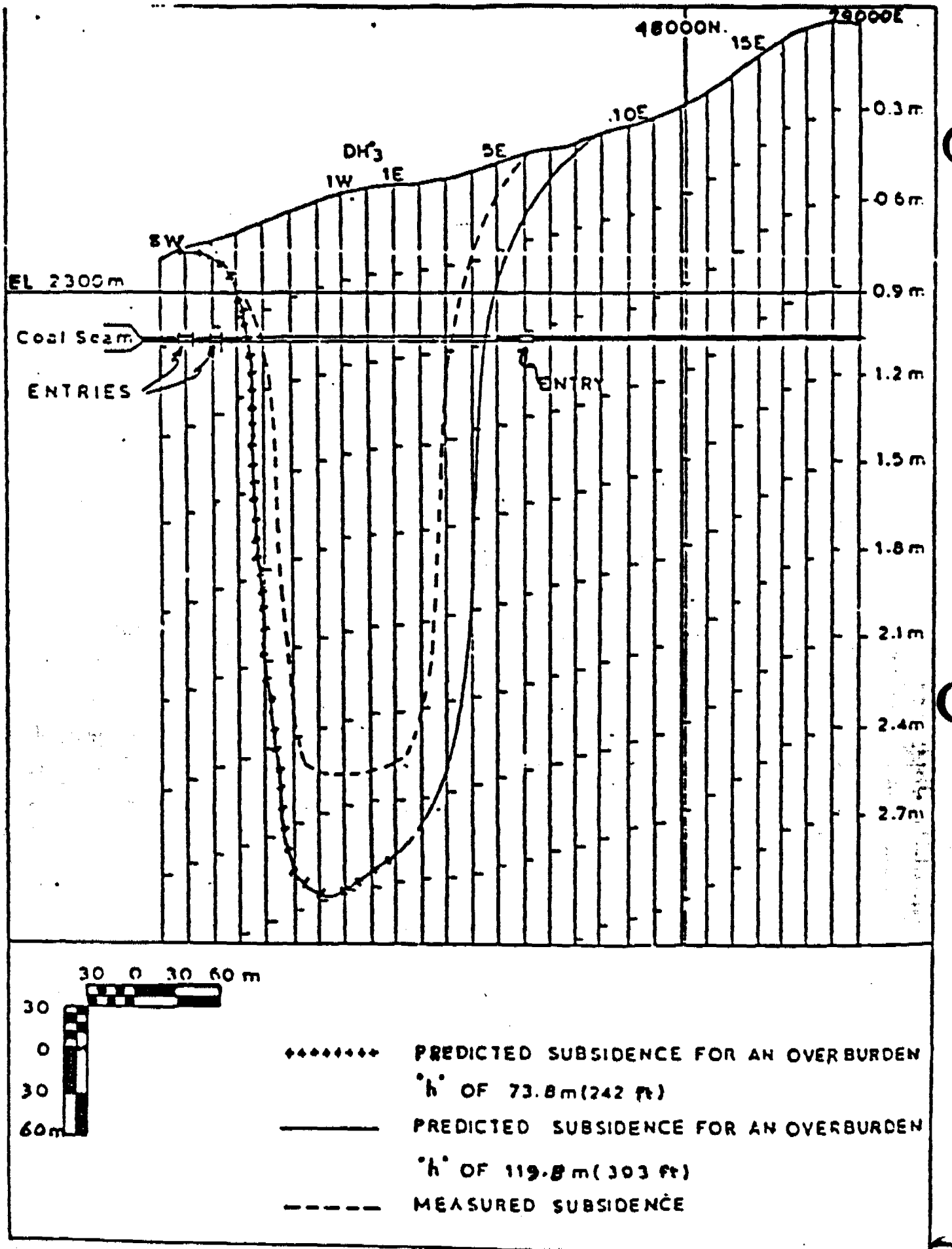


Figure 6-9. Measured vs. predicted total subsidence, (8W-22E), York Canyon Mine Test Panel
The Mines Magazine, April, 1977 - After Gentry

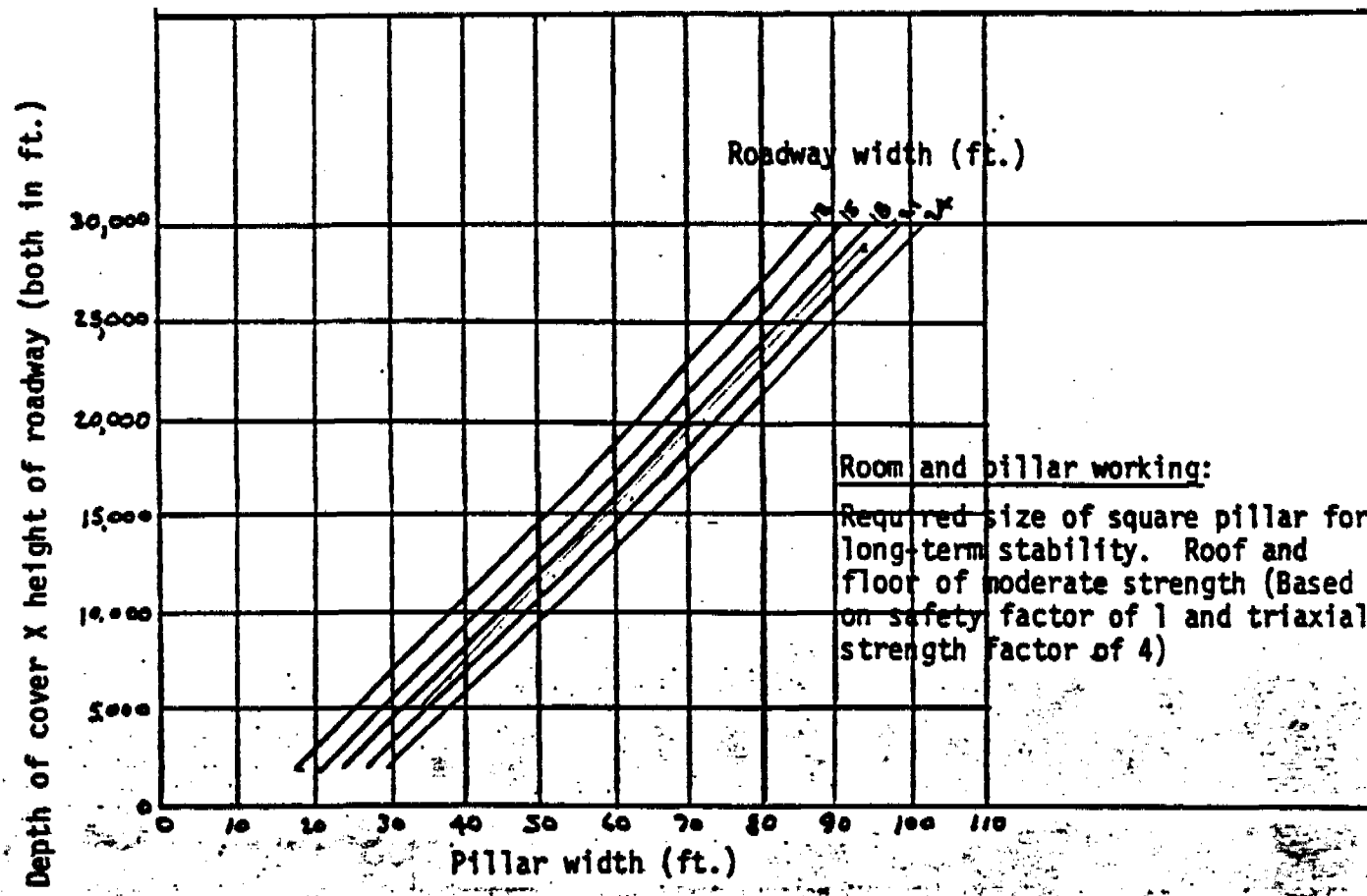


FIGURE 6-10.

PILLAR SIZES IN ROOM AND PILLAR WORKING

FIGURE 6-11

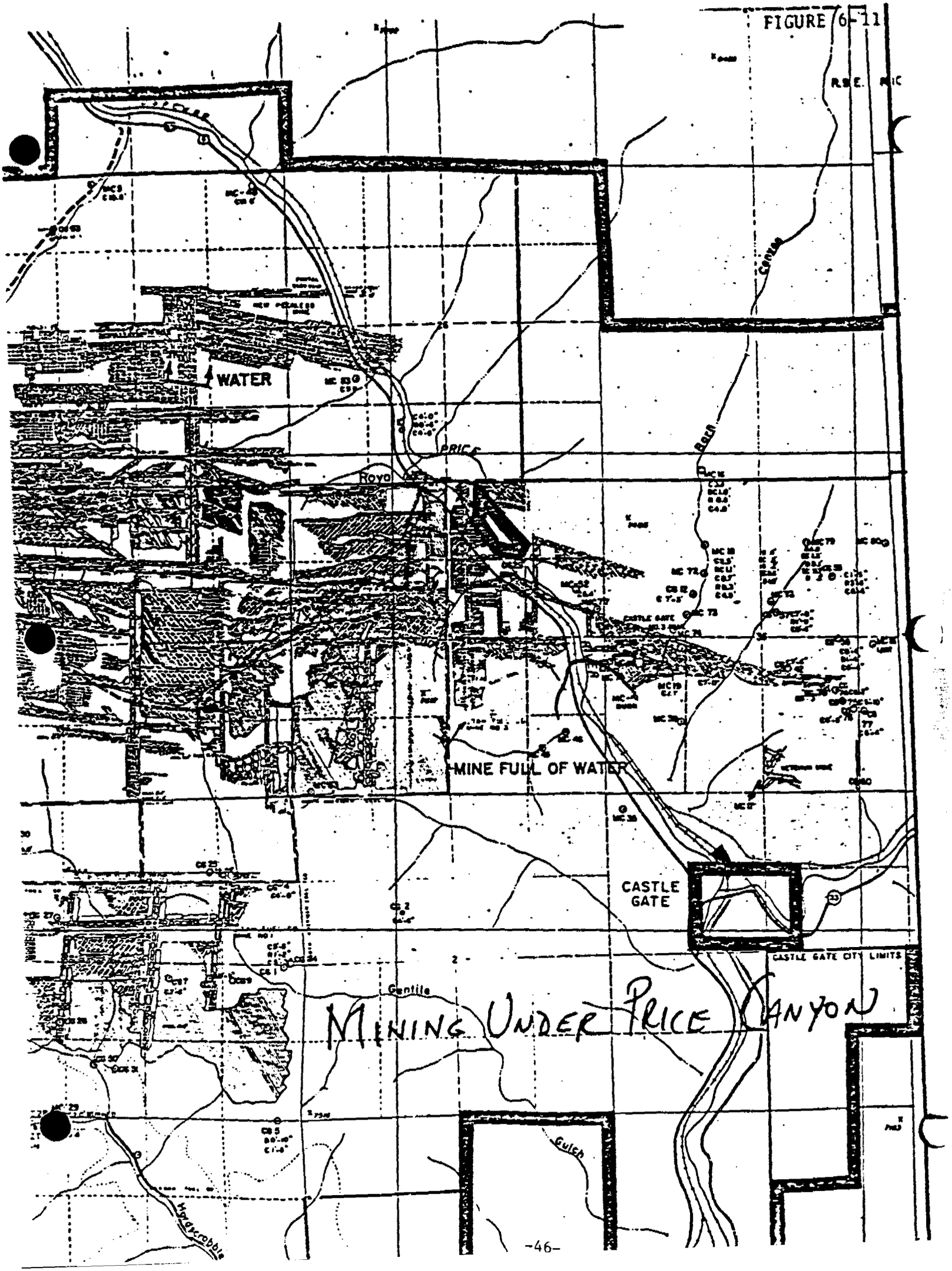
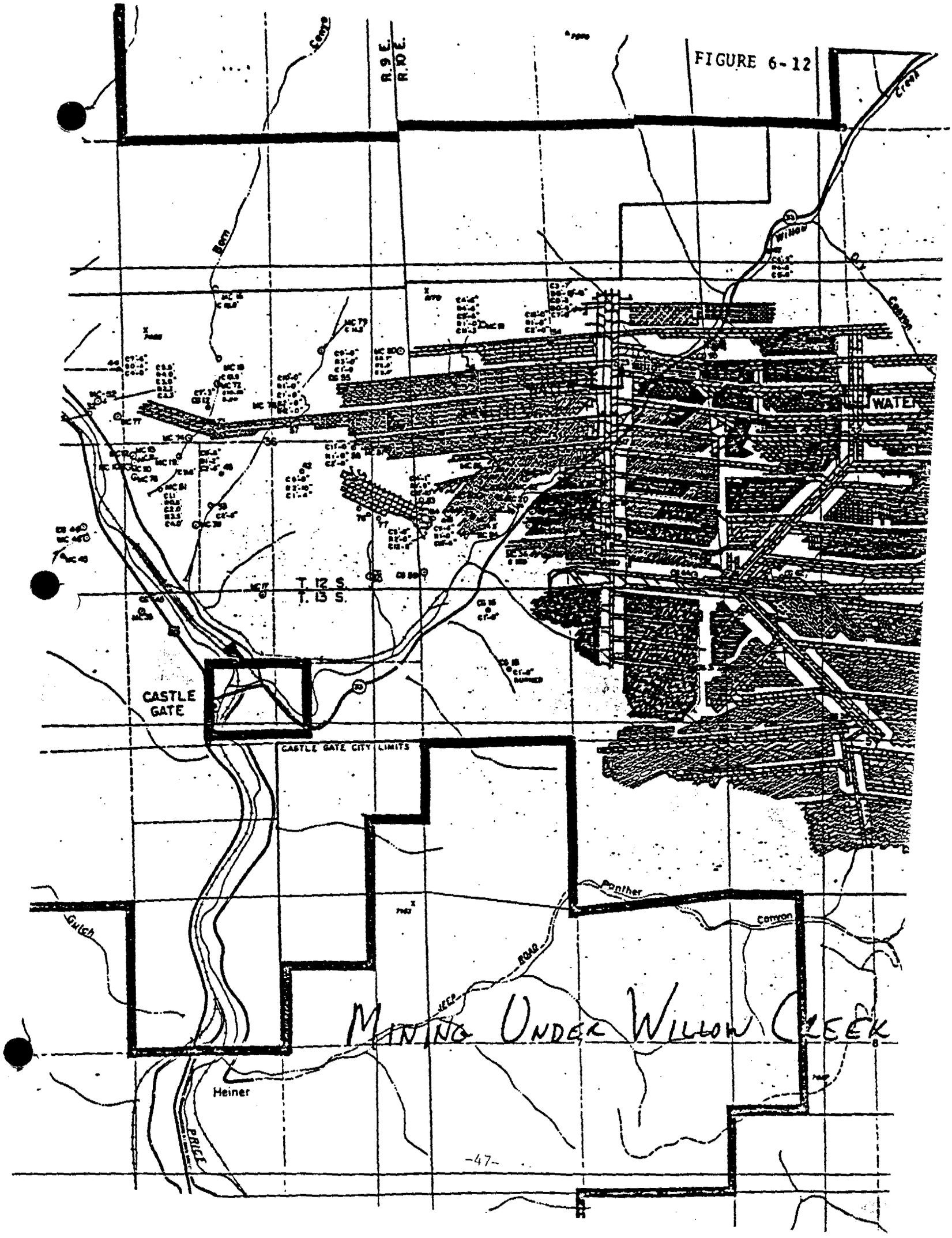

WATER
PRICE
Royo
Rock
Canyon
MINE FULL OF WATER
CASTLE GATE
CASTLE GATE CITY LIMITS
Gentile
Gulch
Hardscrabble
MINING UNDER PRICE CANYON

FIGURE 6-12


R.9 E.
R.10 E.
Willow
Creek
Canyon
WATER
T. 12 S.
T. 13 S.
CASTLE GATE
CASTLE GATE CITY LIMITS
Panther
Canyon
Gulch
JEEP ROAD
MINING UNDER WILLOW CREEK
Heiner
PRICE

APPENDIX 6A

REPRESENTATIVE DRILL LOGS - CROSS-SECTION A-A PRIME ON EXHIBIT 6-2 AND RELATED TO SUBSIDENCE DISCUSSIONS.

LOGS :

MC-11-73
MC-31-74
MC-53-75
MC-69-76
MC-72-76
MC-99-76
MC-117-76
MC-132-77
MC-145-77
MC-160-77
MC-191-78
MC-196-78
MC-205*
MC-206*
MC-207*
MC-6-73
MC-48

*No written logs for these holes.

Drill Hole Log
McCulloch Hole No. 11-73

Location: SE1/4NE1/4, Sec. 36, T. 12 S., R. 8 E., Carbon County, Utah Rains Canyon

Collar Elevation:
Total Depth: 1385.0' Rotary to 803.0'
Inclination: 90

	Rotary	Core
Date Started:	8/26/73	10/24/73
Date Stopped:	9/05/73	11/21/73

Footage

From	To	Feet	Rec'y		Remarks
803.0	809.0	6.0	3.8'	3.8	Med. gr. gray and white ss., irreg. coal partings at 1.0'
809.0	817.0	8.0	9.6'	2.0	Fine gr. ss. and siltstone
				2.1	Med. gr. white ss.
				1.7	Shale to sandy shale
				3.0	Siltstone to fine gr. ss.
				0.2	Bone
				0.5	Bony coal 816.4-816.9
				0.1	Dirty ss.
817.0	827.0	10.0	8.8'	0.5	Sandy shale
				8.3	Fine to med. gr. light gray to white ss
827.0	837.0	10.0	9.4'	2.8	Med. gr. white ss.
				1.3	Gray sandy shale
				2.5	Fine gr. gray ss. to siltstone
				2.8	Fine gr. gray ss.
837.0	847.0	10.0	10.3'	10.3	Fine to med. gr. light and dark gray ss
847.0	857.0	10.0	10.2'	10.2	Med. and fine gr. ss., some siltstone
857.0	867.0	10.0	10.4'	2.3	Med. gr. white ss.
				0.7	Black carb. shale, minor coal partings and bone
				2.0	Fine gr. gray ss. to siltstone
				0.9	Sandy shale
				4.5	Fine gr. gray ss.
867.0	877.0	10.0	10.0'	1.5	Fine gr. gray ss.
				0.9	Carb. shale

Footage From	To		Rec'y		Remarks
				1.9	Fine to med. gr. ss.
				0.4	Bony coal 871.3-871.7
				1.5	Fine and med. gr. ss.
				1.0	Gray siltstone
				1.0	Carb. shale
				1.8	Dirty bony coal 875.2-877.0
877.0	887.0	10.0	10.3'	0.4	Dirty ss.
				4.6	Med. to fine gr. gray ss.
				0.2	Bony shale
				4.3	Fine to med. gr. gray ss.
				0.5	Bony coal 886.2-886.7
				0.3	Dirty ss.
887.0	897.0	10.0	10.0'	10.0	Light gray Med. gr. ss., coarse toward bottom
897.0	907.0	10.0	10.0'	0.5	Coarse gr. white ss.
				9.5	Med. gr. light and dark gray ss., some shaly partings
907.0	917.0	10.0	9.9'	4.8	light and dark gray ss., med. gr.
				0.5	Bony shale
				4.6	Med. gr. light gray ss.
917.0	927.0	10.0	10.2'	10.2	Med. gr. light gray ss., mottled in lower 2 feet
927.0	937.0	10.0	10.1'	1.1	Mottled med. gr. ss.
				3.3	Fine to med. gr. gray ss.
				0.2	Siltstone
				0.5	Bony coal 931.6-932.1
				1.0	Sandy shale 932.1-933.1
				0.8	Coal, some bone and ss. lenses 933.1-933.9
				3.2	Med. gr. white ss.
937.0	947.0	10.0	10.0'	4.6	Med. gr. white ss.
				2.8	Gray ss. with some shaly partings
				2.3	Sandy shale
				0.3	Med. gr. ss.
947.0	957.0	10.0	9.5'	1.7	Med. gr. gray ss., minor shaly partings
				0.4	Carb. shale
				1.0	Bony coal 949.1-950.1
				6.4	Med. gr. light gray ss.

Footage From	To	Feet	Rec'y	Remarks
957.0	967.0	10.0	9.6'	1.4 Med. gr. light gray ss. 1.3 Sandy siltstone, minor partings 1.7 Gray shale 3.3 Fine gr. dirty ss., some shaly partings 1.3 Med. gr. white ss. 0.6 Gray fine gr. ss.
967.0	977.0	10.0	10.1'	2.6 Fine gr. gray ss. 5.7 Med. gr. light and dark gray ss. 0.5 Bony ss., with some coal seams 1.3 Med. gr. gray ss.
977.0	987.0	10.0	10.3'	1.3 Med. gr. gray ss. 1.3 Sandy shale 7.7 Med. gr. light and dark gray ss.
987.0	997.0	10.0	10.3'	3.8 Med. gr. ss., minor partings 0.3 Bony ss. 4.1 Med. gr. gray ss. 2.1 Med. gr. gray ss., with shaly partings
997.0	1007.0	10.0	10.2'	1.2 Dark gray siltstone 3.8 Med. to fine gr. ss. 1.0 Sany siltstone 0.1 Bony ss., minor coal 4.1 Fine to med. gr. ss., with minor siltstone
1007.0	1017.0	10.0	9.7'	3.7 Med. gr. light gray ss. 0.7 Sandy shale with minor coal and bone 2.8 Med. gr. ss. 0.2 Bony shale 2.3 Med. gr. gray ss.
1017.0	1027.0	10.0	10.4'	9.5 Fine to med. gr. light and dark gray ss., some banding and a few partings 0.5 bony shale with irreg. coal seam 0.4 Med. gr. dark gray dirty ss.
1027.0	1037.0	10.0	9.4'	2.3 Dark gray fine gr. ss. 1.2 Med. gr. gray ss. 1.8 Fine gr. dark gray ss. to siltstone 0.8 Carb. shale 0.5 Bony coal 1033.1-1033.6 0.3 Dirty ss. 2.5 Med. gr. gray ss.

From	To	Feet	Rec'y	Remarks
1037.0	1047.0	10.0	10.1'	2.9 Med. to fine gr. gray ss. 0.3 Bony coal 1039.1-1033.6 0.3 Bony shale 4.1 Fine gr. dark gray ss. 2.5 Med. gr. light gray ss.
1047.0	1057.0	10.0	9.5'	0.7 Med. gr. light gray ss. 0.8 Siltstone 2.3 Fine gr. dark gray ss. 0.2 Siltstone 0.5 Coal 1051.0-1051.5 0.1 Bone 4.9 Med. and fine gr. gray ss., minor partings
1057.0	1067.0	10.0	9.9'	8.6 Med. gr. light gray ss., minor banding 0.6 Sandy shale 0.7 Med. gr. dark gray ss.
1067.0	1077.0	10.0	10.1'	10.1 Fine to med. gr. dark gray ss.
1077.0	1087.0	10.0	9.8'	5.5 Med. gr. light and dark gray ss. 4.3 Coal) Sampled
1087.0	1097.0	10.0	9.8'	1.4 Coal, minor bony bands from 1087.0-1087.2) 1082.7-1088.4 5.7' 0.3 bone 0.8 Med. Gr. ss. 2.2 Coal, minor bony bands 1089.5-1091.7 Sampled 5.1 Med. gr. gray ss.
1097.0	1107.0	10.0	10.1'	8.9 Med. and fine gr. gray ss. 1.2 Med. gr. dirty brownish gray ss.
1107.0	1117.0	10.0	10.0'	1.1 Med. gr. dirty ss., numerous carb. inclusions 2.2 Coal 1108.1-1110.3 0.4 Bony shale with some coal 3.4 Med. gr. dark to light gray ss. 2.9 Coarse gr. white ss.
1117.0	1127.0	10.0	10.0'	0.5 Coarse gr. white ss. 0.2 Carb. shale 1.0 Coal, minor bone 1117.7-1118.7 2.0 Dark gray dirty ss. 6.3 Med. gr. gray ss., minor siltstone bands
1127.0	1137.0	10.0	10.0'	10.0 Med. gr. light and dark gray banded ss.

Footage From	To	Feet	Rec'y		Remarks	
1137.0	1147.0	10.0	9.2'	9.2	Fine to med. gr. light and dark gray ss.	
1147.0	1157.0	10.0	8.7'	1.5	Med. gr. light gray ss.	
				4.2	Fine gr. dark gray ss., carb. trash in lower foot	
				3.0	Coal (Core loss appears to be in coal)	) 1152.7-
1157.0	1163.0	6.0	5.9'	1.7	Coal sampled 6.0'	) 1158.7
				0.5	Bony shale, looks like ground core at top of bone	
				0.3	Med. gr. ss.	
				0.1	Bone	
				0.3	Black siltstone	
				0.6	Bony coal 1159.9-1160.5	
				0.6	Bone, minor coal seams	
				1.8	Med. gr. gray ss.	
1163.0	1173.0	10.0	10.0'	4.5	Med. gr. gray ss. with some irreg. brown banding	
				0.2	Bony shale	
				0.5	Bony brown ss.	
				4.8	Med. gr. light gray ss.	
1173.0	1183.0	10.0	10.0'	10.0	Med. to coarse gr. light gray ss.	
1183.0	1194.0	11.0	10.2'	10.2	Med. to coarse gr. light gray ss., some fine dark banding, minor partings	
1194.0	1204.0	10.0	10.0'	8.2	Med. gr. light gray mottled ss.	
				1.8	Med. to fine gr. gray ss. with shaly partings	
1204.0	1214.0	10.0	10.2'	10.2	Med. gr. light gray ss. with some black shaly partings	
1214.0	1224.0	10.0	9.7'	9.7	Med. gr. light and dark gray mottled ss.	
1224.0	1234.0	10.0	10.8'	10.8	Med. gr. light and dark gray mottled ss. grading into fine gr. dark gray ss. in lower 3 feet	
1234.0	1245.0	11.0	10.1'	2.7	Fine gr. dark gray ss.	
				7.4	Med. gr. light gray ss., some dark banding	

Footage From	To	Feet	Rec'y	Remarks
1245.0	1255.0	10.0	10.1'	8.2 Med. gr. light and dark gray mottled to banded ss. 1.9 Fine gr. dark gray dirty ss.
1255.0	1265.0	10.0	10.0'	0.7 Med. gr. dark banded ss. 0.3 Bony coal 1255.7-1256.0 0.5 Bony carb. shale 0.5 Carb. shale 0.7 Bony coal 1257.0-1257.7 7.3 Med. to fine gr. blocky gray ss.
1265.0	1275.0	10.0	10.1'	0.6 Med. gr. gray ss. 5.0 Med. gr. white to gray ss. with carb. trash and dark banding 2.0 Fine gr. dirty ss. with some shaly partings 2.5 Med. gr. dirty ss. with carb. trash
1275.0	1285.0	10.0	10.0'	2.0 Med. gr. dark gray ss. 5.0 Med. gr. white ss. 1.4 White ss. white black partings 1.6 White med. gr. ss.
1285.0	1295.0	10.0	10.1'	0.5 White med. gr. ss. 3.5 Fine gr. dark gray ss. 0.2 Bony shale 0.5 Bony coal 1289.2-1289.7 0.2 Bone 0.9 Dark gray med. gr. ss. 2.0 Med. gr. white ss. 0.7 Shaly ss. 0.2 Carb. shale 1.1 Coal 1293.7-1294.8 0.3 Carb. shale
1295.0	1305.0	10.0	10.1'	3.4 Med. gr. white to mottled ss. 2.1 Coal 1298.4-1300.5 1.0 Bony coal 1300.5-1301.5 0.2 Stone 0.7 Siltstone 0.3 Bony shale 0.5 Bony coal 1302.7-1303.2 0.1 Shale 1.0 Fine gr. gray ss 0.8 Med. gr. light gray ss.

Footage From	To	Feet	Rec'y		Remarks
1305.0	1315.0	10.0	9.8'	4.5	Med. gr. light and dark gray ss., some mottled finer grained at bottom
				0.4	Carb. shale with numerous white shells
				0.4	Coal 1309.9-1310.3
				4.5	Med. gr. light and dark gray ss., minor banding and partings
1315.0	1325.0	10.0	10.0'	10.0	Med. gr. light and dark gray ss.
1325.0	1335.0	10.0	9.9'	0.4	Med. gr. ss.
				0.4	Sandy carb. shale
				0.4	Med. to fine gr. light and dark gray ss.
				2.3	Fine gr. dark gray dirty ss.
				0.3	Bone
				0.3	Coal)
					) 1334.7-1338.5 3.8' Sample
1335.0	1345.0	10.0	10.1'	3.5	Coal)
				0.2	Bone 1338.5-1338.7
				2.2	Coal 1338.7-1340.9
				0.4	Bone
				3.8	Med. gr. light and dark gray mottled ss.
1345.0	1355.0	10.0	10.1'	3.2	Med. gr. light to dark gray ss.
				0.6	Dirty sandy shale, irreg. partings
				0.3	Bony coal 1348.8-1349.1
				2.2	Med. gr. light gray ss.
				0.5	Carb. shale, bony near bottom
				0.3	Coal 1351.8-1352.1
				0.7	Bony dirty ss.
				2.3	Med. gr. light and dark gray ss.
1355.0	1365.0	10.0	9.3'	3.7	Med. gr. light and dark gray ss., some fine gr. dark gray ss.
				5.6	Med. to coarse gr. light gray ss.
1365.0	1375.0	10.0	10.0'	10.0	Coarse gr. light gray ss.
1375.0	1385.0	10.0	10.0	10.0	Coarse gr. light gray ss., some mottling, good Star Point

Drill Hole Log
McCulloch Drill Hole No. 31-74

Location: SW1/4SE1/4, Sec. 32, T. 12 S., R. 9 E.
Carbon County, Utah
Sowbelly Canyon

Collar Elevation: 7570'
Total Depth: 1345'
Inclination: 90

Date Started Sept. 27, 1974
Date Stopped: Oct. 17, 1974

From	To	Feet	Rec'y		Remarks
0	15.0	25.0	14.2'	14.2	White, fine to med. gr. ss., cross-bedded with some carbonaceous partings
15.0	25.0	10.0	6.3'	4.3	White, fine to med. gr. ss., cross-bedded
				.9	Dark gray siltstone, highly carbonaceous, bony
				1.1	Light gray to white, fine gr. ss., weathered
25.0	35.0	10.0	4.0'	2.6	Light gray to white, fine gr. ss. siltstone
				1.4	Light gray siltstone
35.0	65.0	30.0	30.9'	30.9	White, med. gr. ss., cross-bedded, uniform, weathered
65.0	75.0	10.0	9.9'	8.0	White, med. gr. ss., cross-bedded with carbonaceous partings
				1.9	Light gray, fine gr. ss. to siltstone
75.0	85.0	10.0	9.9'	5.9	Light gray to gray mottled, very fine grain sandstone
				2.3	Gray siltstone
				1.7	White, fine gr. ss., carbonaceous partings
85.0	95.0	10.0	9.8'	4.6	White, med. gr. ss., cross-bedded, broken carbonaceous
				1.1	Gray, fine grain sandstone
				2.1	White, medium grain sandstone, stained yellow
				.8	Gray, medium to fine grain sandstone
				.2	Gray, mud slip
95.0	105.0	10.0		4.0	Gray siltstone
				6.0	White and gray mottled, medium grain sandstone

From	To	Feet	Rec'y	Remarks
105.0	115.0	10.0	9.9'	6.5 White and dark gray mottled, med. gray ss. .3 Gray mud slip .3 Dirty coal, bony 1.2 Gray siltstone 1.6 Gray to light gray, fine gr. ss. to siltstone
115.0	125.0	10.0	9.8'	4.5 Gray to light gray, fine gr. ss. to siltstone 5.3 Gray to light gray, fine gr. ss.
125.0	135.0	10.0	9.6'	4.1 Light gray, very fine gr. ss. , broken carbonaceous partings .5 White, fine to Med. gr. ss. with carbonaceous material 1.4 White, very fine gray ss. 3.6 Gray to dark gray siltstone, slightly carbonaceous
135.0	145.0	10.0	10.4'	3.9 Light gray to gray siltstone 2.9 Light gray to white, siltstone 2.6 Gray siltstone, slightly carbonaceous
145.0	155.0	10.0	9.7'	3.0 Light gray to white banded, fine gr. ss. to siltstone 6.7 Light gray to white, med. gr. ss. cross-bedded, abundant dark minerals
155.0	165.0	10.0	10.1'	10.1 Light gray to white, med. gr. ss. cross-bedded abundant dark minerals, some thin siltstone bands
165.0	175.0	10.0	10.0'	10.0 Light gray to white, med. gr. ss. cross-bedded, abundant dark minerals, some thin siltstone bands
175.0	185.0	10.0	10.1'	7.1 White, fine to med. gr. ss., uniform, some carbonaceous debris 2.2 Light gray to white, very fine gr. ss. uniform 0.8 Light gray to white, med. gr. ss., with abundant dark minerals
185.0	195.0	10.0	9.8'	3.1 Light gray to white, fine to med. gr. ss., some carbonaceous partings 1.2 White, fine gr. ss., uniform 5.1 Gray Siltstone 0.4 Light gray, fine gr. ss.

From	To	Feet	Rec'y	Remarks
195.0	215.0	20.0	19.9'	9.1 White to light gray, fine to med. gr. ss. cross-bedded, uniform 4.9 Light gray siltstone to very fine gr. ss. 0.8 White, very fine gr. ss. 5.1 Gray siltstone
215.0	225.0	10.0	9.9'	0.6 Gray siltstone 0.8 White, fine gr. ss. 0.8 Gray siltstone 1.6 White, fine gr. ss. 0.7 Gray siltstone 5.4 White, fine to very fine gr. ss.
225.0	235.0	10.0	10.1'	4.4 White, fine to very fine gr. ss. 3.7 Light gray to gray siltstone to very fine gr. ss. 2.0 Gray to dark gray siltstone, carbonaceous
235.0	245.0	10.0	9.9'	0.3 Gray siltstone White, fine gr. ss. 5.8 Gray siltstone, carbonaceous 1.0 Dark gray siltstone, highly carbonaceous 1.1 light gray to white, fine gr. ss. to siltstone
245.0	255.0	10.0	9.9'	2.3 Gray siltstone 2.5 Light gray to white, very fine gr. ss. 3.4 Gray siltstone 1.9 Light gray to white, fine gr. ss.
255.0	265.0	10.0	10.0	2.1 Light gray to white, fine gr. ss. 6.0 White and gray mottled, fine to med. gr. ss. 1.9 Gray siltstone
265.0	275.0	10.0	9.9'	0.6 Gray siltstone 1.4 White, fine gr. ss. 4.3 Gray siltstone, carbonaceous 3.6 Light gray to gary, fine gr. ss. to siltstone mottled
275.0	285.0	10.0	10.0'	0.5 White, Fine gr. ss. 0.2 Dirty coal, bony 0.4 Gray siltstone 8.9 White, fine to med. gr. ss., cross-bedded, thin dark bedding carbonaceous partings sk 1
285.0	295.0	10.0	10.4'	3.6 White, fine to med. gr. ss., cross-bedded

From	To	Feet	Rec'y	Remarks
				thin dark bedding, carbonaceous partings
				2.0 White, fine gr. ss., uniform
				4.8 Light gray siltstone, uniform
295.0	305.0	10.0	9.9'	3.8 Light gray to white siltstone to very fine gr. ss.
				3.2 Gray to dark gray siltstone, highly carbonaceous some thin coal bands
				2.9 Light gray to white, very fine gr. ss. to siltstone
305.0	315.0	10.0	9.9'	1.3 Light gray to white, very fine gr. ss. to siltstone
				2.5 Gray siltstone to very fine gr. ss.
				1.9 White, fine gr. ss., weekly mottled gr.
				0.5 Gray siltstone
				3.7 White, fine gr. ss., uniform
315.0	325.0	10.0	9.9'	2.7 White, fine gr. ss., cross-bedded, uniform
				0.6 Gray siltstone
				0.6 White, fine gr. ss.
				2.6 Light gray to white, fine gr. ss. to siltstone
				3.4 Gray siltstone to light gray, fine gr. ss.
325.0	335.0	10.0	10.0'	4.9 White, fine gr. ss., weakly mottled gray
				.3 Dark gray siltstone, carbonaceous
				4.8 Light gray to white, fine gr. ss. to siltstone
335.0	345.0	10.0	10.0'	5.0 White, fine gr. ss., weakly mottled gray, carbonaceous partings
				1.2 Gray siltstone, carbonaceous
				1.2 Light gray, fine gr. ss.
				2.1 Gray siltstone
				.5 Light gray, fine gr. ss. to siltstone
345.0	355.0	10.0	9.9'	1.5 Light gray, fine gr. ss. to siltstone
				5.7 Dark gray siltstone, carbonaceous
				2.7 Gray siltstone
355.0	365.0	10.0	9.9'	3.2 Gray siltstone
				1.0 White, very fine gr. ss.
				5.7 Gray siltstone

From	To	Feet	Rec'y	Remarks
365.0	375.0	10.0	10.1′	5.2 Gray siltstone 4.9 White, fine gr. ss., some carbonaceous partings
375.0	385.0	10.0	9.9′	0.2 White, fine gr. ss. 2.3 Light gray to white, fine gr. ss. to siltstone carbonaceous 7.4 Gray siltstone
385.0	395.0	10.0	9.8′	0.3 Gray siltstone 0.7 White, very fine gr. ss. 4.2 Gray to dark gray siltstone, carbonaceous 4.0 White, fine gr. ss., cross-bedded 0.6 Gray siltstone
395.0	405.0	10.0	10.1′	7.2 Gray siltstone .8 White, fine gr. ss. 2.1 Dark gray siltstone, carbonaceous
405.0	415.0	10.0	9.8′	1.0 Light gray to white, fine gr. ss. 4.2 Gray siltstone 3.6 Light gray siltstone to very fine gr. ss. 1.0 Gray siltstone
415.0	425.0	10.0	10.1′	0.5 Dark gray siltstone 2.4 Light gray to white, very fine gr. ss. to siltstone 1.8 Dark gray siltstone, carbonaceous 3.3 White, fine gr. ss. with thin siltstone interbeds 2.1 Gray to dark gray siltstone
425.0	435.0	10.0	10.0′	0.7 Gray siltstone 9.3 White, fine to med. gr. ss., crossbedded
435.0	445.0	10.0	10.0′	10.0 White, fine to med. gr. ss., crossbedded
445.0	455.0	10.0	10.3′	0.3 White, fine to med. gr. ss. 5.6 Light gray to white, very fine gr. ss. to siltstone 4.4 White and gray, mottled, fine gr. ss. crossbedded, some carbonaceous parts
455.0	465.0	10.0	10.0′	3.8 White, fine to med. gr. ss., weakly mottled

From	To	Feet	Rec'y	Remarks
				3.4 White and gray banded, fine gr. ss. and siltstone, interbedded
				2.8 White, fine to med. gr. ss., uniform
465.0	475.0	10.0	9.8'	6.9 White, fine to med. gr. ss., uniform
				2.9 Dark gray siltstone
475.0	485.0	10.0	10.0	0.6 Dark gray siltstone
				0.9 White, very fine gr. ss.
				7.6 Gray to light gray siltstone to very fine gr. ss.
				0.9 White, fine gr. ss.
485.0	495.0	10.0	10.3'	2.1 White, fine gr. ss.
				2.9 White and gray mottled, very fine gr. ss.
				0.4 Dirty coal - bony
				0.9 Coal
				1.7 Gray siltstone
				2.3 White, fine gr. ss., uniform crossbedded
495.0	505.0	10.0	9.8'	2.1 White, fine to med. gr. ss.
				1.4 Gray to dark gray siltstone, carbonaceous
				3.0 White, fine gr. ss.
				3.3 Gray to dark gray siltstone, carbonaceous partings
505.0	515.0	10.0	10.1'	0.5 Gray siltstone, carbonaceous
				0.6 White, very fine gr. ss.
				3.6 Gray siltstone
				1.1 White and gray mottled, fine gr. ss.
				4.3 Gray to dark gray siltstone, carbonaceous
515.0	525.0	10.0	10.0'	2.2 Light gray to gray banded, very fine gr. ss. and siltstone, interbedded
				7.8 White, fine gr. ss., uniform
525.0	535.0	10.0	10.0'	0.2 White, fine gr. ss.
				3.4 Gray siltstone, weakly carbonaceous
				1.1 White, fine gr. ss
				0.3 Dark gray siltstone, carbonaceous
				5.0 White, fine gr. ss.
535.0	545.0	10.0	10.0'	0.7 White, fine gr. ss.
				2.5 Gray siltstone
				4.5 White and gray mottled, fine gr. ss.
				1.4 Gray siltstone
				0.2 Coal

From	To	Feet	Rec'd	Remarks
				0.7 Dark gray siltstone
545.0	555.0	10.0	10.1'	10.1 Gray siltstone
555.0	565.0	10.0	10.0	4.4 Gray siltstone 2.5 Light gray to gray siltstone 1.3 White, fine gr. ss. 1.8 Gray to dark gray siltstone, carbonaceous
565.0	575.0	10.0	9.9'	3.5 Gray siltstone 5.2 Light gray to white siltstone to very fine gr. ss. 1.2 White, fine gr. ss.
575.0	585.0	10.0	10.0'	1.3 White to light gray, fine gr. ss. to siltstone 2.2 Gray to light gray siltstone 5.3 White, fine gr. ss., uniform 9.7 Light gr. siltstone to very fine gr. ss. .5 Dark gray siltstone, highly carbon-aceous bony
585.0	595.0	10.0	10.2'	0.3 Dark gray siltstone, highly carbonaceous 2.2 Light gray siltstone 0.8 White, fine gr. ss. 6.9 Gray to light gray siltstone, carbonaceous
595.0	605.0	10.0	10.0'	2.7 White and gray mottled, fine gr. ss. 5.9 Gray siltstone 0.3 coal 0.1 Dirty coal - bony Gray siltstone
605.0	615.0	10.0		0.1 Gray siltstone 8.3 White, fine to med. gr. ss., uniform 1.7 White and dark gray, fine gr. ss. and siltstone, interbedded
615.0	625.0	10.0	10.0'	3.4 Gray siltstone 6.6 White, fine gr. ss. with some thin gr. siltstone interbeds
625.0	635.0	10.0	10.1'	1.1 White, fine gr. ss. 8.0 Light gray to white, siltstone 1.0 White, very fine gr. ss.

From	To	Feet	Rec'y	Remarks
635.0	645.0	10.0	10.4	1.8 Light gray to white, very fine gr. ss. 3.1 Gray to dark gray siltstone, carbonaceous 0.3 Dirty coal - bony 0.7 Coal 1.0 Dark gray siltstone, carbonaceous 3.8 Dark gray to gray siltstone, carbonaceous
645.0	655.0	10.0	9.6	0.6 Gray siltstone 1.6 White, fine gr. ss. 0.2 Dirty coal, bony 0.9 Light gray to white, siltstone 3.8 White and gray mottled, fine gr. ss. 0.8 Dark gray siltstone —651.7 0.3 Gray coal siltstone
655.0	665.0	10.0	10.1	10.1 Light gray to white siltstone, some very fine gr. ss.
665.0	675.0	10.0	9.9	3.7 Gray siltstone 3.0 White and gray mottled, fine gr. ss. 1.7 Gray siltstone 1.5 Light gray to white, very fine gr. ss. to siltstone
675.0	685.0	10.0	10.3'	5.4 White to light gray, fine to very fine gr. ss. 3.2 Gray siltstone 1.7 Light gray to white, very fine gr. ss.
685.0	695.0	10.0	9.8'	4.8 Gray to light gray siltstone 5.0 White, med. gray ss., uniform
695.0	705.0	10.0	9.9'	9.9 White, med. gr. ss., uniform, some carbonaceous partings
705.0	715.0	10.0	10.0'	2.3 White, Med. gr. ss 7.7 Gray siltstone, uniform
715.0	725.0	10.0	10.0'	1.5 White and light gray mottled, fine gr. ss 5.3 Gray siltstone, uniform 2.0 Gray to dark gray siltstone 1.2 Gray to white mottled, fine gr. ss.
725.0	735.0	10.0	10.0'	0.3 Gray and white mottled, fine gr. ss 2.3 Gray siltstone —727.6 1.6 Coal 0.1 Dirty coal - bony

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From	To	Feet	Rec'y	Remarks
				2.9 Light gray to white, very fine gr. ss. to siltstone
				2.8 Light gray, very fine gr. ss. to siltstone
735.0	745.0	10.0	9.7'	0.3 Light gray, very fine gr. ss.
				5.0 Gray to light gray siltstone —740.3
				1.0 Coal
				0.1 Dirty coal, bony
				1.7 Gray and white mottled, fine gr. ss.
				1.5 Gray to dark gray siltstone, carbonaceous
745.0	755.0	10.0	10.3'	2.4 Gray to dark gray siltstone
				4.3 Gray to light gray siltstone to very fine gray ss.
				3.6 Gray and white mottled, fine gr. ss.
755.0	765.0	10.0	10.2'	4.5 Gray and white mottled, fine gr. ss.
				0.7 Gray siltstone
				1.9 Light gray to white, very fine gr. ss. to siltstone
				3.1 Gray siltstone
765.0	775.0	10.0	10.1'	4.5 Gray siltstone
				3.8 White and gray mottled, fine gr. ss., carbonaceous partings
				0.3 Dirty coal, bony
				0.9 Gray siltstone
				0.6 White, fine gr. ss.
775.0	785.0	10.3	7.3'	1.1 White, fine gr. ss.
				2.4 Gray siltstone
				1.1 Light gray, fine gray ss. Mislatch
				0.2 Coal lost core
				1.3 Gray siltstone
				1.2 White, fine gr. ss.
785.0	795.0	10.0	10.0	3.0 White, fine gr. ss. with some light gray siltstone interbeds
				0.5 Gray siltstone
				0.2 Coal
				1.0 Dirty coal, bony
				0.2 Dark gray siltstone, carbonaceous
				5.1 White and light gray mottled, fine gr. ss.
795.0	805.0	10.0	10.0	0.2 White and light gray mottled, fine gr. ss.
				1.8 Gray, very fine gr. ss., highly carbonaceous

From	To	Feet	Rec'y	Remarks
				1.3 Light gray to white, very fine gr. ss. to siltstone
				0.4 Dark gray siltstone, carbonaceous
				2.5 Light gray to white, very fine gr. ss. to siltstone
				3.8 Gray siltstone, uniform
805.0	815.0	10.0	9.9	5.5 Gray siltstone, uniform
				0.9 Dark gray siltstone, carbonaceous
				0.8 Coal
				0.5 Dirty coal, bony
				2.1 White to gray, fine gr. ss. to siltstone
815.0	825.0	10.0	10.0′	5.7 Gray to light gray siltstone, carbonaceous
				4.3 White, fine gr. ss., uniform
825.0	835.0	10.0	10.0′	5.2 White, fine gr. ss., uniform
				3.0 Light gray, very fine gr. ss. to siltstone
				1.8 Gray siltstone
835.0	845.0	10.0	9.7′	2.5 Gray siltstone
				0.6 Dirty coal, bony
				2.4 Gray siltstone
				0.5 Coal
				0.4 Dirty coal, bony
				1.6 Gray to dark gray siltstone
				1.7 Light gray siltstone to very fine gr. ss.
845.0	855.0	10.0	10.0′	1.4 Light gray siltstone to very fine gr. ss.
				0.4 Dark gray siltstone, highly carbonaceous
				1.4 Gray siltstone
				1.3 Light gray to white, very fine gr. ss. to siltstone
				5.5 Gray siltstone, uniform
855.0	865.0	10.0	9.8′	3.0 Gray siltstone, some white mottling, carbonaceous , to very fine gr. ss.
				3.6 White, fine gr. ss., mottled with gray, carbonaceous
				0.1 Dirty coal, bony
				0.6 Coal
				1.5 Gray siltstone, with some thin white fine gr. ss. interbeds
				1.0 Light gray to white, fine gr. ss.

From	To	Feet	Rec'y	Remarks
865.0	875.0	10.0	10.4'	0.6 White to light gray fine gr. ss. 0.6 Gray siltstone 1.5 Dark gray siltstone —867.7 0.1 Dirty coal, bony 4.0 Coal clean 0.1 Dirty coal, bony — 6.0 Coal 1.8 Coal clean — D Seam —873.7 1.1 Dark gray siltstone, highly carbonaceous 0.6 Gray siltstone
875.0	885.0	10.0	9.9'	3.7 Gray siltstone 0.5 Dark gray to black siltstone, to bony coal 4.4 Light gray, very fine gr. ss. to siltstone 0.5 Gray to dark gray siltstone 0.8 Gray siltstone
885.0	895.0	10.0	9.8'	1.2 Gray to light gray siltstone 0.6 Coal 2.5 White to light gray, very fine gr. ss. 1.2 Gray siltstone 1.2 White and light gray mottled, fine gr. ss. 3.1 Gray siltstone, uniform
895.0	905.0	10.0	10.0	0.3 Gray siltstone 0.2 Dirty coal, bony 0.6 Gray siltstone 0.6 White, fine gr. ss. 1.9 Gray siltstone 1.0 White, fine gr. ss. 5.4 Gray siltstone
905.0	915.0	10.0	10.0'	0.6 Gray siltstone —905.6 0.2 Dirty coal, bony 0.3 Coal 0.2 Dirty coal, bony — 2.3 Coal 1.4 Coal 0.2 Coal 0.2 Dirty coal, bony 3.7 Light gray to white mottled siltstone 2.7 White to light gray, very fine gr. ss. 0.7 Gray siltstone
915.0	925.0	10.0	10.1'	0.9 Gray siltstone, mottled with white 1.1 White, fine gr. ss. 1.4 Gray siltstone 1.0 White to gray, fine gr. ss. to siltstone 0.6 Dirty coal, bony

From	To	Feet	Rec'y	Remarks
				4.5 Gray to light gray siltstone 0.6 White and gray mottled, fine gr. ss.
925.0	935.0	10.0	10.1'	2.2 White and gray mottled, fine gr. ss. 5.6 Gray to light gray siltstone 0.9 White, fine gr. ss. 1.4 Gray to dark gray siltstone
935.0	945.0	10.0	9.9'	1.3 Dark gray siltstone to dirty coal 1.7 Gray siltstone 2.3 White and gray mottled, fine gr. ss. 0.6 Dark gray siltstone, carbonaceous —939.9 1.1 Coal 0.4 Gray to dark gray siltstone, carbonaceous 2.5 White, fine gr. ss.
945.0	955.0	10.0	9.9'	0.6 White, fine gr. ss. 2.4 Gray to dark gray siltstone, carbonaceous 2.5 White to white and gray mottled, fine gr. ss. 0.9 Gray siltstone 1.0 White, fine gr. ss. 0.6 Gray siltstone 1.9 White, fine gr. ss., uniform
955.0	965.0	10.0	9.5'	1.1 White, fine gr. ss. 0.1 Dirty coal, bony 0.6 Coal 2.9 Light gray to white, very fine gr. ss. to siltstone 0.3 Dark gray siltstone, carbonaceous 0.4 Coal 3.4 Light gray to white, fine gr. ss. 0.7 Gray siltstone
965.0	975.0	10.0	9.8'	1.6 Gray to light gray siltstone 1.9 White, fine gr. ss. 1.6 Gray siltstone 1.8 White, fine gr. ss., carbonaceous partings 1.0 Gray siltstone 1.8 White and gray mottled, fine gr. ss. and siltstone 0.1 Gray siltstone
975.0	985.0	10.0	10.4'	1.1 Gray to dark gray siltstone, carbonaceous 6.5 Gray to light gray siltstone 1.2 White, fine gr. ss.

From	To	Feet	Rec'y	Remarks
				1.6 Gray siltstone
985.0	995.0	10.0	9.9′	0.3 Coal 0.6 Gray, fine gr. ss., carbonaceous 8.8 White, fine to med. gr. ss., cross-bedded, uniform 0.2 Gray siltstone
995.0	1005.0	10.0	10.0′	2.1 Gray siltstone 1.2 Light gray to white, fine gr. ss. 0.8 Dirty coal, bony 2.9 Light gray to gray siltstone to very fine gr. ss. 2.8 Light gray and white mottled, very fine gr. ss. to siltstone
1005.0	1015.0	10.0	10.1	4.4 Light gray to white mottled, very fine gr. ss. to siltstone 5.7 Gray to dark gray siltstone, carbonaceous
1015.0	1025.0	10.0	10.0′	0.9 Gray siltstone 0.6 Coal 0.6 Gray siltstone 0.9 White, fine gr. ss. 1.6 Gray siltstone 2.9 White and gray mottled, fine gr. ss. 2.5 White, fine gr. ss., weakly mottled
1025.0	1035.0	10.0	10.2′	3.9 White to white and gray mottled, fine gr. ss. 1.2 Gray to dark gray siltstone 5.1 White, fine gr. ss., weakly mottled gray
1035.0	1045.0	10.0	9.9′	5.4 White, fine gr. ss., some carbonaceous partings 1.5 Gray siltstone 3.0 White to light gray, fine gr. ss., carbonaceous
1045.0	1055.0	10.0	10.1′	1.4 White to light gray, fine gr. ss., highly carbonaceous —1046.4 B Seam 8.4 Coal clean —1054.8 0.3 Gray siltstone
1055.0	1065.0	10.0	10.2′	1.7 Light gray to white, very fine gr. ss. to siltstone 0.8 Gray siltstone 0.7 White, fine gr. ss. 1.7 Gray to dark siltstone, carbonaceous 5.3 White to gray and white mottled, fine

From	To	Feet	Rec'y	Remarks
				gr. ss. to siltstone
1065.0	1075.0	10.0	9.8′	1.3 White and light gray mottled, fine gr. ss 7.0 Gray siltstone, uniform 0.6 Dark gray siltstone, highly carbonaceous —1073.9 0.9 Coal = 2.7 Coal
1075.0	1085.0	10.0	10.0	1.8 Coal 0.3 Gray siltstone 0.7 Light gray, fine gr. ss 0.6 Gray to dark gray siltstone 0.5 Coal 3.3 Gray siltstone 2.8 White to gray and white mottled, fine gr. ss. to siltstone
1085.0	1095.0	10.0	9.6′	1.3 Gray siltstone 5.5 White to light gray, very fine gr. ss. 2.8 Gray siltstone
1095.0	1105.0	10.0	10.0′	5.4 Gray siltstone 1.8 White and gray, mottled, fine gr. ss. 0.8 Dark gray siltstone, carbonaceous 2.0 White, fine gr. ss.
1105.0	1115.0	10.0	9.7′	1.9 White, fine gr. ss., cross-bedded 0.5 Dirty coal, bony 2.3 Gray siltstone 2.8 White, fine gr. ss., carbonaceous partings 2.6 Gray siltstone
1115.0	1125.0	10.0	9.9′	1.4 Gray siltstone 0.8 Dark gray siltstone, carbonaceous —1117.2 A Seam 3.1 Coal, clean 1.1 Dark gray siltsone, highly carbonaceous bony 0.5 Coal 0.25 Dirty coal, bony 0.25 Coal 0.1 Dark gray siltstone, carbonaceous 2.4 White, fine gr. ss., mottled with gray siltstone
1125.0	1165.0	40.0	40.5′	37.8 White fine to med. gr. ss., cross-bedded, abundant dark minerals Aberdeen

From	To	Feet	Rec'y		Remarks
				2.3	White and gray banded, fine gr. ss. and siltstone interbedded
				0.4	White, fine gr. ss.
1165.0	1175.0	10.0	10.0	1.4	Gray siltstone, weakly mottled white
				8.6	White, fine to med. gr. ss., uniform
1175.0	1185.0	10.0	10.0′	10.0	White, fine gr. ss., uniform, two siltstone bands
1185.0	1195.0	10.0	10.1′	10.1	White, fine gr. ss., with occasional gray siltstone banding |sk 1
1195.0	1205.0	10.0	10.1′	10.1	Light gray to white mottled and banded, fine gr. ss.
1205.0	1215.0	10.0	10.0′	2.1	Light gray, fine gr. ss.
				7.9	White, med. gr. ss., cross-bedded some carbonaceous material
1215.0	1225.0	10.0	10.0′	10.0	White, fine to med. gr. ss., crossbedded
1225.0	1235.0	10.0	10.1′	6.1	White, fine gr. ss., cross-bedded, some gray mottling —1231.1
				0.8	Coal
				1.9	Dark gray siltstone, carbonaceous
				1.3	Light gray to white, fine gr. ss.
1235.0	1245.0	10.0	10.0′	9.1	White, fine gr. ss., some thin gr. siltstone, interbeds
				0.9	Gray and white banded, fine gr. ss. and siltstone interbedded
1245.0	1255.0	10.0	10.1′	5.7	Gray and white banded, fine gr. ss. and siltstone interbedded, cross-bedded
				1.3	Gray siltstone, weakly mottled with white
				3.1	White, fine to med. gr. ss., cross-bedded, carbonaceous partings
1255.0	1265.0	10.0	9.9′	9.9	White, med. gr. ss., some carbonaceous partings, uniform
1265.0	1275.0	10.0	10.1	10.1	White, med. gr. ss., uniform
1275.0	1285.0	10.0	10.0′	3.3	White, med. gr. ss., contains ripups of lighter color
				5.6	White, fine to med. gr. ss., uniform

From	To	Feet	Rec'y	Remarks
				0.2 Dark gray siltstone, carbonaceous, bony
				0.3 Coal
				0.6 Dark gray siltstone, highly carbonaceous
1285.0	1295.0	10.0	9.8'	0.1 Dark gray siltstone, carbonaceous —1285.1
				0.7 Coal (
				0.4 Dirty coal, bony (2.1 Coal
				1.0 Coal (
				1.2 Dark gray siltstone, carbonaceous
				3.0 White and gray mottled and banded, fine gr. ss. and interbedded siltstone
				3.4 Coal - clean —1291.4
1295.0	1305.0	10.5	10.5'	0.7 Coal
				0.2 Dirty coal, bony
				0.6 Coal
				5.5 Coal
				0.1 Dirty coal, bony
				0.1 Dirty coal, bony —1296.9
				0.4 Dark gray siltstone, carbonaceous
				0.1 Dirty coal, bony
				1.9 Gray siltstone, some thin ss. interbeds
				6.0 White, fine gr. ss., low angle cross-bedded some carbonaceous material
1305.0	1325.0	20.0	19.8	2.1 White, fine gr. ss., some thin gr. siltstone interbeds
				1.2 White, and gray, fine gr. ss. and siltstone interbedded
				1.2 Gray siltstone
				0.1 Gray siltstone with fossils, pelecy-pods
				2.1 Gray to dark gray siltstoen, carbonaceous
				0.2 Coal
				1.5 Grayish brown to gray siltstone carbonaceous —1313.4
				3.5 Coal, clean
				0.1 Dirty coal, bony
				8.5 Coal
				1.6 Coal, clean
				0.1 Dirty coal, bony
				3.2 Coal, clean
				2.9 Brownish gray, med. gray ss.
1325.0	1335.0	10.0	9.7'	9.7 Light gray to white, med. gr. ss., cross-bedded, abundant dark minerals Star Point
1335.0	1345.0	10.0	10.2'	10.2 Light gray to white, med. gray ss., cross-bedded, uniform

T.D. 1345

October 17, 1974

Drill Hole Log
McCulloch Drill Hole No. 53-75

Location: NW1/4 SW1/4, Sec. 26 T. 12 S., R. 9 E., Carbon County, Utah
Price Canyon

Collar Elevation: 6340'
Total Depth: 1175'
Inclination: 90

Date Started: 4-21-75
Date Complete: 5-5-75

From	To	Feet	Rec'y		Remarks
0	40	40.0	00.0	0.0	Plugged and Cased
40	75	35.0	35.0	35.0	Light gr. to white, fine gr. ss., x bedded
75	85	10.0	9.9	6.9	light gr. to white, fine gr. ss.
				2.4	Gray silst., some carb. material
				0.6	Light gr. siltst. to very fine gr. ss.
85	105	20.0	20.0	1.4	Light gr. siltst. to very fine gr. ss.
				18.6	White to light gr., fine gr. ss., uniform
105	115	10.0	9.8	5.6	White, fine gr. ss.
				4.2	Gray siltst., some carb. material
115	135	20.0	19.7	11.1	White, fine gr. ss., uniform
				1.8	Gray siltst.
				6.8	Light gr. to white, fine gr. ss.
135	145	10.0	10.1	5.8	Gray to light gr. fine gr. ss. to siltst.
				4.3	Light gr. to white, fine gr. ss.
145	155	10.0		5.2	White, fine gr. ss.
				2.9	Gray to light gr. ss
				1.7	White, fine gr. ss.
155	165	10.0	10.0	6.8	White to gr. and white, mottled, fine gr. ss.
				2.7	Gray to dark gr. siltst., carb.
				0.5	Light gr. fine to very fine gr. ss.
165	175	10.0	10.0	6.5	White, fine gr. ss., uniform
				1.7	Gray to dark gr. silst.
				1.8	White to gr. and white mottled, fine gr. ss.
175	185	10.0	10.0	1.2	Gray & white mottled, fine gr. ss.
				3.3	Gray to light gr. siltst. to very fine gr. ss.
				4.5	White to light gr. fine gr. ss.

From	To	Feet	Rec'y	Remarks
185	195	10.0	10.1	3.1 White, fine gr. ss. carb. parts 4.9 Light gr. to gr. silst., carb. 2.1 White, fine gr. ss.
195	205	10.0	10.1	10.1 White, fine gr. ss., x bedded, uniform
205	215	10.0	10.0	0.4 White, fine gr. ss. 2.8 Gray siltst. 6.8 White, fine gr. ss., uniform
215	225	10.0	9.6	0.9 Dark gr. to black siltst. highly carb. 3.9 Gray to light gr. siltst. 4.8 White, fine gr. ss., uniform
225	235	10.0	10.1	10.1 White, fine gr. ss., x bedded, uniform
235	245	10.0	10.3	7.4 White, fine gr. ss., x bedded, uniform 2.9 Gray to light gr. siltst.
245	255	10.0	10.0	1.8 Gray siltst. to very fine gr. ss. 1.6 White, fine gr. ss. 6.6 Gray to light gr. siltst. to very fine gr. ss.
255	265	10.0	10.1	7.6 Gray to light gr. siltst. to very fine gr. ss 2.5 White, fine gr. ss.
265	275	10.0	9.9	4.2 White, fine gr. ss., uniform 5.7 Gray to gr. and white mottled, very fine gr. ss. to siltst.
275	285	10.0	10.0	6.9 Gray siltst. to very fine gr. ss 1.6 White, fine gr. ss. 1.5 Gray to dark gr., very fine gr. ss.
285 CHECKED	295	10.0	10.8	1.5 Gray to dark gr., very fine gr. ss. 0.4 Dark gr. siltst., carb. 4.7 Gray siltst. 4.2 Light gr. to white, fine to very fine gr. ss
295 CHECKED	305	10.0	9.1	8.0 White, fine gr. ss., x bedded 1.1 Gray siltst.
305	315	10.0	9.9	1.7 Gray to light gr. siltst. 8.2 Gray and white mottled, fine gr. ss.
315	325	10.0	9.9	4.2 Gray and white mottled, fine gr. ss. 3.6 Gray to dark gr. siltst., carb. 2.1 White, fine gr. ss., uniform

From	To	Feet	Rec'y	Remarks
325	335	10.0	10.0	1.2 White, fine gr. ss., uniform 1.1 Gray siltst. 4.3 White, fine gr. ss., uniform 2.6 Gray to light gr. very fine gr. ss. to siltst. 0.8 White, fine gr. ss.
335	345	10.0	9.6	4.0 White, fine gr. ss. 4.7 Gray to light gr. siltst. to very fine gr. ss. 0.9 White to light gr. fine gr. ss.
345	355	10.0	10.1	7.1 Light gr. to white fine to very fine gr. ss. 2.7 Gray siltst. 0.3 White, fine gr. ss.
355	365	10.0	11.0	4.3 White, fine gr. ss., uniform 2.6 Gray siltst. to very fine gr. ss. 4.1 Gray and white mottled, fine gr. ss.
365	375	10.0	10.1	10.1 White to gr. and white mottled, fine gr. ss.
375	385	10.0	9.9	2.9 Gray and white mottled, fine gr. ss. 7.0 Gray to light gr. siltst. to very fine gr. ss.
385	395	10.0	10.0	6.6 Gray siltst. to very fine gr. ss. 1.5 Gray to dark gr. siltst., carb. 1.5 Gray to light gr. fine to very fine gr. ss. 0.4 Gray siltst.
395	405	10.0	10.1	2.4 Gray siltst. 7.7 Gray to light gr. very fine gr. ss. to siltst.
405	415	10.0	9.9	1.5 Gray very fine gr. ss. 8.4 Gray and white mottled, fine to med. gr. ss.
415	425	10.0	10.0	0.9 White, fine to med. gr. ss. 3.5 Gray to light gr. very fine gr. ss. 5.6 White, fine to med. gr. ss., x bedded, uniform
425	435	10.0	10.0	3.0 White, fine to med. gr. ss., x bedded, uniform 0.6 Dark gr. to black siltst., highly carb., bony 4.2 Light gr. to white, fine gr. ss. 2.2 Gray siltst. to very fine gr. ss.
435	445	10.0	10.0	0.7 Light gr. to gr. siltst. to very fine gr. ss. 9.3 White, fine gr. ss., uniform, x bedded

From	To	Feet	Rec'y	Remarks
445	455	10.0	9.9	4.5 White, fine gr. ss., uniform 3.5 Gray to dark gr. siltst. 1.9 Light gr. to white, fine to very fine gr. ss.
455	465	10.0	10.1	2.7 White, fine gr. ss., uniform 4.0 Light gr. fine to very fine gr. ss. 3.4 White fine gr. ss., uniform
465	475	10.0	10.0	2.4 White, fine gr. ss. 3.5 Light gr. to gr. siltst. to very fine gr. ss. 1.3 Gray to dark gr. siltst., carb. 1.1 White, fine gr. ss. 0.5 Coal - low quality 1.2 Light gr. siltst.
475	485	10.0	9.9	0.8 Light gr. siltst. 4.0 White to light gr., fine gr. ss. 3.2 Gray to light gr. siltst. 1.9 White to gr. and wh. mottled, fine gr. ss.
485	495	10.0	10.2	3.9 White to gr. & white mottled & banded, fine gr. ss. 1.1 Gray to dark gr. siltst., carb. 3.7 White, fine gr. ss., uniform 1.5 Gray siltst.
495	505	10.0	10.0	3.6 Gray to dark gr. siltst., carb. 1.0 Coal - 3.0 Gray to dark gr. siltst., carb. 0.4 Coal 2.0 White, fine gr. ss.
505	515	10.0	9.8	1.8 Light gr. to gr. stiltst. 7.0 White, fine gr. ss., uniform 1.0 Gray siltst.
515	525	10.0	10.0	9.4 Light gr. to gr. siltst. 0.6 White, gine gr. ss.
525	535	10.0	10.2	10.2 White to gr. & white mottled, fine gr. ss., carb. parts
535	545	10.0	10.0	7.7 White, fine gr. ss., some gr. siltst. zones 0.6 Coal 0.4 Dirty coal, bony 1.3 Light gr. & to white, fine to very fine gr. ss.

From	To	Feet	Rec'y	Remarks
545	555	10.0	10.0	7.3 Gray to light gr. siltst. 2.7 White, fine gr. ss., uniform
555	565	10.0	10.0	10.0 White, fine to med. gr. ss., x bedded, uniform
565	575	10.0	10.0	5.6 White, fine to med. gr. ss., x bedded, uniform 0.6 Gray to dark gr. siltst. 0.4 Coal to dirty coal 3.4 Gray to light gr. to white, siltst. to very fine gr. ss.
576	585	10.0	9.8	1.4 Gray to dark gr. siltst., carb. 1.0 Dark gr. to black siltst., highly carb. 2.2 Light gr. to gr. siltst. 5.2 Light gr. to white, fine gr. ss.
585	595	10.0	10.0	6.4 White to gr. and wh. mottled, fine gr. ss. 0.4 Dark gr. siltst. 3.2 Gary & white mottled, fine gr. ss.
595	605	10.0	10.1	1.0 Gray siltst. 0.4 Dirty coal, bony 1.2 Coal 2.5 Dark gr. to black siltst., highly carb. 3.4 Gray to dark gr. siltst., carb. 1.6 White, fine gr. ss.
605	615	10.0	10.1	0.2 White, fine gr. ss. 2.1 Gray siltst. 4.3 White, fine gr. ss., some carb. parts 0.2 Dirty coal, bony 0.5 Coal 0.5 Coal 0.2 Dirty coal, bony 2.6 Gray to light gr. siltst.
615	625	10.0	9.8	4.7 Gray siltst. 5.1 Gray to light gr. siltst. to very fine gr. ss.
625	635	10.0	9.0	4.5 Gray to light gr. siltst. to very fine gr. ss. 1.6 Gray siltst. 0.0 Dark gr. to black siltst., highly carb. 1.4 Light gr. siltst. 1.5 White, fine gr. ss.

From	To	Feet	Rec'y	Remarks
635	645	10.0	9.8	2.8 Gray siltst. 1.3 Coal to dirty coal 4.3 Gray to light gr. siltst. 1.4 Gray, fine gr. ss.
645	655	10.0	10.0	0.5 Gray, fine gr. ss. 5.5 Gray to dark gr. siltst. 4.0 White, fine gr. ss.
655	665	10.0	10.0	3.3 Gray siltst. 1.0 White, fine gr. ss. 5.7 Gray to dark gr. siltst.
665	675	10.0	10.0	4.7 Gray siltst. 0.5 Dirty coal, bony 2.8 Coal 0.8 Gray to dark gr. siltst. 1.2 White, fine gr. ss.
675	685	10.0	9.8	0.4 White, fine gr. ss. 1.8 Gray to light gr. siltst. to very fine gr. ss. 5.4 White to light gr. fine gr. ss. 2.2 Gray siltst.
685	695	10.0	9.9	6.9 Light gr. to white, fine to vey fine gr. ss. 2.1 Light gr. siltst. to very fine gr. ss. 0.1 Dirty coal, bony 0.3 Coal 1.5 Light gr. to gr. siltst.
695	705	10.0	9.9	8.5 Gray to light gr. siltst. 1.1 Coal 0.3 White, fine gr. ss.
705	715	10.0	10.1	4.0 White to gr. & white mottled, fine gr. ss. 1.1 Gray siltst. 1.9 Light gr. to white, fine to very fine gr. ss. 3.1 Gray siltst.
715	725	10.0	9.9	0.4 Gray to dark gr. siltst., carb. 4.2 Coal —715.4 — 719.6 0.1 Dirty coal, bony 5.2 White gr. mottled fine to very fine gr. ss.
725	735	10.0	10.0	6.7 Gray to gr. & white siltst. to very fine gr. ss.

From	To	Feet	Rec'y	Remarks
				3.3 White to gr. & white mottled, fine gr. ss.
735	745	10.0	9.7	3.8 White, fine to med. gr. ss., uniform 0.2 Dirty coal, bony 5.7 Coal —739.0
745	755	10.0		4.1 Coal 9.8 D Seam —748.8 0.2 Dirty coal, bony 4.8 Light gr. to white, fine to very fine gr. ss 0.7 Gray siltst. 0.2 Gray and white mottled, fine gr. ss.
755	765	10.0	9.9	1.4 Gray and white mottled, fine gr. ss. 0.5 Dirty coal, bony 1.5 Coal 3.3 Gray, fine gr. ss., carb. 1.8 Coal 1.4 Light gr. to white, siltst. to very fine gr. ss.
765	775	10.0	9.6	1.7 Light gr. to white, siltst. to very fine gr. ss. 2.5 Gray siltst. 1.3 White, fine to very fine gr. ss. 1.9 Gray siltst. 2.2 Gray to white mottled, fine gr. ss.
775	785	10.0	10.0	1.7 Gray siltst., carb. 0.4 Dirty coal, bony 1.9 Gray siltst. 0.6 Coal 0.6 Gray siltst. 3.4 White, fine gr. ss. 1.4 Gray siltst. to very fine gr. ss.
785	795	10.0	9.6	3.7 Gray to gr. and white mottled siltst. to very fine gr. 5.9 White, fine to med. gr. ss., uniform
795	805	10.0	10.0	10.0 White, fine to med. gr. ss., uniform, x bedded
805	815	10.0	10.2	8.8 White, fine to med. gr.&ss., x bedded 0.2 Coal 1.2 Gray to dark gr. siltst.
815	825	10.0	9.8	0.3 Gray to dark gr. siltst. 1.9 Coal

From	To	Feet	Rec'y	Remarks
				0.1 Dirty coal, bony 2.4 Light gray to white, fine to very fine gr. ss. 2.7 Dark to black siltst., highly carb. 0.9 Coal 0.1 Dirty coal, bony 0.9 Light gr. to white, fine to very fine gr. ss. 0.4 Gray siltst. 0.1 Coal
825	835	10.0	10.0	2.3 Coal 0.9 Gray siltst., carb. 6.8 White, fine gr. ss., uniform
835	845	10.0	10.1	2.9 White, fine gr. ss., uniform 1.8 Light gr. to white, fine gr. ss. 0.9 Gray siltst. 0.6 Coal, dirty 1.2 Light gr. to white, fine gr. ss. 1.1 Gray siltst. 1.4 White to light gr., fine gr. ss.
845	855	10.0	10.1	1.4 White, fine gr. ss. 4.1 Gray siltst. 1.1 White, fine to very fine gr. ss. 3.5 Gray siltst.
865	875	10.0	10.2	1.1 Gray siltst. 3.3 White, fine gr. ss. 0.6 Dirty coal 2.1 Gray to dark gr. siltst., coal 0.3 Coal 2.8 Gray to light gr. siltst. to very fine gr. ss.
875	885	10.0	10.0	7.1 Gray to light gr. siltst. 2.5 Light gr. to white, very fine gr. ss. 0.4 Gray siltst.
885	895	10.0	10.0	3.4 Gray to light gr. siltst. 4.7 Gray & white mottled, fine to very fine gr. ss. 1.9 Gray siltst.
895	905	10.0	9.9	3.8 Gray siltst. 3.3 White & gray mottled, fine gr. ss. 0.3 Dark gr. to black siltst., highly carb. 2.5 Coal —902.1

cc6.chapter6/2

From	To	Feet	Rec'y	Remarks
905	915	10.0	10.1	0.4 Coal 0.1 Dirty coal, bony 1.4 Gray siltst. 4.8 White to gr. & white mottled, fine gr. ss. 3.4 Gray siltst.
915	925	10.0	10.0	0.1 Gray siltst. 0.3 Dirty coal, bony 9.6 Coal - clean - shiny —915.4
925	935	10.0	10.1	0.4 Coal —925.4 0.4 Gray to dark gr. siltst., carb. 1.8 White, & gr. mottled, fine gr. ss. 0.3 Dirty coal, bony 1.8 Coal 3.9 Gray siltst. 1.5 White & gr. mottled, fine gr. ss.
935	945	10.0	9.9	6.4 White, fine gr. ss., x bedded, carb. partings 3.5 White to gr. & white mottled, fine gr. ss.
945	955	10.0	10.1	0.4 White to gr. & white mottled, fine gr. ss. 0.2 Dark gr. to black siltst., carb. 8.8 Coal - Clean —945.6 —954.4 0.7 Gray to light gr. siltst.
955	965	10.0	9.9	4.4 Gray to dark gr. siltst., carb. 3.8 White, fine gr. ss., uniform 1.7 Gray siltst.
965	975	10.0	10.1	1.6 Gray siltst. to very fine gr. ss. 8.5 White, fine to med. gr. ss., x bedded, uniform, abundant dark minerals - Aberdeen ss.
975	985	20.0	20.1	1.5 White, fine gr. ss. 0.7 Dark gr. to black, fine gr. ss., carb. 17.9 White, fine to med. gr. ss., uniform, x bedded
995	1015	20.0	19.9	19.9 White, fine gr. ss. with gr. siltst. interbedding, some gr. & white mottling
1015	1035	20.0	10.0	20.0 White, fine gr. ss., uniform, some x bedding

From	To	Feet	Rec'y	Remarks
1035	1045	10.0	10.0	3.9 White, fine gr. ss., uniform 5.2 Gray & white mottled, fine to very fine gr. ss. 0.9 White, fine gr. ss.
1045	1075	30.0	29.9	2.5 Gray to light gr. siltst. 0.5 Gray to dark gr. fine gr. ss. 20.3 White, fien to med. gr. ss., uniform 3.0 White & gr. banded fine gr. ss. to siltst. interbedded 3.6 White, fine gr. ss.
1075	1085	10.0	10.7	2.6 White, fine gr. ss. 8.1 White & gray mottled, fine to very fine gr. ss.
1085	1095	10.0	9.2	5.2 White to gr. & white mottld, fine gr. ss. 4.0 White, fine to very fine gr. ss.
1095	1105	10.0	10.0	8.0 White, fine gr. ss., uniform 0.9 White & gray mottled, fine gr. ss. 1.1 White, fine gr. ss.
1105	1115	10.0	9.9	2.7 White, fine to very fine gr. ss. 4.1 Coal - clean - sub 1 —1107.7 1.5 Gray to light gr. siltst. 1.6 Gray white mottled, fine gr. ss.
1115	1125	10.0	10.0	0.5 White to gr. & white, mottled, fine gr. ss. 1.7 Gray siltst. 2.8 White to gr. & white mottled, fine gr. ss. 3.9 Coal - clean —1120.0 0.2 Dirty coal, bony 0.9 White, fine gr. ss.
1125	1135	10.0	9.9	0.6 White, fine gr. ss. 1.8 Gray & white banded, fine gr. ss., to siltst. interbedded 7.5 White, fine gr. ss., uniform
1135	1145	10.0	10.1	1.5 White to gr. & white mottled, fine gr. ss. 3.0 Gray siltst. fossil frag. 0.7 Gray fine gr. ss., carb. 1.2 Dirty coal, bony highly carb. siltst. 3.7 Light gr. to white, very fine gr. ss. to siltst.
1145	1155	10.0	10.1	3.7 Light gr. to white, very fine gr. ss. to siltst.

From	To	Feet	Rec'y	Remarks
				2.7 Gray to light gr. siltst.
				0.9 White & gray banded, fine gr. ss.
				2.8 Gray siltst.
1155	1165	10.0	10.1	0.3 Dark gr. siltst., highly carb., bony coal
				3.6 Coal —1155.3
				0.1 Dirty coal, bony
				6.9 Coal Sub 3
				3.2 Coal —1162.2
				2.9 White, fine to med. gr. ss., abundant dark minerals Star Point SS.
1165	1175	10.0	10.0	10.0 White, fine to med. gr. ss., x bedded

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cc6.chapter6/2

DRILL HOLE LOG
McCULLOCH DRILL HOLE #69

LOCATION: SW1/4 NE1/4, 35, T. 12 S., R. S E. Carbon County, Utah
Ciochetto Canyon

LATITUDE:	
DEPARTURE:	
COLLAR ELEVATION:	
TOTAL DEPTH:	1225.0'
INCLINATION:	90
DATE STARTED:	02/03/76
DATE COMPLETED:	02/13/76

cc6.chapter6/2

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
	ROTARY	0	0	4.5
	Start HQ			
Sandstone	Pale yellowish orange (10 YR 8/6) fine to medium grain, poorly consolidated	31.5	4.5	78.2
Siltstone	Medium dark gray (N4) carbonaceous End HQ to NQ	1.2	78.2	80.0
Siltstone	Medium dark gray (N4) carbonaceous	0.9	80.0	80.9
Sandstone	Very light gray (N8) to light gray (N7) with some medium gray mottling fine to medium grain silty, some medium gray (N5) siltstone laminated in places	59.0	80.9	139.6
Siltstone	Very light gray (N8) to medium gray (N5); light gray (N7) and medium dark gray (N4) mottled fine grain sandstone laminated throughout; light gray (N7) and medium gray (N5) mottled medium grain sandstone from 184.3 to 188.4 and from 202.0 to 204.7	71.6	139.6	211.7
Bone	Bony shale with dirty coal laminated throughout	1.0	211.7	212.6
Siltstone	Medium dark gray (N4) shalely in places; light gray (N7) and dark gray (N3) banded fine grain sandstone from 218.5 to 220.5	10.4	212.6	223.1
Sandstone	Very light gray (N8) and grayish black (N2) mottled fine grain carbonaceous partings; medium light grain (N6) siltstone; laminated in places	47.3	223.1	270.0
Siltstone	Dark gray (N3) with some light gray (N7) mottling	7.8	270.0	277.8

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
Sandstone	Very light gray (N8) and grayish black (N2) banded with some medium dark gray (N4) mottling fine gray; medium gray (N5) siltstone laminated in places	46.8	277.0	324.6
Siltstone	Brownish gray (5 YR 4/1) with some light gray (N7) and medium dark gray (N4) zones, carbonaceous in places; very light gray (N8) and medium dark gray (N4) fine to very fine grain sandstone, laminated in places	33.4	324.6	358.0
Sandstone	Very light gray (N8) and medium gray (N5) banded fine grain sandstone, silty in places; medium dark gray (N4) to olive black (5 YR 2/1) laminated throughout; broken end	34.0	358.0	393.0
Siltstone	Dark gray (N3), medium dark gray (N4), and light gray (N7) zoned; sandy in placed	19.4	393.0	411.9
Sandstone	Light gray (N7) and medium dark gray (N4) mottled very fine to fine grain sandstone; carbonaceous in places, medium dark gray (N4) siltstone laminated throughout from 437.8 to 446.3	11.4	411.9	
Siltstone	Medium gray (N5) with some very light gray (N8) fine grain sandstone mottling	10.1	510.2	520.4
Coal	Dirty, resinous	1.1	520.4	521.5
Siltstone	Medium light gray (N6) with some very light gray (N8) fine grain sandstone mottling	4.9	521.5	526.4
Coal	Dirty, slightly resinous	1.4	526.9	528.3
Sandstone	Medium light gray (N6) fine grain	1.2	528.3	529.7

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
Siltstone	Medium gray (N5) to light gray (N7), some very light gray (N8) fine grain sandstone mottling in places; shaley from 542.8 to 546.4 and from 553.7 to 559.3	49.5	529.7	578.8
Sandstone	Light gray (N7) and grayish black (N2) mottled fine to very fine gray; silty partings; light gray (N7) siltstone laminated throughout	35.4	578.8	614.3
Siltstone	Light gray (N7) to brownish gray (5 YR 4/1), carbonaceous at end	7.7	614.3	621.9
Sandstone	Light gray (N7) and very light gray (N8) mottled very fine grain	13.4	621.9	635.1
Siltstone	Medium gray (N5) to brownish gray (5 YR 4/1)	4.8	635.1	639.9
Coal	Dirty, nonresinous	1.0	639.9	640.9
Siltstone	Brownish gray (5 YR 4/1) to medium gray (N5), shaley in places; some very light gray (N8) very fine grain sandstone mottling in places	34.0	640.9	573.5
Coal	0.6 Coal, resinous; 0.2 bony shale	0.8	673.5	674.3
Shale	Medium gray (N5) to medium dark gray (N4)	5.5	674.3	679.9
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled very fine to medium grain	7.0	679.9	686.6
Coal	0.7 Dirty coal, resinous; 0.9 bony shale	1.6	686.6	688.2
Siltstone	Brownish gray (5 YR 4/1)	1.6	688.2	689.8
Sandstone	Light gray (N7) and dark gray (N3) banded medium to course grain, silty, dirty coal from 700.4 to 700.6	25.9	689.8	715.9

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
Siltstone	Medium gray (N5), shalely at start	4.6	715.9	720.5
Coal	Dirty, slightly resinous	0.5	720.5	721.0
Sandstone	Very light gray (N8) fine grain	5.5	721.0	725.6
Siltstone	Medium gray (N5) to medium dark gray (N4), shalely in places; dirty coal from 737.0 to 737.8	18.9	725.6	744.4
Sandstone	Very light gray (N8) and medium gray (N5) to medium dark gray (N4) mottled very fine to fine grain; carbonaceous partings	13.0	744.4	757.3
Siltstone	Light gray (N7) to medium dark gray (N4); very light gray (N8) and medium gray (N5) mottled dark grain fine grain sandstone laminated throughout dirty coal, nonresinous; from 773.2 to 773.4	58.4	757.3	814.6
Coal	Slightly dirty, resinous	0.8	814.6	815.5
Siltstone	Brownish gray (5 YR 4/1) with some very light gray (N8) very fine grain sandstone mottling, shalely at end	4.2	815.5	819.7
Sandstone	Very light gray (N8) with some medium gray (N5) mottling very fine to fine grain	12.0	819.7	831.8
Shale	Medium gray (N5), broken	6.7		838.5
Coal	0.1 Bony shale; 0.41 coal, resinous; 0.45 dirty coal, resinous; 0.79 coal, resinous; 0.1 bony shale	1.8	838.5	840.2
Sandstone	Very light gray (N8) with some medium dark gray (N4) mottling fine grain	7.6	840.2	847.7

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
Coal	0.15 Bony shale; 0.3 dirty coal, resinous; 0.2 bony shale	0.6	847.7	848.3
Siltstone	Medium gray (N5) to medium dark gray (N4) sandy towards end; grades in and out of very light gray (N8) very fine grain sandstone from 850.8 to 853.1	9.6	848.3	857.8
Shale	Medium gray (N5) to dark gray (N3), carbonaceous	4.2	857.8	862.3
Coal	Coal, resinous	0.8	862.3	863.1
Shale	Medium dark gray (N4), carbonaceous	0.6	863.1	863.7
Sandstone	Light gray (N7) with some medium grain (N5) mottling, very fine grain, carbonaceous	21.5	863.7	885.4
Shale	Medium dark gray (N4) to dark gray (N3), bony in places	12.6	885.4	897.6
Sandstone	Very light gray (N8) with some medium gray (N5) mottling very fine to fine grain; some light gray (N7) siltstone sections	15.5	897.6	913.0
Shale	Dark gray (N3), carbonaceous	2.2	9.0	915.2
Coal	0.1 Dirty coal, resinous; 0.5 coal, resinous; 0.1 bony shale; 0.2 very dirty coal, nonresinous	0.9	615.2	616.1
Siltstone	Medium dark gray (N4), carbonaceous	1.0	616.1	617.1
Sandstone	Very light gray (N8) with some medium gray (N5) mottling fine grain, silty in places	4.8	617.1	922.5
Siltstone	Medium dark gray (N4) to medium gray (N5), shalely at start	5.3	922.5	927.8

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Sandstone	Very light gray (N8) and medium gray (N5) mottled fine grain	2.4	927.8	930.2
Siltstone	Medium dark gray (N4)	2.6	930.2	932.6
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled fine grain	2.8	932.6	935.4
Siltstone	Brownish black (5 YR 2/1), carbonaceous	2.2	935.4	937.6
Coal	4.10 Slightly dirty coal, resinous, middle 2.6′ crushed 0.13 Dirty coal, silty, nonresinous 0.85 Slightly dirty coal, resinous 0.23 Bony shale	5.3	937.6	943.0
Sandstone	Very light gray (N8) fine grain	1.4	943.0	944.3
Siltstone	Medium dark gray (N4) with some very light gray (N8) fine grain sandstone mottling	7.9	944.3	952.2
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled very fine gray; medium dark gray (N4) siltstone laminated throughout	15.6	952.2	967.8
Siltstone	Medium light gray (N6) to medium gray (N5) and medium dark gray (N4) mottled	9.1	967.8	976.2
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled fine to very fine grain	1.6	9 .2	977.8
Coal	0.94 Bony shale, resinous 2.37 Dirty coal, slightly resinous to resinous; siltstone stringers at end 0.81 Slightly dirty coal, highly resinous 0.41 Dirty coal , silty, slightly resinous 1.01 Coal, resinous 0.59 Slightly dirty coal, highly resinous	10.5	977.8	988.1

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
	0.10 Very dirty coal, silty 1.12 Dirty coal, silty, resinous 0.09 Medium dark gray (N4) siltstone, highly carbonaceous 10.49 Coal 1.13 Bony shale 0.77 Slightly dirty coal, resinous 0.14 Bony siltstone			
Siltstone	Medium gray (N5) to dark gray (N3) sandy carbonaceous	2.9	988.1	991.0
Sandstone	Very light gray (N8) and dark gray (N3) banded medium grain, silty ABERDEEN	53.1	991.0	1045.0
Siltstone	Dark gray (N3) and light gray (N7) mottled; very light gray (N8) with some dark gray (N3) mottled very fine to fine grain sandstone laminated to thick bedded sections throughout	30.3	1045.0	1074.8
Shale	Medium dark gray (N4) to olive black (5 Y 2/1), carbonaceous	2.6	1074.8	1077.4
Coal	0.42 Dirty coal, resinous; 0.43 bony shale; 0.52 slightly dirty coal, resinous; 0.46 bony siltstone	1.9	10 .4	1079.4
Siltstone	Medium gray (N5) to very light gray (N8), shalely at start; very light gray (N8) fine grain sandstone laminated throughout	11.1	1079.4	1090.5
Sandstone	Very light gray (N8) with some dark gray (N3) mottling fine to medium gray; medium light gray (N6) to dark gray (N3) siltstone laminated to thick bedded sections near end; bony shale from 1120.6 to 1121.0 and from 1120.6 to 1129.8	31.9	1090.5	1130.9
Coal	1.22 Dirty coal, slightly resinous 0.65 Slightly dirty coal, slightly resinous 0.14 Dirty coal, silty nonresinous 2.39 0.38 Bony shale	3.4	1130.9	1132.9

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	To
Sandstone	Very light gray (N8) and dark gray (N3) mottled fine gray	0.5	1132.9	1133.4
Siltstone	Medium grain (N5) to dark gray (N3) carbonaceous, shalely at end	0.6	1133.4	1134.0
Coal	1.96 Bony shale to dirty coal, nonresinous to resinous 0.87 Slightly dirty coal, slightly resinous 0.03 Medium dark gray (N4) siltstone, carbonaceous 0.80 Slightly dirty coal, nonresinous 0.07 Dirty coal, pyritic 5.58 0.74 Slightly dirty coal, pyritic, nonresinous 0.16 Bony shale 0.58 Slightly dirty coal, pyritic, nonresinous 0.37 Dirty coal, silty, slightly resinous	5.6	1134.0	
Sandstone	Olive black (5Y 2/1) to very light gray (N8) and dark gray (N3) mottled fine grain; medium gray (N5) siltstone, shale from 1145.0 to 1145.4 and from 1150.3 to 1154.5	25.2	1139.6	1165.0
Coal	Dirty, resinous	0.6	1165.0	1165.6
Shale	Medium dark gray (N4)	0.8	1165.6	1166.4
Siltstone	Light gray (N7) to medium dark gray (N4)	5.4	1166.4	1171.8
Coal	0.3 Bony shale; 1.4 dirty coal, resinous' 0.3 bony siltstone	2.0	1171.8	1173.8
Siltstone	Medium dark gray (N4) to light gray (N7), bony last 1.3'	164.	1173.8	1190.2
Coal	1.2 Slightly dirty coal, resinous 0.5 Dirty coal, silty, pyritic 0.4 Slightly dirty coal, resinous	2.1	1190.2	1194.2
Siltstone	Bony	1.6	1192.4	1194.0

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Coal	0.5 Dirty coal, resinous 0.1 Bony siltstone	0.6	1194.0	1194.6
Siltstone	Medium gray (N5) to medium dark gray (N4) and very light gray (N8) mottled; bony shale from 1198.7 to 1199.6	11.7	1194.6	1205.8
Shale	Bony	1.1	1205.8	1206.9
Sandstone	Very light gray (N8) and dark gray (N3) mottled to banded fine grain	18.5	1206.9	1225.0

BOTTOM OF HOLE
T.D. - 1225.0'
STEMMED WITH 17 BAGS CEMENT
02/13/76 6:00 PM

DRILL HOLE LOG #72
McCULLOCH DRILL HOLE #72

LOCATION: SE1/4 NW1/4, Sec. 36, T. 12 S., R. 9 E., Carbon County, Utah Barn Canyon

LATITUDE:	513,974.05
DEPARTURE:	2,179,256.77
COLLAR ELEVATION:	6,347.9
TOTAL DEPTH:	615.0
INCLINATION:	90

DATE STARTED:	February 2, 1976
DATE COMPLETED:	February 5, 1976

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	ROTARY	0	0	1
	START HQ			
Sandstone	Very pale orange (10 YR 8/2) fine gray, silty, poorly consolidated		11	15
Siltstone	Medium light gray (N6) to light olive gray (5 Y 6/1), poorly consolidated, 11' lost 15-27 from 1 to 1	12.1	15	38.6
Sandstone	Light gray (N7) and dark gray (N3) mottled fine gray, some iron stain, carbonaceous partings END HQ TO NQ	11.3	38.6	50.0
Sandstone	Light gray (N7) with some medium dark gray (N4) mottling fine gray, broken in places; bony shale from 64.4 to 65.6		50.0	67.0
Shale	Carbonaceous to bony	2.7	67.0	69.7
Sandstone	Medium light gray (NC) to medium dark gray (N4) fine gray, carbonaceous	11.8	69.7	81.1
Coal	0.3 Bony shale; 2.0 coal; nonresinous, crushed	2.3	81.1	83.4
Sandstone	Light gray (N7) very fine gray; black shale from 93.4 to 93.9	12.3	83.4	95.7
Bone	Bony shale	3.8	95.7	99.55
Siltstone	Medium light gray (N6) to medium dark gray (N4)	5.1	99.5	104.7

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	ROTARY	0	0	1
	START HQ			
Sandstone	Very pale orange (10 YR 8/2) fine gray, silty, poorly consolidated		11	15
Siltstone	Medium light gray (N6) to light olive gray (5 Y 6/1), poorly consolidated, 11' lost 15-27 from 1 to 1	12.1	15	38.6
Sandstone	Light gray (N7) and dark gray (N3) mottled fine gray, some iron stain, carbonaceous partings END HQ TO NQ	11.3	38.6	50.0
Sandstone	Light gray (N7) with some medium dark gray (N4) mottling fine gray, broken in places; bony shale from 64.4 to 65.6		50.0	67.0
Shale	Carbonaceous to bony	2.7	67.0	69.7
Sandstone	Medium light gray (NC) to medium dark gray (N4) fine gray, carbonaceous	11.8	69.7	81.1
Coal	0.3 Bony shale; 2.0 coal; nonresinous, crushed	2.3	81.1	83.4
Sandstone	Light gray (N7) very fine gray; black shale from 93.4 to 93.9	12.3	83.4	95.7
Bone	Bony shale	3.8	95.7	99.55
Siltstone	Medium light gray (N6) to medium dark gray (N4)	5.1	99.5	104.7
Coal	0.15 Bony shale, resinous; 0.75 coal, resinous	10.90	104.7	105.5

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Shale	Bony	2.9	105.5	108.4
Sandstone	Light gray (N7) and medium dark gray (N4) mottled fine gray silty	5.0	108.4	113.0
Siltstone	Dark gray (N3), fossiliferous	1.5	113.0	114.5
Sandstone	Light gray (N7) and white (N9) to light gray (N7) and medium gray (N5) mottled fine gray, fossiliferous @ start	2.3	114.5	116.7
Siltstone	Olive black (5 Y 2/1) with some light gray (N7) mottling, carbonaceous, sandy in places	6.5	116.7	128.0
Sandstone	Brownish black (5 Y 2/1), light gray (N7) and dark gray (N3) mottled very fine to fine gray, silty, carbonaceous partings, fossiliferous in places	22.5	123.0	145.1
Siltstone	Brownish black (5 Y 2/1) and light gray (N7) mottled, bony in places, carbonaceous partings; dirty coal, nonresinous from 161.0 to 161.3	20.2	145.1	165.4
Coal	Dirty, nonresinous	0.8	165.4	166.2
Siltstone	Olive black (5 Y 2/1) and light gray (N7) to dark gray (N3) and light gray (N7) mottled, bony at start, dirty coal, resinous from 174.4 to 175.2	36.1	166.2	201.9
Sandstone	Light gray (N7) and medium gray (N5) mottled very fine to fine gray; medium gray siltstone from 208.9 to 214.5	16.1	201.9	218.8
Coal	0.2 Bony shale, resinous; 0.8 coal, resinous; 0.2 bony shale	1.2	218.8	220.0
Siltstone	Brownish gray (5 YR 4/1) to very light gray (N8) and grayish black (N2) mottled grades to fine gray sandstone			

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	at end	3.9	220.0	224.2
Coal	0.3 Bony shale; 0.55 slightly dirty coal, resinous; 0.6 bony shale to shale black (N1)	1.4	224.2	225.6
Sandstone	Light gray (N7) and medium light gray (N6) mottled very fine to fine gray	2.3	225.6	227.9
Bone	Bony shale with some dirty coal in places	2.1	227.5	280
Siltstone	Medium dark gray (N4) to olive black (5 Y 2/1), shalely towardsend; some light gray (N7) fine gray sandstone in places; bony shale from 234.0 to 234.6	23.0	230	252
Coal	0.2 Bony shale; 0.7 dirty coal; 1.0 bony shale	1.9	252	254.0
Siltstone	Medium dark gray (N6) to light gray (N7) and medium gray (N5) mottled; shale first 1.0'	4.2	254.0	257.9
Coal	0.23 Bony shale; 0.75 coal, nonresinous, 1.0 slightly dirty coal, nonresinous, 0.93 coal, resinous; 0.25 bony shale	3.2	257.9	261.1
Shale	Grayish black (N2) carbonaceous	2.8	261.1	264.1
Coal	0.4 Bony shale, 0.5 dirty coal, resinous, 0.33 bony shale; 1.3 slightly dirty coal, resinous	2.5	264.1	266.6
Siltstone	Slightly bony	1.2	266.6	267.8
Siltstone	Light gray (N7) and dark gray (N3) mottled to medium dark gray (N4); very fine gray sandstone at start; bony shale from 269.9 to 270.3	22.4	267.8	289.5

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Coal	0.40 Dirty coal, resinous; 0.62 coal resinous; 0.13 dirty coal, nonresinous; 0.12 bony shale	1.3	289.5	290.8
Shale	Olive black (5 Y 2/1) carbonaceous, bony at end	1.2	290.8	292.4
Coal	0.8 Dirty coal, resinous; 0.3 bony shale	1.1	292.4	293.5
Siltstone	Medium light gray (N6); grades in and out of light gray (N7) and medium dark gray (N4) mottled very fine gray sandstone from 296.0 to 299.6 and from 304.1 to 307.0	14.8	293.5	308.1
Coal	0.69 Bony shale, 0.15 dirty coal, slightly resinous; bony shale	1.2	308.1	309.3
Siltstone	Dark gray (N3) to medium light gray (N6)	5.6	309.3	315.0
Sandstone	Light gray (N7) and dark gray mottled (N3) fine gray, silty in places	20.9	315.0	335.6
Siltstone	Medium gray (N5) to brownish black (5 YR 2/1), carbonaceous at end	4.3	335.6	339.9
Coal	0.47 Slightly dirty coal, resinous; 0.44 bony shale, sandy in places, 0.74 coal, resinous; 0.25 bony shale; 0.61 dirty coal, slightly resinous	2.5	339.9	342.4
Siltstone	Medium gray (N5)	10.0	342.4	352.6
Coal	0.86 Slightly dirty coal, resinous; 0.13 bony siltstone	1.0	352.6	353.6
Siltstone	Light gray (N7) grading to very light gray (N8) very fine gray sandstone at end	3.8	353.6	357.7
Shale	Medium dark gray; very light gray (N8) and dark gray (N3) mottled fine gray sandstone last 2.1', carbonaceous at end	10.8	357.7	368.6

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Coal	1.08 Coal, slightly resinous 0.21 Dirty coal, nonresinous 1.52 Coal, resinous 0.17 Dirty coal, silty, nonresinous 4.95 Coal (E Seam) 0.51 Coal, resinous 0.67 Dirty coal, resinous 0.79 Coal, resinous	4.9	368.6	373.6
Siltstone	Medium dark gray (N4), carbonaceous in places with very Gray (N8) and medium gray (N5) mottled fine gray sandstone laminated in places	32.5	373.5	406.2
Sandstone	Very light gray (N8) and medium gray (N5) mottled fine gray, carbonaceous partings	6.6	406.2	412.7
Coal	0.14 Bony siltstone 0.32 Dirty coal, slightly resinous 0.74 Slightly dirty coal, resinous 1.10 Coal, nonresinous, crushed 0.69 Bony shale 1.38 Dirty coal, nonresinous, crushed 0.15 Bony shale 0.25 Slightly dirty coal, nonresinous 0.15 Dirty coal, silty 0.48 Coal, resinous 0.07 Dirty coal, silty 1.31 Slightly dirty coal, resinous, crushed at end 0.36 Dirty coal, nonresinous, crushed 0.78 Slightly dirty coal, nonresinous, crushed 0.43 Dirty coal, nonresinous, broken 0.77 Slightly dirty coal, nonresinous, crushed 0.95 Dirty coal, nonresinous, broken	10.1	412.7	425.0

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Siltstone	Dark gray (N3), carbonaceous	1.7	489.7	491.1
Sandstone	Very light gray (N8) with some medium dark gray (N4) mottling fine gray	1.9	491.1	493.0
Shale	Brownish black, carbonaceous	1.9	493.0	494.9
Coal	1.08 Dirty coal, resinous; 0.19 bony shale	1.3	494.9	496.1
Siltstone	Medium gray (N5) with some light gray (N7) fine gray sandstone mottling	3.8	496.1	499.9
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled fine gray, carbonaceous partings	3.8	499.9	503.5
Coal	Dirty, resinous	0.4	503.5	504.0
Shale	Dark gray (N3), bony in places, silty towards end	1.6	504.0	505.5
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled fine gray	4.0	505.5	509.5
Siltstone	Brownish black (5 YR 2/1) to medium dark gray (N4), carbonaceous	3.1	509.5	522.7
Sandstone	Very light gray (N8) and dark gray (N3) mottled fine gray, bony, very highly carbonaceous resinous last 0.9'	3.9	512.9	516.6
Coal	Dirty, resinous	1.1	516.6	5 7.7
Shale	Brownish black (5 YR 2/1), bony	2.7	517.7	520.4
Siltstone	Dark gray (N3) to medium gray (N5) bony in places; grades into light gray (N7) and dark gray (N3) mottled very fine gray sandstone at end; dirty coal, resinous from 526.9-527	15.8	520.4	536.1

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Shale	Brownish black (5 YR 2/1), carbonaceous to bony	0.9	536.1	537.0
Coal	0.15 Bony shale 3.92 Slightly dirty coal, silty in places, resinous 0.26 Dirty coal, siltstone stringers, resinous 0.52 Slightly dirty coal, resinous 0.23 Dirty coal, siltstone stringers, resinous 0.20 Slightly dirty coal, resinous 0.02 Dirty coal, silty 0.54 Slightly dirty coal, resinous — 10.40 Coal 0.03 Dirty coal, siltstone stringers — (B Seam) 1.96 Slightly dirty coal, resinous to highly resinous 1.20 Slightly dirty coal, silty in places, resinous 0.20 Bony shale, resinous 1.18 Slightly dirty coal, resinous 0.09 Bony shale	10.4	537.0	547.9
Siltstone	Light gray (N7) to grayish black (N2) carbonaceous	3.7	547.9	551.7
Shale	Grayish black (N2) to brownish black (5 YR 2/1), bony resinous	0.60	551.7	552.4
Coal	0.85 Slightly dirty coal, resinous 1.10 Coal; resinous, broken 0.92 Slightly dirty coal, resinous 0.09 Dirty coal, nonresinous — 5.43 (A Seam, Top Split) 0.31 Slightly dirty coal, nonresinous 0.51 Dirty coal, siltstone stringers, resinous 1.30 Slightly dirty coal, slightly resinous 0.30 Dirty coal, resinous, silty 0.05 Bony shale	5.4	552.4	558.0
Shale	Medium dark gray (N4) to dark gray (N3), carbonaceous, broken silty towards end; dirty coal from 560.0 to 560.3 and from			

cc6.chapter6/3

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	561.2 to 562.2, broken	7.7	558.0	565.3
Sandstone	Very light gray (N8), medium dark gray (N4), grayish black (N2) mottled, fine gray, carbonaceous	14.8	565.3	580.1
Coal	0.23 Bony shale 0.54 Slightly dirty coal, resinous 0.82 Bony shale 2.53 (A Seam, Bottom Split) 0.47 Slightly dirty coal, silty in places, resinous 0.47 Bony shale	2.5	580.1	582.8
Shale	Bony to carbonaceous to bony	2.2	582.8	585.0
Coal	Slightly dirty, slightly resinous (2.23)	2.2	585.0	587.2
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled to light gray (N7) and dark gray (N3) banded fine to medium gray sandstone, x-bedded; with a middle dark gray (N4) very fine gray sandstone to siltstone from 588.7 to 591.7	27.7	587.2	615.0

BOTTOM OF HOLE
T.D. = 615.0'
ENTIRE HOLE STEMMED WITH 25 BAGS CEMENT
2/5/76 5:30 pm

DRILL HOLE LOG
McCULLOCH DRILL HOLE #99

LOCATION: SW1/4, NE1/4, Sec. 31, T. 12 S., R. 10 E., Carbon County, Utah Willow Creek

LATITUDE:	513,326.253
DEPARTURE:	2,186,377.398
COLLAR ELEVATION:	6,407.29
TOTAL DEPTH:	535.0
INCLINATION:	90

DRILLED BY:	Gary Greener, Longyear Company
LOGGED BY:	K.L. Ball, American Electric Power Service Corp.
DATE STARTED:	6/23/76
DATE FINISHED:	6/29/76

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	Rotary Start NQ		0	60
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled, fine grain	1.3	60	61.3
Siltstone	Medium gray (N5), carbonaceous in places	4.1	61.3	66.1
Sandstone	Very light gray (N8), fine grain, silty in places	2.9	26.1	69.0
Siltstone	Medium dark gray (N4), carbonaceous, bony in places, coal, bright banded from 71.2 to 71.2 and 77.4 to 78.7	11.3	69.0	62.3
Sandstone	Very light gray (N8) and medium gray (N5) mottled fine grain, silty, slickensided at (near horizontal) 83.5'	2.7	82.3	85.0
Siltstone	Medium dark gray (N4) carbonaceous, coal bright banded, from 87.4 to 88.0	8.3	85.0	93.3
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled, fine grain, in places, medium dark gray (N4) siltstone laminated throughout	7.7	93.3	101.0
Siltstone	Medium dark gray (N4) to medium light gray (N6), carbonaceous, 101.2 bony from to 103.8, sandy in places	15.3	101.0	115.0
Sandstone	Very light gray (N8) with medium dark gray (N4) mottling in places, fine grain bony in places	10.4	115.0	126.4
Siltstone	Medium dark gray (N4), medium light gray (N6) and very light gray (N8) mottled, carbonaceous, bony in places, very light gray (N8) sandstone lamina to thin interbeds throughout. Coal bright banded from 150.3 to 150.6	26.6	126.4	152.2

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TB
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled, fine grain to very fine grain carbonaceous partings in places, medium dark gray (N4) siltstone lamina throughout	8.2	152.2	160.4
Siltstone	Medium dark gray (N4) and medium light gray (N6) mottled, carbonaceous, bony in places, sandy, coal, bright banded from 161.5 to 162.5	14.9	160.4	174.7
Sandstone	Very light gray (N8) with medium gray (N5) mottling in places, fine grain enfractured in places, pyritic along fractures	12.8	174.7	188.0
Siltstone	Medium dark gray (N4), carbonaceous, bony in places, fractured in places pyritic along fractures, very light gray (N8) fine grain sandstone lamina in places	19.4	188.0	208.7
Sandstone	Very light gray (N8) and medium gray (N5) mottled, very fine grain to fine grain, carbonaceous in places, silty, coal, bright banded from 212.5 to 214.1	19.3	208.7	227.0
Coal	2.5 Bright banded, vitrain and durain, slightly resinous, very silty 2.5 coal	2.5	227.0	229.5
Siltstone	Medium gray (N5), carbonaceous, coal, bright banded from 233.6 to 235.2 and 241.5 to 243.1		229.5	243.7
Sandstone	Very light gray (N8) and light gray (N7) mottled, very fine grain	5.5	243.7	249.2
Siltstone	Medium dark gray (N4) and light gray (N7) mottled sandy in places	4.8	249.2	254.0
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled, fine grain, carbonaceous in places, silty, broken in places	38.3	254.0	292.7
Siltstone	Medium dark gray (N4), carbonaceous, bony coal, bright banded from 297.3 to 299.5	7.0	292.7	299.9

cc6.chapter6/4

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Sandstone	Very light gray (N8) and medium light gray (N6) mottled, carbonaceous in places, silty bony from 307.9 to 308.4	26.7	299.9	325.3
Coal	8.2 Bright banded, vitrain and durain, slightly 8.2 Coal	8.2	325.3	333.1
Sandstone	Very light gray (N8) and medium dark gray (N4) mottled, fine grain, carbonaceous in places, medium dark gray (N4) siltstone lamina to thick interbeds throughout	19.2	333.1	352.0
Siltstone	Medium dark gray (N4) and light gray (N7) mottled, carbonaceous in places sandy throughout, dark gray (N3) carbonaceous shale from 352.5 to 355.5 and coal bright banded, from 359.7 to 360.1	58.4	352.0	409.5
Shale	Dark gray (N3) carbonaceous	0.5	409.5	410.0
Coal	22.7 Bright banded, vitrain and durain, resinous 22.7 Coal	22.7	410.0	432.3
Sandstone	Very light gray (N8), light gray (N7) and medium gray (N5) mottled, fine grain carbonaceous in places, fractured in places, medium dark gray (N4) siltstone lamina to thick interbeds throughout, coal, bright banded from 435.4 to 436.6	32.4	432.3	465.0
Coal	1.45 bright banded, vitrain and durain, resinous 0.60 Bony shale 6.40 Bright banded, vitrain and durain, resinous 8.70 Coal 0.25 Bony shale	8.7	465.0	473.0
Sandstone	Very light gray (N8), medium gray (N5) and medium dark gray (N4) mottled, fine grain, carbonaceous in places, silty, dark gray (N3) carbonaceous shale from shale from 486.6 to 489.3	22.9	473.0	495.8
Coal	1.15 Bright banded vitrain and durain, slightly resinous 0.25 Bony shale 0.25 Bright banded vitrain and durain, slightly resinous 3.30 Coal	3.3	495.8	498.7

cc6.chapter6/4

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	0.35 Bony shale 0.90 Bright banded, vitrain and durain, nonresinous 0.40 Bony shale			
Sandstone	Very light gray (N8) and dark gray (N3) mottled, fine grain	8.9	498.7	507.6
Siltstone	Medium dark gray (N4) carbonaceous	3.7	507.6	511.3
Sandstone	Very light gray (N4) and medium dark gray (N4) mottled, fine grain, carbonaceous at end	5.3	514.0	519.3
Coal	0.75 Bright banded, vitrain and durian, nonresinous, very silty 0.25 Bony shale 3.35 Coal 2.35 Bright banded, vitrain and durain, nonresinous, very silty and broken	3.4	519.3	522.2
Siltstone	Medium gray (N5), carbonaceous in places, grades to sandstone at end	7.1	522.2	529.5
Sandstone	Very light gray (N8) and dark gray (N3) banded, fine grain, crossbedded	5.1	529.5	535.0

BOTTOM OF HOLE (6/29/76)
T.D. 535.0
Entire hole stemmed 22 bags of cement

DRILL HOLE LOG
McCULLOCH DRILL HOLE MC-117-76

LOCATION: NE1/4, SW1/4, SEC. 33, T. 12 S., R TO E. Carbon County, Utah, Dry Canyon

LATITUDE:	512, 377.568
DEPARTURE:	2,195,837.513
COLLAR ELEVATION:	7,922.63
TOTAL DEPTH:	1,405
INCLINATION:	90

DRILLED BY:	Roy Dennis, Longyear Company
LOGGED BY:	D. Stephens, American Electric Power Service Corporation
DATE STARTED:	11/18/76
DATE FINISHED:	12/9/76

cc6.chapter6/4

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	HQ 0-500' NQ 500' on			
			0	50
Sandstone	Very light gray (N8), with light gray (N7) banding, fine-medium grained, some siltstone interbeds	107	50	155
Siltstone	Very light gray (N8), light gray (N7), with some medium gray (N5) mottling, slightly sandy to very sandy in places, with some fine grained sandstone interbeds	320	155	475
Sandstone	Very light gray (N8), light gray (N7), some medium gray (N5) mottling, fine grained, with siltstone interbeds	125	475	600
Siltstone	Very light gray (N8), light gray (N7), some medium gray (N5) mottling, slightly sandy	15.6	600	615.6
Coal	Bright, hard	3.6	615.6	619.2
Siltstone	Very light gray (N8), light gray (N7), with some medium gray (N5) mottling, slightly sandy in places, some fine grained sandstone interbeds. With coal as follows: TC 621.6 coal 0.8, TC 632.8 coal 0.3, TC 770.5 coal/bone 0.9, TC 739.6 coal 1.2, TC 754.4 coal 1.0, TC 774.3 coal 2.5 bone 0.4, TC 785.5 coal 0.65, TC 799.6 coal 1.9, TC 829.1 coal 2.7, TC 851.2 coal 1.4, TC 860.3 coal, 1.3, TC 877.4 coal 1.6, TC 881.6 coal 0.2, TC 888.0 coal 1.0	280	619.2	899.4
Coal	Bright, hard, with resin	4.4	899.4	903.8
Siltstone	Very light gray (N8), light gray (N7), with medium gray (N5) mottling	15.0	903.8	918.5
Coal	0.04 Coal, bright, hard 0.23 Siltstone 8.47 8.20 Coal, bright, hard	8.47	918.5	926.9

cc6.chapter6/4

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Siltstone	Very lightgray (N8), light gray (N7), with medium gray (N5) mottling, slightly sandy to very sandy in places, some shalely interbeds, with coal seams as follows: TC 981 coal 1.6, TC 984.3 coal 0.7, TC 1/0 TC 1000.2 coal 0.6, TC 1011.5 coal 3.8, TC 1054.5 bone 1.1, TC 1059 coal 1.1, TC 1061.2 coal and bone 0.6, TC 1079 bone 0.4	166	926.9	1092.6
Coal	7.15 Bright, hard, with resin - coal 0.05 Siltstone 9.3 2.07 Bright, hard, with resin - coal	9.3	1092.6	1101.9
Sandstone	Very light gray (N8), light gray (N7), fine grained, silty	83	1101.9	1185
Siltstone	Very light gray (N8), light gray (N7), with medium gray (N5), mottling	70	1185	1255
Sandstone	Very light gray (N8), light gray (N7), fine grained	85	1255	1340.2
Siltstone	Very light gray (N8), light gray (N7), with some medium gray (N5) mottling, sandy to very sandy in places	65	1340.2	1405

Bottom of hole 1405
Finished 12/9/76
25 Bags of cement to stem hole
1 Bag cement used to cap hole

DRILL HOLE LOG
McCULLOCH DRILL HOLE MC-132-77

LOCATION: NW1/4, SW1/4, SEC. 2, T. 13 S., R. 9 E. Carbon County, Utah, Gentil Canyon

LATITUDE:	506,981.411
DEPARTURE:	2,173,406.760
COLLAR ELEVATION:	6,796.63
TOTAL DEPTH:	515.0
INCLINATION:	90

DRILLED BY: G. Greener, Longyear Company

LOGGED BY: K. L. Ball, American Electric Power Service Corporation

DATE STARTED: 2/17/77

DATE FINISHED: 2/24/77

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
	Rotary		0	20.0
	Start HQ			
Sandstone	Very pale orange (10 Y 8/2) to very light gray (N8) and medium dark gray (N4) mottled fine grain, siltstone lamina throughout Top of coal 26.0 coal 1.3'	13.1	20.0	33.4
Siltstone	Medium dark gray (N4), carbonaceous, shalely in places, broken in places, very light gray (N8) sandstone lamina in places, Top of coal 7.3, coal 0.8'	31.1	33.4	65.0
Coal	0.9 Bony shale 2.7 Bright banded, vitrain and durain, nonresinous 3.9 Coal 0.3 Bony shale	3.9	65.0	68.9
Siltstone	Medium dark gray (N4), medium gray (N5) and very light gray (N8) mottled, carbonaceous in places, shalely and broken in places, very light gray (N8) sandstone lamina throughout	11.1	68,9	81.1
Sandstone	Very light gray (N8) and medium light gray (N6) mottled, fine grain, carbonaceous in places, with carbonaceous partings, silty in places, Top of coal 93.7 coal and bone 0.7, Top of coal 100.4 coal 2.9'	43.1	81.1	123.3
Coal	4.2 banded, vitrain and durain, nonresinous 4.2 coal	4.2	123.3	127.5
Sandstone	Very light gray (N8) and medium gray (N5) mottled, fine grain to very fine grain carbonaceous in places, medium gray (N5) siltstone lamina to thin interbed throughout, Top of coal 148.6 coal 1.6', Top/0 of coal 164.8 coal 0.9', Top of coal 174.2 coal 0.3', Top of coal 17/0 7.4 coal 1.2' Mislatch between 145-155-5.0' core missing	59.1	127.5	192.0
Coal	6.9 Bright banded, vitrain and durain, resinous 6.9 Coal	6.9	192.0	198.9

cc6.chapter6/4

LITHOLOGY	DESCRIPTION	THICKNESS RECOVERED	FROM	TO
Siltstone	Medium gray (N5) medium dark gray (N4) and light gray (N7) mottled, carbonaceous bony in places, shalely in places sandy at start, Top of coal 212.1 coal 2.5' Top of coal 217.6 coal 0.3'	38.9	198.9	240.0
Sandstone	Very light gray (N8) and medium gray (N5) mottled fine grain carbonaceous in places with carbonaceous partings, fractured in places, medium gray (N5) siltstone lamina to thin interbeds throughout stuck rods at 260. Hit old mine works 267 - 271	27.3	240.0	267
Coal	Old mine works	4	267	271
Sandstone	Very light gray (N8), and medium gray (N5) mottled to banded fine grain, crossbedded, carbonaceous partings in places, Top of coal 277.4 coal 0.8'	179	271	450.8
Coal	3.4 Bright banded, resinous 3.4 Coal	3.4	450.8	454.2
Sandstone	Very light gray (N8) and medium gray (N5) mottled, fine grain carbonaceous shale at start, fractured in places, medium gray (N5) siltstone lamina throughout, Top of coal 456.1 coal 0.5'	14.1	454.2	469.5
Siltstone	Medium gray (N5) to medium dark gray (N4) in places, carbonaceous shalely in places, Top of coal 475.0 coal and bone 2.8'	15.4	469.5	485.0
Coal	4.5 Bright banded, vitrain and durain, resinous 4.5 Coal	4.5	485.0	489.5
Sandstone	Very light gray (N8) and medium dark gray (N4) banded, medium grain carbonaceous partings in places, crossbedded	25.5	489.5	515.0

Bottom of hole 2/24/77
T.D. 515.0'
Stemmed to surface